

ENERGY MANAGEMENT IN THE JORDANIAN CEMENT INDUSTRY

Thesis Submitted for the degree of

Doctor of Philosophy

APPENDICES

DATA USED AND STATISTICAL ANALYSIS

COMPUTER OUTPUT

Department of Management and Organisation

University of Stirling

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Data for kiln no. (1) Rashadiya plant

Year		EL	FUEL	AvNO	AvHOURS	PRORAT E	AVL
1990	3	21.1	87.36000	0.25810	7.00000	119	98.11828
	4	20.5	85.65867	0.13333	5.86667	121	93.47222
	5	19.3	84.78662	0.09680	7.74200	129	99.86559
	6	18.2	84.63140	0.16667	0.56667	122	95.69444
	7	20.6	86.25434	0.29030	8.70970	122	90.45699
	8	18.5	83.74478	0.19350	9.54840	128	94.35484
	9	18.6	83.58919	0.30000	2.76667	124	96.66667
	10	18.9	84.32321	0.29030	2.87100	126	89.38172
	11	18.4	84.18898	0.20000	0.50000	128	99.30556
	12	18.6	85.06078	0.09680	0.22580	131	99.05914
1991	1	21.8	87.91743	0.38710	16.27420	126	80.00000
	3	23.4	90.83079	0.38710	19.61290	111	92.00000
	4	19.4	87.45671	0.23333	2.90000	120	88.00000
	5	21	86.54315	0.38710	3.06450	130	90.00000
	6	19.4	84.28256	0.33333	5.28000	126	78.00000
	7	19.1	83.70253	0.32260	0.93550	127	96.00000
	8	20	84.53379	0.06450	18.48390	126	99.00000
	9	19.5	84.80962	0.20000	3.90000	127	86.00000
	10	19.7	86.68296	0.19350	1.00000	124	96.00000
	11	20.6	88.69057	0.10000	0.50000	121	99.00000
	12	20.2	86.48848	0.22580	3.22580	122	88.00000
1992	1	22.5	87.72384	0.29030	24.00000	117	91.80108
	2	24.8	87.67612	0.48280	16.03450	109	96.27976
	3	27	89.46272	0.35480	17.00000	118	91.26344
	4	20.9	88.94096	0.36667	20.61000	119	94.44444
	5	20.1	87.83831	0.12900	10.50970	124	95.83333
	6	20.2	90.00887	0.26667	0.80000	122	93.75000
	8	20.07	87.89614	0.38710	6.48390	125	93.14516
	9	19.4	86.64883	0.30000	3.42333	125	98.47222
	10	19.6	85.98422	0.16130	1.12900	124	95.16129
	11	19.6	86.15943	0.50000	6.60000	124	90.41667
	12	20.5	90.11117	0.26810	2.93550	122	93.95161
1993	1	20.5	89.95983	0.51610	2.58060	119	88.70968
	2	20.3	91.83593	0.32140	1.60710	122	93.75000
	3	22.1	90.87378	0.29030	11.25810	117	88.84409
	4	21.4	90.11387	0.20000	10.96667	114	98.47222
	5	19.8	88.26565	0.19350	1.67740	123	91.80108
	6	21	88.68275	0.23333	4.60000	123	82.08333
	7	19.6	87.70541	0.19350	3.09680	129	87.90323
	8	19.9	85.53900	0.22580	5.93550	122	98.11828
	9	19.4	84.57052	0.20000	1.36667	126	94.16667
	10	19.6	86.23240	0.38710	0.87100	123	96.77419
	11	20	86.69504	0.46667	1.96667	125	91.52778
	12	20.1	88.02319	0.29030	1.61290	123	93.27957

Data for kiln no. (2) Rashadiya plant

Year		EL	FUEL	AvNO	AvHOURS	PRORAT E	AVL
1990	1	20.4	87.27000	0.29030	3.35480	118	90.72580
	2	19.5	93.27527	0.28570	3.39290	122	93.00595
	4	20.1	88.40212	0.10000	17.56667	112	90.69444
	5	18	85.25179	0.09680	5.09680	127	99.73118
	6	17.4	85.85651	0.03333	10.60000	119	95.29570
	7	17.6	84.46239	0.09680	6.19350	121	96.23656
	8	16.8	84.15858	0.25810	1.09680	124	90.27778
	9	17.2	82.92186	0.40000	1.73333	119	96.10215
	10	17.9	87.47459	0.29030	1.03226	124	94.02778
	11	17.7	84.02065	0.20000	4.53333	125	96.50538
	12	17.6	84.86631	0.19350	0.56060	129	98.00000
1991	1	20.6	86.44126	0.22580	16.35480	124	98.00000
	2	20.2	86.65330	0.14290	10.35710	125	83.00000
	3	21.8	89.22343	0.22580	11.29030	127	88.00000
	4	20.2	85.54676	0.26667	7.60000	122	93.00000
	5	22.9	102.38040	0.25810	20.00000	105	95.00000
	6	18.5	85.87798	0.36667	1.33333	123	88.00000
	7	18.5	83.95555	0.32260	4.32260	123	97.00000
	8	19.7	83.94484	0.22580	5.03230	125	95.00000
	9	19.5	84.15465	0.20000	6.73333	124	83.00000
	10	20.3	87.70862	0.25810	4.67740	115	90.00000
	11	20.5	89.50666	0.16667	16.70000	117	94.00000
	12	19.4	86.13997	0.38710	1.61290	122	91.26344
1992	1	21.4	104.81946	0.38710	9.45160	118.8823	90.17857
	2	24.5	89.89325	0.62070	19.06900	112.0217	80.24194
	3	21.6	88.53087	0.25065	6.16130	116.0597	96.38889
	4	19.8	87.62711	0.16667	7.43333	117.9315	64.78495
	5	20.5	90.77480	0.38710	11.03230	116.1919	95.55556
	6	18.6	87.65984	0.13333	1.66667	122.4373	75.26882
	8	18.8	86.72009	0.19350	3.00000	123.4439	89.91935
	9	18.4	86.32606	0.16667	2.43333	123.2163	97.08333
	10	18.2	86.44933	0.25810	2.35480	123.7941	91.53226
	11	18.8	87.70863	0.46667	2.00000	122.0984	92.63889
	12	19.1	90.19354	0.19350	3.83870	118.7135	85.88710
1993	1	19.9	91.96710	0.19350	13.51610	116	97.98387
	2	20.2	91.23678	0.21430	17.35710	115	95.68452
	3	20.3	88.78384	0.48390	5.25810	120	81.18280
	4	18.6	85.90425	0.20000	1.60000	127	92.22222
	5	18.6	86.97185	0.38710	2.83870	125	89.91935
	6	19	88.49303	0.23333	1.80000	125	92.22222
	7	19.1	86.83871	0.22580	7.54840	125	96.50538
	8	19.5	86.25005	0.51610	4.29030	118	92.60753
	9	18.8	87.52643	0.36667	2.66667	123	88.61111
	10	19.1	90.10905	0.35480	2.64520	114	88.57527
	11	18.3	88.04215	0.40000	2.66667	123	96.52778
	12	20.3	89.83197	0.38710	8.64520	119	90.05376

Data for kiln no. (4) Fuhais plant

Year	EL	FUEL	AvNO	AvHOURS	PRORATE	AVL	Aratio	Sratio	LSF	
1990	3	38	90	0.129	17.000	23	99	1.66	2.49	95.21
	4	28	88	0.300	2.600	25	95	1.84	2.48	94.76
	5	34	89	0.355	8.450	26	83	1.77	2.51	94.20
	6	29	90	0.100	2.770	24	100	1.74	2.44	95.50
	7	33	88	0.516	3.450	25	89			
	8	34	87	0.161	6.900	25	94	1.76	2.50	94.60
	9	28	88	0.200	5.670	29	95	1.91	2.46	94.80
	11	28	90	0.194	10.400	28	99	1.75	2.53	93.60
	12	26	90	0.226	1.550	30	95	1.72	2.46	94.80
1991	29	88	0.323	6.290	27	93	1.72	2.44	95.90	
	2	25	89	0.071	0.214	28	99	1.72	2.46	95.20
	3	24	88	0.129	1.390	28	94	1.73	2.45	95.20
	4	29	90	0.333	6.070	27	93	1.72	2.47	94.40
	5	27	89	0.129	8.610	28	97	1.71	2.42	94.40
	6	27	97	0.466	3.830	29	89	1.67	2.50	95.70
	7	30	91	0.387	4.350	26	83	1.63	2.50	95.00
	8	28	90	0.387	3.230	26	82	1.61	2.50	94.00
	9	28	89	0.166	2.370	26	93	1.62	2.48	95.00
	10	30	98	0.194	1.260	23	95	1.54	2.48	95.00
	11	30	100	0.200	2.170	24	94	1.52	2.51	94.80
1992	29	104	0.097	1.970	23	97	1.46	2.52	95.70	
	2	29	101	0.310	2.480	22	92	1.10	2.52	96.00
	3	30	101	0.293	4.290	22	95	1.44	2.55	96.10
	4	30	101	0.166	10.530	24	92	0.87	2.53	96.30
	5	32	103	0.419	3.940	24	90	0.86	2.42	94.80
	6	29	93	0.233	2.100	25	91	0.84	2.44	95.10
	7	27	91	0.226	3.960	26	86	0.84	2.36	95.30
	8	26	93	0.355	1.420	27	94	2.20	2.50	94.80
	9	30	93	0.267	5.000	27	96	1.52	2.50	95.70
	10	29	90	0.129	2.740	28	92	0.84	2.40	95.40
	11	32	98	0.367	2.900	26	92	1.31	2.36	95.00
	12	30	102	0.387	3.420	26	86	1.10	2.48	95.70
1993	29	95	0.355	1.900	26	92	1.21	2.43	96.25	
	2	37	93	0.250	14.960	25	95	1.59	2.46	96.40
	3	21	89	0.258	3.160	27	87	1.65	2.44	94.90
	4	26	89	0.400	2.930	27	89	0.90	2.42	94.70
	5	27	90	0.129	1.680	26	93	0.89	2.41	95.20
	6	36	100	0.367	12.770	24	86	0.90	2.36	93.70
	7	29	97	0.129	1.060	25	95	0.90	2.34	93.90
	8	27	97	0.258	1.190	26	95	1.25	2.42	94.60
	9	26	98	0.267	1.330	26	94	1.61	2.46	95.10
	10	29	91	0.161	3.970	28	96	1.71	2.44	94.60
	11	26	92	0.267	2.070	27	92	0.83	2.48	94.70
	12	26	94	0.161	0.871	27	97	0.84	2.45	93.80

Data for kiln no. (5) Fuhais plant

Year	EL	FUEL	AvNO	AvHOURS	PRORATE	AVL	Aratio	Sratio	LSF	
1990	4	30	92	0.500	4.890	60	95	1.87	2.46	94.6
	5	29	88	0.387	0.838	63	97	1.75	2.49	94.2
	6	32	88	0.400	9.000	57	94	1.73	2.50	95.5
	7	31	86	0.129	0.806	53	97	1.64	2.49	95.1
	8	31	89	0.258	5.740	60	94	1.73	2.47	94.9
	9	29	87	0.200	3.167	66	97	1.88	2.45	94.9
	10	33	94	0.484	6.000	60	87	1.91	2.42	96.0
	11	31	89	0.387	0.903	53	98	1.70	2.49	95.4
	12	34	94	0.323	9.190	53	99	1.70	2.44	94.2
1991	1	31	90	0.323	5.100	59	93	1.67	2.44	96.0
	2	30	95	0.429	2.070	64	89	1.70	2.44	94.9
	3	30	88	0.258	1.230	61	96	1.67	2.45	94.6
	4	30	87	0.133	1.170	56	95	1.69	2.43	94.2
	5	33	87	0.032	14.320	57	100	1.69	2.45	94.1
	7	32	92	0.581	4.610	60	86	1.65	2.49	93.6
	8	30	93	0.323	2.970	66	88	1.64	2.48	94.3
	9	30	94	0.400	2.700	63	90	1.64	2.48	94.1
	10	38	98	0.323	4.840	54	79	1.57	2.46	96.1
	11	37	105	0.233	8.530	53	96	1.52	2.48	95.2
	12	33	132	0.581	1.130	41	95	1.71	2.48	94.4
1992	1	39	110	0.903	4.550	53	85	1.54	2.48	95.6
	2	41	104	0.552	6.170	49	90	1.45	2.48	95.5
	3	36	104	0.710	3.030	53	82	1.45	2.48	95.5
	4	34	104	0.300	9.870	60	89	1.55	2.49	94.8
	5	33	101	0.355	10.350	61	98	1.59	2.46	94.5
	6	33	99	0.467	2.330	58	91	1.58	2.44	96.0
	7	38	105	0.548	6.810	55	85	1.58	2.46	94.6
	8	37	110	0.323	10.060	53	91	1.54	2.46	96.2
	9	33	102	0.600	2.930	58	88	1.62	2.48	94.6
	10	35	100	0.290	4.680	59	88	1.73	2.41	96.0
	11	40	110	0.533	9.330	53	80	1.81	2.42	95.6
	12	33	103	0.581	4.840	60	80	1.66	2.48	94.8
1993	1	37	105	0.807	9.710	56	82	1.59	2.46	96.3
	2	34	99	1.070	4.750	63	89	1.54	2.48	96.1
	3	34	99	0.549	5.000	63	91	1.56	2.44	95.2
	4	33	97	0.400	1.700	64	93	1.70	2.45	95.6
	5	32	100	0.226	1.480	63	94	1.65	2.46	95.6
	6	40	108	0.667	10.570	58	87	1.68	2.43	94.5
	7	36	102	0.323	9.610	58	92	1.75	2.43	94.6
	8	33	97	0.452	2.550	65	92	1.66	2.46	94.8
	9	36	103	0.467	4.330	60	82	1.71	2.45	95.2
	10	31	92	0.452	0.935	63	96	1.64	2.44	95.3
	11	30	93	0.200	0.567	64	98	1.54	2.44	96.3
	12	32	97	0.129	0.742	62	97	1.60	2.45	96.9

Data for kiln no. (6) Fuhais plant

Year	EL	FUEL	AvNO	AvHOURS	PRORATE	AVL	Aratio	Sratio	LSF	
1990	1	28	84	0.355	9.940	117	89	1.82	2.48	93.2
	2	37	83	0.107	14.860	107	89	1.90	2.44	94.3
	4	27	84	0.300	2.710	120	93	1.88	2.47	93.6
	5	27	82	0.129	0.903	121	96	1.84	2.47	93.5
	6	27	81	0.133	0.933	119	98	1.84	2.47	93.7
	7	34	84	0.419	11.260	115	87			
	8	27	81	0.323	2.810	121	86	1.87	2.47	92.3
	9	26	83	0.433	4.000	124	83	1.93	2.47	94.1
	10	32	87	0.323	14.060	118	93	1.91	2.46	94.0
	11	28	84	0.367	2.530	121	90	1.81	2.48	94.0
	12	26	85	0.355	1.970	123	92	1.74	2.29	94.3
1991	31	84	0.323	13.590	122	93	1.77	2.22	96.3	
	2	26	84	0.143	1.690	120	100	1.75	2.21	95.3
	3	26	83	0.129	1.520	120	96	1.74	2.24	94.9
	4	27	83	0.300	1.600	113	96	1.61	2.28	94.5
	5	26	80	0.226	3.940	118	97	1.71	2.36	94.5
	6	33	83	0.467	15.400	113	93	1.63	2.36	95.4
	7	27	83	0.226	1.420	118	94	1.72	2.35	94.3
	8	26	83	0.161	0.483	118	98	1.69	2.38	94.0
	9	28	84	0.533	6.800	121	89	1.72	2.40	93.9
	10	26	86	0.258	1.550	120	97	1.69	2.40	94.5
	11	33	103	0.300	10.900	101	93	1.68	2.40	94.4
1992	36	102	0.258	9.000	100	86	1.57	2.46	94.1	
	2	48	101	0.207	18.000	101	93	1.53	2.45	95.9
	3	32	95	0.548	4.420	99	90	1.59	2.45	95.6
	4	27	84	0.300	1.570	111	94	1.70	2.44	94.8
	5	26	88	0.387	0.419	111	98	1.69	2.45	94.0
	6	28	89	0.333	9.400	100	98	1.69	2.46	93.4
	7	22	86	0.516	6.130	112	89	1.72	2.44	93.3
	8	28	83	0.258	13.320	119	86	1.70	2.49	92.1
	9	26	85	0.400	4.500	115	88	1.73	2.43	93.2
	10	26	84	0.419	5.770	114	95	1.85	2.36	92.6
	11	29	94	0.500	3.770	101	94	1.87	2.40	93.1
	12	29	92	0.613	4.160	108	91	1.83	2.41	92.4
1993	32	91	0.258	10.840	105	87	1.77	2.41	92.2	
	3	26	90	0.419	2.550	117	89	1.79	2.41	93.2
	4	29	91	0.500	6.170	114	76	1.84	2.38	92.9
	5	29	90	0.258	4.320	117	82	1.77	2.40	93.2
	6	30	96	0.600	7.100	114	70	1.74	2.41	92.3
	7	34	102	0.419	6.680	109	73	1.73	2.43	93.1
	8	27	90	0.290	2.870	119	89	1.72	2.43	93.3
	9	26	93	0.133	12.270	113	99	1.71	2.44	94.1
	10	29	86	0.194	1.190	114	95	1.74	2.41	92.8
	11	31	84	0.167	1.130	119	95	1.70	2.44	91.2
	12	28	88	0.194	1.610	120	93	1.69	2.43	93.4

Data for raw mill 1 - Rashadiya Plant

Year	EI	NO	HOURS	PRORATE	AVL
1990	25.3	42	352	243	86
2	24	40	276	245	89
3	25.5	37	337	244	96
4	22.5	41	136	233	98
5	24.6	26	345	234	95
6	25.3	33	390	232	96
7	22.7	27	173	230	90
8	21.7	31	201.5	235	89
9	20.6	32	118	242	88
10	21.2	28	95	237	96
11	23.3	20	495.8	234	79
12	26	9	666	239	94
1991	19.4	40	197	239	86
2	22	33	183	240	90
3	21	45	271	244	89
4	20.5	40	124	237	95
5	23	10	612	231	99
6	20.5	37	215	248	91
7	20.7	29	174	249	93
8	22.6	34	160	241	88
9	22.2	46	244	239	89
10	26.9	24	578	238	93.27957
11	27.4	26	553	239	91.66667
12	27	17	668	245	89.1129
1992	23.5	39	382	239	92.08333
2	22.6	54	161	240	86.55914
3	21.7	48	162	235	94.72222
4	22	38	302	239	88.97849
5	22	46	213	236	91.12903
6	21.9	69	167	241	94.16667
7	22.2	56	321	242	87.36559
8	22	65	187	239	85.55556
9	25	60	300	229	86.42473
10	24	86	199	230	81.58602
11	24	90	170	240	82.7381
12	25	48	446	239	89.38172
1993	26	50	432	230	87.91667
2	23	58	187	241	83.19892
3	23	39	265	241	94.72222
4	24	52	249	241	90.86022
5	24.79288	49	306	237	91.12903
6	23	44	169	241	90.41667
7	24	50	209	248	82.12366
8	23	55	241	254	88.33333
9	23	54	232	256	89.51613

Data for raw mill 2 - Rashadiya Plant

Year	EI	NO	HOURS	PRORATE	AVL
1990	23.5	57	267	246	90
2	22.5	43	221	250	81
3	25.5	13	612	239	96
4	20.5	51	244	242	92
5	21.3	33	435	247	95
6	20.6	33	306	243	93
7	19.8	50	191	244	91
8	19.3	51	194	243	87
9	20.7	40	168	239	88
10	19.5	32	231	240	90
11	18.4	42	118	235	94
12	22.8	16	548	232	95
1991	24	27	354	231	89
2	24	23	410	237	83
3	21	42	349	236	77
4	22	11	630	245	99
5	21.1	54	167	235	87
6	20.3	40	232	237	95
7	23	47	266	232	92
8	20.9	44	307	246	90
9	20.7	48	296	251	91
10	22.7	16	564	242	98
11	22	49	208	238	92
12	23.5	52	386	235	89.38172
1992	30.6	20	601	238	95.53571
2	23.5	42	291	239	81.98925
3	23	33	369	239	88.47222
4	22.3	40	437	250	79.43548
5	21.2	52	174	240	89.86111
6	21.5	38	284	243	91.80108
7	20.77	60	231	248	91.53226
8	20.9	65	227	250	94.16667
9	20.7	57	227	256	94.48925
10	21	69	246	260	86.94444
11	22	56	300	256	81.45161
12	22	45	505	251	88.17204
1993	23	28	550	250	95.08929
2	23	59	301	253	87.23118
3	21	90	221	251	83.05556
4	20	58	225	251	91.93548
5	19	54	222	255	95.83333
6	21	41	408	252	90.45699
7	20.71127	59	269	234	80.37634
8	20	54	204	238	86.11111
9	21	46	247	236	82.39247
10	20	71	242	259	90
11	22	51	393	255	86.55914

Data for raw mill 5 - Fuhais Plant

Year	EI	NO	HOURS	PRORATE	AVL
1990		1			100
2		1			100
3	39	9	660	111	98
4	29	27	232	112	78
5	23	31	158	133	95
6	26	17	444	133	93
7	25	19	182	129	95
8	24	19	364	136	93
9	21	22	306	151	89
10	23	20	381	142	92
11	21	25	302	141	83
12	22	12	468	140	100
1991	25	13	313	119	0
2	26	14	160	117	92
3	25	16	210	132	94
4	27	9	164	107	99
5	30		520	111	
6	21	8	695	93	98
7	25	33	289	134	93
8	24	14	293	141	99
9	24	22	271	141	92
10	28	15	373	133	98
11	29	21	413	129	98
12	39	23	289	115	93
1992	39	48	294	104	86
2	38	45	380	102	87
3	32	52	263	112	82
4	29	35	396	125	92
5	29	32	466	140	90
6	27	46	290	135	93
7	29	35	413	141	96
8	30	25	722	148	90
9	27	44	317	145	82
10	27	32	369	143	84
11	29	27	459	147	97
12	31	41	228	104.9	90
1993	26	39	431	123	88
2	31	48	255	128	87
3	28	37	331	142	90
4	28	37	295	145	89
5	25	57	335	164	77
6	26	31	513	169	85
7	26	25	513	174	84
8	24	38	336	164	89
9	25	43	368	154	72
10	24	45	339	168	74
11	24	44	307	169	79
12	23	40	345	174	80

Data for cement mill 4 - Fuhais Plant

Year	EI	NO	HOURS	PRORATE	AVL
1990	49	9	645	35	98
2	52	6	654	35	98
3	49	11	646	32	99
4	50	8	530	30	97
5	51	6	556	30	91
6	50	40	344	30	91
7	49	36	284	30	89
8	48	37	274	31	92
9	46	41	278	31	94
10	49	35	306	30	75
11	49	37	275	31	93
12	49	26	387	30	91
1991	45	5	711	33	100
2	45	43	496	31	100
3	46	20	585	30	100
4	43	32	515	30	97
5	46	42	552	30	100
6	44	30	582	30	100
7	45	26	551	30	99
8	44	44	417	31	94
9	44	38	266	30	89
10	45	37	293	30	75
11	45	31	211	30	90
12	41	23	497	32	100
1992	45	5	518	30	98
2	46	11	543	30	98
3	51	30	428	31	70
4	51	57	239	31	83
5	56	54	204	28	82
6	51	34	304	30	83
7	46	4	476	35	98
8	41	8	301	40	99
9	41	8	385	39	88
10	48	17	434	33	93
11	41	22	504	39	98
12	39	7	616	40	99
1993	39	10	556	41	89
2	42	8	526	38	99
3	40	39	472	40	92
4	49	38	430	32	85
5	48	43	360	32	90
6	51	28	526	30	87
7	45	37	428	35	89
8	51	39	472	32	90
9	50	42	359	28	86
10	48	34	448	31	90
11	49	35	340	30	88
12	48	37	473	32	88

Data for cement mill 5 - Fuhais Plant

Year	EI	NO	HOURS	PRORATE	AVL
1990	53	31	613	134	94
2	52	19	564	125	91
3	64	13	674	117	85
4	65	23	585	106	89
5	60	15	570	112	81
6	52	7	530	116	98
7	54	17	626	119	86
8	48	21	519	128	91
9	52	29	473	113	89
10	69	21	357	86	92
11	59	14	461	100	94
12	54	15	571	120	91
1991	66	21	622	106	96
2	58	12	595	110	82
3	61	11	641	104	99
4	58	17	586	105	96
5	56	12	538	108	96
6	55	12	533	110	98
7	52	17	552	116	94
8	50	31	506	124	92
9	56	32	472	110	95
10	47	35	380	130	88
11	43	39	504	138	93
12	45	24	548	137	96
1992	55	19	652	120	80
2	52	26	590	121	92
3	55	37	596	118	59
4	48	61	347	120	72
5	51	29	383	110	
6	51	30	552	115	
7	54	26	606	122	92
8	55	30	607	125	82
9	55	38	394	115	81
10	52	39	522	120	79
11	56	36	537	110	83
1993	55	52	375	115	84
2	51	32	393	115	90
3	58	44	353	100	78
4	61	48	540	97	75
5	49	28	645	113	78
6	55	47	519	105	82
7	49	48	544	116	74
8	50	52	498	117	81
9	54	54	489	110	83
10	54	45	552	105	83
11	55	36	536	102	89
12	58	29	656	110	89

Data for cement mill 6 - Fuhais Plant

Year	EI	NO	HOURS	PRORATE	AVL
1990	54	23	606	190	91
2	54	12	515	188	99
3	57	14	560	173	85
4	59	21	571	171	88
5	53	18	548	185	91
6	54	23	520	182	94
7	55	18	557	184	93
8	52	30	557	183	93
9	53	35	515	176	82
11	64	11	604	154	96
12	56	26	557	180	94
1991	60	19	601	172	95
2	63	18	571	160	95
3	67	19	616	148	90
4	69	26	592	146	96
5	63	36	511	156	92
6	71	36	487	136	90
7	70	44	463	136	90
8	56	48	442	170	90
9	69	52	400	141	76
10	53	60	453	172	63
11	52	28	474	181	96
12	70	42	617	151	88
1992	66	22	625	152	89
2	60	10	657	162	94
3	62	41	468	150	85
4	57	33	381	149	89
5	52	25	398	170	
6	51	21	441	173	
7	54	15	465	170	97
8	51	27	515	185	69
9	56	30	421	172	85
10	59	42	392	158	79
11	56	39	275	165	91
1993	64	19	574	151	93
2	74	5	618	141	90
3	65	30	594	156	89
4	56	70	240	168	87
5	53	63	304	183	81
6	58	60	365	186	78
7	54	93	316	189	80
8	57	84	354	168	75
9	60	45	318	160	81
10	60	68	309	166	80
11	61	42	284	155	84
12	58	53	325	162	85

Data for cement mill 7 - Fuhais Plant

Year	EI	NO	HOURS	PRORATE	AVL
1990	56	5	707	185	100
2	58	7	575	184	99
3	53	14	501	180	95
4	54	12	516	182	99
5	52	16	496	187	97
6	51	16	390	186	97
7	52	13	477	183	99
8	51	42	434	182	94
9	52	7	492	178	98
10	64	11	477	152	96
11	62	16	475	155	98
12	55	6	542	176	99
1991	74	4	736	174	55
2	58	3	619	180	67
3	57	12	609	178	98
4	53	11	540	182	98
5	53	33	466	176	
6	56	22	430	170	97
7	54	52	390	166	92
8	60	64	419	156	91
9	64	67	284	143	87
10	57	60	316	162	89
11	55	60	392	169	76
12	57	38	440	168	92
1992	56	18	532	171	90
2	59	12	589	168	97
3	55	32	426	172	96
4	55	42	298	167	91
5	65	60	299	146	
6	54	30	426	162	
7	52	37	367	179	93
8	54	39	471	173	88
9	54	56	309	171	75
10	55	52	334	173	84
11	62	49	364	152	78
12	55	42	378	168	90
1993	63	47	384	149	93
2	65	45	442	147	90
3	57	49	441	166	93
4	51	53	269	173	93
5	48	56	351	188	87
6	48	61	338	193	94
7	52	84	302	176	80
8	50	60	335	191	87
9	52	56	393	184	89
10	51	58	397	186	90
11	54	32	378	173	89
12	53	41	394	177	98

Data for cement mill 2 - Rashadiya Plant

Year	EI	NO	HOURS	PRORAT E	AVL
1990	64	1	579.5	78.7	97
2	65	15	683	79	99
3	55	6	650	85	97
4	61	5	714.24	83	99
5	55	7	599.9	82	97
6	51.8	8	639	82	99
7	53.4	2	676	81	100
8	54.4	5	635	81	99
9	56.9	13	651	80	90
10	55	13	681	79	100
11	66.2	7	666.5	68	100
12	54.8	39	638.2	76	100
1991	50.9	38	541	80	95.83333
2	51.7	62	520	77	96.37097
3	48.2	50	247	78.6	99.16667
4	51	54	284	75	95.43011
5	46.7	21	522.8	84	99.19355
6	47.5	44	270	81	100
7	50	22	433	79	98.92473
8	48	58	235	80	100
9	48	30	452	81	89.78495
10	51	39	542	79	73.52151
11	49	52	268	78	75.74405
12	48	46	354	80	55.37634
1992	51	41	439	80	72.36111
2	49	59	338	79	78.76344
3	49	45	370	81	85.97222
4	48	43	195	81	87.36559
5	47.95997	45	260	81	73.92473
6	47	54	184	81	89.86111
7	49	73	209	80	85.21505
8	51	44	216	75	83.61111
9	53	33	409	71	89.38172

Data for cement mill 3 - Rashadiya Plant

Year	EI	NO	HOURS	PRORATE	AVL
1990	60.1	29	425	60.1	77
2	65.2	10	632	65.2	96
3	61	6	544	61	93
4	57.4	10	579	57.4	93
5	62.9	4	644.1	84	99
6	70	25	559	83	97
7	80.4	11	706	83	99
8	63	25	570	86	99
9	57	2	555	92	96
10	62.5	7	529.9	88	99
11	56.7	5	680.8	86	99
12	51.4	4	452	90	97
1991	57.7	6	564	82	90
2	79.6	1	731.6	60	99.32796
3	60	19	639	79	97.17262
4	54.8	47	567.3	81	98.79032
5	54.1	43	459	79	99.30556
6	53	47	448	79	96.10215
7	53.8	54	235	74.5	98.61111
8	54	66	259	75	99.46237
9	53.6	57	441.9	76	100
10	53.2	51	385	76	96.66667
11	47	47	360	83	89.86111
12	48	36	334	81	96.37097
1992	52	45	382	76	75.80645
2	50	59	351	78	57.8869
3	48	61	331	81	64.51613
4	48	45	454	84	59.58333
5	48	57	292	82	70.43011
6	49	49	325	85	79.86111
7	46	38	267	85	74.32796
8	49.40402	57	212	79	85.61828
9	46	56	227	85	84.86111
10	46	59	276	85	85.34946
11	48	64	210	83	82.77778
12	46	55	173	84	86.96237

Data for cement mill 4 - Rashadiya Plant

Year	EI	NO	HOURS	PRORATE	AVL
1990	62.2	19	586	85	93
2	62.6	15	594.3	80.8	96
3	60	7	570	82.5	82
4	56.5	12	565	87	95
5	62.6	4	652.4	84	100
6	71	12	626	82	100
7	82.7	21	672	85	95
8	55	10	619.4	87	96
9	49.8	19	463	90	96
10	52.1	17	224	87	97
11	60.2	7	585	89	90
12	55.9	14	590	84	96
1991	56.2	11	664.6	83	99.73118
2	58.6	25	638	81	99.55357
3	53.3	44	518.8	80	94.75806
4	50.8	44	459.6	82	100
5	50.7	41	474	81	100
6	48.6	66	231	81.2	100
7	49	28	556	84	96.37097
8	49.1	62	333.3	82	95.43011
9	49.3	67	239	81	96.52778
10	50.2	39	373	80	0
11	48	67	232	82	89.58333
12	50	46	336	81	92.33871
1992	52	21	112	78	96.23656
2	50	53	230	79	68.15476
3	47	56	397	85	61.55914
4	50	45	418	84	72.63889
5	49	67	500	85	79.7043
6	49	48	434	86	80.97222
7	49	32	279	81	86.96237
8	50.97681	54	412	76	68.14516
9	49	59	492	78	81.66667
10	50	44	356	78	84.81183
11	50	45	314	78	89.58333
12	49	72	575	77	85.21505

Data for kiln no. (6) Fuhais plant -- test for the effect of rounded data

Year	EL	FUEL	AvNO	AvHOURS	PRORATE	AVL	Aratio	Sratio	LSF	REL	RFU	RPR	
1990	1	28	84	0.355	9.94	117	89	1.82	2.48	93.2	28.10429	84.319	117.35
	2	37	83	0.107	14.86	107	89	1.9	2.44	94.3	37.08402	83.388	107.36
	4	27	84	0.3	2.71	120	93	1.88	2.47	93.6	27.21597	84.175	120.41
	5	27	82	0.129	0.903	121	96	1.84	2.47	93.5	27.45044	82.300	121.23
	6	27	81	0.133	0.933	119	98	1.84	2.47	93.7	27.32477	81.060	119.26
	7	34	84	0.419	11.26	115	87		0.1		34.06235	84.096	115.19
	8	27	81	0.323	2.81	121	86	1.87	2.47	92.3	27.48666	81.385	121.41
	9	26	83	0.433	4	124	83	1.93	2.47	94.1	26.14631	83.291	124.44
	10	32	87	0.323	14.06	118	93	1.91	2.46	94	32.33836	87.341	118.13
	11	28	84	0.367	2.53	121	90	1.81	2.48	94	28.34298	84.104	121.14
	12	26	85	0.355	1.97	123	92	1.74	2.29	94.3	26.30555	85.422	123.41
1991		31	84	0.323	13.59	122	93	1.77	2.22	96.3	31.33235	84.119	122.42
	2	26	84	0.143	1.69	120	100	1.75	2.21	95.3	26.47714	84.173	120.30
	3	26	83	0.129	1.52	120	96	1.74	2.24	94.9	26.46096	83.292	120.41
	4	27	83	0.3	1.6	113	96	1.61	2.28	94.5	27.47369	83.430	113.43
	5	26	80	0.226	3.94	118	97	1.71	2.36	94.5	26.38665	80.002	118.08
	6	33	83	0.467	15.4	113	93	1.63	2.36	95.4	33.26309	83.425	113.32
	7	27	83	0.226	1.42	118	94	1.72	2.35	94.3	27.38154	83.459	118.46
	8	26	83	0.161	0.483	118	98	1.69	2.38	94	26.00161	83.294	118.03
	9	28	84	0.533	6.8	121	89	1.72	2.4	93.9	28.05887	84.446	121.09
	10	26	86	0.258	1.55	120	97	1.69	2.4	94.5	26.10348	86.113	120.46
	11	33	103	0.3	10.9	101	93	1.68	2.4	94.4	33.41421	103.45	101.17
1992		36	102	0.258	9	100	86	1.57	2.46	94.1	36.36712	102.23	100.17
	2	48	101	0.207	18	101	93	1.53	2.45	95.9	48.19682	101.43	101.02
	3	32	95	0.548	4.42	99	90	1.59	2.45	95.6	32.11113	95.320	99.294
	4	27	84	0.3	1.57	111	94	1.7	2.44	94.8	27.25173	84.448	111.47
	5	26	88	0.387	0.419	111	98	1.69	2.45	94	26.39814	88.051	111.06
	6	28	89	0.333	9.4	100	98	1.69	2.46	93.4	28.09802	89.249	100.09
	7	22	86	0.516	6.13	112	89	1.72	2.44	93.3	22.04974	86.228	112.42
	8	28	83	0.258	13.32	119	86	1.7	2.49	92.1	28.13425	83.291	119.16
	9	26	85	0.4	4.5	115	88	1.73	2.43	93.2	26.28049	85.446	115.27
	10	26	84	0.419	5.77	114	95	1.85	2.36	92.6	26.48625	84.418	114.07
	11	29	94	0.5	3.77	101	94	1.87	2.4	93.1	29.40422	94.286	101.34
	12	29	92	0.613	4.16	108	91	1.83	2.41	92.4	29.13833	92.045	108.48
1993		32	91	0.258	10.84	105	87	1.77	2.41	92.2	32.19071	91.026	105.31
	3	26	90	0.419	2.55	117	89	1.79	2.41	93.2	26.11313	90.284	117.26
	4	29	91	0.5	6.17	114	76	1.84	2.38	92.9	29.07594	91.499	114.42
	5	29	90	0.258	4.32	117	82	1.77	2.4	93.2	29.09105	90.102	117.43
	6	30	96	0.6	7.1	114	70	1.74	2.41	92.3	30.05389	96.392	114.01
	7	34	102	0.419	6.68	109	73	1.73	2.43	93.1	34.48468	102.19	109.14
	8	27	90	0.29	2.87	119	89	1.72	2.43	93.3	27.20314	90.340	119.48
	9	26	93	0.133	12.27	113	99	1.71	2.44	94.1	26.10899	93.448	113.22
	10	29	86	0.194	1.19	114	95	1.74	2.41	92.8	29.42644	86.369	114.35
	11	31	84	0.167	1.13	119	95	1.7	2.44	91.2	31.21285	84.345	119.15
	12	28	88	0.194	1.61	120	93	1.69	2.43	93.4	28.10615	88.292	120.04

Reputable Manufacturer's plans data

Plant	FUEL	PRORATE	NO	AVL	WORK_HR
SE	3894	698	143	86	7523
TD	3785	690	69	96	8377
UV	3505	651	9	64	1609
PA	4009	721	327	89	7762
PA	4023	721	275	82	7176
YO	4403	586	125	71	5951
CT	3578	1171	122	90	7897
KO	3504	1240	144	84	7271
ER	3724	1147	151	84	7366
SM	3795	1138	246	86	7567
AL	3687	1146	52	88	7221
KW	3613	1492		78	6637
OZ	3633	1595	49	75	6525
PO	3581	1726	136	83	7096
SG	3350	1776	32	87	7608
RE	3463	1467	59	91	7615
CB	3509	1915	108	83	7243
EC	3289	1622	44	81	7111
AP	3746	1188	25	84	7351
GA	3452	1855	66	93	8125
JE	3535	2109	148	88	7712
LG	3568	1933	48	81	6595
CB	3502	1879	105	88	7629
UV	3369	1775	25	81	6974
SM	3824	1815	214	85	7010
MS	3595	1837	71	73	5868
OJ	3939	1755	158	64	5470
OJ	3930	1794	181	63	5521
YO	3848	1743	233	55	4855

Fuhais Plant - Specifications for Kiln4

- Built and started production in 1968
- Nominal production capacity 800 tonne/day
- 4 stages preheater tower, dry process and without precalciner
- Manufacturer: Polysius / Germany
- Burner type: Pillard – old generation, using the fuel oil.
- Kiln diameter: 3600 mm
- Kiln length: 54000 mm
- The clinker cooler used is 3 stages Polysius type, old design.
- Dedusting * EP (electrostatic precipitator) for kiln & raw mill exhaust gases)
 - * Gravel bed filter for the clinker cooler.

Fuhais Plant - Specifications for Kiln 5

- Built and started production in 1979
 - Nominal production capacity 2000 tonne/day
Upgraded in 1996 to be 2400 tonne/day
 - 4 stages preheater tower, dry process and without precalciner
 - Manufacturer: Polysius / Germany
 - Burner type: FLS (dofflex burner) used after upgrading, using the fuel oil.
 - Kiln diameter: 4600 mm
 - Kiln length: 71500 mm
 - The clinker cooler used is IKN type.
- Dedusting * EP (electrostatic precipitator) for kiln & raw mill
* EP (electrostatic precipitator) for the clinker cooler.
- Fuel type: Bunker C fuel oil.

Fuhais Plant - Specifications for Kiln 6

- Built and started production in 1982
 - Nominal production capacity 3000 tonne/day
Upgraded in 1998 to be 3600 tonne/day
 - 4 stages preheater tower, dry process and with precalciner
 - Manufacturer: Kobe- steel / Japan
 - Burner type: Low Nox pillard, using the fuel oil.
 - Kiln diameter: 4400 mm
 - Kiln length: 70000 mm
 - The clinker cooler used is 3 stages grate cooler.
- Dedusting * EP (electrostatic precipitator) for kiln & raw mill
*Gravel bed filter for the clinker cooler.
- Fuel type: Bunker C fuel oil.

Rashadiya Plant

Consist of 2 parallel symmetric kilns 1 and 2

Specifications for Kiln 1&2

- Built and started production in 1984
- Nominal production capacity 3200 tonne/day
- Suspension preheater with precalciner short, dry process
- Manufacturer: Kobe- steel / Japan
- Burner type: Low Nox pillard, using the fuel oil.
- Kiln diameter: 4500 mm
- Kiln length: 70000 mm
- The clinker cooler used is 2 stages grate cooler.

Dedusting * EP (electrostatic precipitator) for kiln &raw mill

*Multiclone for the clincker cooler (The multiclone will be changed to a bag filter in December 2001 for line A and in April 2002 for kiln B).

- Fuel type: Bunker C fuel oil.

Appendix 02: NCSS2000 Statistical Package

There are several statistical packages such as SAS, SPSS, Minitab, and S-Plus2000, Statistica, NCSS2000, etc. In this work, the NCSS2000 Statistical Package is used to analyze the collected data.

This package provides a regression report including several sections. The following is a summary of the output of each of these sections.

1. Correlation Matrix Section

Pearson correlations are given for all variables. Outliers, nonnormality, nonconstant variance, and nonlinearities can all impact these correlations.

These correlation coefficients show which independent variables are highly correlated with the dependent variable and with each other. Independent variables that are highly correlated with one another may cause collinearity problems.

2. Regression Equation Section

The regression equation section includes the point estimates of regression coefficients, their standard errors, t-values, probability level, decision at 0.05 level of significance, and the corresponding power. Moreover, it gives the value of R^2 .

Before using these results, one should check that the assumptions are reasonable. For instance, collinearity can cause the t-tests to give false results and the regression coefficients to be of the wrong magnitude or sign.

The regression coefficients are the least square estimates of the parameters. The value indicates how much change in Y occurs for a one-unit change in x when the remaining X's are held constant. These coefficients are often called partial-regression coefficients since the effect of the other X's is removed. These coefficients are the values of estimated parameters and the estimated constant term in the regression model.

The standard error of the regression coefficient is used in hypothesis tests and confidence limits about the parameter in the model.

T-Value (Ho: B=0) is the t-test value for testing the hypothesis that $\beta_j = 0$ versus the alternative that $\beta_j \neq 0$ after removing the influence of all other X's. This t-value has $n-k-1$ degrees of freedom where n is the sample size and k is the number of independent variables.

Alpha Level

The value of alpha for the statistical tests and power analysis. Usually, this number will range from 0.1 to 0.001. A common choice for alpha is 0.05.

Prob Level is the p-value for the significance test of the regression coefficient. The p-value is the probability that this t-statistic will take on a value at least as extreme as the actually observed value, assuming that the null hypothesis is true (i.e., the regression estimate is equal to zero). If the p-value is less than alpha, say 0.05, the null hypothesis is rejected. This p-value is for a two-tail test

Decision(5%) is the conclusion reached about the null hypothesis. It will be either accept H_0 or reject H_0 at the 5% level of significance.

Power (5%) is the probability of rejecting the null hypothesis that $\beta_j = 0$ when $\beta_j \neq 0$. The reported value of the power is calculated for the case when $\beta_j = \hat{\beta}_j$, $\sigma^2 = s^2$ and $\alpha = 0.05$. where s^2 is the point estimate for the variance of the error term.

High power is desirable. High power means that there is a high probability of rejecting the null hypothesis when the null hypothesis is false. This is a critical measure of sensitivity in hypothesis testing.

R-Squared is the coefficient of determination. It represents the percent of variation in the dependent variable explained by the independent variables in the model

3. Regression Coefficient Section

In addition to what is given above, this section lists the following quantities.

a) Lower - Upper 95% C.L

These are the lower and upper values of a $100(1-\alpha)\%$ interval estimate for β_j based on a t-distribution with $n-k-1$ degrees of freedom. This interval estimate assumes that the residuals for the regression model are normally distributed

These confidence limits may be used for significance testing values of β_j other than zero. If a specific value is not within this interval, it is significantly different from that value. Note that these confidence limits are set up as if one is interested in each separately

b) Standardized regression coefficients are the coefficients that would be obtained if one standardized each independent and dependent variable. Here standardizing is defined as subtracting the mean and then dividing by the standard deviation of a variable. A regression analysis on these standardized variables would yield these standardized coefficients. When there are vastly different units involved for the variables, this is a way of making comparisons between variables.

c. T-Critical

This is the value of t used to construct the confidence limits

4. Analysis of Variance Section

An analysis of variance (ANOVA) table summarizes the information related to the sources of variation in data. This table gives the F-ratio, its degree of freedom and its probability level. This provides a test of the validity of the regression model as a whole.

It contains the following components.

Source

This represents the partitions of the variation in y . There are four sources of variation listed: intercept, model, error, and total (adjusted for the mean)

df

The degrees of freedom are the number of dimensions associated with this term. Note that each observation can be interpreted as a dimension in n -dimensional space. The degrees of freedom for the intercept, model, error (residuals), and adjusted total are 1, k , $n-k-1$, and $n-1$, respectively.

Sum of Squares

These are the sums of squares associated with the corresponding sources of variation.

Mean Square

The mean square is the sum of squares divided by the degrees of freedom. This mean square is an estimated variance.

F-Ratio

This is the F statistic for testing the null hypothesis that all $\beta_j = 0$. This F-statistic has k degrees of freedom for the numerator variance and $n-k-1$ degrees of freedom for the denominator variance.

Prob Level

This is the p-value for the above F test. The p-value is the probability that the test statistic will take on a value at least as extreme as the observed value, assuming that the null hypothesis is true.

If the p-value is less than , say 0.05, the null hypothesis is rejected. If the p-value is greater than , say 0.05, then the null hypothesis is accepted.

Power(5%)

Power is the probability of rejecting the null hypothesis that all the regression coefficients are zero when at least one is not zero.

Root Mean Square Error

This is the square root of the mean square error. It is an estimate of σ , the standard deviation of the residuals .

Mean of Dependent Variable

This is the arithmetic mean of the dependent variable Y.

Coefficient of Variation

The coefficient of variation is a relative measure of dispersion, computed by dividing root mean square error by the mean of the dependent variable Y. By itself, it has little value, but it can be useful in comparative studies

R-Squared

R^2 , officially known as the coefficient of determination.

It is probably the most popular statistical measure of how well the regression model fits the data. A value of R^2 near zero indicates no linear relationship between the Y and the X's, while a value near 1 indicates a perfect linear fit.

R^2 does not measure the appropriateness of a linear model. It measures the strength of the linear component of the model. A large R^2 does not necessarily mean high predictability, nor does a low R^2 necessarily mean poor predictability.

Adjusted R-squared

This is an adjusted version of R^2 . It is defined as

$R^2_{adjusted} = 1 - (1 - R^2) \left(\frac{n-1}{n-k-1} \right)$, where k is the number of independent variables and n is the sample size. The adjustment seeks to remove the distortion due to a small sample size

Press Value

PRESS stands for prediction sum of squares. It is used to validate a regression model in predictability. To calculate PRESS, a jackknif procedure in which each observation is individually omitted. The remaining n -1 observations are used to calculate regression and estimate the value of the omitted observation. This is done n times, once for each observation. The difference between the actual Y value, and the predicted value of Y with the ith observation deleted, is called the prediction error. The sum of the squared prediction errors is the PRESS value. The smaller PRESS is, the better the predictability of the model.

PRESS is especially popular in variable selection, where it is often used to compare various regression models

Press R-Squared

The PRESS value above can be used to compute an R^2 -like statistic, called R2Predict, which reflects the prediction ability of the model. This is a good way to validate the prediction of a regression model without selecting another sample or splitting the data. It is very possible to have a high R^2 and a very low R2Predict. When this occurs, it implies that the fitted model is data dependent. This R2Predict ranges from zero to one.

Sum |Press residuals

This is the sum of the absolute value of the PRESS residuals or prediction errors. If a large value for the PRESS is due to one or a few large PRESS residuals, this statistic may be a more accurate way to evaluate predictability.

5. Normality Tests Section

The normality of the residuals should be visually evaluated by graphical displays, such as box plots, normal probability plots, and density plots. The more formal option is to use normality tests, which deal with skewness and kurtosis, with a preference to the omnibus test based on both skewness and kurtosis.

The column labeled Decision(5%) states whether the hypothesis of normality is accepted or rejected at the given value of $\alpha=0.05$.

6. Serial-Correlation Section

This section reports on the correlation structure of the residuals. It lists

a. Lag and Correlation

The lag, k , is the number of periods back. The correlation here is the sample autocorrelation coefficient of lag k .

To test the null hypothesis that $r_k = 0$ at a 5% level of significance with a large-sample normal approximation, reject when the absolute value of the autocorrelation coefficient, $|r_k|$, is greater than $2/\sqrt{n}$.

b. Durbin-Watson Value

The Durbin-Watson test is a significance test of first-order (lag = 1) autocorrelation. It is calculated as $DW = 2(1-r_1)$. Since r_1 ranges between -1 and 1, the Durbin-Watson statistic ranges between 0 and 4. If the Durbin-Watson statistic is close to 2, then r_1 is close to zero, which says the residuals are uncorrelated. On other hand, if the Durbin-Watson statistic is the much different from 2, the residuals are correlated.

7. Multicollinearity Section

This section provides information useful in assessing the amount of multicollinearity in the data

a. Variance Inflation

The variance inflation factor (VIF) is a measure of multicollinearity. Its value for a given independent variable is $VIF = 1/(1 - R^2)$, where R^2 is obtained when this variable is regressed on the remaining independent variables. A VIF of 10 or more for large data sets indicates a collinearity problem since the R^2 with the remaining X's is 90 percent. For small data sets, even VIF's of 5 or more can signify collinearity. Variables with a high VIF are candidates for exclusion from the model

b. R-Squared vs Other X's

This is the R^2 obtained when this variable is regressed on the remaining independent variables. A high R^2 indicates a lot of overlap in explaining the variation among the remaining independent variables

c. Tolerance

Tolerance is just $1 - R^2$, the denominator of the variance inflation factor

d. Diagonal of X'X Inverse

The X'X inverse is an important matrix in regression. This column gives the jth row and jth column element of this matrix

8. Eigenvalues of Centered Correlations Section

This section gives an eigenvalue analysis of the independent variables when they have been centered and scaled. It provides another method to check multicollinearity. The method includes the following measures.

a. Eigenvalue

The eigenvalues of the correlation matrix. The sum of the eigenvalues is equal to the number of independent variables. Eigenvalues near zero mean that there is collinearity in the data

b. Incremental Percent

Incremental percent is the percent this eigenvalue is of the total. In an ideal situation, these percentages would be equal. Percents near zero mean that there is collinearity in the data

c. Cumulative Percent

This is the running total of the Incremental Percent

d. Condition Number

The condition number of an independent variable is the largest eigenvalue of all independent variables divided by the corresponding eigenvalue of that independent variable. Since the eigenvalues are really variances, the condition number is a ratio of variances. Condition numbers greater than 1000 indicate a severe collinearity problem while condition numbers between 100 and 1000 indicate a mild collinearity problem

9. Graphic Residual Analysis

Plots section that includes histogram of residuals, normal probability plot of residuals (q-q-plot), and residuals vs. predicted values and vs. each of the independent variables. These plots provide tests of normality, and randomness of the residuals of the fitted models.

Histogram

The purpose of the histogram and density trace of the residuals is to evaluate whether they are normally distributed.

Probability Plot of Residuals

If the residuals are normally distributed the data points of the normal probability plot will fall along a straight line through the origin with a slope of 1.0. Major deviations from this ideal picture reflect departures from normality. Stragglers at either end of the normal probability plot indicate outliers, curvature at both ends of the plot indicates long or short distributional tails, convex or concave curvature indicates a lack of symmetry, and gaps or plateaus or segmentation in the normal probability plot may require a closer examination of the data or model. Of course, use of this graphic tool with very small sample sizes is not recommended.

It is interesting to note that if less than 5% of the plotted points in the normal probability plot of residuals are outside the plotted band then normality of residuals still hold with probability .95.

If the residuals are not normally distributed, then the t-tests on regression coefficients, the F-tests, and any interval estimates are not valid. This is a critical assumption to check

The other residual plots guarantee the randomness of error terms, if the scatter plots have no patterns and they are scattered at random about the horizontal line through the point labelled zero on the vertical axis.

Residual vs Predicted Plot

This plot should always be examined. The preferred pattern to look for is a point cloud or a horizontal band. A wedge or bowtie pattern is an indicator of nonconstant variance.

Residual vs Independent variable(s) Plot

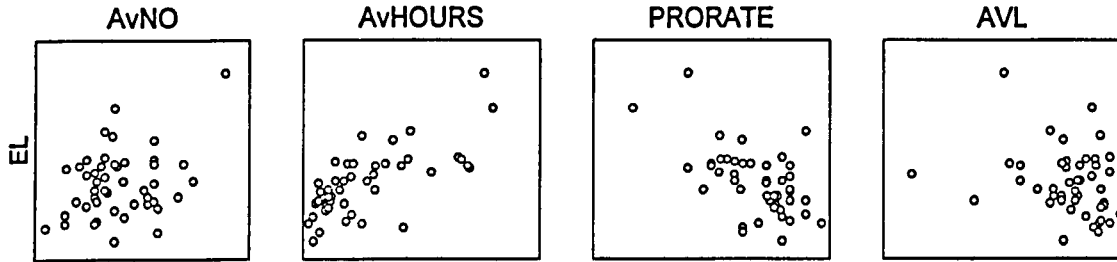
This is a scatter plot of the residuals versus each independent variable. Again, the preferred pattern is a rectangular shape or point cloud. Any other nonrandom pattern may require a redefining of the regression model.

Appendix 03 : Complete Computer Output of Kiln 2

A) EL of Kiln 2

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Plot Section



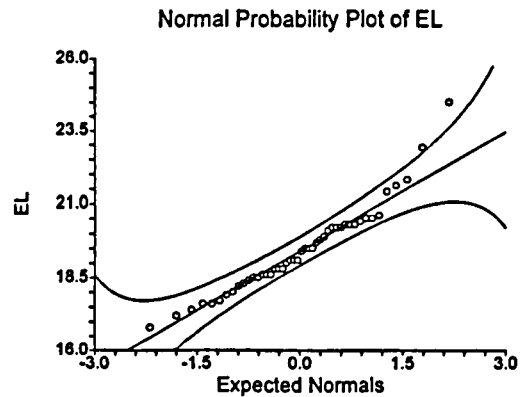
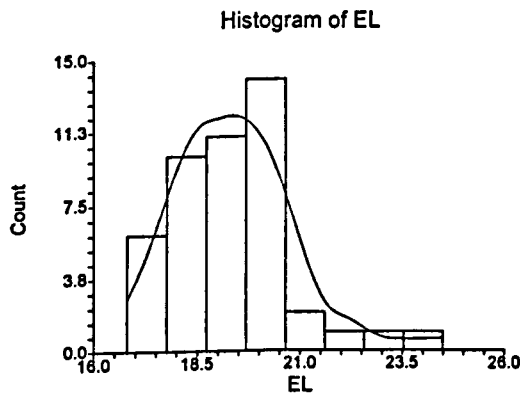
Descriptive Statistics Report

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Normality Test Section of EL

Test Name	Test Value	Prob Level	10% Critical Value	5% Critical Value	Decision (5%)
D'Agostino Skewness	2.6396	0.008301	1.645	1.960	Reject Normality
D'Agostino Kurtosis	2.1169	0.034268	1.645	1.960	Reject Normality
D'Agostino Omnibus	11.4485	0.003266	4.605	5.991	Reject Normality

Plots Section of EL



Correlation Report

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Pearson Correlations Section (Row-Wise Deletion)

	EL	AvNO	AvHOURS	PRORATE	AVL
EL	1.000000	0.313520	0.702421	-0.580540	-0.244018
AvNO	0.000000	0.033863	0.000000	0.000023	0.102201
AvHOURS	46.000000	46.000000	46.000000	46.000000	46.000000
PRORATE	0.313520	1.000000	-0.106310	-0.195630	-0.108459
AVL	0.033863	0.000000	0.481942	0.192594	0.473078

	46.000000	46.000000	46.000000	46.000000	46.000000
AvHOURS	0.702421	-0.106310	1.000000	-0.604090	0.017859
	0.000000	0.481942	0.000000	0.000009	0.906226
	46.000000	46.000000	46.000000	46.000000	46.000000
PRORATE	-0.580540	-0.195630	-0.604090	1.000000	0.112665
	0.000023	0.192594	0.000009	0.000000	0.455981
	46.000000	46.000000	46.000000	46.000000	46.000000
AVL	-0.244018	-0.108459	0.017859	0.112665	1.000000
	0.102201	0.473078	0.906226	0.455981	0.000000
	46.000000	46.000000	46.000000	46.000000	46.000000

Cronbachs Alpha =- 0.432463 Standardized Cronbachs Alpha =- 0.478986

Data Screening Report

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Normality Tests Section

Variable	----- Skewness Test -----			----- Kurtosis Test -----			- Omnibus Test -		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	0.95	2.64	0.0083	4.62	2.12	0.0343	11.45	0.0033	No

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.42	0.5197	
2	0.00	0.9620	
3	0.20	0.6559	
4	0.91	0.3453	
5	1.83	0.1824	
6	1.49	0.2285	
7	3.08	0.0861	
8	2.21	0.1438	
9	1.04	0.3130	
10	1.33	0.2546	
11	1.49	0.2285	
12	0.61	0.4381	
13	0.27	0.6089	
14	2.51	0.1203	
15	0.27	0.6089	
16	5.37	0.0250	Yes
17	0.38	0.5385	
18	0.38	0.5385	
19	0.03	0.8568	
20	0.00	0.9620	
21	0.34	0.5634	
22	0.51	0.4779	
23	0.00	0.9850	
24	1.73	0.1947	
25	11.47	0.0015	Yes
26	2.10	0.1540	
27	0.06	0.8051	
28	0.51	0.4779	
29	0.31	0.5830	
30	0.18	0.6768	
31	0.47	0.4959	
32	0.67	0.4165	
33	0.18	0.6768	
34	0.05	0.8275	
35	0.10	0.7542	
36	0.27	0.6089	
37	0.34	0.5634	

38	0.31	0.5830
39	0.31	0.5830
40	0.08	0.7762
41	0.05	0.8275
42	0.00	0.9620
43	0.18	0.6768
44	0.05	0.8275

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
45	0.57	0.4552	
46	0.34	0.5634	

All Possible Regression Report

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 Dependent EL

All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
1	0.493395	1.078017	25.984241	B (AvHOURS)
1	0.337026	1.233215	46.968208	C (PRORATE)
1	0.098295	1.438212	79.004947	A (AvNO)
1	0.059545	1.468791	84.205065	D (AVL)

Variables in Best Model
 AvHOURS

2	0.645813	0.9117998	7.530435	AB
2	0.559240	1.017148	19.148091	BD
2	0.531820	1.048309	22.827732	BC
2	0.378597	1.207729	43.389602	AC
2	0.369339	1.216693	44.632052	CD
2	0.142926	1.418378	75.015675	AD

Variables in Best Model
 AvNO, AvHOURS

3	0.692469	0.8596796	3.269285	ABD
3	0.650993	0.9158183	8.835189	ABC
3	0.584260	0.9995477	17.790561	BCD
3	0.404943	1.195837	41.854127	ACD

Variables in Best Model
 AvNO, AvHOURS, AVL

4	0.694476	0.867257	5.000000	ABCD
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Variables in Best Model
 AvNO, AvHOURS, PRORATE, AVL

Stepwise Regression Report

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Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	1.497652	0.000000
1	Added	AvHOURS	0.493395	1.078017	0.000000
2	Added	AvNO	0.645813	0.9117998	0.011302
3	Added	AVL	0.692469	0.8596796	0.022661
4	Unchanged		0.692469	0.8596796	0.022661

List of Variables Selected

AvNO, AvHOURS, AVL

Stepwise Regression Report

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Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.694476	0.867257	0.442438
1	Removed	PRORATE	0.692469	0.8596796	0.022661
2	Unchanged		0.692469	0.8596796	0.022661

List of Variables Selected

AvNO, AvHOURS, AVL

Stepwise Regression Report

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Database C:\My Documents\DATA\K2.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	1.497652	0.000000
1	Added	AvHOURS	0.493395	1.078017	0.000000
2	Unchanged		0.493395	1.078017	0.000000
3	Added	AvNO	0.645813	0.9117998	0.011302
4	Unchanged		0.645813	0.9117998	0.011302
5	Added	AVL	0.692469	0.8596796	0.022661
6	Unchanged		0.692469	0.8596796	0.022661

List of Variables Selected

AvNO, AvHOURS, AVL

Stepwise Regression Report

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Database C:\My Documents\DATA\K2.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	1.497652	0.000000
1	Added	AvHOURS	0.493395	1.078017	0.000000
2	Added	AvNO	0.645813	0.9117998	0.011302
3	Added	AVL	0.692469	0.8596796	0.022661
4	Unchanged		0.692469	0.8596796	0.022661

List of Variables Selected
AvNO, AvHOURS, AVL

Multiple Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	23.66305	4.773427	4.9572	0.000013	Reject Ho	0.998001
AvNO	4.368386	1.13587	3.8458	0.000411	Reject Ho	0.963620
AvHOURS	0.1947135	3.123759E-02	6.2333	0.000000	Reject Ho	0.999981
PRORATE	-1.886802E-02	3.635969E-02	-0.5189	0.606602	Accept Ho	0.079915
AVL	-4.835395E-02	2.001725E-02	-2.4156	0.020250	Reject Ho	0.654978
R-Squared	0.694476					

Model

23.66305+ 4.368386*AvNO+ .1947135*AvHOURS-1.886802E-02*PRORATE-4.835395E-02*AVL

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	23.66305	4.773427	14.02291	33.30318	0.0000
AvNO	4.368386	1.13587	2.07445	6.662322	0.3541
AvHOURS	0.1947135	3.123759E-02	0.1316279	0.2577991	0.7076
PRORATE	-1.886802E-02	3.635969E-02	-9.229789E-02	5.456186E-02	-0.0600
AVL	-4.835395E-02	2.001725E-02	-8.877961E-02	-7.928285E-03	-0.2115
T-Critical	2.019541				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	17363.04	17363.04			
Model	4	70.09573	17.52393	23.2989	0.000000	1.000000
Error	41	30.83752	0.7521347			
Total(Adjusted)	45	100.9333	2.242961			

Root Mean Square Error	0.867257	R-Squared	0.6945
Mean of Dependent	19.42826	Adj R-Squared	0.6647
Coefficient of Variation	4.463894E-02	Press Value	39.34911
Sum Press Residuals	33.21677	Press R-Squared	0.6101

Multiple Regression Report

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 Dependent EL

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	1.3968	0.162472	Accepted
Kurtosis	1.3411	0.179885	Accepted
Omnibus	3.7496	0.153382	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.214269	9	-0.120594	17	-0.062298
2	0.259650	10	0.090585	18	-0.234736
3	0.138909	11	-0.122293	19	-0.129038
4	-0.076910	12	0.136962	20	-0.080748
5	0.180478	13	-0.111290	21	-0.205265
6	-0.209162	14	-0.027552	22	-0.014631
7	-0.080928	15	0.022652	23	-0.108279
8	-0.169314	16	-0.262939	24	0.089434

Above serial correlations significant if their absolute values are greater than 0.294884
 Durbin-Watson Value 1.5046

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.137454	0.120844	0.879156	1.715385
AvHOURS	1.729320	0.421738	0.578262	1.297356E-03
PRORATE	1.793523	0.442438	0.557562	1.757699E-03
AVL	1.028677	0.027877	0.972123	5.327376E-04

Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.621921	40.55	40.55	1.00
2	1.153805	28.85	69.39	1.41
3	0.901298	22.53	91.93	1.80
4	0.322975	8.07	100.00	5.02

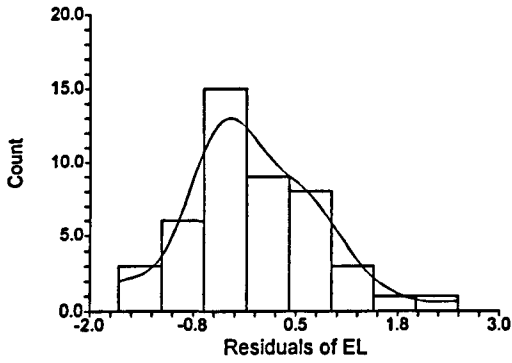
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Multiple Regression Report

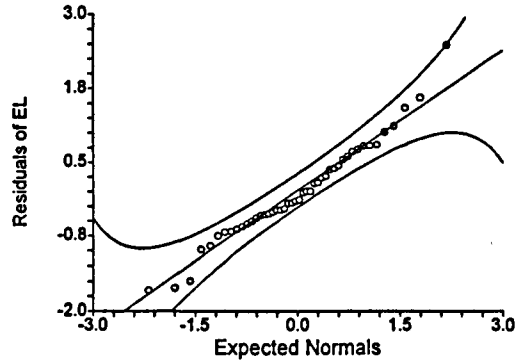
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Dependent EL

Plots Section

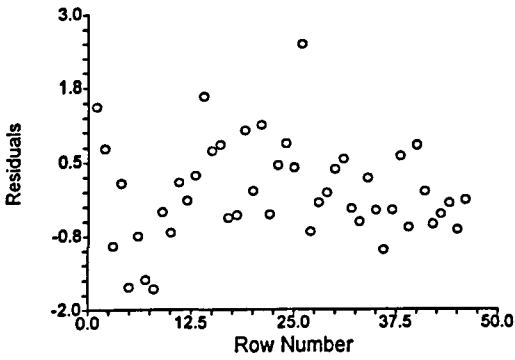
Histogram of Residuals of EL



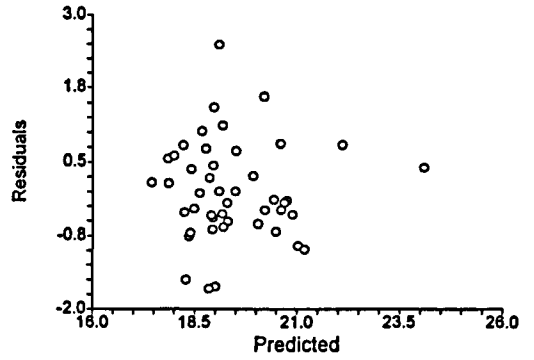
Normal Probability Plot of Residuals of EL



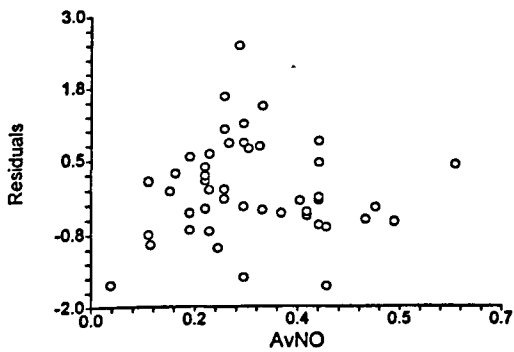
Residuals vs Row



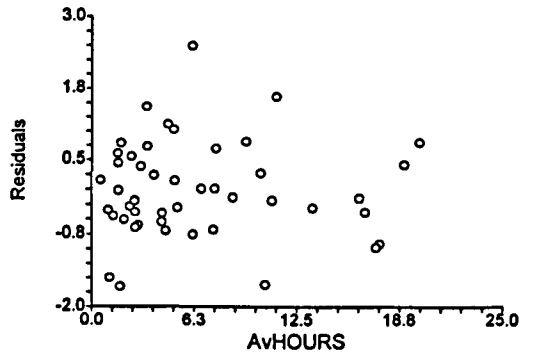
Residuals vs Predicted



Residuals vs AvNO

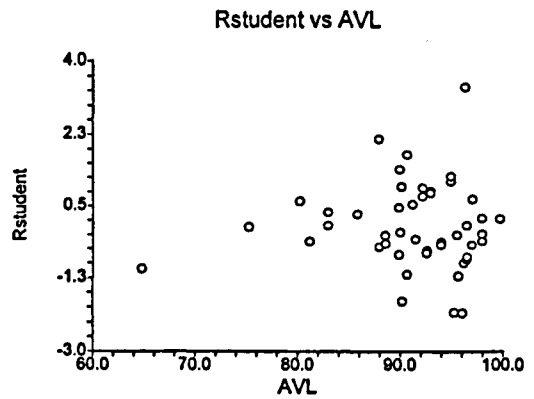
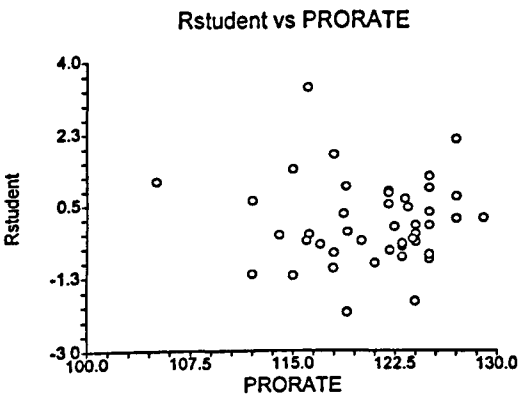
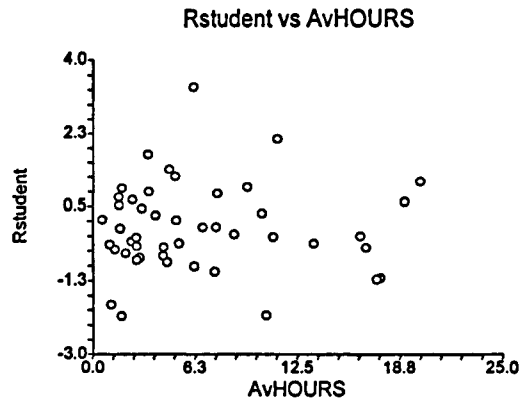
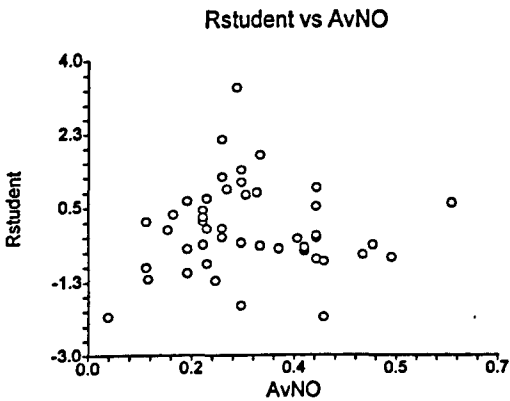
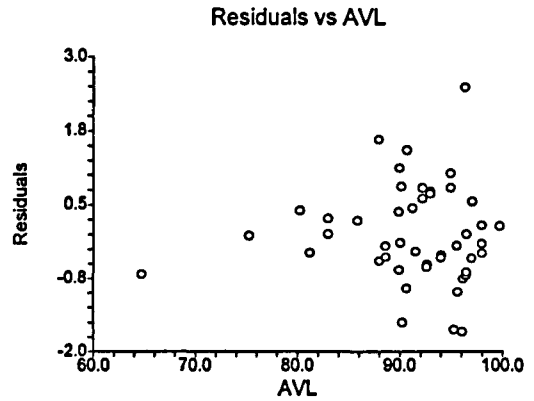
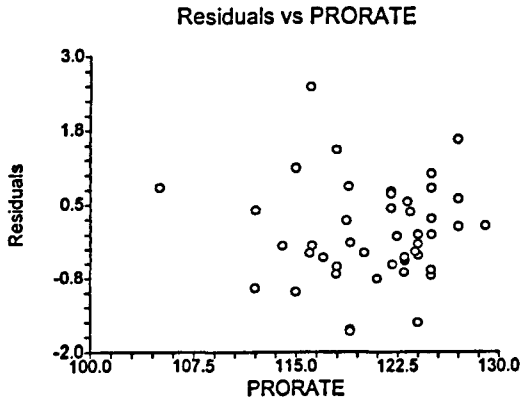


Residuals vs AvHOURS



Multiple Regression Report

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 Dependent EL



Robust Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	24.03158	3.284243	7.3172	0.000000	Reject Ho	1.000000
AvNO	3.806809	0.762458	4.9928	0.000011	Reject Ho	0.998210
AvHOURS	0.1843329	2.161329E-02	8.5287	0.000000	Reject Ho	1.000000
PRORATE	-0.023665	2.634436E-02	-0.8983	0.374274	Accept Ho	0.141772
AVL	-4.407377E-02	1.265658E-02	-3.4823	0.001196	Reject Ho	0.925017
R-Squared	0.821279					

Model
 24.03158+ 3.806809*AvNO+ .1843329*AvHOURS-.023665*PRORATE-4.407377E-02*AVL

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	24.03158	3.284243	17.39892	30.66424	0.000000
AvNO	3.806809	0.762458	2.266994	5.346625	0.358486
AvHOURS	0.1843329	2.161329E-02	0.140684	0.2279818	0.761532
PRORATE	-0.023665	2.634436E-02	-7.686851E-02	2.953851E-02	-0.083643
AVL	-4.407377E-02	1.265658E-02	-6.963424E-02	-1.851329E-02	-0.238549
T-Critical	2.019541				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	12439.23	12439.23			
Model	4	44.38211	11.09553	47.1019	0.000000	1.000000
Error	41	9.658142	0.2355645			
Total(Adjusted)	45	54.04025	1.200894			

Root Mean Square Error 0.4853498 R-Squared 0.821279
 Mean of Dependent Variable 19.37138 Adj R-Squared 0.803843
 Coefficient of Variation 2.505499E-02

Robust Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	21.05387	3.904237	5.3926	0.000003	Reject Ho	0.999521
AvNO	4.53777	0.888605	5.1066	0.000008	Reject Ho	0.998752
AvHOURS	0.2057262	2.520772E-02	8.1612	0.000000	Reject Ho	1.000000
PRORATE	5.928104E-03	3.065992E-02	0.1934	0.847639	Accept Ho	0.054096
AVL	-5.467566E-02	1.560438E-02	-3.5039	0.001124	Reject Ho	0.927953
R-Squared	0.788249					

Model
 21.05387+ 4.53777*AvNO+ .2057262*AvHOURS+ 5.928104E-03*PRORATE-5.467566E-02*AVL

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	21.05387	3.904237	13.16911	28.93864	0.000000
AvNO	4.53777	0.888605	2.743196	6.332344	0.394886
AvHOURS	0.2057262	2.520772E-02	0.1548182	0.2566342	0.791140
PRORATE	5.928104E-03	3.065992E-02	-5.599087E-02	6.784708E-02	0.019391
AVL	-5.467566E-02	1.560438E-02	-8.618935E-02	-2.316197E-02	-0.258317
T-Critical	2.019541				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	14937.53	14937.53			
Model	4	62.35914	15.58978	38.1560	0.000000	1.000000
Error	41	16.75179	0.4085804			
Total(Adjusted)	45	79.11093	1.758021			

Root Mean Square Error	0.639203	R-Squared	0.788249
Mean of Dependent Variable	19.37724	Adj R-Squared	0.767591
Coefficient of Variation	0.0329873		

Robust Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	22.71663	3.797009	5.9828	0.000000	Reject Ho	0.999947
AvNO	4.184063	0.842611	4.9656	0.000013	Reject Ho	0.998052
AvHOURS	0.1984934	2.402989E-02	8.2603	0.000000	Reject Ho	1.000000
PRORATE	-8.909876E-03	2.998319E-02	-0.2972	0.767843	Accept Ho	0.059707
AVL	-5.159259E-02	1.487398E-02	-3.4686	0.001243	Reject Ho	0.923117
R-Squared	0.803048					

Model

22.71663+ 4.184063*AvNO+ .1984934*AvHOURS-8.909876E-03*PRORATE-5.159259E-02*AVL

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	22.71663	3.797009	15.04842	30.38485	0.000000
AvNO	4.184063	0.842611	2.482376	5.885751	0.372850
AvHOURS	0.1984934	2.402989E-02	0.1499641	0.2470228	0.760689
PRORATE	-8.909876E-03	2.998319E-02	-6.946215E-02	0.0516424	-0.028728
AVL	-5.159259E-02	1.487398E-02	-8.163121E-02	-2.155398E-02	-0.247413
T-Critical	2.019541				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	14050.9	14050.9			
Model	4	58.52818	14.63204	41.7932	0.000000	1.000000
Error	41	14.35433	0.3501056			
Total(Adjusted)	45	72.88251	1.619611			

Root Mean Square Error	0.5916972	R-Squared	0.803048
Mean of Dependent Variable	19.3703	Adj R-Squared	0.783834
Coefficient of Variation	3.054663E-02		

Nonlinear Regression Report

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 Dependent EL

Initial Specification Section

Parameter Name	Variable Type	Variable Name	Lower Bound	Starting Value	Upper Bound
B1	Overall Rate	AvNO	-1E+09	1	1E+09
B2	Overall Rate	AvHOURS	-1E+09	1	1E+09
B3	Overall Rate	PRORATE	-1E+09	1	1E+09
B4	Overall Rate	AVL	-1E+09	1	1E+09

Parameter Test Section

Parameter Variable	Parameter	Asymptotic	T-Value	Prob
--------------------	-----------	------------	---------	------

Name	Name	Estimate	Standard Error	(Ho: BI=0)	Level
B1	AvNO	7.917824E-02	1.570282E-02	5.0423	0.000009
B2	AvHOURS	8.701563E-02	9.368221E-03	9.2884	0.000000
B3	PRORATE	0.6552985	9.061152E-02	7.2320	0.000000
B4	AVL	-0.0437992	9.724433E-02	-0.4504	0.654736

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	7.917824E-02	1.570282E-02	4.748867E-02	0.1108678
B2	AvHOURS	8.701563E-02	9.368221E-03	0.0681098	0.1059215
B3	PRORATE	0.6552985	9.061152E-02	0.4724371	0.83816
B4	AVL	-0.0437992	9.724433E-02	-0.2400462	0.1524478

R-Squared 0.555313

Iterations 15

Model

$AvNO^{(B1)} * AvHOURS^{(B2)} * PRORATE^{(B3)} * AVL^{(B4)}$

Estimated Model

$AvNO^{(7.917824E-02)} * AvHOURS^{(8.701563E-02)} * PRORATE^{(0.6552985)} * AVL^{(-0.0437992)}$

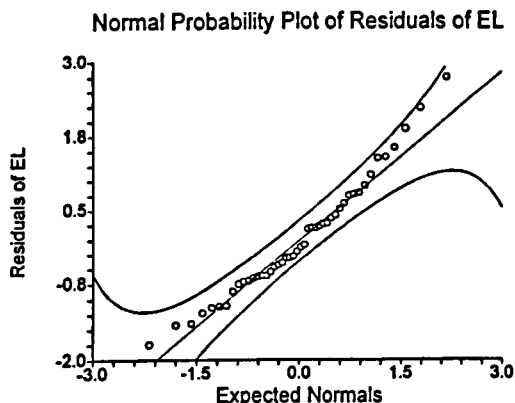
Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
Mean	1	17363.04	17363.04		
Model	4	17419.09	4354.771		
Model (Adjusted)	3	56.04953	18.68317	17.4828	0.000000
Error	42	44.88374	1.06866		
Total (Adjusted)	45	100.9333			
Total	46	17463.97			

Nonlinear Regression Report

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 Dependent EL

Plot Section



Response-Surface Regression Report

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 Response EL

Hierarchical Model Summary Section

Number of Terms Removed 5
 Number of Terms Remaining 9
 R-Squared Cutoff Value 0.010000
 R-Squared of Final Model 0.824909

Coded Hierarchical Model

	A	B	C	D
A AvNO	2	1(11)	1(11)	1(11)
B AvHOURS		2	1(11)	1(11)
C PRORATE			2	1(11)
D AVL				2

Notes:

For off-diagonal entries:

1=u1w1, 2=u1w2, 3=u2w1, 4=u2w2, 5=u1w3, 6=u3w1, 7=u2w3, 8=u3w2, 9=u3w3.

For diagonal entries:

1=u1, 2=u2, 3=u3.

Where $u1=u$, $u2=u^2=u*u$, and $u3=u^3=u*u*u$.

Sequential ANOVA Section

Source	df	Sequential Sum-Squares	Mean Square	F-Ratio	Prob Level	Incremental R-Squared
Regression	9	83.2608	9.2512	18.85	0.000000	0.824909
Linear	4	70.09573	17.52393	35.70	0.000000	0.694476
Quadratic	1	1.724359	1.724359	3.51	0.069036	0.017084
Lin x Lin	4	11.4407	2.860176	5.83	0.001011	0.113349
Total Error	36	17.67246	0.4909017			0.175091

ANOVA Section

Factor	df	Last Sum-Squares	Mean Square	F-Ratio	Prob Level	Term R-Squared
AvNO	3	20.73651	6.912169	14.08	0.000003	0.205448
AvHOURS	3	30.25736	10.08579	20.55	0.000000	0.299776
PRORATE	5	10.308	2.061599	4.20	0.004146	0.102127
AVL	2	2.792263	1.396131	2.84	0.071325	0.027664

Total Error

36

17.67246

0.4909017

0.175091

Response-Surface Regression Report

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 Response EL

Estimation Section

Parameter	df	Regression Coefficient	Standard Error	T-Ratio	Prob Level	Last R-Squared
Intercept	1	313.4885				
AvNO	1	-120.8771	54.4363	-2.22	0.032766	0.023981
AvHOURS	1	-2.942841	0.7832392	-3.76	0.000608	0.068660
PRORATE	1	-5.076616	1.604602	-3.16	0.003160	0.048683
AVL	1	0.858216	0.5685765	1.51	0.139921	0.011081
PRORATE^2	1	2.205254E-02	5.84565E-03	3.77	0.000582	0.069217
AvNO*AvHOURS	1	1.143889	0.3130664	3.65	0.000817	0.064931
AvNO*PRORATE	1	0.9777962	0.4394921	2.22	0.032449	0.024074
AvHOURS*PRORATE	1	2.349981E-02	6.166553E-03	3.81	0.000522	0.070632
PRORATE*AVL	1	-7.387972E-03	4.720734E-03	-1.57	0.126331	0.011912

Model

313.4885-120.8771*AvNO-2.942841*AvHOURS-5.076616*PRORATE+ .858216*AVL+ 2.205254E-02*PRORATE
 1.143889*AvNO*AvHOURS+ .9777962*AvNO*PRORATE+ 2.349981E-02*AvHOURS*PRORATE-7.387972E-
 03*PRORATE*AVL

Optimum Solution Section

Parameter	Maximum Exponent	Optimum Value
AvNO	1 Held Constant	51.27125
AvHOURS	1 Held Constant	14201.53
PRORATE	2	-6932.2
AVL	1 Held Constant	2732.249

Function at optimum -638601.4
 Number of Function Evaluations 1001
 Maximum Functions Evaluations 1000

Nonlinear Regression Report

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 Dependent EL

Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	167.2217	66.4143	32.65356	301.7899
B	10.6614	4.203731	2.143836	19.17897
C	0.4086648	9.859985E-02	0.2088825	0.6084471
D	-2.70166	1.097622	-4.925653	-0.4776673
E	0.3309649	0.2877848	-0.2521426	0.9140724
F	-9.797669	6.57823	-23.12643	3.531091
G	-1.198751E-02	5.459975E-03	-2.305047E-02	-9.24555E-04
H	1.119571E-02	4.585976E-03	1.903636E-03	2.048778E-02
I	-2.282007E-03	1.686482E-03	-5.699145E-03	1.135131E-03

Model

EL =
 A+B*AVNO+C*AVHOURS+D*PRORATE+E*AVL+F*AVNO^2+G*AVHOURS^2+H*PRORATE^2+I*AVL^2

R-Squared 0.771008

Iterations 13

Estimated Model

(167.2217)+(10.6614)*(AVNO)+(0.4086648)*(AVHOURS)+(-2.70166)*(PRORATE)+(0.3309649)*(AVL)+(-
 9.797669)*(AVNO)^2+(-1.198751E-02)*(AVHOURS)^2+(1.119571E-02)*(PRORATE)^2+(-2.282007E-03)*(AVL)^2

Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square
Mean	1	17363.04	17363.04
Model	9	17440.86	1937.873
Model (Adjusted)	8	77.82033	9.727541
Error	37	23.11293	0.6246739
Total (Adjusted)	45	100.9333	
Total	46	17463.97	

Multiple Regression Report

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 Dependent LNEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	4.880777	0.9524718	5.1243	0.000008	Reject Ho	0.998822
LNNO	0.0598521	1.236937E-02	4.8387	0.000019	Reject Ho	0.997134
LNHR	5.885975E-02	8.719902E-03	6.7500	0.000000	Reject Ho	0.999998
LNPR	-0.2425609	0.1904994	-1.2733	0.210087	Accept Ho	0.237553
LNAV	-0.1682204	7.946013E-02	-2.1170	0.040369	Reject Ho	0.542772
R-Squared	0.725209					

Model

$$4.880777 + .0598521 * LNNO + 5.885975E-02 * LNHR - .2425609 * LNPR - .1682204 * LNAV$$

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	4.880777	0.9524718	2.957222	6.804333	0.0000
LNNO	0.0598521	1.236937E-02	3.487166E-02	8.483255E-02	0.4198
LNHR	5.885975E-02	8.719902E-03	4.124955E-02	7.646995E-02	0.6971
LNPR	-0.2425609	0.1904994	-0.6272821	0.1421603	-0.1301
LNAV	-0.1682204	7.946013E-02	-0.3286934	-7.747428E-03	-0.1745
T-Critical	2.019541				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	404.1041	404.1041			
Model	4	0.1837112	4.592779E-02	27.0511	0.000000	1.000000
Error	41	6.961043E-02	1.697815E-03			
Total(Adjusted)	45	0.2533216	5.629369E-03			

Root Mean Square Error 4.120456E-02 R-Squared 0.7252
 Mean of Dependent 2.963928 Adj R-Squared 0.6984
 Coefficient of Variation 1.390201E-02 Press Value 9.517088E-02
 Sum |Press Residuals| 1.716537 Press R-Squared 0.6243

Multiple Regression Report

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 Dependent LNEL

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.7134	0.475591	Accepted
Kurtosis	-0.5490	0.582985	Accepted
Omnibus	0.8104	0.666847	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.148365	9	0.011800	17	-0.086454
2	0.276136	10	0.218242	18	-0.202183
3	0.113517	11	-0.081452	19	-0.134394
4	-0.149153	12	0.211505	20	-0.171251
5	0.026655	13	-0.072724	21	-0.111515
6	-0.285631	14	0.064580	22	-0.041881
7	-0.118883	15	0.097363	23	-0.092139
8	-0.105629	16	-0.273469	24	0.109127

Above serial correlations significant if their absolute values are greater than 0.294884
 Durbin-Watson Value 1.6546

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
LNNO	1.122896	0.109445	0.890555	9.011655E-02
LNHR	1.591115	0.371510	0.628490	4.478501E-02
LNPR	1.558142	0.358210	0.641790	21.37453
LNAV	1.014191	0.013993	0.986007	3.718845

Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.572780	39.32	39.32	1.00
2	1.120853	28.02	67.34	1.40
3	0.934356	23.36	90.70	1.68
4	0.372011	9.30	100.00	4.23

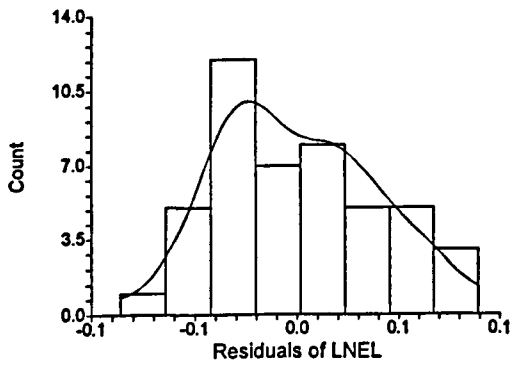
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Multiple Regression Report

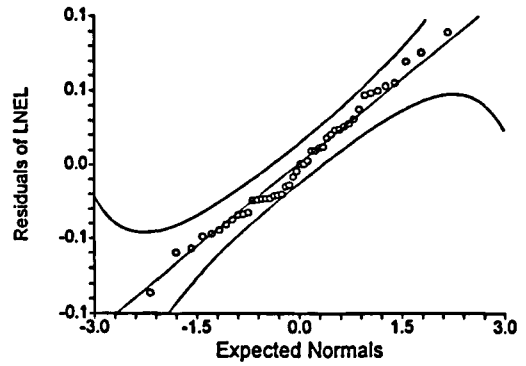
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Database C:\My Documents\DATA\K2.S0
Dependent LNEL

Plots Section

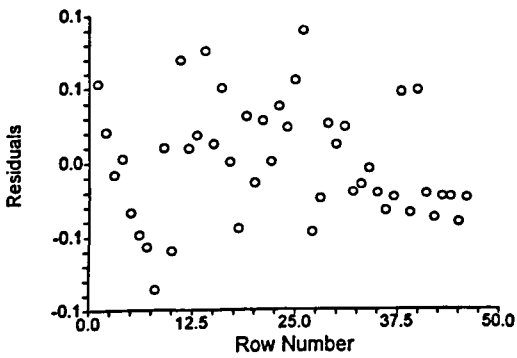
Histogram of Residuals of LNEL



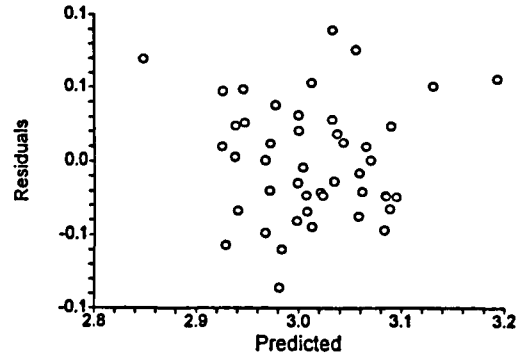
Normal Probability Plot of Residuals of LNEL



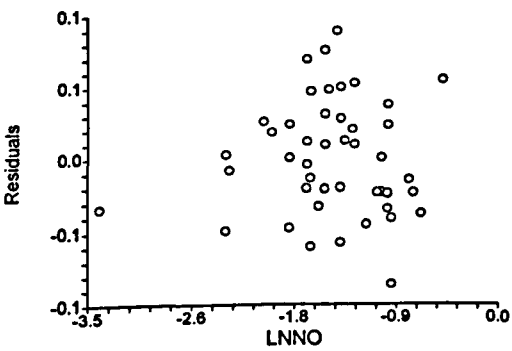
Residuals vs Row



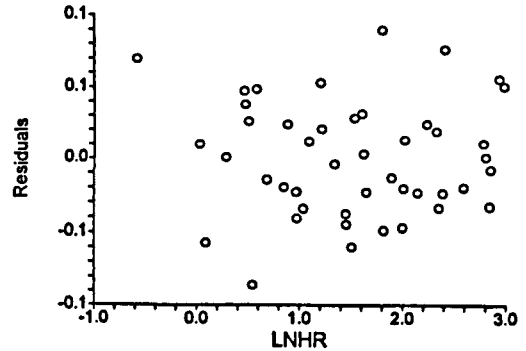
Residuals vs Predicted



Residuals vs LNNO

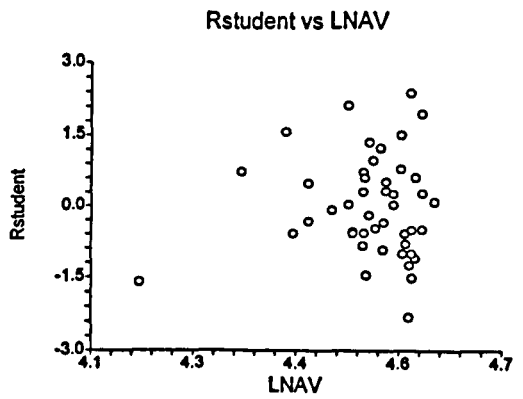
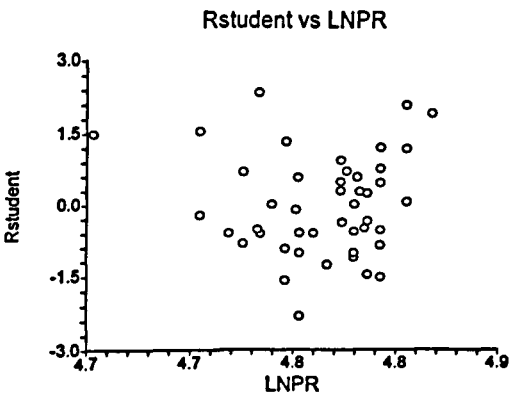
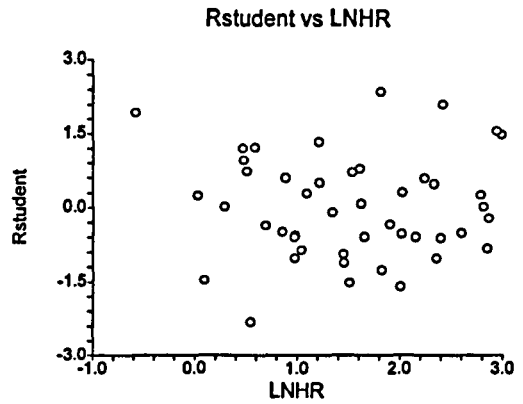
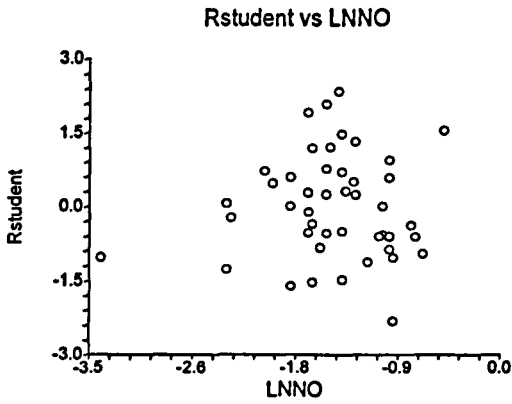
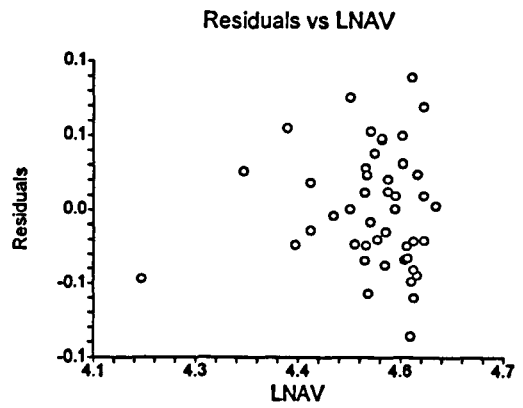
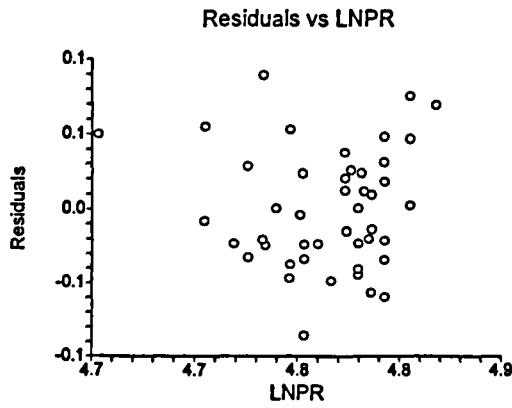


Residuals vs LNHR



Multiple Regression Report

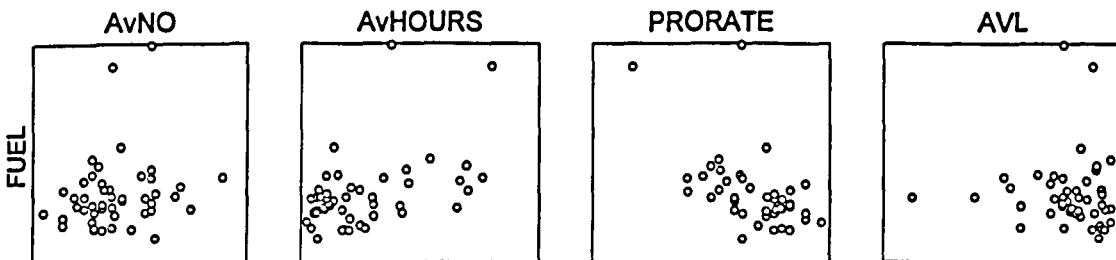
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 Dependent LNEL



B) FUEL of Kiln 2

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Plot Section



Data Screening Report

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Normality Tests Section

Variable	----- Skewness Test -----			----- Kurtosis Test -----			- Omnibus Test -		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
FUEL	2.46	5.10	0.0000	10.40	4.14	0.0000	43.17	0.0000	No

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.03	0.8580	
2	1.67	0.2024	
3	0.01	0.9225	
4	0.46	0.5031	
5	0.28	0.6010	
6	0.75	0.3896	
7	0.89	0.3506	
8	1.55	0.2189	
9	0.02	0.8974	
10	0.95	0.3337	
11	0.59	0.4455	
12	0.15	0.7033	
13	0.11	0.7420	
14	0.09	0.7660	
15	0.36	0.5497	
16	12.44	0.0010	Yes
17	0.27	0.6046	
18	0.99	0.3260	
19	0.99	0.3247	
20	0.89	0.3501	
21	0.01	0.9427	
22	0.14	0.7140	
23	0.21	0.6497	
24	17.02	0.0002	Yes
25	0.22	0.6451	
26	0.02	0.8976	
27	0.01	0.9269	
28	0.46	0.5000	
29	0.01	0.9332	
30	0.10	0.7543	
31	0.17	0.6827	
32	0.15	0.7048	
33	0.01	0.9427	
34	0.29	0.5937	
35	0.95	0.3360	
36	0.63	0.4317	
37	0.04	0.8490	
38	0.27	0.6091	
39	0.06	0.8014	
40	0.01	0.9049	
41	0.08	0.7764	
42	0.19	0.6691	
43	0.01	0.9074	
44	0.27	0.6079	

yy
yy
yy
yy
yy

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
45	0.00	0.9924	
46	0.20	0.6558	

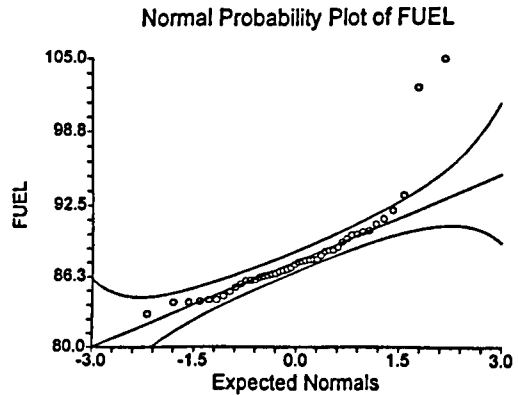
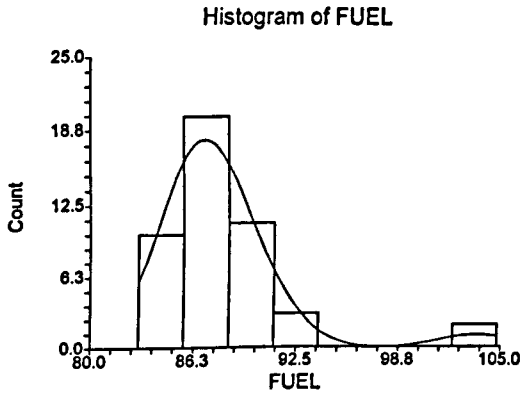
Descriptive Statistics Report

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Normality Test Section of FUEL

Test Name	Test Value	Prob Level	10% Critical Value	5% Critical Value	Decision (5%)
Shapiro-Wilk W	0.7549646	0.000000			Reject Normality
Anderson-Darling	2.715172	0.000001			Reject Normality
Martinez-Iglewicz	2.8864		1.101297	1.156321	Reject Normality
Kolmogorov-Smirnov	0.1658953		0.119	0.129	Reject Normality
D'Agostino Skewness	5.1024	0.000000	1.645	1.960	Reject Normality
D'Agostino Kurtosis	4.1390	0.000035	1.645	1.960	Reject Normality
D'Agostino Omnibus	43.1656	0.000000	4.605	5.991	Reject Normality

Plots Section of FUEL



Correlation Report

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Pearson Correlations Section (Row-Wise Deletion)

	FUEL	AvNO	AvHOURS	PRORATE	AVL
FUEL	1.000000	0.176764	0.462299	-0.562898	-0.054222
	0.000000	0.239932	0.001218	0.000047	0.720424
	46.000000	46.000000	46.000000	46.000000	46.000000
AvNO	0.176764	1.000000	-0.106310	-0.195630	-0.108459
	0.239932	0.000000	0.481942	0.192594	0.473078
	46.000000	46.000000	46.000000	46.000000	46.000000
AvHOURS	0.462299	-0.106310	1.000000	-0.604090	0.017859
	0.001218	0.481942	0.000000	0.000009	0.906226
	46.000000	46.000000	46.000000	46.000000	46.000000
PRORATE	-0.562898	-0.195630	-0.604090	1.000000	0.112665
	0.000047	0.192594	0.000009	0.000000	0.455981
	46.000000	46.000000	46.000000	46.000000	46.000000

AVL	-0.054222	-0.108459	0.017859	0.112665	1.000000
	0.720424	0.473078	0.906226	0.455981	0.000000
	46.000000	46.000000	46.000000	46.000000	46.000000

Cronbachs Alpha =- 0.409758 Standardized Cronbachs Alpha =- 0.657841

All Possible Regression Report

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 Dependent FUEL

All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
1	0.316854	3.406805	1.362116	C (PRORATE)
1	0.213720	3.654931	7.908461	B (AvHOURS)
1	0.031245	4.05693	19.490887	A (AvNO)
1	0.002940	4.115771	21.287547	D (AVL)

Variables in Best Model
PRORATE

2	0.340390	3.386307	1.868210	BC
2	0.321472	3.434524	3.068984	AC
2	0.316940	3.445976	3.356678	CD
2	0.265339	3.573766	6.631991	AB
2	0.217625	3.687994	9.660613	BD
2	0.032489	4.101198	21.411980	AD

Variables in Best Model
AvHOURS, PRORATE

3	0.354068	3.390672	3.000009	ABC
3	0.340445	3.42624	3.864702	BCD
3	0.321708	3.474567	5.054041	ACD
3	0.266810	3.612438	8.538606	ABD

Variables in Best Model
AvNO, AvHOURS, PRORATE

4	0.354068	3.431772	5.000000	ABCD
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Variables in Best Model
AvNO, AvHOURS, PRORATE, AVL

Stepwise Regression Report

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 Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.075779	0.000000
1	Added	PRORATE	0.316854	3.406805	0.000000
2	Unchanged		0.316854	3.406805	0.000000

List of Variables Selected

PRORATE

Stepwise Regression Report

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 Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.354068	3.431772	0.442438
1	Removed	AVL	0.354068	3.390672	0.433219
2	Removed	AvNO	0.340390	3.386307	0.364925
3	Removed	AvHOURS	0.316854	3.406805	0.000000
4	Unchanged		0.316854	3.406805	0.000000

List of Variables Selected
PRORATE

Stepwise Regression Report

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Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.075779	0.000000
1	Added	PRORATE	0.316854	3.406805	0.000000
2	Unchanged		0.316854	3.406805	0.000000

List of Variables Selected
PRORATE

Stepwise Regression Report

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Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.075779	0.000000
1	Added	PRORATE	0.316854	3.406805	0.000000
2	Unchanged		0.316854	3.406805	0.000000

List of Variables Selected
PRORATE

Multiple Regression Report

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Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	126.637	18.88865	6.7044	0.000000	Reject Ho	0.999998
AvNO	4.179579	4.494685	0.9299	0.357869	Accept Ho	0.148528
AvHOURS	0.1771547	0.1236084	1.4332	0.159385	Accept Ho	0.288041
PRORATE	-0.3386031	0.1438768	-2.3534	0.023478	Reject Ho	0.632358
AVL	-2.334129E-04	0.0792091	-0.0029	0.997663	Accept Ho	0.050001
R-Squared	0.354068					

Model

126.637+ 4.179579*AvNO+ .1771547*AvHOURS-.3386031*PRORATE-2.334129E-04*AVL

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	126.637	18.88865	88.49059	164.7834	0.0000
AvNO	4.179579	4.494685	-4.897621	13.25678	0.1245
AvHOURS	0.1771547	0.1236084	-7.247759E-02	0.426787	0.2366
PRORATE	-0.3386031	0.1438768	-0.6291682	-4.803807E-02	-0.3956
AVL	-2.334129E-04	0.0792091	-0.1601994	0.1597326	-0.0004
T-Critical	2.019541				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	356250.7	356250.7			
Model	4	264.6795	66.16988	5.6185	0.001061	0.964041
Error	41	482.8594	11.77706			
Total(Adjusted)	45	747.5389	16.61197			
Root Mean Square Error		3.431772	R-Squared	0.3541		
Mean of Dependent		88.0033	Adj R-Squared	0.2911		
Coefficient of Variation		3.899595E-02	Press Value	640.7445		
Sum Press Residuals		108.8167	Press R-Squared	0.1429		

Multiple Regression Report

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 Database C:\My Documents\DATA\K2.S0
 Dependent FUEL

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	4.9084	0.000001	Rejected
Kurtosis	4.3405	0.000014	Rejected
Omnibus	42.9318	0.000000	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.225149	9	-0.137402	17	0.023267
2	0.062469	10	0.138732	18	-0.160531
3	-0.067056	11	-0.010461	19	-0.040005
4	-0.141796	12	0.012375	20	0.021140
5	0.093981	13	-0.010428	21	-0.116950
6	-0.173108	14	0.080668	22	0.235452
7	0.084199	15	0.090485	23	-0.103878
8	0.105977	16	-0.104339	24	0.046670

Above serial correlations significant if their absolute values are greater than 0.294884
 Durbin-Watson Value 2.4471

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.137454	0.120844	0.879156	1.715385
AvHOURS	1.729320	0.421738	0.578262	1.297356E-03
PRORATE	1.793523	0.442438	0.557562	1.757699E-03
AVL	1.028677	0.027877	0.972123	5.327376E-04

Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.621921	40.55	40.55	1.00
2	1.153805	28.85	69.39	1.41
3	0.901298	22.53	91.93	1.80
4	0.322975	8.07	100.00	5.02

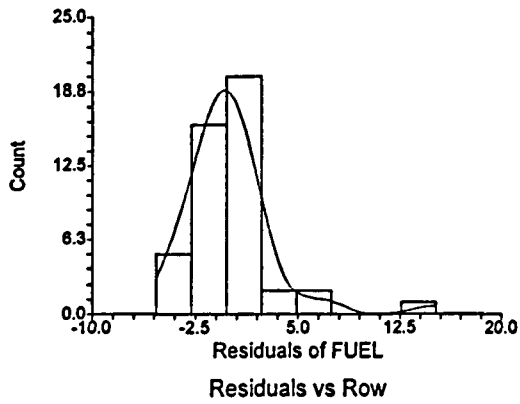
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Multiple Regression Report

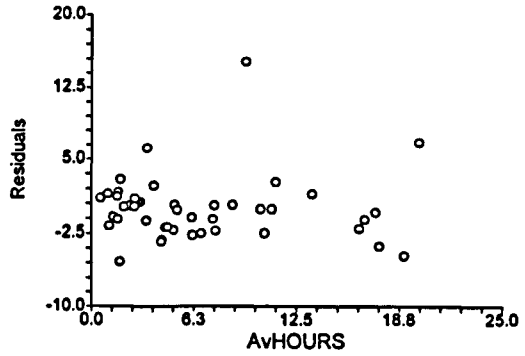
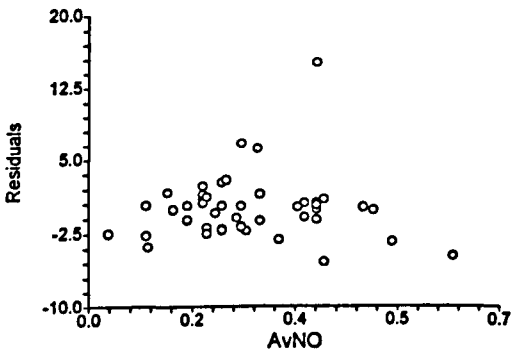
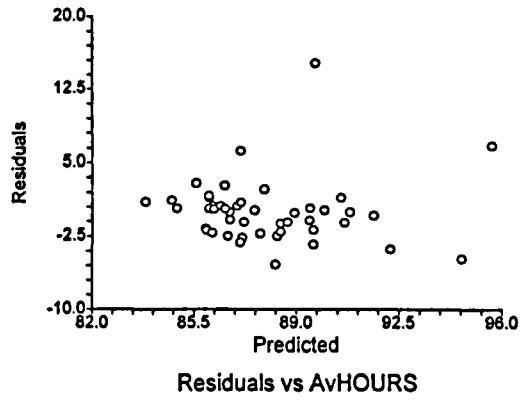
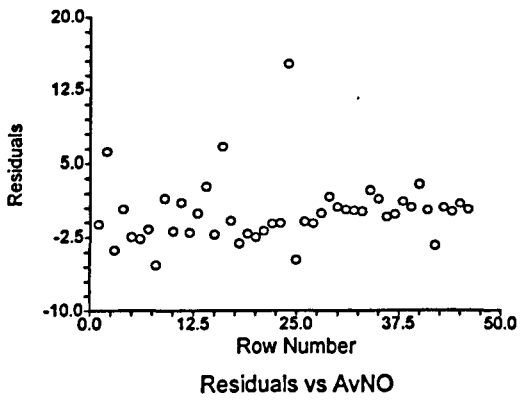
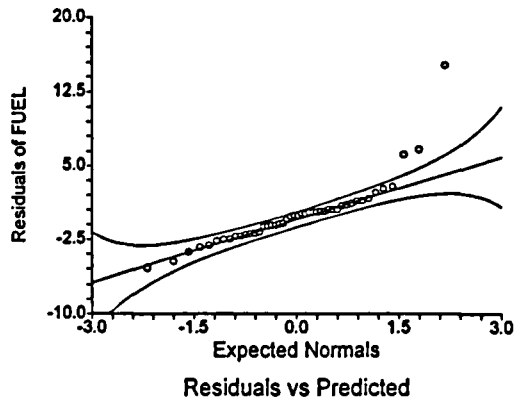
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Database C:\My Documents\DATA\K2.S0
Dependent FUEL

Plots Section

Histogram of Residuals of FUEL

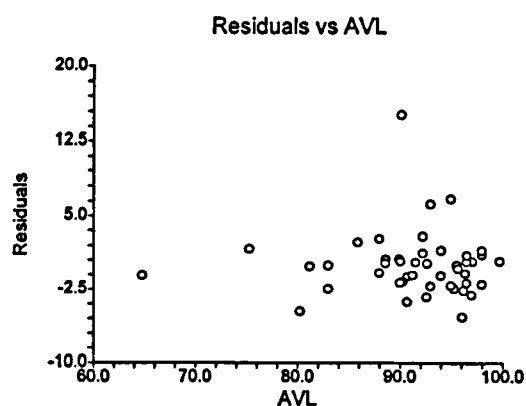
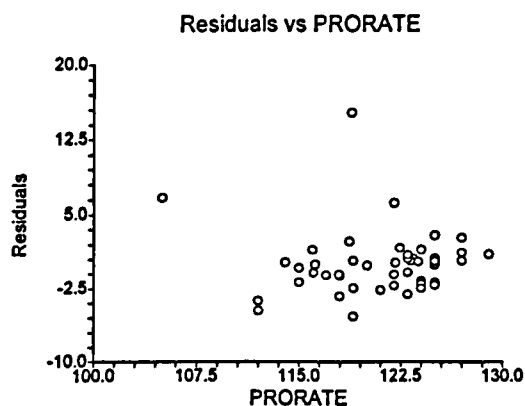


Normal Probability Plot of Residuals of FUEL



Multiple Regression Report

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 Dependent FUEL



Robust Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	112.3856	7.664457	14.6632	0.000000	Reject Ho	1.000000
AvNO	3.32656	1.729263	1.9237	0.061715	Accept Ho	0.466705
AvHOURS	5.018888E-02	4.940099E-02	1.0159	0.315915	Accept Ho	0.167884
PRORATE	-0.2016648	6.220261E-02	-3.2421	0.002433	Reject Ho	0.885182
AVL	-0.021949	3.038854E-02	-0.7223	0.474432	Accept Ho	0.108533
R-Squared	0.471992					

Model

$$112.3856 + 3.32656 \cdot \text{AvNO} + 5.018888 \cdot \text{AvHOURS} - 0.2016648 \cdot \text{PRORATE} - 0.021949 \cdot \text{AVL}$$

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	112.3856	7.664457	96.88274	127.8884	0.000000
AvNO	3.32656	1.729263	-0.1712042	6.824324	0.238673
AvHOURS	5.018888E-02	4.940099E-02	-4.973404E-02	0.1501118	0.144794
PRORATE	-0.2016648	6.220261E-02	-0.3274814	-7.584813E-02	-0.486464
AVL	-0.021949	3.038854E-02	-8.341563E-02	3.951763E-02	-0.088088
T-Critical	2.022691				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	240613.8	240613.8			
Model	4	46.66453	11.66613	8.7156	0.000040	0.997679
Error	39	52.20272	1.338531			
Total(Adjusted)	43	98.86725	2.299238			

Root Mean Square Error	1.156949	R-Squared	0.471992
Mean of Dependent Variable	87.10788	Adj R-Squared	0.417837
Coefficient of Variation	0.0132818		

Robust Regression Report

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Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	113.4744	9.867445	11.4999	0.000000	Reject Ho	1.000000
AvNO	2.419786	2.254175	1.0735	0.289658	Accept Ho	0.181995
AvHOURS	0.0987749	6.196832E-02	1.5940	0.119019	Accept Ho	0.342883
PRORATE	-0.2085551	7.804588E-02	-2.6722	0.010941	Reject Ho	0.740848
AVL	-2.467395E-02	0.0394678	-0.6252	0.535503	Accept Ho	0.093584
R-Squared	0.402501					

Model

$$113.4744 + 2.419786 * AvNO + .0987749 * AvHOURS - .2085551 * PRORATE - 2.467395E-02 * AVL$$

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	113.4744	9.867445	93.51565	133.4332	0.000000
AvNO	2.419786	2.254175	-2.139713	6.979286	0.142264
AvHOURS	0.0987749	6.196832E-02	-2.656787E-02	0.2241177	0.241911
PRORATE	-0.2085551	7.804588E-02	-0.3664178	-5.069241E-02	-0.420023
AVL	-2.467395E-02	0.0394678	-0.1045051	5.515721E-02	-0.079511
T-Critical	2.022691				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	304089.1	304089.1			
Model	4	70.29739	17.57435	6.5680	0.000385	0.983447
Error	39	104.3541	2.675746			
Total(Adjusted)	43	174.6515	4.061662			
Root Mean Square Error		1.635771	R-Squared	0.402501		
Mean of Dependent Variable		87.20157	Adj R-Squared	0.341219		
Coefficient of Variation		0.0187585				

Robust Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	117.8641	9.893016	11.9139	0.000000	Reject Ho	1.000000
AvNO	3.739973	2.476943	1.5099	0.138734	Accept Ho	0.314010
AvHOURS	0.1114986	0.0651496	1.7114	0.094559	Accept Ho	0.386579
PRORATE	-0.2617749	7.874322E-02	-3.3244	0.001874	Reject Ho	0.900714
AVL	-4.060191E-03	3.974939E-02	-0.1021	0.919140	Accept Ho	0.051141
R-Squared	0.462703					

Model

$$117.8641 + 3.739973 * AvNO + .1114986 * AvHOURS - .2617749 * PRORATE - 4.060191E-03 * AVL$$

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	117.8641	9.893016	97.88474	137.8434	0.000000
AvNO	3.739973	2.476943	-1.262314	8.742259	0.186968
AvHOURS	0.1114986	0.0651496	-2.007369E-02	0.2430709	0.244155
PRORATE	-0.2617749	7.874322E-02	-0.4208001	-0.1027498	-0.480345

AVL -4.060191E-03 3.974939E-02 -8.433571E-02 7.621533E-02 -0.012034
T-Critical 2.019541

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	264596.2	264596.2			
Model	4	85.42879	21.3572	8.8270	0.000031	0.998020
Error	41	99.20123	2.419542			
Total(Adjusted)	45	184.63	4.10289			
Root Mean Square Error		1.555488	R-Squared	0.462703		
Mean of Dependent Variable		87.43117	Adj R-Squared	0.410283		
Coefficient of Variation		0.017791				

Response-Surface Regression Report

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Response FUEL

Hierarchical Model Summary Section

Number of Terms Removed 4
Number of Terms Remaining 10
R-Squared Cutoff Value 0.010000
R-Squared of Final Model 0.539777

Coded Hierarchical Model

	A	B	C	D
A AvNO	2	1(11)	1(11)	1(11)
B AvHOURS		2	1(11)	1(11)
C PRORATE			2	1(11)
D AVL				2

Notes:

For off-diagonal entries:

1=u1w1, 2=u1w2, 3=u2w1, 4=u2w2, 5=u1w3, 6=u3w1, 7=u2w3, 8=u3w2, 9=u3w3.

For diagonal entries:

1=u1, 2=u2, 3=u3.

Where u1=u, u2=u^2=u*u, and u3=u^3=u*u*u.

Sequential ANOVA Section

Source	df	Sequential Sum-Squares	Mean Square	F-Ratio	Prob Level	Incremental R-Squared
Regression	10	403.5041	40.35041	4.11	0.000861	0.539777
Linear	4	264.6795	66.16988	6.73	0.000397	0.354068
Quadratic	3	68.00742	22.66914	2.31	0.093642	0.090975
Lin x Lin	3	70.81716	23.60572	2.40	0.084217	0.094734
Total Error	35	344.0348	9.829566			0.460223

ANOVA Section

Factor	df	Last Sum-Squares	Mean Square	F-Ratio	Prob Level	Term R-Squared
AvNO	3	76.69485	25.56495	2.60	0.067524	0.102596
AvHOURS	5	122.1239	24.42478	2.48	0.050023	0.163368
PRORATE	2	105.3985	52.69927	5.36	0.009309	0.140994
AVL	3	30.4641	10.1547	1.03	0.389896	0.040753
Total Error	35	344.0348	9.829566			0.460223

Response-Surface Regression Report

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 Response FUEL

Estimation Section

Parameter	df	Regression Coefficient	Standard Error	T-Ratio	Prob Level	Last R-Squared
Intercept	1	40.40039				
AvNO	1	36.50691	18.22221	2.00	0.052922	0.052777
AvHOURS	1	4.421195	3.422174	1.29	0.204849	0.021947
PRORATE	1	0.1287451	0.2493037	0.52	0.608810	0.003507
AVL	1	0.8154204	1.164257	0.70	0.488321	0.006450
AvNO^2	1	-58.64738	29.65239	-1.98	0.055864	0.051437
AvHOURS^2	1	-4.849597E-02	2.633479E-02	-1.84	0.074034	0.044592
AVL^2	1	-6.105033E-03	6.734934E-03	-0.91	0.370884	0.010805
AvNO*AvHOURS	1	0.8275254	0.7510174	1.10	0.278037	0.015965
AvHOURS*PRORATE	1	-5.103951E-02	2.288911E-02	-2.23	0.032269	0.065382
AvHOURS*AVL	1	2.793724E-02	2.075399E-02	1.35	0.186920	0.023827

Model

40.40039+ 36.50691*AvNO+ 4.421195*AvHOURS+ .1287451*PRORATE+ .8154204*AVL-58.64738*AvNO^2-4.849597E-02*AvHOURS^2-6.105033E-03*AVL^2+ .8275254*AvNO*AvHOURS-5.103951E-02*AvHOURS*PRORATE+ 2.793724E-02*AvHOURS*AVL

Optimum Solution Section

Parameter	Maximum Exponent	Optimum Value
AvNO	2	14195.27
AvHOURS	2	-14188.47
PRORATE	1 Held Constant	-13404.2
AVL	2	14286.25

Function at optimum -1.201037E+10
 Number of Function Evaluations 1001
 Maximum Functions Evaluations 1000

Nonlinear Regression Report

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 Dependent FUEL

Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	554.1558	270.3284	6.418413	1101.893
B	39.92229	17.11059	5.252937	74.59164
C	0.6393881	0.4013344	-0.1737927	1.452569
D	-8.170973	4.467688	-17.22337	0.8814217
E	0.8539421	1.171381	-1.5195	3.227385
F	-56.76058	26.7756	-111.0131	-2.508067
G	-2.395827E-02	2.222392E-02	-6.898822E-02	2.107167E-02
H	3.278494E-02	1.866646E-02	-5.036897E-03	7.060677E-02
I	-5.312963E-03	6.864548E-03	-1.922186E-02	8.595931E-03

Model FUEL =
 A+B*AVNO+C*AVHOURS+D*PRORATE+E*AVL+F*AVNO^2+G*AVHOURS^2+H*PRORATE^2+I*AVL^2
 R-Squared 0.487751
 Iterations 11
 Estimated Model

$$(554.1558)+(39.92229)*(AVNO)+(.6393881)*(AVHOURS)+(-8.170973)*(PRORATE)+(.8539421)*(AVL)+(-56.76058)*(AVNO)^2+(-2.395827E-02)*(AVHOURS)^2+(3.278494E-02)*(PRORATE)^2+(-5.312963E-03)*(AVL)^2$$

Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square
Mean	1	356250.7	356250.7
Model	9	356615.3	39623.92
Model (Adjusted)	8	364.6125	45.57656
Error	37	382.9264	10.34936
Total (Adjusted)	45	747.5389	
Total	46	356998.2	

Multiple Regression Report

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 Dependent LNFU

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	6.737533	0.8391204	8.0293	0.000000	Reject Ho	1.000000
LNNO	1.630561E-02	1.089732E-02	1.4963	0.142236	Accept Ho	0.309325
LNHR	1.090177E-02	7.682167E-03	1.4191	0.163428	Accept Ho	0.283387
LNPR	-0.4760121	0.1678285	-2.8363	0.007059	Reject Ho	0.790842
LNAV	6.008889E-03	7.000376E-02	0.0858	0.932014	Accept Ho	0.050806
R-Squared	0.380868					

Model
 6.737533+ 1.630561E-02*LNNO+ 1.090177E-02*LNHR-.4760121*LNPR+ 6.008889E-03*LNAV

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	Standardized Coefficient
Intercept	6.737533	0.8391204	5.042894	8.432171	0.0000
LNNO	1.630561E-02	1.089732E-02	-5.701974E-03	3.831319E-02	0.1948
LNHR	1.090177E-02	7.682167E-03	-4.612681E-03	2.641622E-02	0.2200
LNPR	-0.4760121	0.1678285	-0.8149485	-0.1370756	-0.4351
LNAV	6.008889E-03	7.000376E-02	-0.1353666	0.1473844	0.0106
T-Critical	2.019541				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	921.7527	921.7527			
Model	4	3.323609E-02	8.309023E-03	6.3054	0.000475	0.979904
Error	41	5.402797E-02	1.317755E-03			
Total(Adjusted)	45	8.726405E-02	1.939201E-03			

Root Mean Square Error 0.0363009 R-Squared 0.3809
 Mean of Dependent 4.476394 Adj R-Squared 0.3205
 Coefficient of Variation 8.109407E-03 Press Value 6.910226E-02
 Sum |Press Residuals| 1.170822 Press R-Squared 0.2081

Multiple Regression Report

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 Dependent LNFU

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	4.4589	0.000008	Rejected
Kurtosis	4.0254	0.000057	Rejected
Omnibus	36.0859	0.000000	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.212224	9	-0.122710	17	-0.001365
2	0.068528	10	0.120274	18	-0.158541
3	-0.095652	11	0.040547	19	-0.007728
4	-0.184805	12	0.036393	20	0.020489
5	0.106609	13	0.011832	21	-0.101254
6	-0.212169	14	0.037334	22	0.212300
7	0.104043	15	0.077913	23	-0.099892
8	0.058913	16	-0.129561	24	0.065649

Above serial correlations significant if their absolute values are greater than 0.294884
 Durbin-Watson Value 2.4186

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
LNNO	1.122896	0.109445	0.890555	9.011655E-02
LNHR	1.591115	0.371510	0.628490	4.478501E-02
LNPR	1.558142	0.358210	0.641790	21.37453
LNAV	1.014191	0.013993	0.986007	3.718845

Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.572780	39.32	39.32	1.00
2	1.120853	28.02	67.34	1.40
3	0.934356	23.36	90.70	1.68
4	0.372011	9.30	100.00	4.23

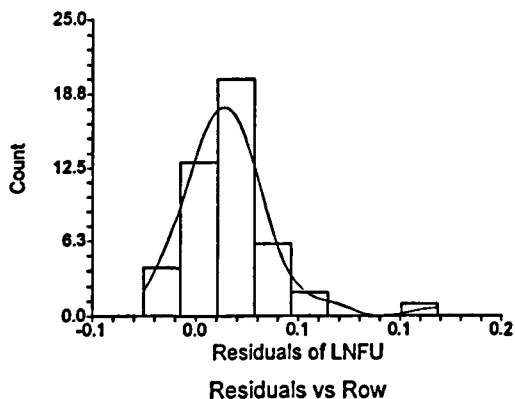
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Multiple Regression Report

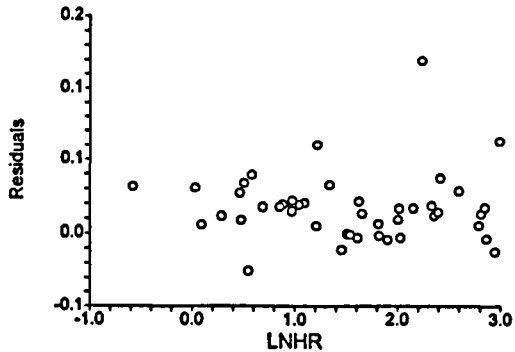
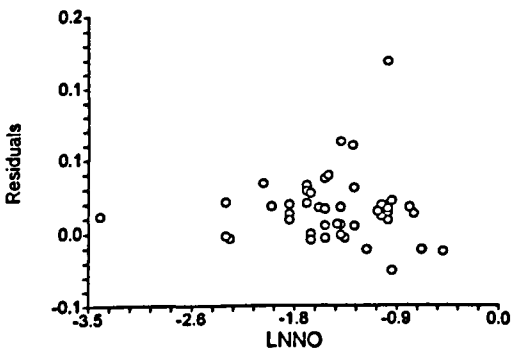
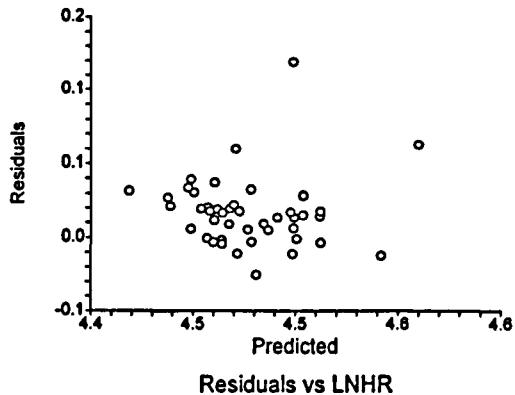
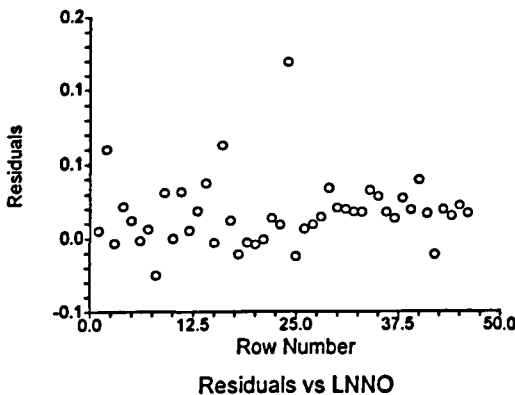
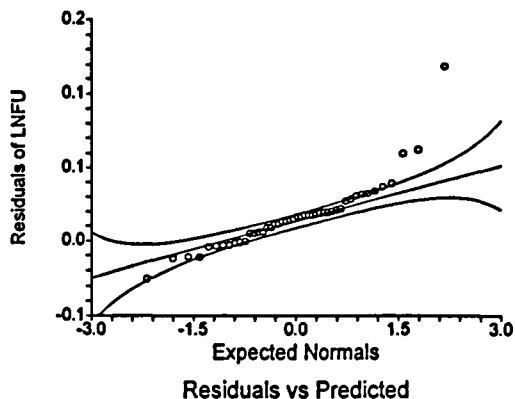
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Dependent LNFU

Plots Section

Histogram of Residuals of LNFU



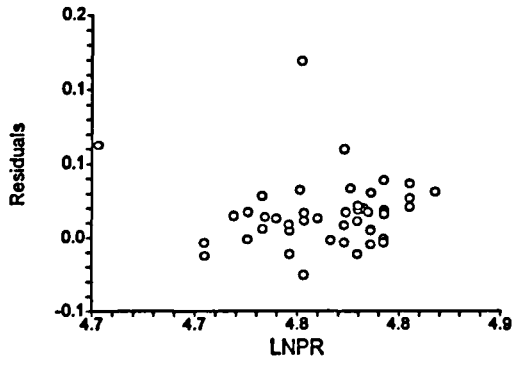
Normal Probability Plot of Residuals of LNFU



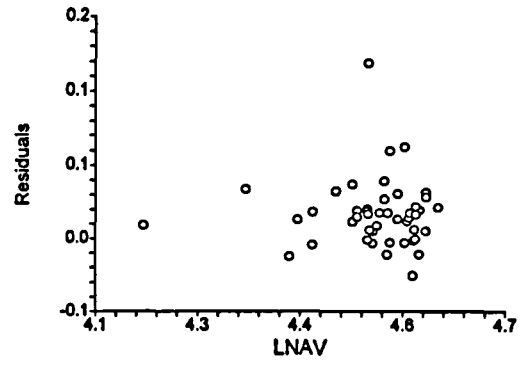
Multiple Regression Report

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Dependent LNFU

Residuals vs LNPR



Residuals vs LNAV



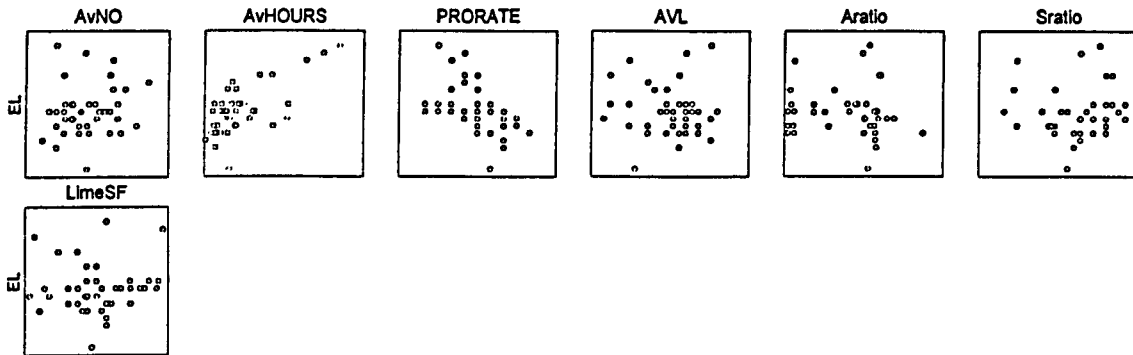
Appendix 04: Screening of data of other Kilns

Kiln 4: EL

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Plot Section

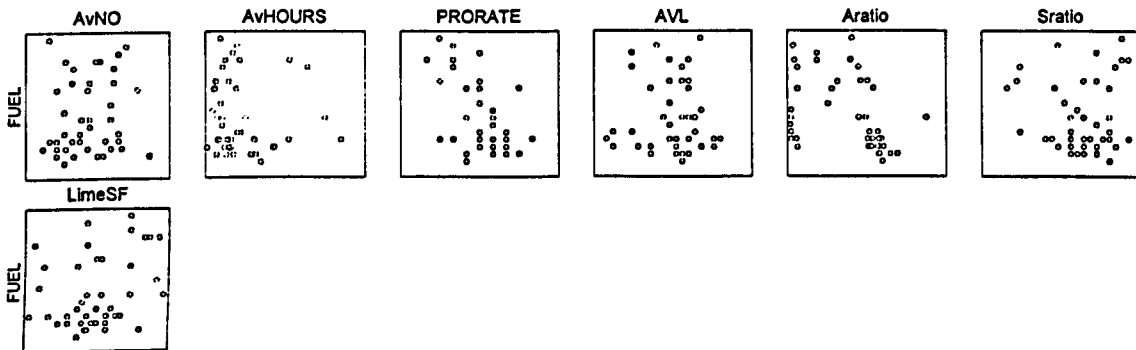


Kiln 4: FUEL

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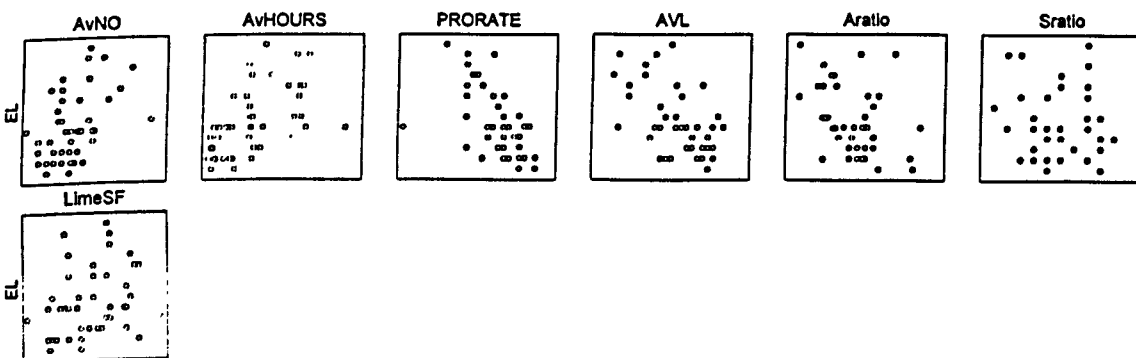


Kiln 5: EL

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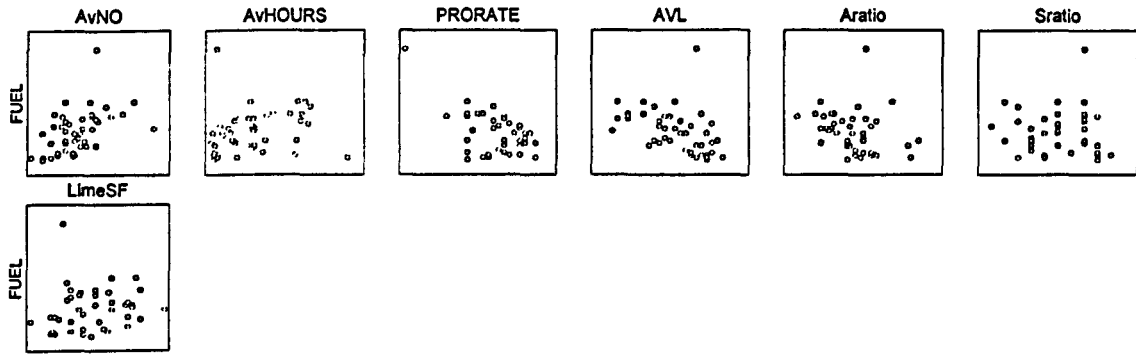


Kiln 5: FUEL

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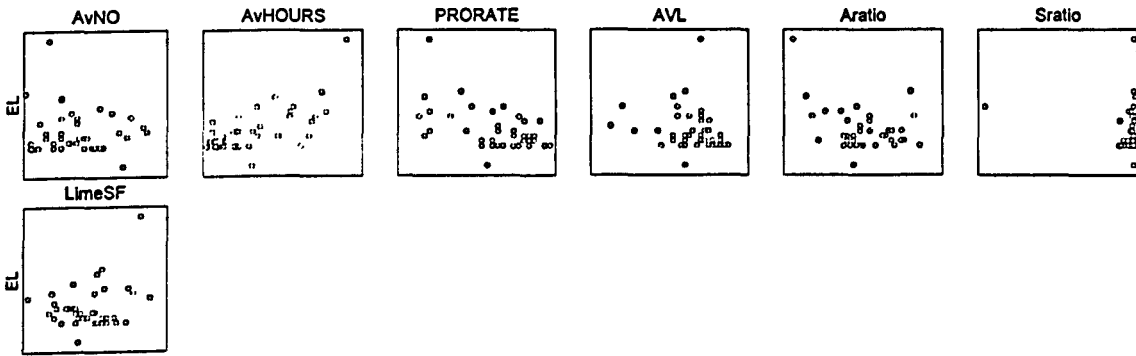


Kiln 6: EL

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Plot Section

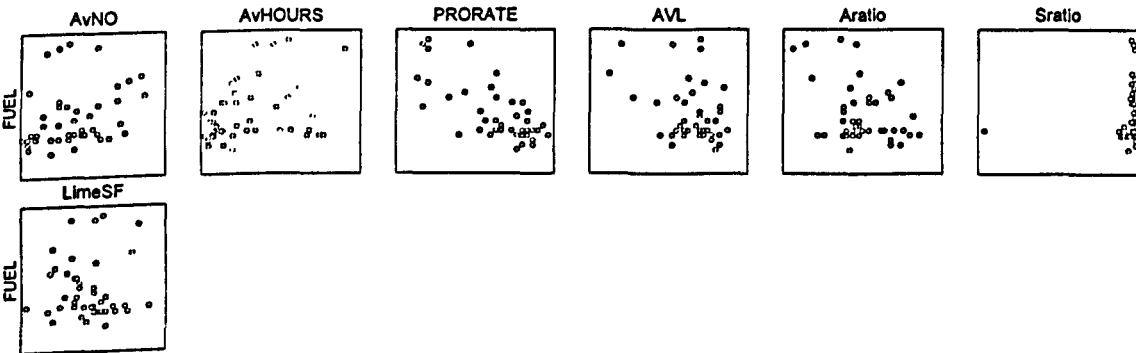


Kiln 6: FUEL

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Plot Section



b) Correlation Report of Kilns

Kiln 4:

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Correlation Report

Pearson Correlations Section (Row-Wise Deletion)

	EL	FUEL	AvNO	AvHOURS	PRORATE	AVL
EL	1.000000 0.000000	0.225745 0.145515	0.113564 0.468395	0.711479 0.000000	-0.514869 0.000412	-0.042750 0.785471
FUEL	0.225745 0.145515	1.000000 0.000000	0.237053 0.125876	-0.087562 0.576613	-0.575602 0.000054	-0.068766 0.661272
AvNO	0.113564 0.468395	0.237053 0.125876	1.000000 0.000000	0.017915 0.909221	0.017096 0.913353	-0.674955 0.000001
AvHOURS	0.711479 0.000000	-0.087562 0.576613	0.017915 0.909221	1.000000 0.000000	-0.176623 0.257213	0.005222 0.973486
PRORATE	-0.514869 0.000412	-0.575602 0.000054	0.017096 0.913353	-0.176623 0.257213	1.000000 0.000000	-0.007470 0.962083
AVL	-0.042750 0.785471	-0.068766 0.661272	-0.674955 0.000001	0.005222 0.973486	-0.007470 0.962083	1.000000 0.000000
Aratio	-0.047229 0.763613	-0.420117 0.005035	-0.039477 0.801553	0.121681 0.436982	0.259653 0.092673	0.256171 0.097292
Sratio	0.048582 0.757042	0.084271 0.591075	0.050851 0.746063	0.131835 0.399388	-0.190055 0.222196	0.092373 0.555766
LimeSF	0.091321 0.560294	0.266252 0.084385	0.016702 0.915344	0.018611 0.905709	-0.264637 0.086358	0.088349 0.573179

Correlation Report

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Pearson Correlations Section (Row-Wise Deletion)

	Aratio	Sratio	LimeSF
EL	-0.047229 0.763613	0.048582 0.757042	0.091321 0.560294
FUEL	-0.420117 0.005035	0.084271 0.591075	0.266252 0.084385
AvNO	-0.039477 0.801553	0.050851 0.746063	0.016702 0.915344
AvHOURS	0.121681 0.436982	0.131835 0.399388	0.018611 0.905709
PRORATE	0.259653 0.092673	-0.190055 0.222196	-0.264637 0.086358
AVL	0.256171 0.097292	0.092373 0.555766	0.088349 0.573179
Aratio	1.000000 0.000000	0.444158 0.002848	-0.042203 0.788153
Sratio	0.444158 0.002848	1.000000 0.000000	0.241475 0.118765
LimeSF	-0.042203 0.788153	0.241475 0.118765	1.000000 0.000000

Correlation Report

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 Database E:\DATA\K5.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	FUEL	AvNO	AvHOURS	PRORATE	AVL
EL	1.000000 0.000000	0.652595 0.000002	0.439431 0.002841	0.546581 0.000124	-0.534700 0.000185	-0.576955 0.000041
FUEL	0.652595 0.000002	1.000000 0.000000	0.483033 0.000897	0.215094 0.160864	-0.558598 0.000081	-0.431385 0.003460
AvNO	0.439431 0.002841	0.483033 0.000897	1.000000 0.000000	0.058096 0.707966	-0.158303 0.304740	-0.585609 0.000030
AvHOURS	0.546581 0.000124	0.215094 0.160864	0.058096 0.707966	1.000000 0.000000	-0.237467 0.120631	-0.150328 0.330053
PRORATE	-0.534700 0.000185	-0.558598 0.000081	-0.158303 0.304740	-0.237467 0.120631	1.000000 0.000000	0.116095 0.452979
AVL	-0.576955 0.000041	-0.431385 0.003460	-0.585609 0.000030	-0.150328 0.330053	0.116095 0.452979	1.000000 0.000000

Aratio	-0.385261 0.009809	-0.299988 0.047880	-0.235468 0.123883	-0.018158 0.906871	0.211031 0.169111	0.167042 0.278467
Sratio	-0.112646 0.466603	0.018793 0.903625	0.202800 0.186748	-0.114003 0.461217	-0.185676 0.227546	0.018137 0.906977
LimeSF	0.268562 0.077952	0.139483 0.366518	0.111812 0.469929	-0.091950 0.552759	-0.030708 0.843142	-0.185101 0.229014

Correlation Report

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 Database E:\DATA\K5.S0

Pearson Correlations Section (Row-Wise Deletion)

	Aratio	Sratio	LimeSF
EL	-0.385261 0.009809	-0.112646 0.466603	0.268562 0.077952
FUEL	-0.299988 0.047880	0.018793 0.903625	0.139483 0.366518
AvNO	-0.235468 0.123883	0.202800 0.186748	0.111812 0.469929
AvHOURS	-0.018158 0.906871	-0.114003 0.461217	-0.091950 0.552759
PRORATE	0.211031 0.169111	-0.185676 0.227546	-0.030708 0.843142
AVL	0.167042 0.278467	0.018137 0.906977	-0.185101 0.229014
Aratio	1.000000 0.000000	-0.358697 0.016802	-0.253471 0.096880
Sratio	-0.358697 0.016802	1.000000 0.000000	-0.225996 0.140188
LimeSF	-0.253471 0.096880	-0.225996 0.140188	1.000000 0.000000

Correlation Report

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Pearson Correlations Section (Row-Wise Deletion)

	EL	FUEL	AvNO	AvHOURS	PRORATE	AVL
EL	1.000000 0.000000	0.575974 0.000043	-0.082809 0.593067	0.654625 0.000001	-0.554805 0.000093	-0.206998 0.177596
FUEL	0.575974 0.000043	1.000000 0.000000	0.265155 0.081948	0.340764 0.023604	-0.713741 0.000000	-0.394591 0.008035
AvNO	-0.082809 0.593067	0.265155 0.081948	1.000000 0.000000	0.060785 0.695090	-0.211198 0.168767	-0.510319 0.000402
AvHOURS	0.654625 0.000001	0.340764 0.023604	0.060785 0.695090	1.000000 0.000000	-0.395775 0.007831	-0.192361 0.210946
PRORATE	-0.554805 0.000093	-0.713741 0.000000	-0.211198 0.168767	-0.395775 0.007831	1.000000 0.000000	0.056486 0.715718
AVL	-0.206998 0.177596	-0.394591 0.008035	-0.510319 0.000402	-0.192361 0.210946	0.056486 0.715718	1.000000 0.000000

Aratio	-0.318890 0.034875	-0.377072 0.011632	0.081642 0.598304	-0.120933 0.434239	0.393853 0.008165	-0.155872 0.312322
Sratio	0.153171 0.320882	0.178126 0.247347	0.096136 0.534745	0.122261 0.429169	-0.211708 0.167716	-0.230385 0.132446
LimeSF	0.250252 0.101342	0.004251 0.978152	-0.161600 0.294647	0.210710 0.169775	-0.075056 0.628231	0.371611 0.013003

Correlation Report

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Pearson Correlations Section (Row-Wise Deletion)

	Aratio	Sratio	LimeSF
EL	-0.318890 0.034875	0.153171 0.320882	0.250252 0.101342
FUEL	-0.377072 0.011632	0.178126 0.247347	0.004251 0.978152
AvNO	0.081642 0.598304	0.096136 0.534745	-0.161600 0.294647
AvHOURS	-0.120933 0.434239	0.122261 0.429169	0.210710 0.169775
PRORATE	0.393853 0.008165	-0.211708 0.167716	-0.075056 0.628231
AVL	-0.155872 0.312322	-0.230385 0.132446	0.371611 0.013003
Aratio	1.000000 0.000000	0.141898 0.358195	-0.360947 0.016080
Sratio	0.141898 0.358195	1.000000 0.000000	-0.434453 0.003211
LimeSF	-0.360947 0.016080	-0.434453 0.003211	1.000000 0.000000

c) Screening for Outliers

Kiln 4

Variable: EL

Data Screening Report

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Database E:\DATA\K4.S0

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	7.39	0.0094	Yes
2	0.10	0.7583	
3	2.27	0.1391	
4	0.00	0.9945	

5	1.45	0.2351	
6	2.27	0.1391	
7	0.10	0.7583	
8	0.10	0.7583	
9	0.84	0.3651	
10	0.00	0.9945	
11	1.48	0.2298	
12	2.31	0.1356	
13	0.00	0.9945	
14	0.38	0.5434	
15	0.38	0.5434	
16	0.09	0.7687	
17	0.10	0.7583	
18	0.10	0.7583	
19	0.09	0.7687	
20	0.09	0.7687	
21	0.00	0.9945	
22	0.00	0.9945	
23	0.09	0.7687	
24	0.09	0.7687	
25	0.81	0.3723	
26	0.00	0.9945	
27	0.38	0.5434	
28	0.84	0.3651	
29	0.09	0.7687	
30	0.00	0.9945	
31	0.81	0.3723	
32	0.09	0.7687	
33	0.00	0.9945	
34	5.83	0.0200	Yes
35	5.90	0.0194	Yes
36	0.84	0.3651	
37	0.38	0.5434	
38	4.46	0.0405	Yes
39	0.00	0.9945	
40	0.38	0.5434	
41	0.84	0.3651	
42	0.00	0.9945	
43	0.84	0.3651	
44	0.84	0.3651	
45			

Variable : FUEL

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.44	0.5131	
2	1.13	0.2939	
3	0.74	0.3940	
4	0.44	0.5131	
5	1.13	0.2939	
6	1.60	0.2130	
7	1.13	0.2939	
8	0.44	0.5131	
9	0.44	0.5131	
10	1.13	0.2939	
11	0.74	0.3940	
12	1.13	0.2939	

13	0.44	0.5131	
14	0.74	0.3940	
15	0.56	0.4566	
16	0.21	0.6492	
17	0.44	0.5131	
18	0.74	0.3940	
19	0.91	0.3461	
20	1.84	0.1823	
21	4.67	0.0362	Yes
22	2.43	0.1267	
23	2.43	0.1267	
24	2.43	0.1267	
25	3.84	0.0565	
26	0.00	0.9564	
27	0.21	0.6492	
28	0.00	0.9564	
29	0.00	0.9564	
30	0.44	0.5131	
31	0.91	0.3461	
32	3.09	0.0857	
33	0.12	0.7295	
34	0.00	0.9564	
35	0.74	0.3940	
36	0.74	0.3940	
37	0.44	0.5131	
38	1.84	0.1823	
39	0.56	0.4566	
40	0.56	0.4566	
41	0.91	0.3461	
42	0.21	0.6492	
43	0.07	0.7988	
44	0.02	0.8842	
45			

Variable : AvNO

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	1.31	0.2592	
2	0.17	0.6845	
3	0.83	0.3687	
4	1.98	0.1667	
5	5.62	0.0223	Yes
6	0.73	0.3985	
7	0.25	0.6205	
8	0.31	0.5830	
9	0.07	0.7941	
10	0.38	0.5399	
11	2.79	0.1022	
12	1.31	0.2592	
13	0.50	0.4823	
14	1.31	0.2592	
15	3.67	0.0620	
16	1.44	0.2371	
17	1.44	0.2371	
18	0.65	0.4239	
19	0.31	0.5830	
20	0.25	0.6205	

21	2.06	0.1589
22	0.25	0.6197
23	0.12	0.7313
24	0.65	0.4239
25	2.22	0.1437
26	0.04	0.8431
27	0.07	0.7941
28	0.83	0.3687
29	0.01	0.9133
30	1.31	0.2592
31	1.04	0.3146
32	1.44	0.2371
33	0.83	0.3687
34	0.00	0.9645
35	0.00	0.9779
36	1.73	0.1948
37	1.31	0.2592
38	1.04	0.3146
39	1.31	0.2592
40	0.00	0.9779
41	0.01	0.9133
42	0.73	0.3985
43	0.01	0.9133
44	0.73	0.3985
45		

Variable : AvHOURS

Data Screening Report

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 Database E:\DATA\K4.S0

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier? Yes
1	11.09	0.0018	
2	0.21	0.6483	
3	1.17	0.2862	
4	0.17	0.6805	
5	0.06	0.8148	
6	0.45	0.5051	
7	0.12	0.7292	
8	2.54	0.1185	
9	0.54	0.4659	
10	0.26	0.6116	
11	1.18	0.2830	
12	0.60	0.4410	
13	0.21	0.6523	
14	1.26	0.2681	
15	0.02	0.8927	
16	0.00	0.9991	
17	0.09	0.7705	
18	0.27	0.6058	
19	0.66	0.4213	
20	0.33	0.5700	
21	0.39	0.5352	
22	0.24	0.6260	
23	0.00	0.9884	
24	2.65	0.1110	
25	0.01	0.9155	
26	0.35	0.5577	
27	0.01	0.9196	
28	0.59	0.4456	

29	0.03	0.8641	
30	0.18	0.6748	
31	0.14	0.7055	
32	0.06	0.8087	
33	0.41	0.5233	
34	7.80	0.0078	Yes
35	0.10	0.7565	
36	0.14	0.7113	
37	0.49	0.4868	
38	4.91	0.0320	Yes
39	0.75	0.3921	
40	0.69	0.4109	
41	0.63	0.4318	
42	0.01	0.9217	
43	0.36	0.5524	
44	0.84	0.3657	
45			

Variable : PRORATE

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	2.45	0.1248	
2	0.25	0.6213	
3	0.00	0.9711	
4	1.06	0.3080	
5	0.25	0.6213	
6	0.25	0.6213	
7	2.68	0.1086	
8	1.22	0.2756	
9	4.72	0.0354	Yes
10	0.33	0.5714	
11	1.22	0.2756	
12	1.22	0.2756	
13	0.33	0.5714	
14	1.22	0.2756	
15	2.68	0.1086	
16	0.00	0.9711	
17	0.00	0.9711	
18	0.00	0.9711	
19	2.45	0.1248	
20	1.06	0.3080	
21	2.45	0.1248	
22	4.41	0.0417	Yes
23	4.41	0.0417	Yes
24	1.06	0.3080	
25	1.06	0.3080	
26	0.25	0.6213	
27	0.00	0.9711	
28	0.33	0.5714	
29	0.33	0.5714	
30	1.22	0.2756	
31	0.00	0.9711	
32	0.00	0.9711	
33	0.00	0.9711	
34	0.25	0.6213	
35	0.33	0.5714	
36	0.33	0.5714	

37	0.00	0.9711
38	1.06	0.3080
39	0.25	0.6213
40	0.00	0.9711
41	0.00	0.9711
42	1.22	0.2756
43	0.33	0.5714
44	0.33	0.5714
45		

Variable : AVL

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	2.13	0.1520	
2	0.30	0.5886	
3	4.82	0.0336	Yes
4	2.85	0.0989	
5	0.68	0.4138	
6	0.10	0.7531	
7	0.30	0.5886	
8	2.13	0.1520	
9	0.30	0.5886	
10	0.01	0.9301	
11	2.13	0.1520	
12	0.10	0.7531	
13	0.01	0.9301	
14	1.00	0.3221	
15	0.68	0.4138	
16	4.82	0.0336	Yes
17	5.88	0.0196	Yes
18	0.01	0.9301	
19	0.30	0.5886	
20	0.10	0.7531	
21	1.00	0.3221	
22	0.02	0.8892	
23	0.30	0.5886	
24	0.02	0.8892	
25	0.36	0.5537	
26	0.14	0.7143	
27	2.28	0.1383	
28	0.10	0.7531	
29	0.60	0.4435	
30	0.02	0.8892	
31	0.02	0.8892	
32	2.28	0.1383	
33	0.02	0.8892	
34	0.30	0.5886	
35	1.64	0.2067	
36	0.68	0.4138	
37	0.01	0.9301	
38	2.28	0.1383	
39	0.30	0.5886	
40	0.30	0.5886	
41	0.10	0.7531	
42	0.60	0.4435	
43	0.02	0.8892	
44	1.00	0.3221	

Variable : Aratio**Data Screening Report**

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.40	0.5326	
2	1.21	0.2783	
3	0.84	0.3649	
4	0.70	0.4069	
5			
6	0.79	0.3786	
7	1.64	0.2073	
8	0.75	0.3926	
9	0.62	0.4365	
10	0.62	0.4365	
11	0.62	0.4365	
12	0.66	0.4215	
13	0.62	0.4365	
14	0.58	0.4517	
15	0.43	0.5158	
16	0.30	0.5845	
17	0.25	0.6204	
18	0.28	0.6023	
19	0.10	0.7531	
20	0.07	0.7927	
21	0.01	0.9144	
22	0.69	0.4113	
23	0.00	0.9556	
24	2.04	0.1603	
25	2.12	0.1530	
26	2.27	0.1392	
27	2.27	0.1392	
28	4.15	0.0481	Yes
29	0.07	0.7927	
30	2.27	0.1392	
31	0.09	0.7689	
32	0.69	0.4113	
33	0.30	0.5898	
34	0.20	0.6572	
35	0.36	0.5496	
36	1.83	0.1839	
37	1.90	0.1758	
38	1.83	0.1839	
39	1.83	0.1839	
40	0.19	0.6629	
41	0.25	0.6204	
42	0.58	0.4517	
43	2.35	0.1327	
44	2.27	0.1392	
45			

Variable : Sratio**Data Screening Report**

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.37	0.5440	
2	0.17	0.6832	
3	1.03	0.3166	
4	0.15	0.6968	
5			
6	0.66	0.4210	
7	0.00	0.9926	
8	2.00	0.1644	
9	0.00	0.9926	
10	0.15	0.6968	
11	0.00	0.9926	
12	0.04	0.8491	
13	0.04	0.8346	
14	0.63	0.4317	
15	0.66	0.4210	
16	0.66	0.4210	
17	0.66	0.4210	
18	0.17	0.6832	
19	0.17	0.6832	
20	1.03	0.3166	
21	1.47	0.2314	
22	1.47	0.2314	
23	3.30	0.0764	
24	2.00	0.1644	
25	0.63	0.4317	
26	0.15	0.6968	
27	4.00	0.0521	
28	0.66	0.4210	
29	0.66	0.4210	
30	1.43	0.2386	
31	4.41	0.0418	Yes
32	0.17	0.6832	
33	0.35	0.5563	
34	0.00	0.9926	
35	0.15	0.6968	
36	0.63	0.4317	
37	0.99	0.3255	
38	4.00	0.0521	
39	5.76	0.0209	Yes
40	0.80	0.3762	
41	0.00	0.9926	
42	0.15	0.6968	
43	0.17	0.6832	
44	0.04	0.8491	
45			

Variable : LimeSF

Data Screening Report

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 Database E:\DATA\K4.S0

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.07	0.7857	
2	0.14	0.7123	
3	1.38	0.2471	
4	0.48	0.4945	
5			

6	0.36	0.5513	
7	0.10	0.7551	
8	4.14	0.0483	Yes
9	0.10	0.7551	
10	1.59	0.2137	
11	0.07	0.7967	
12	0.07	0.7967	
13	0.79	0.3800	
14	0.79	0.3800	
15	0.95	0.3347	
16	0.00	0.9783	
17	2.13	0.1516	
18	0.00	0.9783	
19	0.00	0.9783	
20	0.10	0.7551	
21	0.95	0.3347	
22	1.98	0.1671	
23	2.40	0.1289	
24	3.37	0.0735	
25	0.10	0.7551	
26	0.01	0.9082	
27	0.16	0.6893	
28	0.10	0.7551	
29	0.95	0.3347	
30	0.30	0.5880	
31	0.00	0.9783	
32	0.95	0.3347	
33	3.11	0.0850	
34	3.92	0.0544	
35	0.03	0.8653	
36	0.21	0.6498	
37	0.07	0.7967	
38	3.57	0.0656	
39	2.57	0.1163	
40	0.36	0.5513	
41	0.01	0.9082	
42	0.36	0.5513	
43	0.21	0.6498	
44	3.05	0.0879	
45			

Kiln 5

Variable : EL
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E:\DATA\K5.S0

Data Screening Report

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	1.20	0.2794	
2	0.02	0.8764	
3	0.02	0.8764	
4	0.02	0.8764	
5	0.22	0.6411	
6	4.14	0.0481	Yes
7	0.61	0.4383	
8	0.02	0.8764	
9	0.61	0.4383	
10	0.61	0.4383	
11	1.20	0.2794	
12	0.22	0.6411	

13	2.96	0.0924	
14	5.51	0.0236	Yes
15	0.61	0.4383	
16	0.02	0.8764	
17	0.02	0.8764	
18	0.02	0.8764	
19	1.98	0.1662	
20	1.20	0.2794	
21	0.02	0.8764	
22	0.22	0.6411	
23	4.14	0.0481	Yes
24	0.02	0.8764	
25	0.61	0.4383	
26	1.20	0.2794	
27	1.20	0.2794	
28	1.20	0.2794	
29	0.02	0.8764	
30	0.22	0.6411	
31	1.20	0.2794	
32	1.20	0.2794	
33	1.98	0.1662	
34	1.20	0.2794	
35	0.02	0.8764	
36	1.20	0.2794	
37	1.98	0.1662	
38	0.22	0.6411	
39	0.61	0.4383	
40	0.61	0.4383	
41	1.98	0.1662	
42	0.02	0.8764	
43	0.61	0.4383	
44	0.02	0.8764	

Variable : FUEL

Data Screening Report

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 Database E:\DATA\K5.S0

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.64	0.4284	
2	0.01	0.9096	
3	0.01	0.9096	
4	0.01	0.9096	
5	0.05	0.8204	
6	1.30	0.2597	
7	0.21	0.6501	
8	0.01	0.9096	
9	0.33	0.5709	
10	0.47	0.4968	
11	0.33	0.5709	
12	0.01	0.9096	
13	1.88	0.1776	
14	0.47	0.4968	
15	0.47	0.4968	
16	0.47	0.4968	
17	0.12	0.7335	
18	0.01	0.9096	
19	0.64	0.4284	
20	1.88	0.1776	
21	0.21	0.6501	

22	0.05	0.8204	
23	1.88	0.1776	
24	0.33	0.5709	
25	0.83	0.3659	
26	0.12	0.7335	
27	1.30	0.2597	
28	1.58	0.2157	
29	1.58	0.2157	
30	0.47	0.4968	
31	0.33	0.5709	
32	0.21	0.6501	
33	0.00	1.0000	
34	0.64	0.4284	
35	15.08	0.0003	Yes
36	0.47	0.4968	
37	1.30	0.2597	
38	1.30	0.2597	
39	1.88	0.1776	
40	1.06	0.3097	
41	1.58	0.2157	
42	0.21	0.6501	
43	1.06	0.3097	
44	0.21	0.6501	

Variable : AvNO

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	3.42	0.0714	
2	9.69	0.0033	Yes
3	0.37	0.5461	
4	0.01	0.9145	
5	0.89	0.3502	
6	1.38	0.2462	
7	0.23	0.6350	
8	0.02	0.8877	
9	0.05	0.8314	
10	0.02	0.8877	
11	1.14	0.2908	
12	1.99	0.1655	
13	5.34	0.0257	Yes
14	0.39	0.5367	
15	1.91	0.1740	
16	0.35	0.5591	
17	0.11	0.7473	
18	0.05	0.8314	
19	0.36	0.5493	
20	0.23	0.6350	
21	0.73	0.3981	
22	0.41	0.5276	
23	0.28	0.5978	
24	0.58	0.4501	
25	0.23	0.6350	
26	0.00	0.9750	
27	0.63	0.4335	
28	1.94	0.1712	
29	3.52	0.0673	
30	0.58	0.4501	

31	0.23	0.6350
32	0.01	0.9145
33	0.23	0.6350
34	0.83	0.3675
35	0.58	0.4501
36	0.14	0.7111
37	0.03	0.8655
38	0.01	0.9145
39	1.99	0.1655
40	0.63	0.4335
41	1.14	0.2908
42	0.09	0.7687
43	0.03	0.8655
44	0.23	0.6350

Variable : AvHOURS

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	1.88	0.1775	
2	0.00	0.9635	
3	0.00	0.9799	
4	0.84	0.3640	
5	0.96	0.3324	
6	2.61	0.1132	
7	1.80	0.1865	
8	0.46	0.5035	
9	0.03	0.8689	
10	1.29	0.2622	
11	1.54	0.2212	
12	1.42	0.2401	
13	0.01	0.9183	
14	0.13	0.7209	
15	0.29	0.5937	
16	2.01	0.1637	
17	2.41	0.1275	
18	0.54	0.4648	
19	0.29	0.5903	
20	2.16	0.1485	
21	0.32	0.5743	
22	0.00	0.9476	
23	1.59	0.2136	
24	0.00	0.9838	
25	0.00	0.9573	
26	0.66	0.4214	
27	1.11	0.2987	
28	1.14	0.2910	
29	7.23	0.0102	Yes
30	0.01	0.9318	
31	0.31	0.5820	
32	0.40	0.5308	
33	0.00	0.9838	
34	1.07	0.3069	
35	1.17	0.2860	
36	0.00	0.9952	
37	1.35	0.2509	
38	1.36	0.2491	
39	1.38	0.2473	

40	0.06	0.8140
41	0.25	0.6207
42	0.10	0.7573
43	1.31	0.2584
44	1.49	0.2282

Variable : PRORATE

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.23	0.6357	
2	0.83	0.3684	
3	0.83	0.3684	
4	1.23	0.2744	
5	0.83	0.3684	
6	0.01	0.9358	
7	0.01	0.9358	
8	1.70	0.1988	
9	0.10	0.7543	
10	0.83	0.3684	
11	1.23	0.2744	
12	0.51	0.4809	
13	1.15	0.2901	
14	3.47	0.0693	
15	1.15	0.2901	
16	0.10	0.7543	
17	0.26	0.6105	
18	0.01	0.9358	
19	0.46	0.5033	
20	1.15	0.2901	
21	0.01	0.9358	
22	0.01	0.9074	
23	1.15	0.2901	
24	0.10	0.7543	
25	0.01	0.9074	
26	1.23	0.2744	
27	0.26	0.6105	
28	0.23	0.6357	
29	0.08	0.7816	
30	0.10	0.7543	
31	2.26	0.1401	
32	0.83	0.3684	
33	0.76	0.3875	
34	1.15	0.2901	
35	11.88	0.0013	Yes
36	0.10	0.7543	
37	0.83	0.3684	
38	0.08	0.7816	
39	1.15	0.2901	
40	0.10	0.7543	
41	2.26	0.1401	
42	0.10	0.7543	
43	1.15	0.2901	
44	1.15	0.2901	

Variable : AVL

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	2.51	0.1205	
2	0.13	0.7242	
3	0.00	0.9968	
4	0.12	0.7302	
5	0.27	0.6039	
6	0.50	0.4838	
7	0.03	0.8646	
8	0.03	0.8646	
9	2.51	0.1205	
10	0.76	0.3870	
11	1.50	0.2272	
12	1.10	0.2998	
13	1.12	0.2962	
14	0.03	0.8583	
15	2.51	0.1205	
16	0.13	0.7242	
17	1.50	0.2272	
18	0.00	0.9968	
19	1.12	0.2962	
20	0.00	0.9968	
21	0.28	0.5984	
22	0.28	0.5984	
23	3.75	0.0596	
24	3.75	0.0596	
25	0.12	0.7302	
26	0.13	0.7242	
27	0.76	0.3870	
28	0.49	0.4888	
29	2.48	0.1223	
30	0.78	0.3828	
31	0.28	0.5984	
32	0.03	0.8583	
33	4.46	0.0406	Yes
34	0.76	0.3870	
35	0.49	0.4888	
36	0.49	0.4888	
37	1.10	0.2998	
38	0.27	0.6039	
39	1.10	0.2998	
40	0.27	0.6039	
41	1.10	0.2998	
42	0.50	0.4838	
43	1.50	0.2272	
44	1.96	0.1685	

Variable : Aratio

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.40	0.5324	
2	1.26	0.2688	
3	0.85	0.3606	

4	0.20	0.6544	
5	0.00	0.9681	
6	0.06	0.8004	
7	0.89	0.3515	
8	0.00	0.9540	
9	0.30	0.5858	
10	0.02	0.8906	
11	1.26	0.2688	
12	0.28	0.5980	
13	1.26	0.2688	
14	4.02	0.0514	
15	4.02	0.0514	
16	1.04	0.3124	
17	0.40	0.5324	
18	0.53	0.4708	
19	0.53	0.4708	
20	1.26	0.2688	
21	0.11	0.7394	
22	0.56	0.4600	
23	2.34	0.1331	
24	0.00	0.9540	
25	0.02	0.8766	
26	0.20	0.6544	
27	0.02	0.8766	
28	0.12	0.7261	
29	0.12	0.7261	
30	0.00	0.9681	
31	0.02	0.8906	
32	0.02	0.8906	
33	0.68	0.4135	
34	1.73	0.1949	
35	0.30	0.5858	
36	4.50	0.0398	Yes
37	0.89	0.3515	
38	0.56	0.4600	
39	0.02	0.8906	
40	0.56	0.4600	
41	4.92	0.0318	Yes
42	6.32	0.0158	Yes
43	0.20	0.6544	
44	0.20	0.6544	

Variable : Sratio

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.00	0.9841	
2	0.82	0.3708	
3	0.75	0.3922	
4	0.18	0.6751	
5	0.00	0.9841	
6	1.71	0.1983	
7	1.71	0.1983	
8	0.00	0.9841	
9	0.18	0.6751	
10	0.75	0.3922	
11	0.75	0.3922	
12	0.18	0.6751	

13	0.82	0.3708	
14	0.82	0.3708	
15	0.82	0.3708	
16	1.81	0.1851	
17	0.00	0.9841	
18	0.75	0.3922	
19	0.00	0.9841	
20	0.00	0.9841	
21	0.82	0.3708	
22	4.80	0.0339	Yes
23	3.06	0.0875	
24	0.82	0.3708	
25	0.75	0.3922	
26	0.75	0.3922	
27	0.18	0.6751	
28	1.71	0.1983	
29	0.18	0.6751	
30	1.81	0.1851	
31	0.82	0.3708	
32	0.82	0.3708	
33	0.00	0.9841	
34	0.82	0.3708	
35	0.82	0.3708	
36	0.00	0.9841	
37	1.81	0.1851	
38	3.20	0.0807	
39	1.81	0.1851	
40	0.21	0.6462	
41	0.18	0.6751	
42	3.06	0.0875	
43	1.81	0.1851	
44	0.75	0.3922	

Variable : LimeSF

Data Screening Report

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	2.36	0.1319	
2	1.61	0.2110	
3	0.01	0.9427	
4	0.37	0.5487	
5	0.37	0.5487	
6	0.74	0.3951	
7	0.53	0.4718	
8	0.21	0.6479	
9	0.01	0.9427	
10	0.04	0.8383	
11	2.36	0.1319	
12	5.45	0.0243	Yes
13	0.37	0.5487	
14	0.26	0.6118	
15	0.25	0.6210	
16	0.17	0.6863	
17	0.72	0.4024	
18	1.15	0.2906	
19	0.53	0.4718	
20	1.97	0.1679	
21	0.53	0.4718	

22	1.29	0.2620	
23	0.37	0.5487	
24	0.20	0.6574	
25	1.29	0.2620	
26	0.11	0.7454	
27	0.53	0.4718	
28	1.58	0.2151	
29	1.94	0.1713	
30	4.23	0.0458	Yes
31	1.27	0.2668	
32	1.94	0.1713	
33	1.61	0.2110	
34	0.01	0.9427	
35	0.98	0.3267	
36	0.53	0.4718	
37	1.75	0.1923	
38	0.22	0.6397	
39	0.00	0.9518	
40	0.11	0.7454	
41	0.11	0.7454	
42	1.29	0.2620	
43	0.11	0.7367	
44	1.58	0.2151	

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Variable : EL

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Data Screening Report

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.06	0.8101	
2	3.56	0.0659	
3	0.23	0.6349	
4	0.23	0.6349	
5	0.23	0.6349	
6	1.39	0.2455	
7	0.23	0.6349	
8	0.51	0.4786	
9	0.50	0.4851	
10	0.06	0.8101	
11	0.51	0.4786	
12	0.22	0.6423	
13	0.51	0.4786	
14	0.51	0.4786	
15	0.23	0.6349	
16	0.51	0.4786	
17	0.88	0.3521	
18	0.23	0.6349	
19	0.51	0.4786	
20	0.06	0.8101	
21	0.51	0.4786	
22	0.88	0.3521	
23	2.72	0.1061	
24	20.14	0.0001	Yes
25	0.50	0.4851	
26	0.23	0.6349	
27	0.51	0.4786	
28	0.06	0.8101	
29	2.76	0.1039	

30	0.06	0.8101
31	0.51	0.4786
32	0.51	0.4786
33	0.00	0.9958
34	0.00	0.9958
35	0.50	0.4851
36	0.51	0.4786
37	0.00	0.9958
38	0.00	0.9958
39	0.05	0.8182
40	1.39	0.2455
41	0.23	0.6349
42	0.51	0.4786
43	0.00	0.9958
44	0.22	0.6423
45	0.06	0.8101
46		

Variable : FUEL

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.01	0.9103	
2	0.03	0.8551	
3	0.01	0.9103	
4	0.06	0.8006	
5	0.11	0.7471	
6	0.01	0.9103	
7	0.11	0.7471	
8	0.03	0.8551	
9	0.01	0.9224	
10	0.01	0.9103	
11	0.00	0.9660	
12	0.01	0.9103	
13	0.01	0.9103	
14	0.03	0.8551	
15	0.03	0.8551	
16	0.16	0.6948	
17	0.03	0.8551	
18	0.03	0.8551	
19	0.03	0.8551	
20	0.01	0.9103	
21	0.00	0.9781	
22	1.50	0.2271	
23	1.33	0.2545	
24	1.17	0.2843	
25	0.44	0.5118	
26	0.01	0.9103	
27	0.03	0.8670	
28	0.06	0.8124	
29	0.00	0.9781	
30	0.03	0.8551	
31	0.00	0.9660	
32	0.01	0.9103	
33	0.35	0.5576	
34	0.20	0.6549	
35	0.14	0.7060	
36	0.10	0.7586	

37	0.14	0.7060	
38	0.10	0.7586	
39	0.54	0.4682	
40	1.33	0.2545	
41	0.10	0.7586	
42	0.27	0.6053	
43	0.00	0.9781	
44	0.01	0.9103	
45	0.03	0.8670	
46	36.33	0.0000	Yes

Variable : AvNO

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.06	0.8074	
2	2.52	0.1197	
3	0.03	0.8728	
4	2.03	0.1614	
5	1.95	0.1701	
6	0.52	0.4765	
7	0.00	0.9930	
8	0.67	0.4158	
9	0.00	0.9930	
10	0.11	0.7400	
11	0.06	0.8074	
12	0.00	0.9930	
13	1.74	0.1934	
14	2.03	0.1614	
15	0.03	0.8728	
16	0.50	0.4828	
17	1.15	0.2893	
18	0.50	0.4828	
19	1.41	0.2412	
20	2.43	0.1259	
21	0.22	0.6397	
22	0.03	0.8728	
23	0.22	0.6397	
24	0.72	0.4010	
25	2.79	0.1018	
26	0.03	0.8728	
27	0.23	0.6324	
28	0.01	0.9344	
29	2.06	0.1584	
30	0.22	0.6397	
31	0.33	0.5664	
32	0.52	0.4765	
33	1.73	0.1948	
34	4.63	0.0370	Yes
35	0.22	0.6397	
36	0.52	0.4765	
37	1.73	0.1948	
38	0.22	0.6397	
39	4.22	0.0458	Yes
40	0.52	0.4765	
41	0.06	0.8154	
42	1.95	0.1701	
43	0.89	0.3503	

44 1.31 0.2590
 45 0.89 0.3503
 46

Variable : AvHOURS

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.72	0.3998	
2	3.48	0.0687	
3	0.41	0.5235	
4	1.03	0.3151	
5	1.02	0.3180	
6	1.26	0.2676	
7	0.39	0.5369	
8	0.14	0.7083	
9	2.89	0.0960	
10	0.46	0.4999	
11	0.63	0.4304	
12	2.57	0.1159	
13	0.73	0.3979	
14	0.79	0.3789	
15	0.76	0.3878	
16	0.15	0.6991	
17	3.91	0.0542	
18	0.83	0.3680	
19	1.22	0.2760	
20	0.04	0.8411	
21	0.78	0.3822	
22	1.10	0.3001	
23	0.43	0.5152	
24	6.32	0.0156	Yes
25	0.08	0.7733	
26	0.77	0.3844	
27	1.25	0.2704	
28	0.55	0.4640	
29	0.00	0.9498	
30	2.40	0.1287	
31	0.07	0.7859	
32	0.00	0.9912	
33	0.18	0.6735	
34	0.12	0.7328	
35	1.07	0.3058	
36	0.46	0.5025	
37	0.01	0.9433	
38	0.10	0.7576	
39	0.07	0.7933	
40	0.03	0.8604	
41	0.37	0.5450	
42	1.77	0.1899	
43	0.92	0.3438	
44	0.94	0.3376	
45	0.76	0.3889	
46			

Variable : PRORATE

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.15	0.6977	
2	1.08	0.3043	
3	0.67	0.4166	
4	0.93	0.3408	
5	0.46	0.5019	
6	0.01	0.9169	
7	0.93	0.3408	
8	1.94	0.1709	
9	0.29	0.5960	
10	0.93	0.3408	
11	1.56	0.2182	
12	1.22	0.2747	
13	0.67	0.4166	
14	0.67	0.4166	
15	0.03	0.8571	
16	0.29	0.5960	
17	0.03	0.8571	
18	0.29	0.5960	
19	0.29	0.5960	
20	0.93	0.3408	
21	0.67	0.4166	
22	3.60	0.0643	
23	4.16	0.0473	Yes
24	3.60	0.0643	
25	4.77	0.0344	Yes
26	0.22	0.6426	
27	0.22	0.6426	
28	4.16	0.0473	Yes
29	0.11	0.7473	
30	0.46	0.5019	
31	0.01	0.9169	
32	0.00	0.9697	
33	3.60	0.0643	
34	0.80	0.3750	
35	1.76	0.1919	
36	0.15	0.6977	
37	0.00	0.9697	
38	0.15	0.6977	
39	0.00	0.9697	
40	0.57	0.4553	
41	0.46	0.5019	
42	0.03	0.8571	
43	0.00	0.9697	
44	0.46	0.5019	
45	0.67	0.4166	
46			

Variable : AVL

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.09	0.7681	

2	0.09	0.7681	
3	0.10	0.7527	
4	0.60	0.4411	
5	1.18	0.2841	
6	0.36	0.5492	
7	0.57	0.4531	
8	1.48	0.2300	
9	0.10	0.7527	
10	0.02	0.8868	
11	0.03	0.8707	
12	0.10	0.7527	
13	1.94	0.1712	
14	0.60	0.4411	
15	0.60	0.4411	
16	0.87	0.3570	
17	0.10	0.7527	
18	0.22	0.6403	
19	1.18	0.2841	
20	0.09	0.7681	
21	0.87	0.3570	
22	0.10	0.7527	
23	0.57	0.4531	
24	0.10	0.7527	
25	0.02	0.8868	
26	0.22	0.6403	
27	1.18	0.2841	
28	1.18	0.2841	
29	0.09	0.7681	
30	0.57	0.4531	
31	0.20	0.6549	
32	0.39	0.5359	
33	0.22	0.6403	
34	0.00	0.9919	
35	0.36	0.5492	
36	0.09	0.7681	
37	5.25	0.0268	Yes
38	1.88	0.1774	
39	10.32	0.0025	Yes
40	7.57	0.0086	Yes
41	0.09	0.7681	
42	1.53	0.2224	
43	0.39	0.5359	
44	0.39	0.5359	
45	0.10	0.7527	
46			

Variable : Aratio

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.62	0.4348	
2	2.78	0.1029	
3	2.09	0.1552	
4	1.02	0.3191	
5	1.02	0.3191	
6			
7	1.79	0.1882	
8	3.98	0.0523	

9	3.16	0.0828	
10	0.46	0.5010	
11	0.01	0.9289	
12	0.06	0.8119	
13	0.00	0.9842	
14	0.01	0.9289	
15	2.30	0.1366	
16	0.18	0.6772	
17	1.68	0.2014	
18	0.10	0.7585	
19	0.41	0.5264	
20	0.10	0.7585	
21	0.41	0.5264	
22	0.56	0.4583	
23	3.83	0.0570	
24	5.74	0.0210	Yes
25	3.02	0.0897	
26	0.28	0.5996	
27	0.41	0.5264	
28	0.41	0.5264	
29	0.10	0.7585	
30	0.28	0.5996	
31	0.04	0.8427	
32	1.25	0.2699	
33	1.79	0.1882	
34	0.81	0.3741	
35	0.06	0.8119	
36	0.21	0.6485	
37	1.02	0.3191	
38	0.06	0.8119	
39	0.01	0.9289	
40	0.04	0.8427	
41	0.10	0.7585	
42	0.18	0.6772	
43	0.01	0.9289	
44	0.28	0.5996	
45	0.41	0.5264	
46			

Variable : Sratio

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.12	0.7257	
2	0.06	0.8122	
3	0.11	0.7471	
4	0.11	0.7471	
5	0.11	0.7471	
6	41.42	0.0000	Yes
7	0.11	0.7471	
8	0.11	0.7471	
9	0.09	0.7686	
10	0.12	0.7257	
11	0.04	0.8511	
12	0.15	0.6995	
13	0.17	0.6787	
14	0.11	0.7418	
15	0.05	0.8289	

16	0.00	0.9915
17	0.00	0.9915
18	0.00	0.9859
19	0.00	0.9462
20	0.02	0.9012
21	0.02	0.9012
22	0.02	0.9012
23	0.09	0.7686
24	0.07	0.7903
25	0.07	0.7903
26	0.06	0.8122
27	0.07	0.7903
28	0.09	0.7686
29	0.06	0.8122
30	0.15	0.7046
31	0.04	0.8343
32	0.00	0.9915
33	0.02	0.9012
34	0.02	0.8788
35	0.02	0.8788
36	0.02	0.8788
37	0.00	0.9462
38	0.02	0.9012
39	0.02	0.8788
40	0.04	0.8343
41	0.04	0.8343
42	0.06	0.8122
43	0.02	0.8788
44	0.06	0.8122
45	0.04	0.8343
46		

Variable : LimeSF

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Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
1	0.27	0.6066	
2	0.26	0.6125	
3	0.02	0.8857	
4	0.06	0.8129	
5	0.00	0.9595	
6			
7	1.85	0.1808	
8	0.10	0.7482	
9	0.05	0.8195	
10	0.05	0.8195	
11	0.26	0.6125	
12	5.67	0.0218	Yes
13	2.09	0.1556	
14	1.15	0.2900	
15	0.49	0.4894	
16	0.49	0.4894	
17	2.37	0.1311	
18	0.26	0.6125	
19	0.05	0.8195	
20	0.02	0.8924	
21	0.49	0.4894	
22	0.36	0.5492	

23	0.10	0.7482	
24	4.03	0.0511	
25	2.98	0.0915	
26	0.96	0.3336	
27	0.05	0.8195	
28	0.11	0.7418	
29	0.18	0.6728	
30	2.40	0.1291	
31	0.27	0.6066	
32	1.17	0.2862	
33	0.37	0.5436	
34	1.61	0.2120	
35	2.11	0.1532	
36	0.27	0.6066	
37	0.64	0.4285	
38	0.27	0.6066	
39	1.85	0.1808	
40	0.37	0.5436	
41	0.18	0.6728	
42	0.10	0.7482	
43	0.80	0.3769	
44	5.71	0.0213	Yes
45	0.11	0.7418	
46			

d) Normality Tests of Dependent Variables

Data Screening Report

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Normality Tests Section

Variable	----- Skewness Test -----			Kurtosis Test -----			Omnibus Test -		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	0.67	1.91	0.0561	4.04	1.65	0.0987	6.37	0.0413	No
FUEL	0.68	1.94	0.0519	2.09	-1.73	0.0839	6.77	0.0339	No

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Normality Tests Section

Variable	----- Skewness Test -----			Kurtosis Test -----			Omnibus Test -		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	0.67	1.91	0.0559	2.54	-0.42	0.6728	3.83	0.1470	Yes
FUEL	1.25	3.22	0.0013	6.23	2.96	0.0031	19.14	0.0001	No

Data Screening Report

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Normality Tests Section

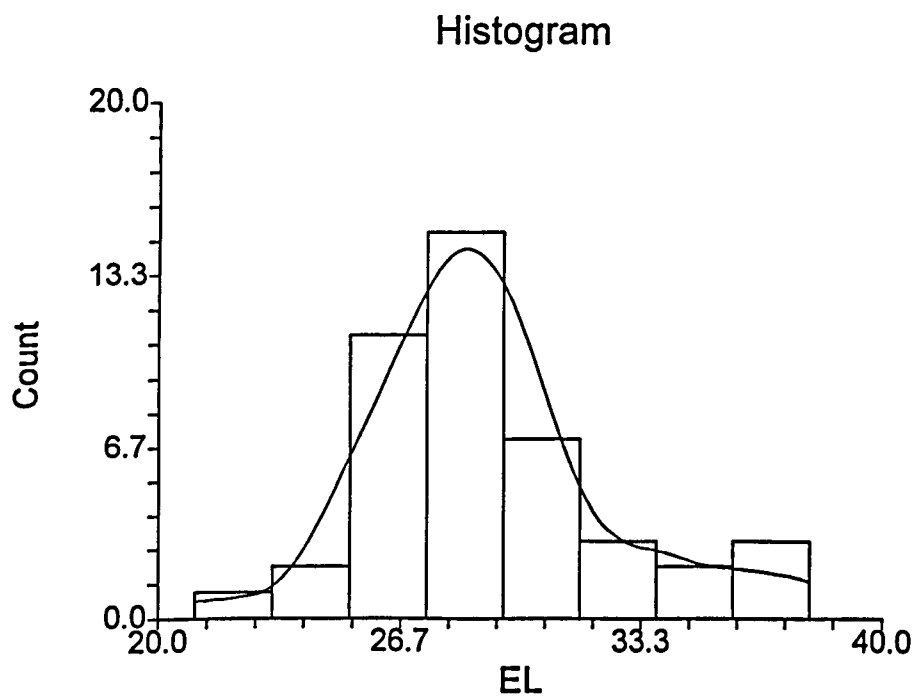
	----- Skewness Test -----			Kurtosis Test -----			Omnibus Test -		Variable
--	---------------------------	--	--	---------------------	--	--	----------------	--	----------

Variable	Value	Z	Prob	Value	Z	Prob	K2	Prob	Normal?
EL	2.25	4.81	0.0000	10.30	4.10	0.0000	39.94	0.0000	No
FUEL	1.23	3.21	0.0013	3.64	1.27	0.2042	11.90	0.0026	No

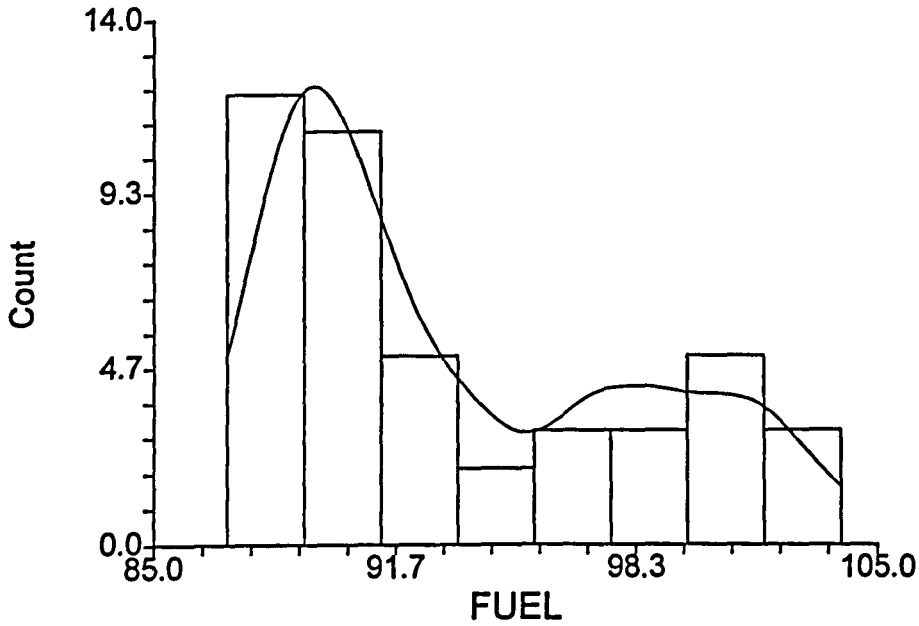
e) Histograms of Dependent Variables

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Histogram Section



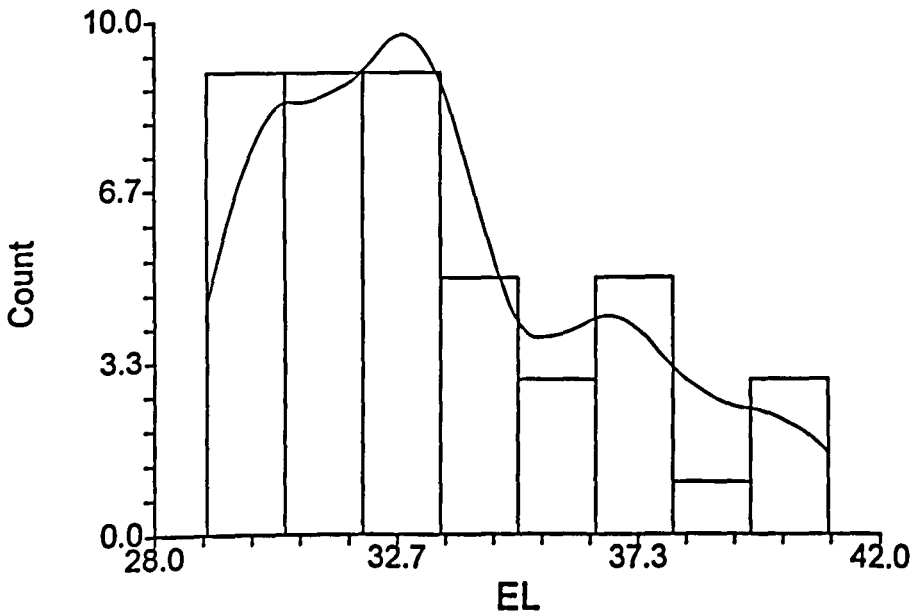
Histogram



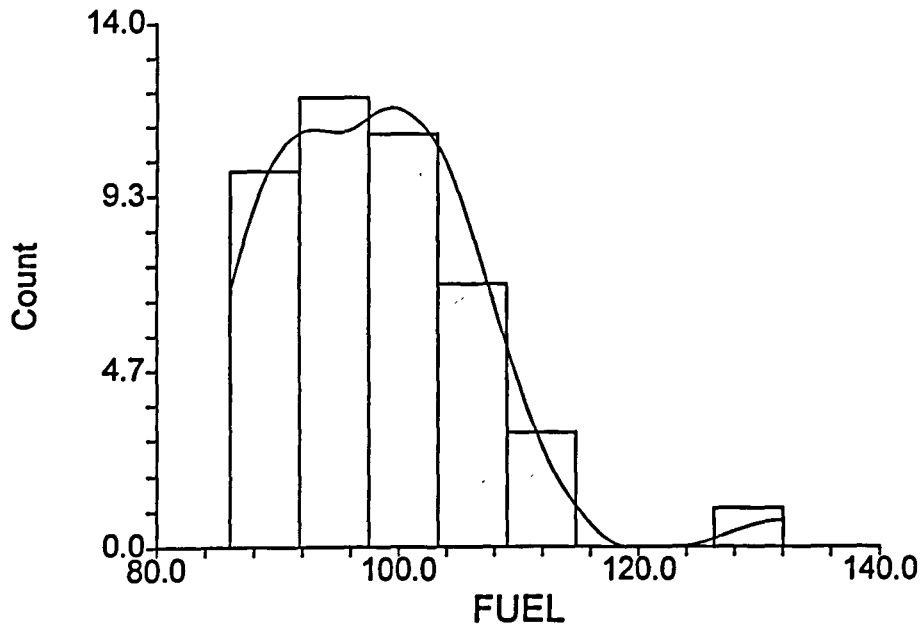
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Histogram Section

Histogram



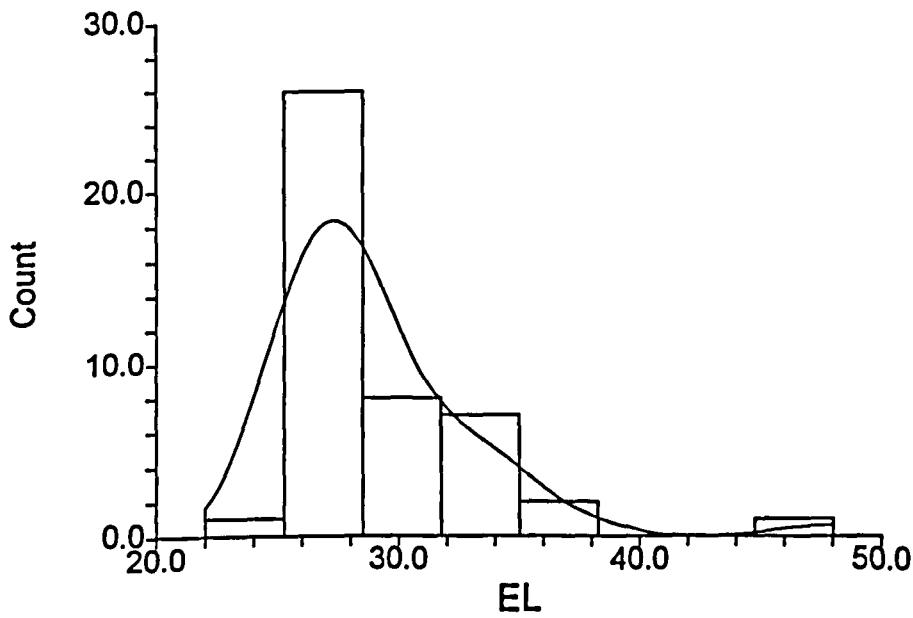
Histogram



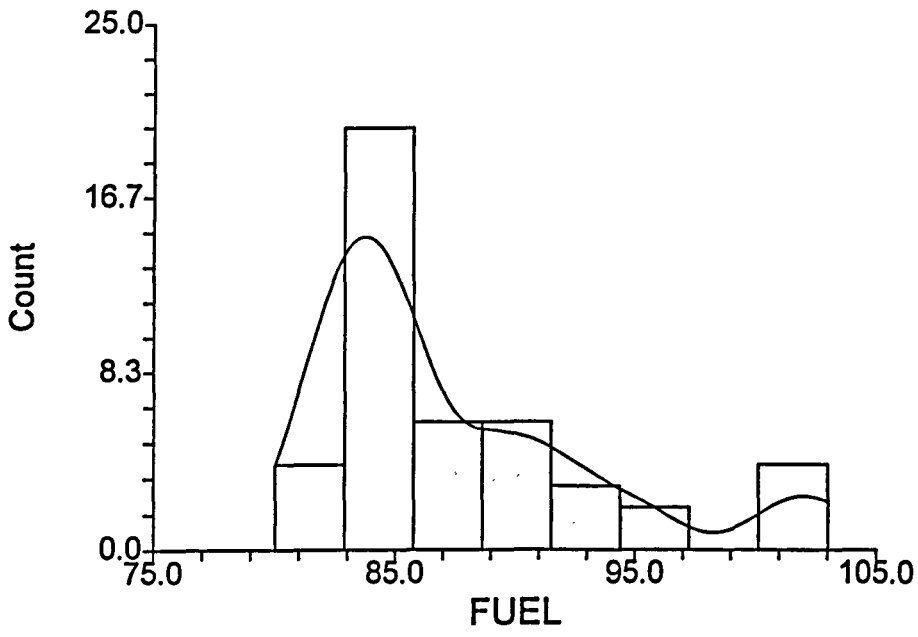
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Histogram Section

Histogram



Histogram



Appendix 05: All Possible Regression of other Kilns

Kiln 4: EL

All Possible Regression Report

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 Database E:\Data\K4.S0
 Dependent EL

All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
1	0.478692	2.335238	17.435451	B (AvHOURS)
1	0.265091	2.848877	44.991852	C (PRORATE)
1	0.012897	3.301704	73.814761	A (AvNO)
1	0.008340	3.309317	74.335594	G (LimeSF)
1	0.002360	3.319279	75.018966	F (Sratio)
1	0.002231	3.319494	75.033784	E (Aratio)
1	0.001828	3.320164	75.079836	D (AVL)
2	0.642689	1.954412	1.565417	BC
2	0.524375	2.320338	17.358584	BE
2	0.516370	2.339781	18.273422	AB
2	0.512301	2.349603	18.738452	BG
2	0.508362	2.359074	19.188686	BD
2	0.508283	2.359262	19.197653	BF
2	0.280068	2.854726	45.280061	AC
2	0.273106	2.868496	46.075764	CE
2	0.267609	2.879322	46.703997	CF
2	0.267262	2.880004	46.743693	CD
2	0.267262	2.880005	46.743735	CG
2	0.020896	3.329149	74.900573	AG
2	0.015008	3.339144	75.573518	AD
2	0.014734	3.339608	75.604792	AF
2	0.014727	3.33962	75.605611	AE
2	0.010942	3.346028	76.038121	DG
2	0.010224	3.347242	76.120194	EG
2	0.009087	3.349165	76.250172	FG
2	0.008258	3.350565	76.344910	EF
2	0.004611	3.356721	76.761745	DF
2	0.003236	3.359038	76.918865	DE
3	0.675762	1.940209	2.056766	BCF
3	0.674442	1.944154	2.207611	ABC
3	0.664972	1.972227	3.289911	BCD
3	0.663341	1.977022	3.476315	BCG
3	0.663043	1.977898	3.510403	BCE
3	0.533449	2.327373	18.321486	ABE
3	0.529577	2.337011	18.764045	BEG
3	0.524585	2.349379	19.334607	BEF
3	0.524523	2.349531	19.341654	BDE
3	0.522215	2.355226	19.605404	ABG
3	0.518931	2.363306	19.980706	ABF
3	0.517229	2.367485	20.175311	ABD
3	0.516711	2.368753	20.234434	BFG
3	0.515171	2.372525	20.410487	BDG
3	0.510084	2.38494	20.991905	BDF
3	0.289130	2.87284	46.244378	ACE
3	0.285956	2.879248	46.607221	CEF

3

0.283319

2.884558

46.908505

ACF

All Possible Regression Report

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 Database E:\Data\K4.S0
 Dependent EL

All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
3	0.282499	2.886209	47.002287	ACG
3	0.282449	2.886308	47.007940	ACD
3	0.278463	2.894315	47.463539	CDE
3	0.275523	2.900205	47.799538	CEG
3	0.269384	2.912467	48.501149	CDF
3	0.269076	2.913081	48.536373	CDG
3	0.268995	2.913242	48.545615	CFG
3	0.022424	3.368928	76.725904	AEG
3	0.022064	3.369548	76.767054	ADG
3	0.021378	3.37073	76.845469	AFG
3	0.019529	3.373912	77.056734	AEF
3	0.018616	3.375484	77.161166	ADE
4	0.689051	1.924871	2.537989	ABCF
4	0.677623	1.959922	3.844016	BCEF
4	0.677253	1.961048	3.886382	BCDF
4	0.675781	1.965515	4.054618	BCFG
4	0.675545	1.96623	4.081577	ABCD
4	0.675366	1.966772	4.101995	ABCG
4	0.674714	1.968744	4.176467	ABCE
4	0.665530	1.996346	5.226194	BCDG
4	0.665053	1.997769	5.280698	BCDE
4	0.663782	2.001555	5.425933	BCEG
4	0.538862	2.34408	19.702891	ABDE
4	0.538455	2.345115	19.749411	ABEG
4	0.533504	2.357659	20.315245	ABEF
4	0.529966	2.366581	20.719537	BDEG
4	0.529622	2.367448	20.758906	BEFG
4	0.527270	2.373358	21.027659	ABFG
4	0.524725	2.37974	21.318561	BDEF
4	0.522583	2.385096	21.563366	ABDG
4	0.520412	2.390512	21.811443	ABDF
4	0.519094	2.393796	21.962153	BDFG
4	0.304902	2.877928	46.441870	ACEF
4	0.292311	2.903877	47.880853	CDEF
4	0.291848	2.904826	47.933781	ACEG
4	0.289501	2.909636	48.201983	ACDE
4	0.286893	2.914971	48.500079	ACDF
4	0.286576	2.915618	48.536258	CEFG
4	0.285673	2.917464	48.639492	ACDG
4	0.284811	2.919223	48.738007	ACFG
4	0.280320	2.928375	49.251326	CDEG
4	0.270558	2.94817	50.367036	CDFG
5	0.692094	1.941139	4.190139	ABCDF
5	0.691942	1.94162	4.207567	ABCEF
5	0.689083	1.950607	4.534257	ABCDFG
5	0.680294	1.977987	5.538807	BCDEF

All Possible Regression Report

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 Dependent EL

All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
5	0.677624	1.986229	5.843966	BCEFG
5	0.677255	1.987365	5.886110	BCDFG
5	0.676804	1.988752	5.937623	ABCDG
5	0.676370	1.990089	5.987305	ABCDE
5	0.675604	1.99244	6.074748	ABCEG
5	0.665606	2.022913	7.217476	BCDEG
5	0.542460	2.366258	21.291599	ABDEG
5	0.538882	2.375495	21.700628	ABDEF
5	0.538642	2.376112	21.728018	ABEFG
5	0.530027	2.398194	22.712577	BDEFG
5	0.528152	2.402975	22.926953	ABDFG
5	0.305545	2.915211	48.368389	ACEFG
5	0.305322	2.915679	48.393857	ACDEF
5	0.292601	2.942254	49.847722	CDEFG
5	0.292566	2.942326	49.851718	ACDEG
5	0.288961	2.949813	50.263686	ACDFG
5	0.026983	3.450707	80.204872	ADEFG
6	0.693707	1.962753	6.005784	ABCDEF
6	0.692236	1.967463	6.173987	ABCDFG
6	0.691943	1.968398	6.207408	ABCEFG
6	0.680314	2.005209	7.536544	BCDEFG
6	0.677652	2.013539	7.840738	ABCDEG
6	0.542638	2.398432	23.271288	ABDEFG
6	0.306136	2.954165	50.300858	ACDEFG
7	0.693758	1.990431	8.000000	ABCDEFG

Plots Section

Kiln 4: FUEL**All Possible Regression Report**

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 Database E:\Data\K4.S0
 Dependent FUEL

All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
1	0.306427	4.099166	13.509869	C (PRORATE)
1	0.176499	4.549018	25.667372	E (Aratio)
1	0.070890	4.831912	33.960509	G (LimeSF)
1	0.056194	4.869976	35.114548	A (AvNO)
1	0.007667	4.993605	38.925260	B (AvHOURS)
1	0.007102	4.995028	38.969666	F (Sratio)
1	0.004729	5.000993	39.156009	D (AVL)
2	0.409871	3.898711	9.341296	CE
2	0.392292	3.956352	10.721708	AC
2	0.368277	4.033766	12.607509	BC
2	0.345274	4.106551	14.413880	CG
2	0.336656	4.133489	15.090626	CD
2	0.331972	4.148057	15.458443	CF
2	0.267900	4.342427	20.489833	EF
2	0.238372	4.429134	22.808613	EG
2	0.225181	4.467326	23.844486	AE
2	0.178115	4.601009	27.540482	DE
2	0.177847	4.601759	27.561519	BE
2	0.125011	4.747322	31.710535	AG
2	0.079475	4.869287	35.286413	DG
2	0.079453	4.869344	35.288122	BG
2	0.071483	4.890377	35.913958	AD
2	0.071314	4.890822	35.927225	FG
2	0.064626	4.908401	36.452436	AB
2	0.061423	4.916798	36.703942	AF
2	0.017010	5.031784	40.191583	BF
2	0.013012	5.042006	40.505543	DF
2	0.012333	5.043739	40.558839	BD
3	0.464826	3.760042	7.025814	ACE
3	0.431317	3.87597	9.657199	ABC
3	0.430930	3.877286	9.687533	BCE
3	0.429720	3.881407	9.782568	CEF
3	0.425789	3.894762	10.091258	CEG
3	0.409874	3.948366	11.341007	CDE
3	0.408382	3.953355	11.458180	ACD
3	0.405000	3.964639	11.723773	ACG
3	0.393833	4.00167	12.600673	ACF
3	0.380931	4.044032	13.613811	BCG
3	0.373505	4.068214	14.196962	BCD
3	0.368314	4.085034	14.604613	BCF
3	0.352328	4.136402	15.859972	CDG
3	0.347823	4.150763	16.213725	CFG
3	0.337014	4.185019	17.062567	CDF
3	0.307154	4.278223	19.407338	AEF
3	0.296164	4.312021	20.270370	EFG
3	0.295289	4.3147	20.339060	ADE

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Model Size	R-Squared	Root MSE	Cp	Model
3	0.285426	4.34479	21.113605	AEG
3	0.271920	4.385656	22.174154	BEF
3	0.270174	4.390912	22.311270	DEF
3	0.240194	4.480191	24.665548	BEG
3	0.238589	4.48492	24.791561	DEG
3	0.226926	4.519137	25.707413	ABE
3	0.179385	4.656021	29.440733	BDE
3	0.134352	4.78207	32.977069	ABG
3	0.132939	4.785969	33.087960	ADG
3	0.125099	4.807558	33.703636	AFG
3	0.087976	4.908495	36.618847	BDG
3	0.080543	4.928456	37.202514	BFG
4	0.515544	3.624206	5.043059	ACDE
4	0.487981	3.725878	7.207469	ABCE
4	0.479401	3.756965	7.881231	ACEG
4	0.479165	3.757818	7.899789	ACEF
4	0.451269	3.857139	10.090370	BCEF
4	0.448686	3.866206	10.293190	ABCD
4	0.445603	3.877001	10.535292	BCEG
4	0.442729	3.887039	10.761012	ABCG
4	0.439257	3.899128	11.033648	CEFG
4	0.431696	3.92533	11.627441	ABCF
4	0.430952	3.927896	11.685806	BCDE
4	0.429818	3.931809	11.774886	CDEF
4	0.425867	3.945406	12.085105	CDEG
4	0.417548	3.973889	12.738416	ACDG
4	0.412300	3.991751	13.150505	ACDF
4	0.408996	4.002955	13.409948	ACFG
4	0.387776	4.074185	15.076319	BCDG
4	0.381825	4.093938	15.543614	BCFG
4	0.373506	4.121395	16.196930	BCDF
4	0.371640	4.127528	16.343469	ADEF
4	0.354281	4.184151	17.706585	CDFG
4	0.338018	4.236516	18.983724	ADEG
4	0.335920	4.243221	19.148398	AEFG
4	0.311596	4.320234	21.058517	ABEF
4	0.300151	4.356	21.957289	BEFG
4	0.296980	4.365857	22.206293	DEFG
4	0.296708	4.366701	22.227649	ABDE
4	0.287690	4.394607	22.935773	ABEG
4	0.274047	4.436494	24.007154	BDEF
4	0.240376	4.538216	26.651289	BDEG
5	0.536422	3.592839	5.403515	ABCDE
5	0.529359	3.620108	5.958205	ACDEF
5	0.523678	3.641891	6.404312	ACDEG
5	0.502656	3.721388	8.055098	ABCEF

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Model Size	R-Squared	Root MSE	Cp	Model
5	0.501283	3.72652	8.162888	ABCEG
5	0.488564	3.773741	9.161680	ACEFG
5	0.459740	3.878626	11.425173	BCEFG
5	0.456601	3.889877	11.671647	ABCDG
5	0.451280	3.908876	12.089513	BCDEF
5	0.450548	3.911481	12.146968	ABCDF
5	0.445825	3.92826	12.517923	BCDEG
5	0.444518	3.932889	12.620556	ABCFG
5	0.439257	3.951468	13.033647	CDEFG
5	0.424147	4.004353	14.220190	ACDFG
5	0.389253	4.123892	16.960353	ADEFG
5	0.388336	4.126986	17.032338	BCDFG
5	0.375465	4.170182	18.043091	ABDEF
5	0.340330	4.285879	20.802117	ABEFG
5	0.339878	4.287348	20.837649	ABDEG
5	0.300880	4.412173	23.900056	BDEFG
5	0.142737	4.885776	36.318570	ABDFG
6	0.550562	3.586419	6.293168	ABCDEF
6	0.543764	3.613439	6.826961	ABCDEG
6	0.533724	3.652984	7.615427	ACDEFG
6	0.510948	3.741136	9.403922	ABCEFG
6	0.460281	3.930156	13.382659	ABCDFG
6	0.459774	3.932005	13.422540	BCDEFG
6	0.393102	4.167582	18.658102	ABDEFG
7	0.554295	3.622155	8.000000	ABCDEFG

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Model Size	R-Squared	Root MSE	Cp	Model
1	0.332877	2.640648	87.616588	D (AVL)
1	0.298751	2.707347	94.144789	B (AvHOURS)
1	0.285904	2.732032	96.602195	C (PRORATE)
1	0.193100	2.90414	114.355153	A (AvNO)
1	0.148426	2.98345	122.900895	E (Aratio)
1	0.072125	3.114241	137.496817	G (LimeSF)
1	0.012689	3.212437	148.866621	F (Sratio)
2	0.554627	2.183748	47.197225	CD
2	0.549227	2.196947	48.230238	BD
2	0.472496	2.376584	62.908270	BC
2	0.465514	2.392261	64.243992	AB
2	0.439675	2.449404	69.186843	BE
2	0.418728	2.494768	73.193911	DE
2	0.415013	2.502726	73.904428	AC

2	0.401263	2.531968	76.534698	BG
2	0.363578	2.610436	83.743734	CE
2	0.359974	2.617816	84.433127	DG
2	0.349540	2.639069	86.429088	CG
2	0.348575	2.641025	86.613639	AD
2	0.343322	2.651653	87.618624	DF
2	0.332421	2.673571	89.703867	CF
2	0.301317	2.735145	95.653762	BF
2	0.277166	2.782016	100.273754	AE
2	0.241858	2.849152	107.027996	AG
2	0.235554	2.860974	108.233970	AF
2	0.220637	2.888752	111.087468	EF
2	0.179642	2.963754	118.929588	EG
2	0.074970	3.147156	138.952728	FG
3	0.690792	1.842162	23.149672	BCD
3	0.637037	1.995876	33.432641	BDE
3	0.599251	2.097194	40.660932	BDG
3	0.596574	2.104187	41.172970	CDE
3	0.595110	2.108	41.452937	ABC
3	0.592556	2.114638	41.941530	CDF
3	0.580281	2.146255	44.289642	CDG
3	0.569609	2.173371	46.331165	ABD
3	0.561285	2.194288	47.923578	BCG
3	0.559945	2.197636	48.179860	ACD
3	0.558582	2.201037	48.440647	BCE
3	0.551742	2.218024	49.749030	BDF
3	0.548191	2.226793	50.428347	ABE
3	0.540567	2.245501	51.886707	ABG
3	0.495941	2.352031	60.423458	ACF
3	0.493856	2.35689	60.822296	BCF
3	0.493365	2.358033	60.916255	BEG
3	0.485128	2.377125	62.491947	ABF

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Model Size	R-Squared	Root MSE	Cp	Model
3	0.479960	2.389024	63.480421	BEF
3	0.470516	2.410621	65.287171	CEF
3	0.469550	2.412817	65.471836	DEF
3	0.461061	2.432049	67.095853	ACG
3	0.458313	2.438241	67.621476	ACE
3	0.428724	2.503947	73.281586	DEG
3	0.424498	2.513192	74.090057	ADE
3	0.401973	2.561902	78.398898	BFG
3	0.398888	2.568503	78.989177	CEG
3	0.378444	2.611814	82.899869	AEF
3	0.375496	2.618001	83.463854	ADG
3	0.375365	2.618276	83.488897	CFG
4	0.741333	1.706359	15.481444	BCDE
4	0.734638	1.728302	16.762229	BCDG
4	0.709511	1.808278	21.568876	BCDF
4	0.700189	1.837061	23.351988	ABCD
4	0.676096	1.909449	27.960863	CDEF
4	0.666419	1.937763	29.812072	BDEF
4	0.663057	1.947504	30.455207	ABCG
4	0.662520	1.949053	30.557801	BDEG
4	0.645716	1.996988	33.772325	ABDE
4	0.645649	1.997177	33.785146	ABCE
4	0.641155	2.009802	34.644824	ABCF
4	0.625221	2.053939	37.692970	BCEF
4	0.619654	2.069138	38.757930	ABDG
4	0.612310	2.089019	40.162805	BCEG
4	0.610146	2.094841	40.576764	ABEF
4	0.609972	2.095307	40.609934	CDEG
4	0.608223	2.100001	40.944565	ACDF
4	0.606507	2.104595	41.272844	CDFG
4	0.599271	2.123857	42.657015	BDFG
4	0.598325	2.126363	42.838044	ACDE
4	0.593089	2.140176	43.839556	ABEG
4	0.592264	2.142346	43.997473	ACEF
4	0.585524	2.159979	45.286728	ACDG
4	0.577809	2.179991	46.762664	ABDF
4	0.566437	2.209155	48.938028	BCFG
4	0.545208	2.262592	52.998923	ABFG
4	0.517076	2.331522	58.380473	ACFG
4	0.508742	2.351554	59.974739	BEFG
4	0.487269	2.402397	64.082384	ACEG
4	0.486011	2.405343	64.323064	ADEF
5	0.792597	1.547918	7.674917	BCDEF
5	0.767730	1.638087	12.431809	BCDEG
5	0.745385	1.715071	16.706232	ABCDE
5	0.744244	1.718911	16.924604	ABCDG

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Model Size	R-Squared	Root MSE	Cp	Model
5	0.741949	1.726604	17.363512	BCDFG
5	0.734033	1.752888	18.877827	ABCEF
5	0.727446	1.774462	20.137917	ABCDF
5	0.691439	1.88804	27.025931	ABCEG
5	0.686806	1.902159	27.912030	ACDEF
5	0.684483	1.909201	28.356445	ABCFG
5	0.684182	1.910112	28.414035	ABDEF
5	0.677333	1.930713	29.724242	BDEFG
5	0.676522	1.933137	29.879302	CDEFG
5	0.672503	1.94511	30.648224	ABDEG
5	0.646526	2.020781	35.617454	BCEFG
5	0.626137	2.078246	39.517820	ABEFG
5	0.620893	2.09277	40.520940	ABDFG
5	0.620377	2.094193	40.619565	ACDFG
5	0.612069	2.116983	42.208773	ACDEG
5	0.593934	2.165903	45.678027	ACEFG
5	0.486361	2.435957	66.256129	ADEFG
6	0.805211	1.520247	7.262050	ABCDEF
6	0.799882	1.540902	8.281443	BCDEFG
6	0.772686	1.64227	13.483832	ABCDEG
6	0.757109	1.697605	16.463489	ABCDFG
6	0.745673	1.737112	18.651255	ABCEFG
6	0.694018	1.90537	28.532480	ABDEFG
6	0.687075	1.926866	29.860675	ACDEFG
7	0.811808	1.514892	8.000000	ABCDEFG

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Model Size	R-Squared	Root MSE	Cp	Model
1	0.312032	7.347728	14.041407	C (PRORATE)
1	0.233320	7.75668	20.224376	A (AvNO)
1	0.186093	7.992018	23.934228	D (AVL)
1	0.089993	8.450676	31.483103	E (Aratio)
1	0.046265	8.651326	34.917958	B (AvHOURS)
1	0.019456	8.77208	37.023940	G (LimeSF)
1	0.000353	8.857114	38.524471	F (Sratio)
2	0.471748	6.516621	3.495401	AC
2	0.448215	6.660191	5.343943	CD
2	0.346740	7.246772	13.314994	CE
2	0.327011	7.355391	14.864800	CG
2	0.319502	7.396311	15.454642	CF
2	0.319235	7.397758	15.475562	BC
2	0.270045	7.660367	19.339554	AE
2	0.268420	7.668892	19.467244	AB

2	0.266890	7.676908	19.587439	AD
2	0.240719	7.812733	21.643218	AG
2	0.239856	7.817169	21.710961	AF
2	0.239535	7.81882	21.736201	DE
2	0.209188	7.973303	24.120029	BD
2	0.189775	8.070576	25.644976	DG
2	0.186801	8.085372	25.878557	DF
2	0.133959	8.343935	30.029444	BE
2	0.099045	8.510466	32.772038	EF
2	0.094294	8.532872	33.145202	EG
2	0.071846	8.637971	34.908563	BG
2	0.048166	8.747465	36.768641	BF
2	0.022123	8.866325	38.814366	FG
3	0.500316	6.416697	3.251318	ACD
3	0.497488	6.434825	3.473413	ACF
3	0.482764	6.528418	4.630029	ACE
3	0.478075	6.557941	4.998339	ACG
3	0.477576	6.561075	5.037531	ABC
3	0.466055	6.633026	5.942530	CDE
3	0.453324	6.711639	6.942609	CDF
3	0.451334	6.723844	7.098931	CDG
3	0.449676	6.733993	7.229134	BCD
3	0.371504	7.196392	13.369741	CEF
3	0.355057	7.289947	14.661719	BCE
3	0.352796	7.302713	14.839312	CEG
3	0.336594	7.393554	16.111995	BCG
3	0.330519	7.427333	16.589251	CFG
3	0.324621	7.459977	17.052544	BCF
3	0.304815	7.56857	18.608334	ABE
3	0.301109	7.588717	18.899434	ADE
3	0.293362	7.630658	19.507955	ABD

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Model Size	R-Squared	Root MSE	Cp	Model
3	0.293085	7.632153	19.529704	AEF
3	0.279471	7.705297	20.599157	ABG
3	0.271820	7.746099	21.200167	AEG
3	0.271693	7.746771	21.210102	ABF
3	0.270426	7.75351	21.309681	ADG
3	0.269389	7.759017	21.391101	ADF
3	0.263136	7.792151	21.882320	BDE
3	0.244426	7.890456	23.352015	AFG
3	0.243450	7.895549	23.428656	DEF
3	0.239596	7.915637	23.731433	DEG
3	0.215593	8.0396	25.616943	BDG
3	0.211125	8.062463	25.967886	BDF
4	0.523736	6.344322	3.411603	ACEF
4	0.517806	6.383694	3.877378	ACDF
4	0.510228	6.433665	4.472702	ACDE
4	0.503352	6.478664	5.012764	ACDG
4	0.503132	6.480102	5.030080	ABCD
4	0.499933	6.500926	5.281342	ABCF
4	0.499011	6.506917	5.353772	ACFG
4	0.489245	6.570036	6.120966	ABCE
4	0.485934	6.591295	6.381031	ACEG
4	0.485332	6.595154	6.428318	ABCG
4	0.481629	6.618834	6.719161	CDEF
4	0.468118	6.704537	7.780480	BCDE
4	0.466706	6.713431	7.891399	CDEG
4	0.454951	6.787022	8.814841	CDFG
4	0.454054	6.792603	8.885284	BCDF
4	0.453431	6.796474	8.934174	BCDG
4	0.375901	7.262534	15.024390	BCEF
4	0.372088	7.284684	15.323887	CEFG
4	0.362637	7.339301	16.066270	BCEG
4	0.338259	7.47834	17.981197	BCFG
4	0.327624	7.538193	18.816586	ABDE
4	0.321025	7.575097	19.334984	ABEF
4	0.315426	7.606263	19.774769	ADEF
4	0.308622	7.643973	20.309293	ABEG
4	0.301396	7.683815	20.876914	ADEG
4	0.299782	7.692686	21.003695	ABDG
4	0.294441	7.721968	21.423226	ABDF
4	0.293274	7.728351	21.514894	AEFG
4	0.280356	7.798663	22.529627	ABFG
4	0.271795	7.844913	23.202122	ADFG
5	0.540915	6.315758	4.124832	ACDEF
5	0.525950	6.412298	5.237650	ABCEF
5	0.524058	6.425086	5.386323	ACEFG
5	0.518928	6.459616	5.789251	ABCDF

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Model Size	R-Squared	Root MSE	Cp	Model
5	0.518380	6.463296	5.832319	ACDFG
5	0.513535	6.495726	6.212923	ABCDE
5	0.511294	6.510668	6.388924	ACDEG
5	0.507033	6.538989	6.723631	ABCDG
5	0.502183	6.57108	7.104641	ABCDFG
5	0.493414	6.628699	7.793432	ABCEG
5	0.482338	6.700771	8.663465	BCDEF
5	0.481961	6.703211	8.693083	CDEFG
5	0.469090	6.785974	9.704136	BCDEG
5	0.456143	6.868222	10.721202	BCDFG
5	0.377178	7.349938	16.924033	BCEFG
5	0.338010	7.577528	20.000796	ABDEF
5	0.329056	7.628602	20.704132	ABDEG
5	0.321226	7.672986	21.319205	ABEFG
5	0.316091	7.701953	21.722541	ADEFG
5	0.299952	7.792303	22.990355	ABDFG
5	0.265274	7.982969	25.714338	BDEFG
6	0.541197	6.393019	6.040011	ABCDEF
6	0.540915	6.394985	6.062182	ACDEFG
6	0.526049	6.497699	7.229922	ABCEFG
6	0.519838	6.540133	7.717779	ABCDFG
6	0.515132	6.572104	8.087443	ABCDEG
6	0.482521	6.789519	10.649102	BCDEFG
6	0.338011	7.679241	22.000738	ABDEFG
7	0.541706	6.477604	8.000000	ABCDEFG

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Model Size	R-Squared	Root MSE	Cp	Model
1	0.442506	3.219174	21.261272	B (AvHOURS)
1	0.307808	3.542929	34.203082	C (PRORATE)
1	0.101691	4.036102	56.298881	E (Aratio)
1	0.062626	4.122927	60.486659	G (LimeSF)
1	0.042848	4.166195	62.606841	D (AVL)
1	0.023461	4.208176	64.685094	F (Sratio)
1	0.006857	4.243801	66.465060	A (AvNO)
2	0.538271	2.947812	12.145395	BC
2	0.486855	3.087466	17.009270	BE
2	0.443620	3.2149	21.643994	AB
2	0.441735	3.220344	21.846135	BG
2	0.435359	3.23868	22.529583	BD
2	0.433964	3.242679	22.679169	BF
2	0.351573	3.470664	31.511501	CG

2	0.349668	3.475757	31.715686	AC
2	0.338763	3.504777	32.884703	CD
2	0.319734	3.55485	34.924639	CE
2	0.309144	3.582414	36.059929	CF
2	0.169229	3.928463	51.058832	DE
2	0.167042	3.93363	51.293273	DG
2	0.147172	3.98027	53.423255	FG
2	0.141871	3.992622	53.991580	EF
2	0.122692	4.036992	56.047528	EG
2	0.104936	4.077641	57.951026	AE
2	0.090864	4.109571	59.459572	AD
2	0.064469	4.168799	62.289069	AG
2	0.054598	4.190734	63.347224	DF
2	0.033063	4.238195	65.655797	AF
3	0.569587	2.863621	10.167774	ABC
3	0.548849	2.930927	12.363495	BCE
3	0.546125	2.939761	12.655501	BCG
3	0.540265	2.958678	13.283669	BCD
3	0.532491	2.983589	14.117081	BCF
3	0.503555	3.074535	17.218992	BDE
3	0.499746	3.086307	17.627306	BEF
3	0.497166	3.094254	17.903841	ABE
3	0.487975	3.122406	18.889169	BEG
3	0.472055	3.170575	20.595767	ABD
3	0.463096	3.197364	21.556183	BDG
3	0.462938	3.197836	21.573165	BFG
3	0.456057	3.218255	22.310750	ACD
3	0.452543	3.228633	22.687446	ABG
3	0.450850	3.233622	22.868953	ABF
3	0.438660	3.269315	24.175739	BDF
3	0.427356	3.30207	25.387540	CDG
3	0.380249	3.435204	30.437419	ACG

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All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
3	0.374136	3.452103	31.092689	CFG
3	0.360118	3.49055	32.595476	CDE
3	0.354984	3.504525	33.145851	ACE
3	0.352869	3.510265	33.372530	CEG
3	0.351936	3.512794	33.472534	ACF
3	0.338772	3.548294	34.883792	CDF
3	0.324095	3.587457	36.457124	CEF
3	0.237283	3.810882	45.763355	DFG
3	0.231191	3.826071	46.416413	DEG
3	0.220701	3.852086	47.541013	ADG
3	0.216860	3.861566	47.952691	ADE
3	0.204753	3.891302	49.250648	EFG
4	0.617841	2.725868	6.787007	ABCD
4	0.578352	2.869568	11.200721	ABCE
4	0.576468	2.875971	11.402682	ABCG
4	0.570289	2.896877	12.065134	BCDG
4	0.570054	2.897667	12.090293	ABCF
4	0.562363	2.923469	12.914755	BCDE
4	0.554437	2.949825	13.764468	BCEG
4	0.553033	2.954467	13.914892	BCFG
4	0.551348	2.960032	14.095582	BCEF
4	0.547438	2.972901	14.514681	ACDG
4	0.540702	2.994945	15.236836	ABDE
4	0.540278	2.996328	15.282316	BCDF
4	0.512082	3.086844	18.304837	BDEG
4	0.511970	3.087201	18.316910	ABEF
4	0.511796	3.087749	18.335510	BDEF
4	0.508805	3.097194	18.656161	BEFG
4	0.503252	3.114651	19.251425	ABDG
4	0.497478	3.132703	19.870465	ABEG
4	0.483843	3.174916	21.332065	BDFG
4	0.474889	3.202338	22.291984	ABDF
4	0.473914	3.20531	22.396555	ABFG
4	0.468703	3.221146	22.955162	ACDE
4	0.456825	3.256952	24.228430	ACDF
4	0.445283	3.291373	25.465717	CDFG
4	0.430325	3.335454	27.069209	CDEG
4	0.401105	3.419928	30.201681	ACFG
4	0.380456	3.478384	32.415202	ACEG
4	0.376786	3.488672	32.808625	CEFG
4	0.360987	3.532617	34.502344	CDEF
4	0.359551	3.536581	34.656187	ACEF
5	0.655646	2.627149	4.914823	ABCDG
5	0.634073	2.708192	7.227463	ABCDE
5	0.620105	2.759394	8.724792	ABCDF
5	0.582358	2.893238	12.771285	ABCFG

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All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
5	0.581292	2.896928	12.885569	ABCEG
5	0.581015	2.897886	12.915269	ABCEF
5	0.579571	2.902874	13.070036	BCDEG
5	0.576771	2.912526	13.370231	BCDFG
5	0.563226	2.958764	14.822210	BCDEF
5	0.562732	2.960437	14.875183	BCEFG
5	0.559275	2.972118	15.245831	ACDFG
5	0.551229	2.999123	16.108278	ABDEG
5	0.548205	3.009212	16.432511	ABDEF
5	0.547710	3.010859	16.485539	ACDEG
5	0.532422	3.061324	18.124489	BDEFG
5	0.524015	3.088722	19.025719	ABDFG
5	0.518469	3.106664	19.620236	ABEFG
5	0.468708	3.263237	24.954553	ACDEF
5	0.449892	3.320519	26.971661	CDEFG
5	0.402003	3.462037	32.105409	ACEFG
5	0.349252	3.611507	37.760297	ADEFG
6	0.659905	2.645897	6.458217	ABCDFG
6	0.659147	2.648845	6.539494	ABCDEG
6	0.634083	2.744505	9.226327	ABCDEF
6	0.588228	2.911397	14.142030	ABCEFG
6	0.587465	2.914092	14.223787	BCDEFG
6	0.571587	2.969643	15.925927	ABDEFG
6	0.560073	3.009286	17.160297	ACDEFG
7	0.664180	2.665484	8.000000	ABCDEFG

Kiln 6: FUEL

All Possible Regression Report

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 Dependent FUEL

All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
1	0.509426	4.285896	13.841560	C (PRORATE)
1	0.155702	5.622603	52.663597	D (AVL)
1	0.142183	5.667438	54.147297	E (Aratio)
1	0.116120	5.752892	57.007809	B (AvHOURS)
1	0.070307	5.900098	62.035842	A (AvNO)
1	0.031729	6.021269	66.269923	F (Sratio)
1	0.000018	6.119072	69.750249	G (LimeSF)
2	0.635339	3.739961	2.022394	CD
2	0.523128	4.27684	14.337740	AC
2	0.520326	4.289389	14.645307	CE
2	0.513454	4.320004	15.399501	BC
2	0.511873	4.32702	15.573080	CG
2	0.510191	4.334467	15.757666	CF

2	0.352842	4.982272	33.027052	DE
2	0.230598	5.43249	46.443607	BE
2	0.230352	5.433359	46.470630	AE
2	0.228548	5.439721	46.668560	BD
2	0.196939	5.550045	50.137731	EF
2	0.182116	5.601033	51.764600	DG
2	0.176093	5.621616	52.425583	AB
2	0.163735	5.66362	53.781914	DF
2	0.162173	5.668909	53.953428	EG
2	0.161204	5.672186	54.059773	AD
2	0.135025	5.760021	56.932949	BF
2	0.120895	5.806876	58.483718	BG
2	0.093822	5.895613	61.455051	AF
2	0.072585	5.964296	63.785838	AG
2	0.039944	6.068347	67.368256	FG
3	0.666537	3.620827	0.598268	CDE
3	0.643666	3.742942	3.108505	CDG
3	0.640908	3.757394	3.411096	ACD
3	0.638162	3.771738	3.712566	CDF
3	0.635344	3.786393	4.021777	BCD
3	0.539525	4.25488	14.538194	ACE
3	0.529074	4.302892	15.685162	CEG
3	0.527545	4.309872	15.852974	ABC
3	0.524929	4.321788	16.140123	BCE
3	0.523948	4.326249	16.247799	ACG
3	0.523585	4.327896	16.287583	ACF
3	0.523418	4.328656	16.305954	CEF
3	0.517455	4.355652	16.960409	BCG
3	0.514077	4.370872	17.331178	BCF
3	0.511902	4.380642	17.569874	CFG
3	0.394153	4.880515	30.493068	BDE
3	0.372285	4.967816	32.893149	DEF
3	0.358507	5.022038	34.405242	ADE

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All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
3	0.353122	5.043073	34.996261	DEG
3	0.306995	5.21978	40.058800	ABE
3	0.274167	5.341982	43.661759	AEF
3	0.269920	5.357589	44.127906	BEG
3	0.268145	5.364099	44.322752	BEF
3	0.240390	5.464867	47.368934	AEG
3	0.235981	5.480703	47.852808	ABD
3	0.235438	5.482649	47.912374	BDG
3	0.233148	5.490853	48.163668	BDF
3	0.209406	5.575205	50.769431	DFG
3	0.199304	5.610713	51.878185	EFG
3	0.189557	5.644758	52.947910	ABF
4	0.669816	3.648884	2.238462	ACDE
4	0.667915	3.659371	2.447065	CDEG
4	0.666768	3.665685	2.572942	CDEF
4	0.666539	3.666943	2.598060	BCDE
4	0.649422	3.759884	4.476761	ACDG
4	0.644600	3.785653	5.005987	BCDG
4	0.644351	3.786977	5.033281	ACDF
4	0.643937	3.789182	5.078753	CDFG
4	0.641080	3.80435	5.392227	ABCD
4	0.638167	3.819759	5.711988	BCDF
4	0.545400	4.281507	15.893384	ACEG
4	0.544787	4.284392	15.960657	ABCE
4	0.542491	4.295181	16.212584	ACEF
4	0.537467	4.318703	16.764047	BCEG
4	0.529427	4.356076	17.646459	CEFG
4	0.529352	4.356423	17.654684	ABCG
4	0.527886	4.363204	17.815611	ABCF
4	0.527776	4.363711	17.827659	BCEF
4	0.524033	4.38097	18.238452	ACFG
4	0.517493	4.410964	18.956185	BCFG
4	0.408455	4.883999	30.923340	BDEF
4	0.401274	4.913555	31.711480	ABDE
4	0.395848	4.93577	32.307013	BDEG
4	0.378514	5.006075	34.209430	ADEF
4	0.377771	5.009069	34.291029	DEFG
4	0.358700	5.08525	36.384056	ADEG
4	0.336967	5.170701	38.769342	ABEF
4	0.331514	5.19192	39.367822	ABEG
4	0.283525	5.375049	44.634749	BEFG
4	0.274425	5.409074	45.633435	AEFG
5	0.671408	3.687658	4.063674	ACDEG
5	0.670249	3.694156	4.190879	ACDEF
5	0.669910	3.696058	4.228153	ABCDE
5	0.668101	3.706169	4.426638	BCDEG

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All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
5	0.667917	3.707199	4.446889	CDEFG
5	0.666770	3.713594	4.572734	BCDEF
5	0.651242	3.799133	6.276981	ABCDG
5	0.649909	3.806385	6.423239	ACDFG
5	0.644749	3.834337	6.989629	BCDFG
5	0.644537	3.835479	7.012867	ABCDF
5	0.553909	4.296691	16.959501	ABCEG
5	0.547495	4.327469	17.663427	ABCEF
5	0.546024	4.334496	17.824845	ACEFG
5	0.537499	4.375006	18.760515	BCEFG
5	0.529357	4.41335	19.654161	ABCFG
5	0.416025	4.916086	32.092545	ABDEF
5	0.408553	4.947439	32.912675	BDEFG
5	0.403360	4.96911	33.482603	ABDEG
5	0.383654	5.050505	35.645386	ADEFG
5	0.344793	5.207289	39.910454	ABEFG
5	0.255459	5.550942	49.715054	ABDFG
6	0.671977	3.733925	6.001287	ABCDEG
6	0.671448	3.736933	6.059302	ACDEFG
6	0.670349	3.743179	6.179946	ABCDEF
6	0.668101	3.755917	6.426603	BCDEFG
6	0.651514	3.848626	8.247066	ABCDFG
6	0.554050	4.353681	18.944055	ABCEFG
6	0.416058	4.981937	34.088975	ABDEFG
7	0.671988	3.785362	8.000000	ABCDEFG

Appendix 06: Stepwise Regression of other Kilns

Kiln 4: EL

Forward

Stepwise Regression Report

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Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	3.283402	0.000000
1	Added	AvHOURS	0.506203	2.335238	0.000000
2	Added	PRORATE	0.662561	1.954412	0.031196
3	Unchanged		0.662561	1.954412	0.031196

List of Variables Selected

AvHOURS, PRORATE

Backward

Stepwise Regression Report

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Database E:\DATA\K4.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.693758	1.990431	0.521804
1	Removed	LimeSF	0.693707	1.962753	0.512297
2	Removed	Aratio	0.692094	1.941139	0.472517
3	Removed	AVL	0.689051	1.924871	0.060314
4	Removed	AvNO	0.675762	1.940209	0.059500
5	Removed	Sratio	0.662561	1.954412	0.031196
6	Unchanged		0.662561	1.954412	0.031196

List of Variables Selected

AvHOURS, PRORATE

Stepwise

Stepwise Regression Report

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Database E:\DATA\K4.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	3.283402	0.000000
1	Added	AvHOURS	0.506203	2.335238	0.000000
2	Unchanged		0.506203	2.335238	0.000000
3	Added	PRORATE	0.662561	1.954412	0.031196
4	Unchanged		0.662561	1.954412	0.031196

List of Variables Selected

AvHOURS, PRORATE

Min MSE

Stepwise Regression Report

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 Database E:\DATA\K4.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	3.283402	0.000000
1	Added	AvHOURS	0.506203	2.335238	0.000000
2	Added	PRORATE	0.662561	1.954412	0.031196
3	Unchanged		0.662561	1.954412	0.031196

List of Variables Selected
 AvHOURS, PRORATE

Kiln 4: FUEL

Forward

Stepwise Regression Report

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 Database E:\DATA\K4.S0
 Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.952823	0.000000
1	Added	PRORATE	0.331317	4.099166	0.000000
2	Added	Aratio	0.409871	3.898711	0.067420
3	Unchanged		0.409871	3.898711	0.067420

List of Variables Selected
 PRORATE, Aratio

Backward

Stepwise Regression Report

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 Database E:\DATA\K4.S0
 Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.554295	3.622155	0.521804
1	Removed	LimeSF	0.550562	3.586419	0.512297
2	Removed	Sratio	0.536422	3.592839	0.512247
3	Removed	AvHOURS	0.515544	3.624206	0.511667
4	Unchanged		0.515544	3.624206	0.511667

List of Variables Selected
 AvNO, PRORATE, AVL, Aratio

Stepwise

Stepwise Regression Report

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 Database E:\DATA\K4.S0
 Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.952823	0.000000

1	Added	PRORATE	0.331317	4.099166	0.000000
2	Unchanged		0.331317	4.099166	0.000000
3	Added	Aratio	0.409871	3.898711	0.067420
4	Unchanged		0.409871	3.898711	0.067420

List of Variables Selected

PRORATE, Aratio

Min MSE

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 Dependent FUEL

Stepwise Regression Report

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.952823	0.000000
1	Added	PRORATE	0.331317	4.099166	0.000000
2	Added	Aratio	0.409871	3.898711	0.067420
3	Added	AvNO	0.464826	3.760042	0.069349
4	Added	AVL	0.515544	3.624206	0.511667
5	Unchanged		0.515544	3.624206	0.511667

List of Variables Selected

AvNO, PRORATE, AVL, Aratio

Kiln 5: EL

Forward

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 Database E:\DATA\K5.S0
 Dependent EL

Stepwise Regression Report

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	3.1952	0.000000
1	Added	AVL	0.332877	2.640648	0.000000
2	Added	PRORATE	0.554627	2.183748	0.013478
3	Added	AvHOURS	0.690792	1.842162	0.071667
4	Added	Aratio	0.741333	1.706359	0.101405
5	Added	Sratio	0.792597	1.547918	0.174880
6	Unchanged		0.792597	1.547918	0.174880

List of Variables Selected

AvHOURS, PRORATE, AVL, Aratio, Sratio

Backward

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 Database E:\DATA\K5.S0
 Dependent EL

Stepwise Regression Report

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.811808	1.514892	0.395912
1	Removed	LimeSF	0.805211	1.520247	0.395074
2	Unchanged		0.805211	1.520247	0.395074

List of Variables Selected

Stepwise

Stepwise Regression Report

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 Database E:\DATA\K5.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	3.1952	0.000000
1	Added	AVL	0.332877	2.640648	0.000000
2	Unchanged		0.332877	2.640648	0.000000
3	Added	PRORATE	0.554627	2.183748	0.013478
4	Unchanged		0.554627	2.183748	0.013478
5	Added	AvHOURS	0.690792	1.842162	0.071667
6	Unchanged		0.690792	1.842162	0.071667
7	Added	Aratio	0.741333	1.706359	0.101405
8	Unchanged		0.741333	1.706359	0.101405
9	Added	Sratio	0.792597	1.547918	0.174880
10	Unchanged		0.792597	1.547918	0.174880

List of Variables Selected

AvHOURS, PRORATE, AVL, Aratio, Sratio

Min MSE

Stepwise Regression Report

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 Database E:\DATA\K5.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	3.1952	0.000000
1	Added	AVL	0.332877	2.640648	0.000000
2	Added	PRORATE	0.554627	2.183748	0.013478
3	Added	AvHOURS	0.690792	1.842162	0.071667
4	Added	Aratio	0.741333	1.706359	0.101405
5	Added	Sratio	0.792597	1.547918	0.174880
6	Added	AvNO	0.805211	1.520247	0.395074
7	Unchanged		0.805211	1.520247	0.395074

List of Variables Selected

AvNO, AvHOURS, PRORATE, AVL, Aratio, Sratio

Kiln 5 : FUEL

Forward

Stepwise Regression Report

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 Database E:\DATA\K5.S0
 Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	8.755065	0.000000
1	Added	PRORATE	0.312032	7.347728	0.000000
2	Added	AvNO	0.471748	6.516621	0.025060
3	Unchanged		0.471748	6.516621	0.025060

List of Variables Selected
AvNO, PRORATE

Backward

Stepwise Regression Report

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Database E:\DATA\K5.S0
Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.541706	6.477604	0.395912
1	Removed	LimeSF	0.541197	6.393019	0.395074
2	Removed	AvHOURS	0.540117	6.315758	0.394673
3	Removed	AVL	0.523736	6.344322	0.172446
4	Unchanged		0.523736	6.344322	0.172446

List of Variables Selected
AvNO, PRORATE, Aratio, Sratio

Stepwise

Stepwise Regression Report

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Database E:\DATA\K5.S0
Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	8.755065	0.000000
1	Added	PRORATE	0.312032	7.347728	0.000000
2	Unchanged		0.312032	7.347728	0.000000
3	Added	AvNO	0.471748	6.516621	0.025060
4	Unchanged		0.471748	6.516621	0.025060

List of Variables Selected
AvNO, PRORATE

Min MSE

Stepwise Regression Report

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Database E:\DATA\K5.S0
Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	8.755065	0.000000
1	Added	PRORATE	0.312032	7.347728	0.000000
2	Added	AvNO	0.471748	6.516621	0.025060
3	Added	AVL	0.500316	6.416697	0.351207
4	Unchanged		0.500316	6.416697	0.351207

List of Variables Selected
AvNO, PRORATE, AVL

Kiln 6 : EL

Forward

Stepwise Regression Report

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Database E:\DATA\K6.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.208619	0.000000
1	Added	AvHOURS	0.428534	3.219174	0.000000
2	Added	PRORATE	0.532227	2.947812	0.156638
3	Unchanged		0.532227	2.947812	0.156638

List of Variables Selected
AvHOURS, PRORATE

Backward**Stepwise Regression Report**

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Database E:\DATA\K6.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.664180	2.665484	0.419748
1	Removed	Aratio	0.659905	2.645897	0.415200
2	Removed	Sratio	0.655646	2.627149	0.414215
3	Unchanged		0.655646	2.627149	0.414215

List of Variables Selected
AvNO, AvHOURS, PRORATE, AVL, LimeSF

Stepwise**Stepwise Regression Report**

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Database E:\DATA\K6.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.208619	0.000000
1	Added	AvHOURS	0.428534	3.219174	0.000000
2	Unchanged		0.428534	3.219174	0.000000
3	Added	PRORATE	0.532227	2.947812	0.156638
4	Unchanged		0.532227	2.947812	0.156638

List of Variables Selected
AvHOURS, PRORATE

Min MSE**Stepwise Regression Report**

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Database E:\DATA\K6.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.208619	0.000000
1	Added	AvHOURS	0.428534	3.219174	0.000000
2	Added	PRORATE	0.532227	2.947812	0.156638
3	Added	AvNO	0.569331	2.863621	0.191789
4	Added	AVL	0.619525	2.725868	0.308062

5	Added	LimeSF	0.655646	2.627149	0.414215
6	Unchanged		0.655646	2.627149	0.414215

List of Variables Selected
AvNO, AvHOURS, PRORATE, AVL, LimeSF

Kiln 6 : FUEL

Forward

Stepwise Regression Report

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Database E:\DATA\K6.S0
Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	6.047556	0.000000
1	Added	PRORATE	0.509426	4.285896	0.000000
2	Added	AVL	0.635339	3.739961	0.003191
3	Unchanged		0.635339	3.739961	0.003191

List of Variables Selected
PRORATE, AVL

Backward

Stepwise Regression Report

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Database E:\DATA\K6.S0
Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.671988	3.785362	0.419748
1	Removed	Sratio	0.671977	3.733925	0.415003
2	Removed	AvHOURS	0.671408	3.687658	0.346667
3	Removed	LimeSF	0.669816	3.648884	0.300852
4	Removed	AvNO	0.666537	3.620827	0.186948
5	Unchanged		0.666537	3.620827	0.186948

List of Variables Selected
PRORATE, AVL, Aratio

Stepwise

Stepwise Regression Report

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Database E:\DATA\K6.S0
Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	6.047556	0.000000
1	Added	PRORATE	0.509426	4.285896	0.000000
2	Unchanged		0.509426	4.285896	0.000000
3	Added	AVL	0.635339	3.739961	0.003191
4	Unchanged		0.635339	3.739961	0.003191

List of Variables Selected
PRORATE, AVL

Min MSE

Stepwise Regression Report

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Database E:\DATA\K6.S0
Dependent FUEL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	6.047556	0.000000
1	Added	PRORATE	0.509426	4.285896	0.000000
2	Added	AVL	0.635339	3.739961	0.003191
3	Added	Aratio	0.666537	3.620827	0.186948
4	Unchanged		0.666537	3.620827	0.186948

List of Variables Selected
PRORATE, AVL, Aratio

Appendix 07: Multiple Regression of other Kilns

Multiple Regression Report for EL of Kiln 4

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Database E:\Data\K4.S0

Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	69.28985	46.00584	1.5061	0.141012	Accept Ho	0.310577
AvNO	5.105814	4.119006	1.2396	0.223380	Accept Ho	0.226124
AvHOURS	0.5499542	8.262671E-02	6.6559	0.000000	Reject Ho	0.999997
PRORATE	-0.778922	0.1874268	-4.1559	0.000198	Reject Ho	0.981210
AVL	4.602864E-02	0.1010684	0.4554	0.651619	Accept Ho	0.072775
Aratio	0.4303903	1.03182	0.4171	0.679140	Accept Ho	0.069068
Sratio	-10.27637	7.57432	-1.3567	0.183551	Accept Ho	0.261502
LimeSF	-0.035973	0.4729972	-0.0761	0.939810	Accept Ho	0.050627
R-Squared	0.693758					

Model

69.28985+ 5.105814*AvNO+ .5499542*AvHOURS-.778922*PRORATE+ 4.602864E-02*AVL+ .4303903*Aratio-10.27637*Sratio-.035973*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	35989.21	35989.21			
Model	7	314.1272	44.87531	11.3270	0.000000	0.999999
Error	35	138.6635	3.961815			
Total(Adjusted)	42	452.7907	10.78073			

Root Mean Square Error	1.990431	R-Squared	0.6938
Mean of Dependent	28.93023	Adj R-Squared	0.6325
Coefficient of Variation	6.880107E-02	Press Value	209.6724
Sum Press Residuals	72.06046	Press R-Squared	0.5369

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	-2.3866	0.017007	Rejected
Kurtosis	2.5391	0.011115	Rejected
Omnibus	12.1425	0.002308	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.110349	9	-0.044692	17	-0.099292
2	-0.051185	10	0.036695	18	-0.151887
3	0.008850	11	0.039914	19	-0.070399
4	-0.155352	12	0.160276	20	-0.070134
5	-0.178579	13	0.225836	21	0.000580
6	-0.139621	14	0.135551	22	0.044894
7	-0.257571	15	-0.081841	23	0.131102
8	-0.022579	16	-0.078110	24	0.025434

Above serial correlations significant if their absolute values are greater than 0.304997

Durbin-Watson Value 1.8025

Multiple Regression Report

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 Database E:\Data\K4.S0
 Dependent EL

Multicollinearity Section

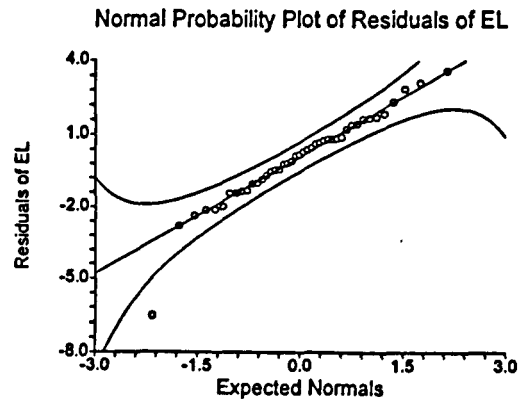
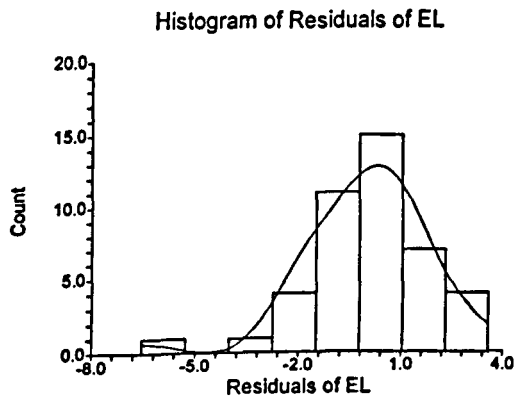
Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.935519	0.483343	0.516657	4.282434
AvHOURS	1.068870	0.064432	0.935568	1.723244E-03
PRORATE	1.329202	0.247669	0.752331	8.866843E-03
AVL	2.091195	0.521804	0.478196	2.578317E-03
Aratio	1.662361	0.398446	0.601554	0.2687283
Sratio	1.508043	0.336889	0.663111	14.48082
LimeSF	1.154744	0.134007	0.865993	5.647067E-02

Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.803427	25.76	25.76	1.00
2	1.529425	21.85	47.61	1.18
3	1.358021	19.40	67.01	1.33
4	0.983388	14.05	81.06	1.83
5	0.673014	9.61	90.68	2.68
6	0.380639	5.44	96.11	4.74
7	0.272085	3.89	100.00	6.63

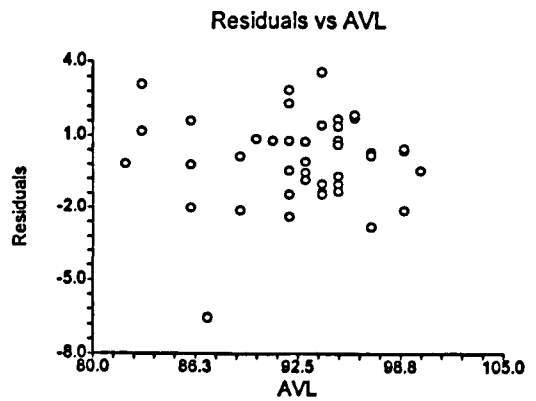
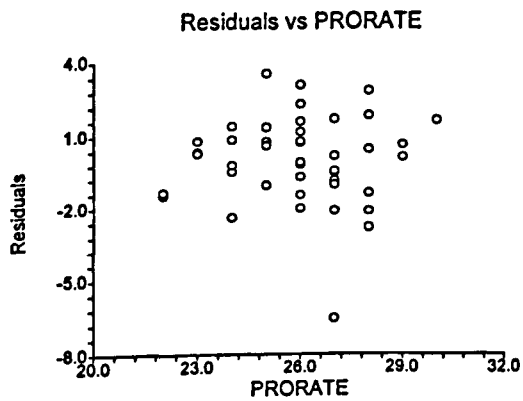
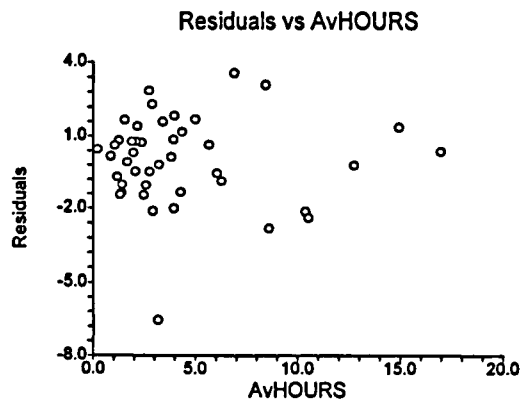
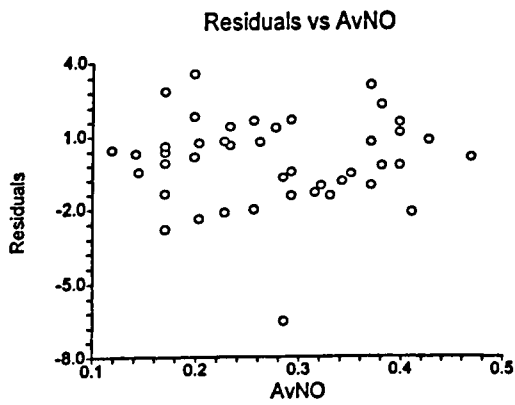
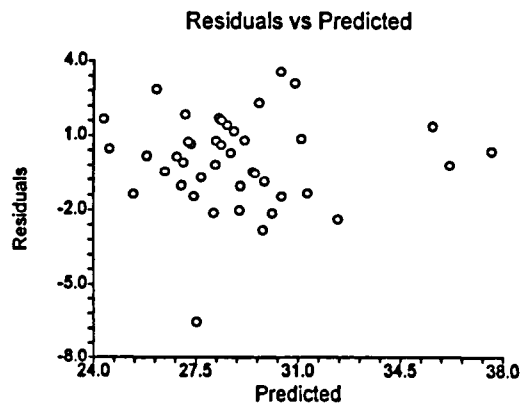
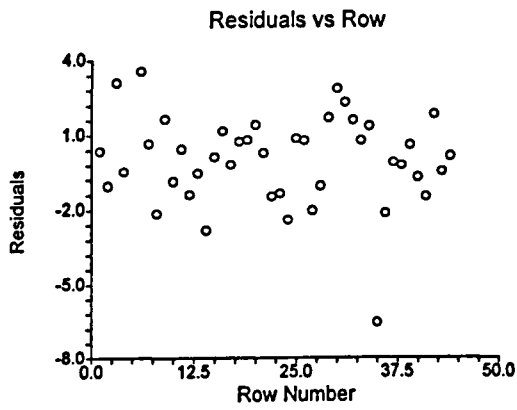
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section



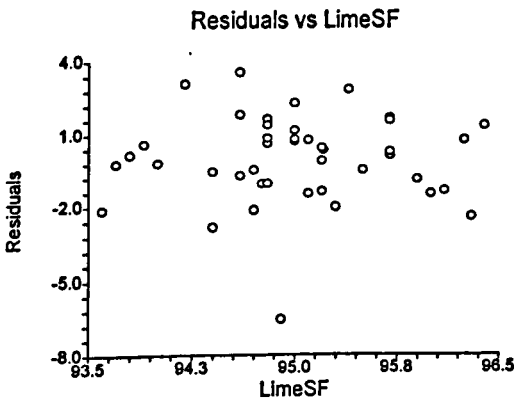
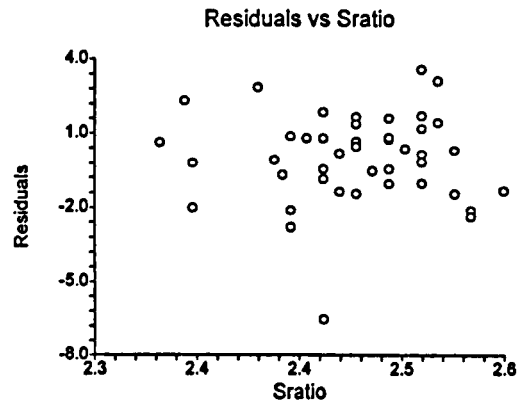
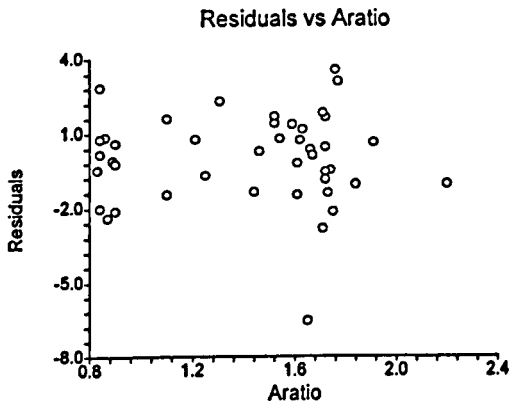
Multiple Regression Report

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Database E:\Data\K4.S0
Dependent EL



Multiple Regression Report

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 Database E:\Data\K4.S0
 Dependent EL



Multiple Regression Report for FUEL of Kiln 4

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 Database E:\Data\K4.S0
 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	21.31061	83.7207	0.2545	0.800565	Accept Ho	0.057054
AvNO	20.42155	7.495702	2.7244	0.009984	Reject Ho	0.754610
AvHOURS	-0.1911103	0.1503628	-1.2710	0.212113	Accept Ho	0.235323
PRORATE	-1.213489	0.3410763	-3.5578	0.001098	Reject Ho	0.933018
AVL	0.3393321	0.1839226	1.8450	0.073517	Accept Ho	0.434301
Aratio	-5.101879	1.877689	-2.7171	0.010168	Reject Ho	0.752364
Sratio	12.53447	13.78363	0.9094	0.369373	Accept Ho	0.143330
LimeSF	0.4660547	0.8607528	0.5415	0.591628	Accept Ho	0.082343
R-Squared	0.554295					

Model

21.31061+ 20.42155*AvNO-.1911103*AvHOURS-1.213489*PRORATE+ .3393321*AVL-5.101879*Aratio+ 12.53447*Sratio+ .4660547*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	375075.7	375075.7			
Model	7	571.0789	81.5827	6.2182	0.000090	0.997837
Error	35	459.2002	13.12			
Total(Adjusted)	42	1030.279	24.53045			

Root Mean Square Error	3.622155	R-Squared	0.5543
Mean of Dependent	93.39535	Adj R-Squared	0.4652
Coefficient of Variation	3.878303E-02	Press Value	704.7622
Sum Press Residuals	141.0963	Press R-Squared	0.3160

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.0107	0.991454	Accepted
Kurtosis	-0.3405	0.733502	Accepted
Omnibus	0.1160	0.943633	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.210046	9	0.040591	17	0.125581
2	-0.146598	10	0.182281	18	-0.014987
3	-0.005464	11	-0.017925	19	-0.124375
4	0.011993	12	-0.114608	20	0.070329
5	-0.330517	13	-0.066062	21	-0.017396
6	0.036150	14	-0.023630	22	-0.208468
7	0.196955	15	-0.211377	23	-0.007205
8	0.051856	16	-0.025489	24	0.059347

Above serial correlations significant if their absolute values are greater than 0.304997

Durbin-Watson Value 1.4804

Multiple Regression Report

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 Database E:\Data\K4.S0
 Dependent FUEL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.935519	0.483343	0.516657	4.282434
AvHOURS	1.068870	0.064432	0.935568	1.723244E-03
PRORATE	1.329202	0.247669	0.752331	8.866843E-03
AVL	2.091195	0.521804	0.478196	2.578317E-03
Aratio	1.662361	0.398446	0.601554	0.2687283
Sratio	1.508043	0.336889	0.663111	14.48082
LimeSF	1.154744	0.134007	0.865993	5.647067E-02

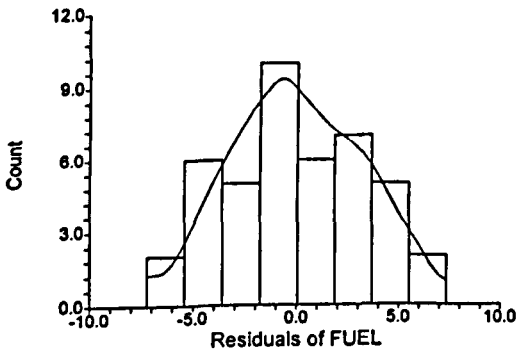
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.803427	25.76	25.76	1.00
2	1.529425	21.85	47.61	1.18
3	1.358021	19.40	67.01	1.33
4	0.983388	14.05	81.06	1.83
5	0.673014	9.61	90.68	2.68
6	0.380639	5.44	96.11	4.74
7	0.272085	3.89	100.00	6.63

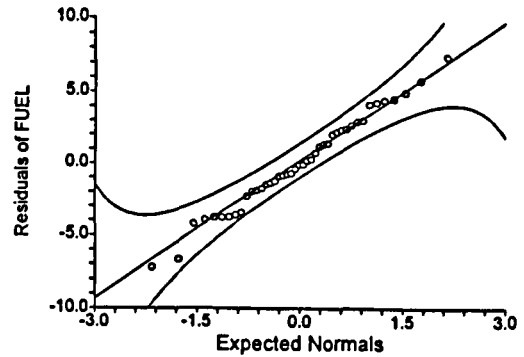
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

Histogram of Residuals of FUEL



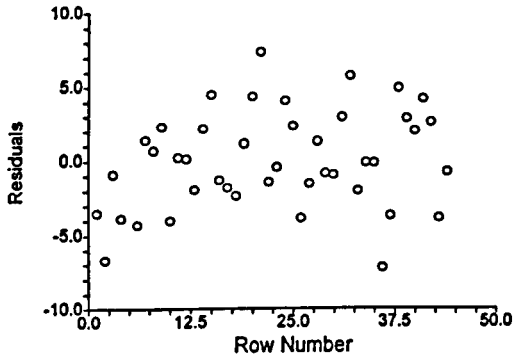
Normal Probability Plot of Residuals of FUEL



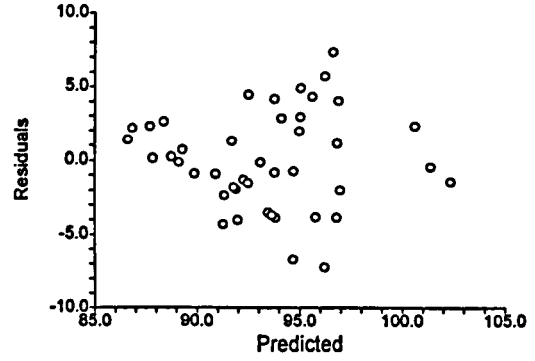
Multiple Regression Report

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Database E:\Data\K4.S0
Dependent FUEL

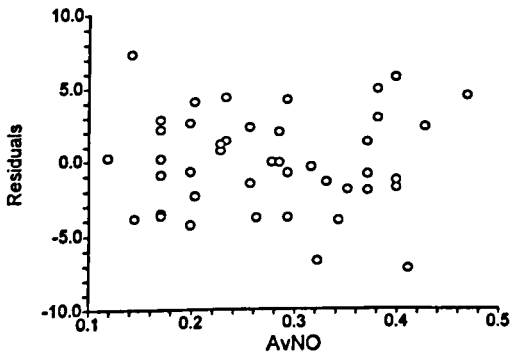
Residuals vs Row



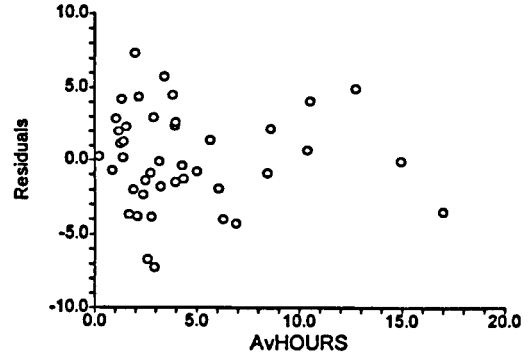
Residuals vs Predicted



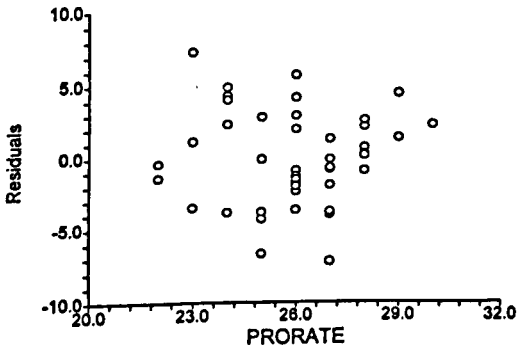
Residuals vs AvNO



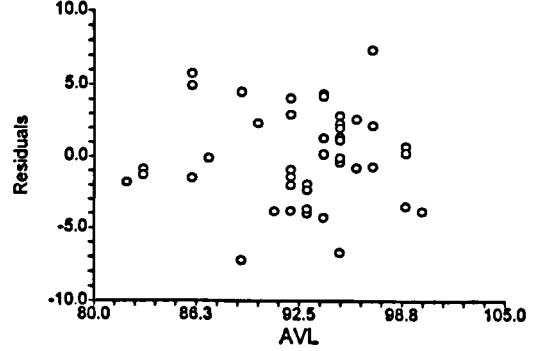
Residuals vs AvHOURS



Residuals vs PRORATE

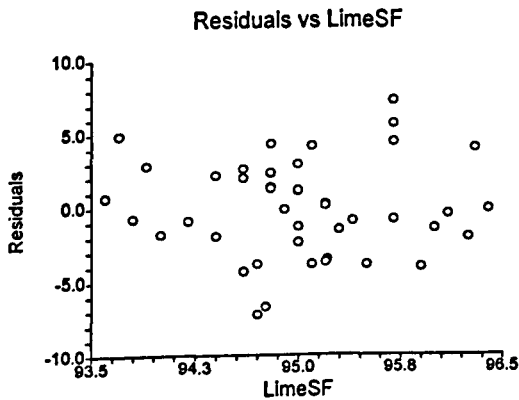
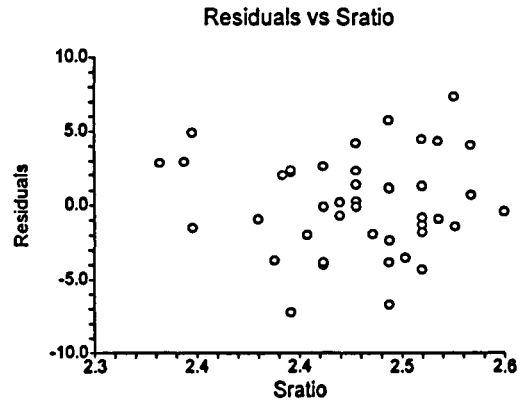
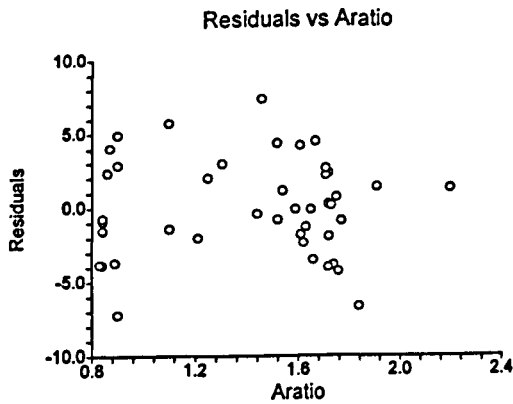


Residuals vs AVL



Multiple Regression Report

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 Database E:\Data\K4.S0
 Dependent FUEL



Multiple Regression Report for EL of Kiln 5

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 Database E:\Data\K5.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	121.0618	55.13527	2.1957	0.034640	Reject Ho	0.570251
AvNO	2.158435	1.429006	1.5104	0.139658	Accept Ho	0.312465
AvHOURS	0.345149	7.065863E-02	4.8847	0.000021	Reject Ho	0.997372
PRORATE	-0.2328336	4.905023E-02	-4.7468	0.000032	Reject Ho	0.996057
AVL	-0.1838958	5.170172E-02	-3.5569	0.001074	Reject Ho	0.933259
Aratio	-8.629664	2.667815	-3.2347	0.002611	Reject Ho	0.882456
Sratio	-33.66404	12.30564	-2.7357	0.009603	Reject Ho	0.758690
LimeSF	0.3914206	0.3484219	1.1234	0.268699	Accept Ho	0.194276
R-Squared	0.811808					

Model

121.0618 + 2.158435*AvNO + .345149*AvHOURS - .2328336*PRORATE - .1838958*AVL - 8.629664*Aratio - 33.66404*Sratio + .3914206*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	49379	49379			
Model	7	356.3837	50.91196	22.1849	0.000000	1.000000
Error	36	82.6163	2.294897			
Total(Adjusted)	43	439	10.2093			

Root Mean Square Error	1.514892	R-Squared	0.8118
Mean of Dependent	33.5	Adj R-Squared	0.7752
Coefficient of Variation	4.522065E-02	Press Value	123.2042
Sum Press Residuals	62.27302	Press R-Squared	0.7194

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	1.0673	0.285854	Accepted
Kurtosis	-0.8591	0.390301	Accepted
Omnibus	1.8770	0.391205	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.310446	9	0.056603	17	-0.089583
2	0.161625	10	0.108571	18	-0.123568
3	0.043335	11	-0.153072	19	-0.185134
4	0.129560	12	-0.314543	20	-0.092957
5	0.033592	13	-0.141250	21	-0.217684
6	0.019704	14	0.063308	22	-0.186626
7	0.067675	15	0.019815	23	-0.058329
8	0.045337	16	-0.171543	24	-0.000742

Above serial correlations significant if their absolute values are greater than 0.301511

Durbin-Watson Value 1.3183

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 Dependent EL

Multicollinearity Section

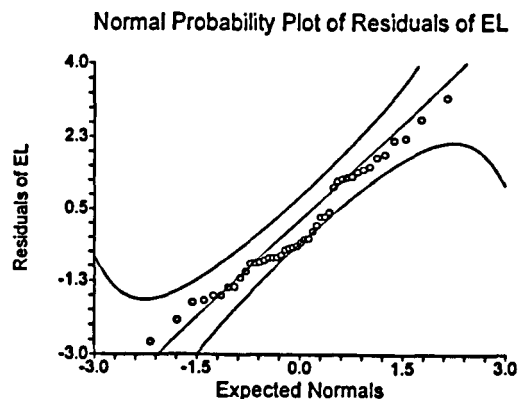
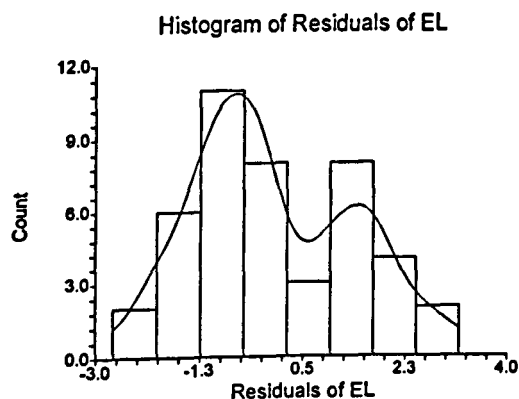
Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.655389	0.395912	0.604088	0.8898261
AvHOURS	1.145893	0.127318	0.872682	2.175541E-03
PRORATE	1.149692	0.130202	0.869798	1.04838E-03
AVL	1.624852	0.384559	0.615441	1.164788E-03
Aratio	1.382770	0.276814	0.723186	3.101331
Sratio	1.451070	0.310853	0.689147	65.98499
LimeSF	1.285144	0.221877	0.778123	5.289902E-02

Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.978944	28.27	28.27	1.00
2	1.335159	19.07	47.34	1.48
3	1.203796	17.20	64.54	1.64
4	1.022407	14.61	79.15	1.94
5	0.682403	9.75	88.90	2.90
6	0.412968	5.90	94.80	4.79
7	0.364323	5.20	100.00	5.43

All Condition Numbers less than 100. Multicollinearity is NOT a problem.

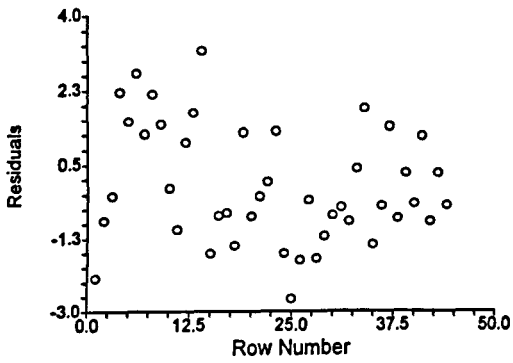
Plots Section



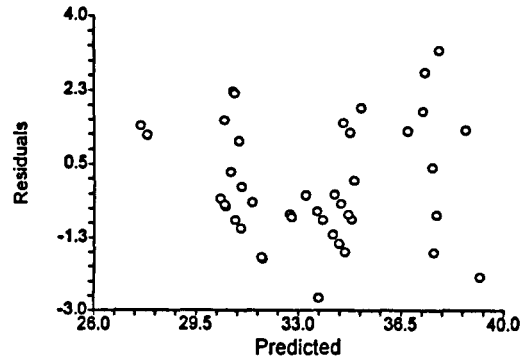
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Dependent EL

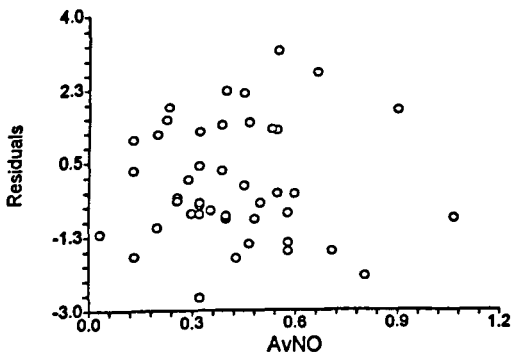
Residuals vs Row



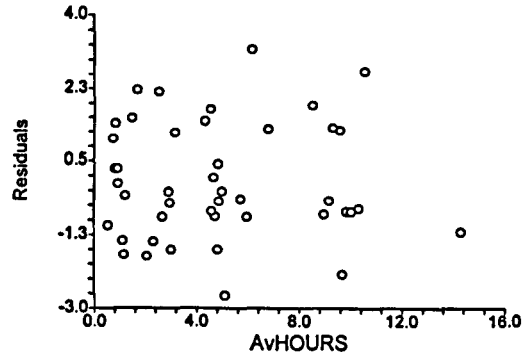
Residuals vs Predicted



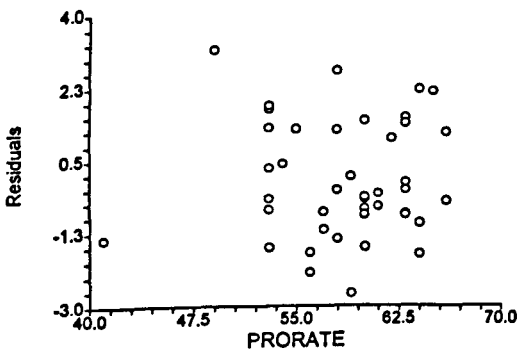
Residuals vs AvNO



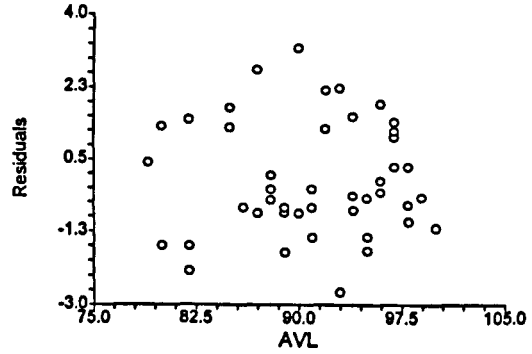
Residuals vs AvHOURS



Residuals vs PRORATE

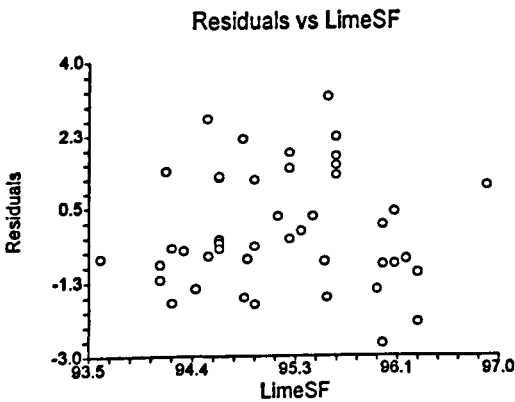
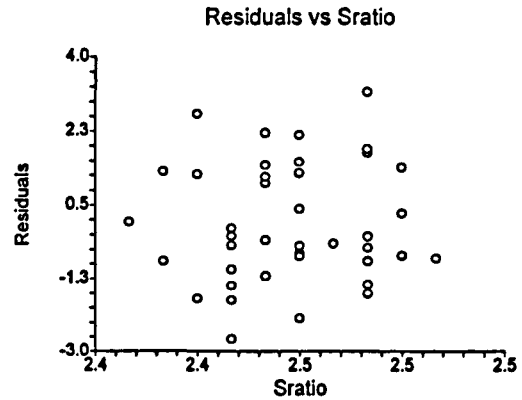
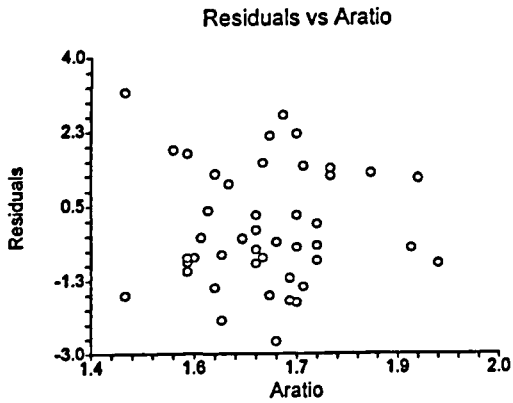


Residuals vs AVL



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 Dependent EL



Multiple Regression Report for FUEL of Kiln 5

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	403.4502	235.7557	1.7113	0.095629	Accept Ho	0.384412
AvNO	13.17503	6.110362	2.1562	0.037827	Reject Ho	0.555099
AvHOURS	7.534107E-02	0.3021329	0.2494	0.804497	Accept Ho	0.056779
PRORATE	-0.838965	0.2097364	-4.0001	0.000301	Reject Ho	0.973278
AVL	-0.2451752	0.221074	-1.1090	0.274776	Accept Ho	0.190515
Aratio	-14.95106	11.40745	-1.3106	0.198279	Accept Ho	0.247546
Sratio	-76.02286	52.61832	-1.4448	0.157163	Accept Ho	0.290306
LimeSF	-0.2980092	1.489835	-0.2000	0.842584	Accept Ho	0.054356
R-Squared	0.541706					

Model

403.4502+ 13.17503*AvNO+ 7.534107E-02*AvHOURS-.838965*PRORATE-.2451752*AVL-14.95106*Aratio-76.02286*Sratio-.2980092*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	422576	422576			
Model	7	1785.463	255.0662	6.0789	0.000100	0.997490
Error	36	1510.537	41.95935			
Total(Adjusted)	43	3296	76.65116			

Root Mean Square Error	6.477604	R-Squared	0.5417
Mean of Dependent	98	Adj R-Squared	0.4526
Coefficient of Variation	0.066098	Press Value	3336.543
Sum Press Residuals	267.6359	Press R-Squared	-0.0123

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	2.3772	0.017445	Rejected
Kurtosis	2.1105	0.034818	Rejected
Omnibus	10.1051	0.006393	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.307832	9	-0.143455	17	-0.054159
2	-0.105584	10	-0.057479	18	0.092331
3	0.040678	11	0.180259	19	0.056341
4	0.089919	12	0.122370	20	-0.213604
5	-0.065631	13	0.058949	21	-0.219478
6	-0.120525	14	0.179231	22	-0.170431
7	-0.201978	15	0.267671	23	-0.057846
8	-0.148684	16	-0.021184	24	-0.041236

Above serial correlations significant if their absolute values are greater than 0.301511

Durbin-Watson Value 1.3479

Multiple Regression Report

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 Database E:\Data\K5.S0
 Dependent FUEL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.655389	0.395912	0.604088	0.8898261
AvHOURS	1.145893	0.127318	0.872682	2.175541E-03
PRORATE	1.149692	0.130202	0.869798	1.04838E-03
AVL	1.624852	0.384559	0.615441	1.164788E-03
Aratio	1.382770	0.276814	0.723186	3.101331
Sratio	1.451070	0.310853	0.689147	65.98499
LimeSF	1.285144	0.221877	0.778123	5.289902E-02

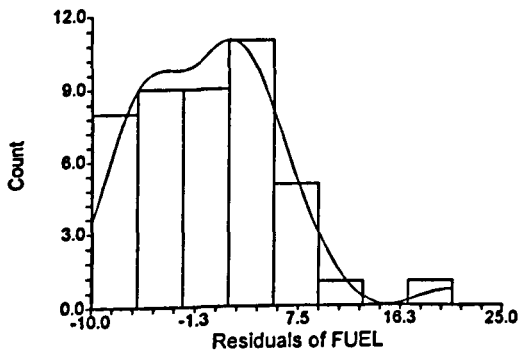
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.978944	28.27	28.27	1.00
2	1.335159	19.07	47.34	1.48
3	1.203796	17.20	64.54	1.64
4	1.022407	14.61	79.15	1.94
5	0.682403	9.75	88.90	2.90
6	0.412968	5.90	94.80	4.79
7	0.364323	5.20	100.00	5.43

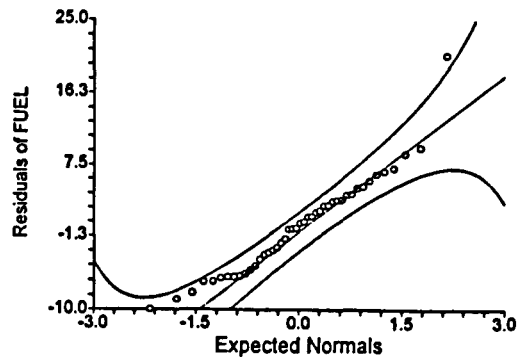
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

Histogram of Residuals of FUEL



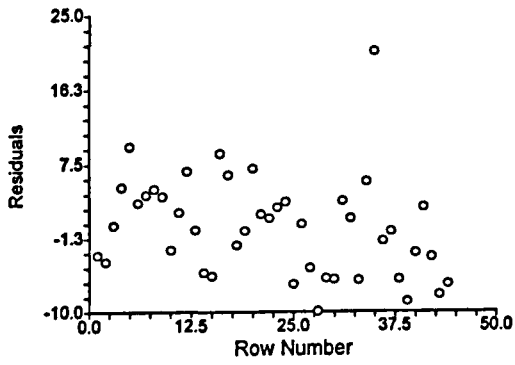
Normal Probability Plot of Residuals of FUEL



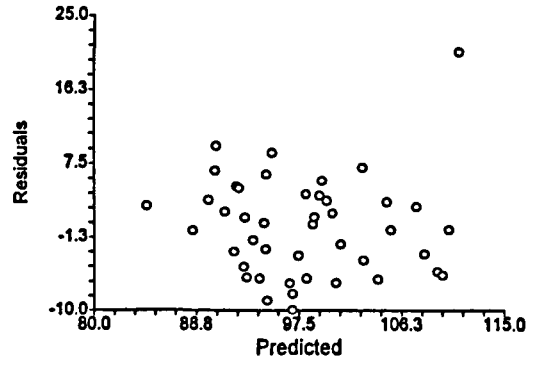
Multiple Regression Report

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Database E:\Data\K5.S0
Dependent FUEL

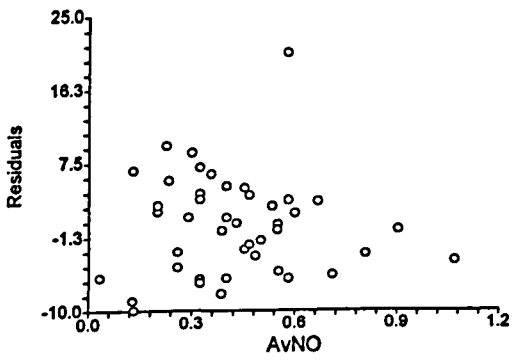
Residuals vs Row



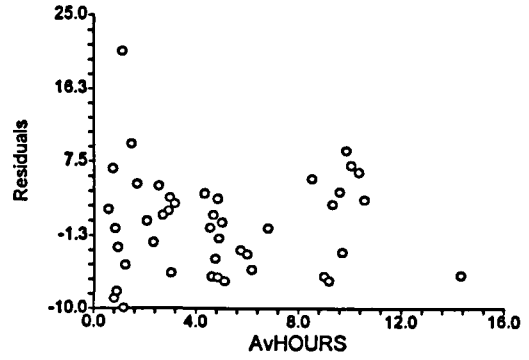
Residuals vs Predicted



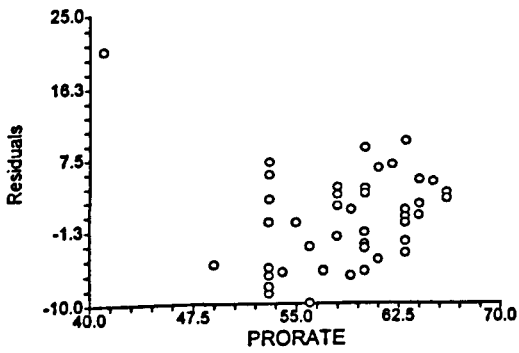
Residuals vs AvNO



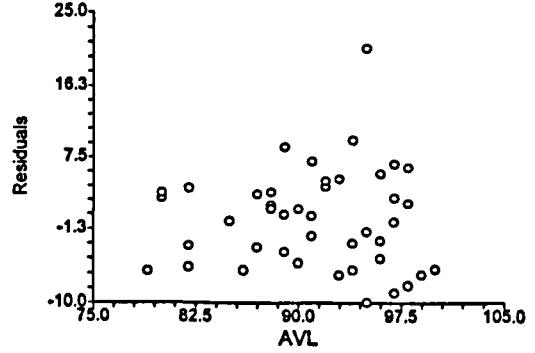
Residuals vs AvHOURS



Residuals vs PRORATE

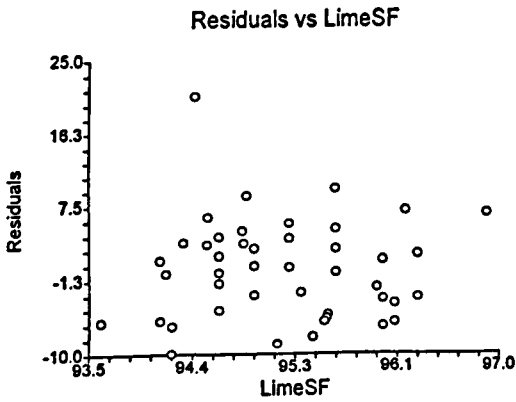
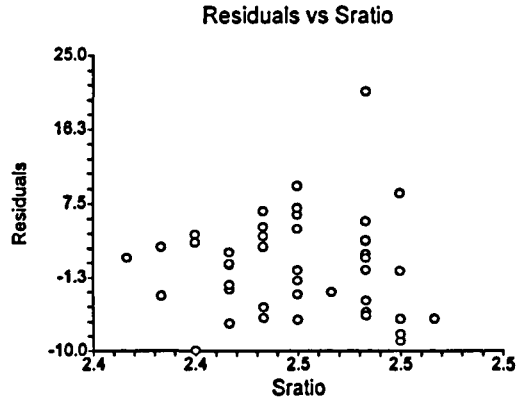
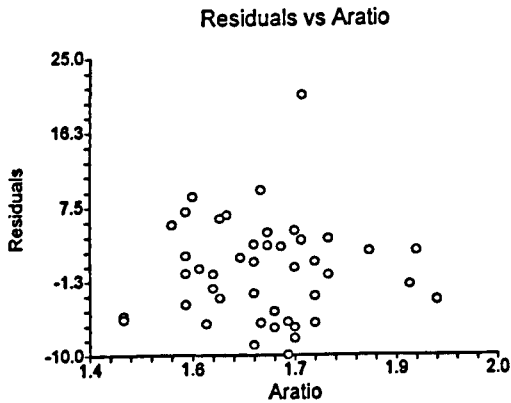


Residuals vs AVL



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 Dependent FUEL



Multiple Regression Report for EL of Kiln 6

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 Database E:\Data\K6.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-12.32015	56.87759	-0.2166	0.829736	Accept Ho	0.055110
AvNO	-10.42198	3.634247	-2.8677	0.006871	Reject Ho	0.796874
AvHOURS	0.3354227	0.1004048	3.3407	0.001956	Reject Ho	0.901541
PRORATE	-0.2309186	7.329485E-02	-3.1505	0.003274	Reject Ho	0.865530
AVL	-0.2312389	8.103909E-02	-2.8534	0.007127	Reject Ho	0.792925
Aratio	-3.598366	5.315811	-0.6769	0.502785	Accept Ho	0.101048
Sratio	5.115469	6.964536	0.7345	0.467400	Accept Ho	0.110321
LimeSF	0.8965291	0.499126	1.7962	0.080859	Accept Ho	0.416275
R-Squared	0.664180					

Model

$$-12.32015 - 10.42198 \cdot \text{AvNO} + 0.3354227 \cdot \text{AvHOURS} - 0.2309186 \cdot \text{PRORATE} - 0.2312389 \cdot \text{AVL} - 3.598366 \cdot \text{Aratio} + 5.115469 \cdot \text{Sratio} + 0.8965291 \cdot \text{LimeSF}$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	36772.36	36772.36			
Model	7	505.8633	72.26619	10.1715	0.000001	0.999996
Error	36	255.773	7.104806			
Total(Adjusted)	43	761.6364	17.71247			

Root Mean Square Error	2.665484	R-Squared	0.6642
Mean of Dependent	28.90909	Adj R-Squared	0.5989
Coefficient of Variation	9.220228E-02	Press Value	448.671
Sum Press Residuals	88.24784	Press R-Squared	0.4109

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	1.4899	0.136251	Accepted
Kurtosis	2.9268	0.003424	Rejected
Omnibus	10.7861	0.004548	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.222166	9	-0.005380	17	-0.035581
2	-0.147106	10	0.172467	18	-0.334810
3	-0.011141	11	0.020165	19	-0.033422
4	-0.095702	12	0.088676	20	0.169558
5	-0.291110	13	0.141769	21	0.019630
6	-0.152322	14	0.040651	22	-0.064143
7	0.034136	15	-0.081106	23	-0.017538
8	-0.124630	16	-0.056174	24	0.035184

Above serial correlations significant if their absolute values are greater than 0.301511

Durbin-Watson Value 1.5408

Multiple Regression Report

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 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.480752	0.324667	0.675333	1.858988
AvHOURS	1.420651	0.296097	0.703903	1.418917E-03
PRORATE	1.625862	0.384942	0.615058	7.561269E-04
AVL	1.712801	0.416161	0.583839	9.243508E-04
Aratio	1.419313	0.295434	0.704566	3.977287
Sratio	1.379232	0.274959	0.725041	6.827035
LimeSF	1.723390	0.419748	0.580252	3.506454E-02

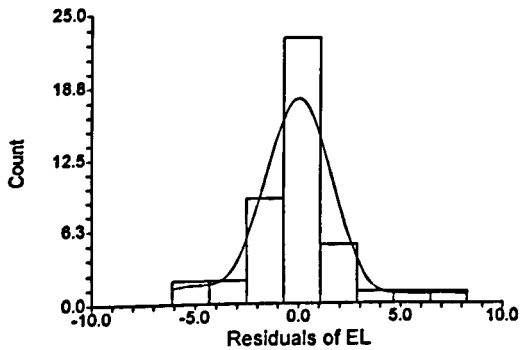
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	2.059288	29.42	29.42	1.00
2	1.768898	25.27	54.69	1.16
3	1.051625	15.02	69.71	1.96
4	0.840487	12.01	81.72	2.45
5	0.551949	7.88	89.60	3.73
6	0.441528	6.31	95.91	4.66
7	0.286225	4.09	100.00	7.19

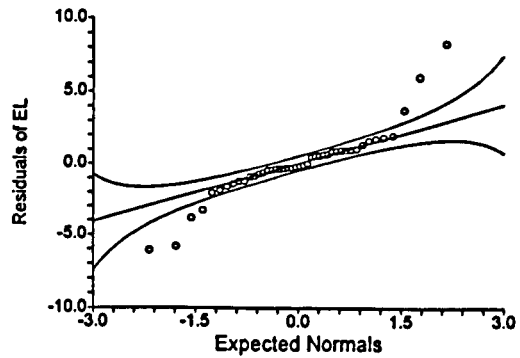
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

Histogram of Residuals of EL



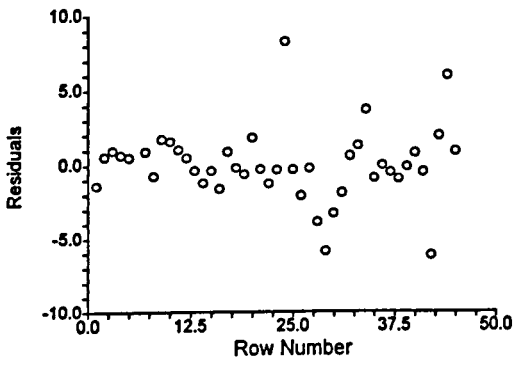
Normal Probability Plot of Residuals of EL



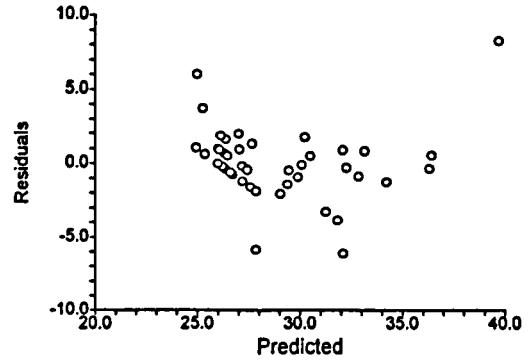
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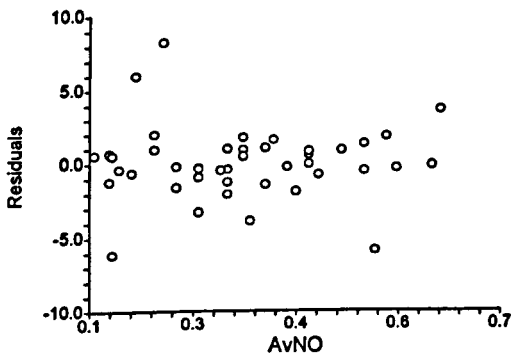
Residuals vs Row



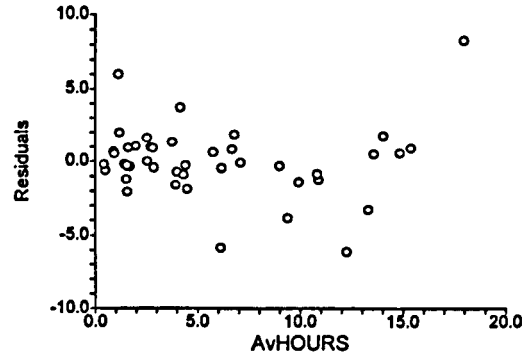
Residuals vs Predicted



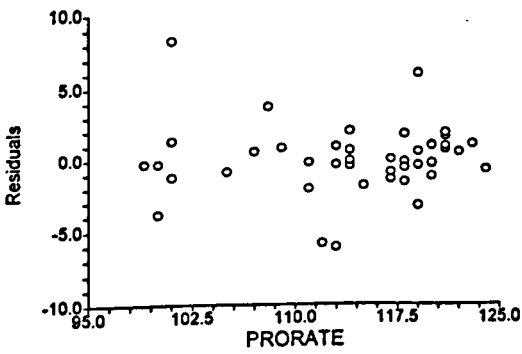
Residuals vs AvNO



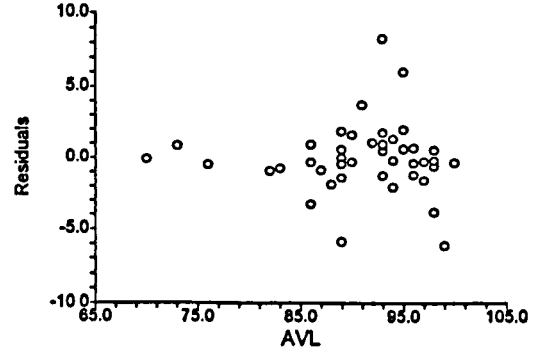
Residuals vs AvHOURS



Residuals vs PRORATE

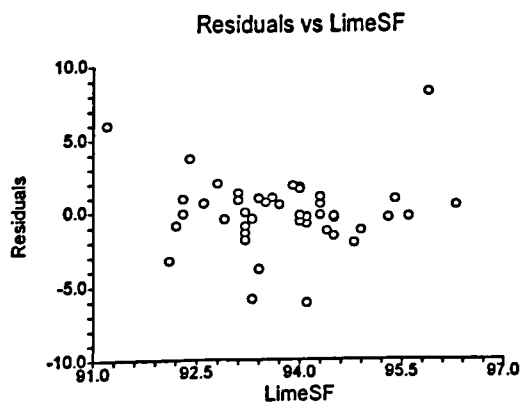
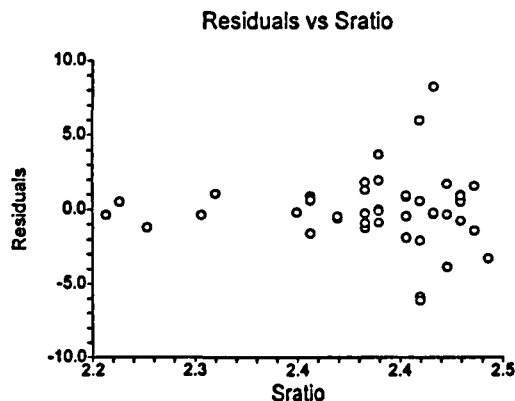
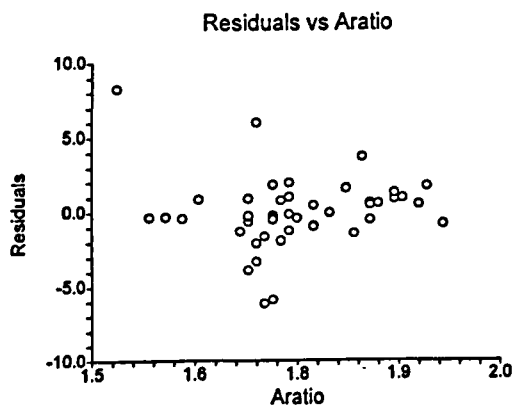


Residuals vs AVL



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 Dependent EL



Multiple Regression Report for FUEL of Kiln 6

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	182.0291	80.77418	2.2536	0.030409	Reject Ho	0.592218
AvNO	-3.370992	5.161141	-0.6531	0.517810	Accept Ho	0.097455
AvHOURS	-3.472324E-02	0.142589	-0.2435	0.808985	Accept Ho	0.056464
PRORATE	-0.5516616	0.104089	-5.2999	0.000006	Reject Ho	0.999299
AVL	-0.4140579	0.1150869	-3.5978	0.000957	Reject Ho	0.938255
Aratio	-11.31641	7.5492	-1.4990	0.142587	Accept Ho	0.308555
Sratio	-0.3548891	9.890621	-0.0359	0.971575	Accept Ho	0.050140
LimeSF	0.3006852	0.7088292	0.4242	0.673944	Accept Ho	0.069759
R-Squared	0.671988					

Model

182.0291-3.370992*AvNO-3.472324E-02*AvHOURS-.5516616*PRORATE-.4140579*AVL-11.31641*Aratio-.3548891*Sratio+ .3006852*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	337575.4	337575.4			
Model	7	1056.793	150.9705	10.5360	0.000000	0.999998
Error	36	515.8429	14.32897			
Total(Adjusted)	43	1572.636	36.57294			

Root Mean Square Error	3.785362	R-Squared	0.6720
Mean of Dependent	87.59091	Adj R-Squared	0.6082
Coefficient of Variation	4.321638E-02	Press Value	844.8357
Sum Press Residuals	150.6432	Press R-Squared	0.4628

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.0045	0.996373	Accepted
Kurtosis	0.1036	0.917489	Accepted
Omnibus	0.0108	0.994638	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.352531	9	0.040422	17	-0.133674
2	0.220427	10	0.038341	18	0.124079
3	0.056544	11	0.082111	19	-0.026814
4	-0.168871	12	0.113462	20	-0.051517
5	-0.138675	13	0.159790	21	-0.027993
6	-0.227002	14	0.066604	22	-0.107184
7	-0.358250	15	0.028940	23	0.040164
8	-0.152588	16	-0.095376	24	0.035781

Above serial correlations significant if their absolute values are greater than 0.301511

Durbin-Watson Value 1.2588

Multiple Regression Report

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 Dependent FUEL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.480752	0.324667	0.675333	1.858988
AvHOURS	1.420651	0.296097	0.703903	1.418917E-03
PRORATE	1.625862	0.384942	0.615058	7.561269E-04
AVL	1.712801	0.416161	0.583839	9.243508E-04
Aratio	1.419313	0.295434	0.704566	3.977287
Sratio	1.379232	0.274959	0.725041	6.827035
LimeSF	1.723390	0.419748	0.580252	3.506454E-02

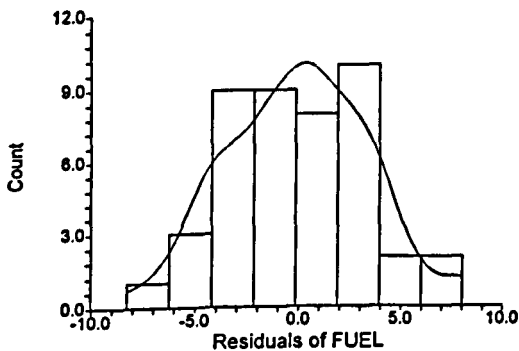
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	2.059288	29.42	29.42	1.00
2	1.768898	25.27	54.69	1.16
3	1.051625	15.02	69.71	1.96
4	0.840487	12.01	81.72	2.45
5	0.551949	7.88	89.60	3.73
6	0.441528	6.31	95.91	4.66
7	0.286225	4.09	100.00	7.19

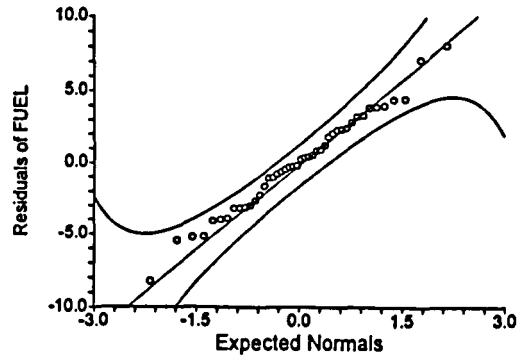
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

Histogram of Residuals of FUEL



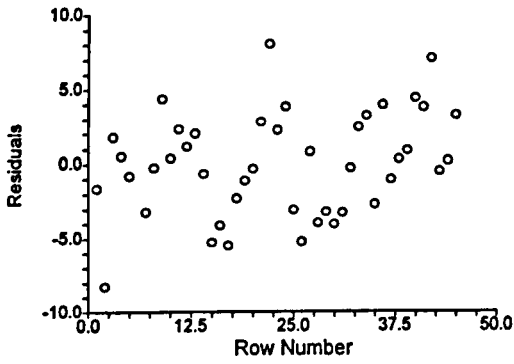
Normal Probability Plot of Residuals of FUEL



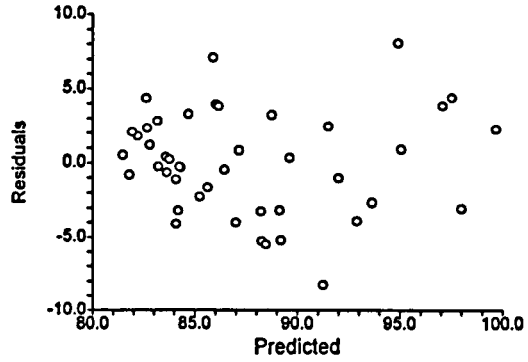
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Dependent FUEL

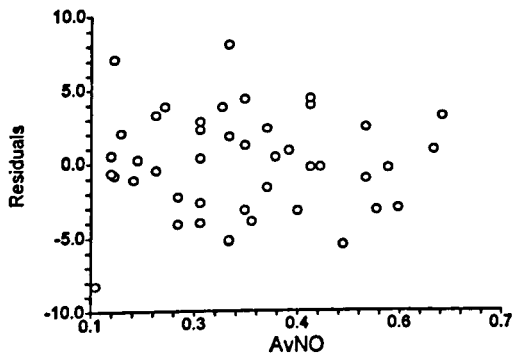
Residuals vs Row



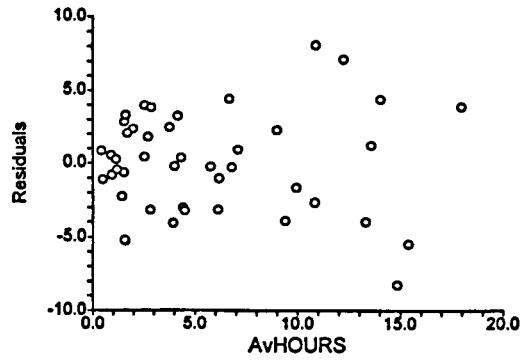
Residuals vs Predicted



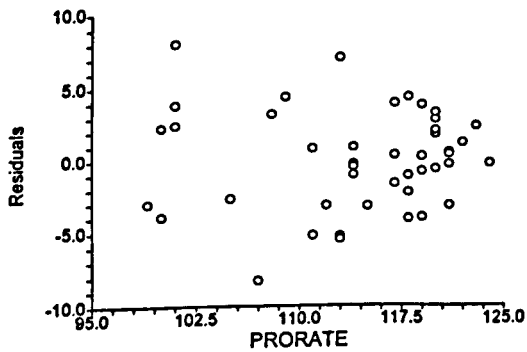
Residuals vs AvNO



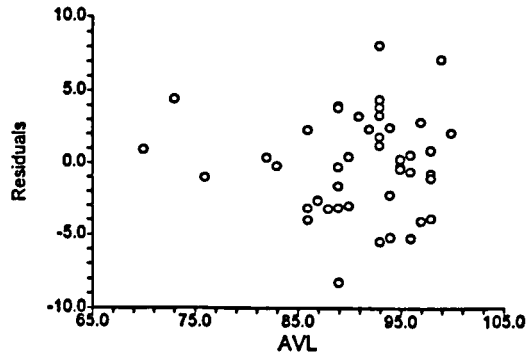
Residuals vs AvHOURS



Residuals vs PRORATE



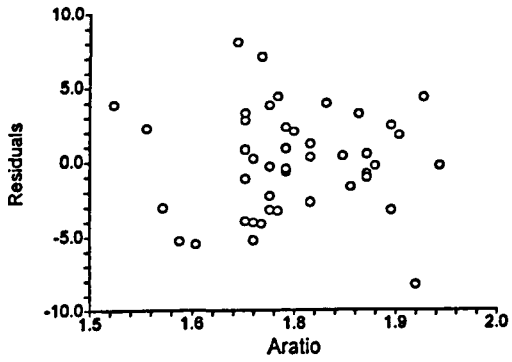
Residuals vs AVL



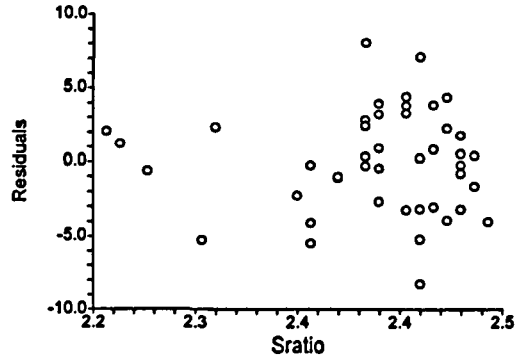
Multiple Regression Report

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Dependent FUEL

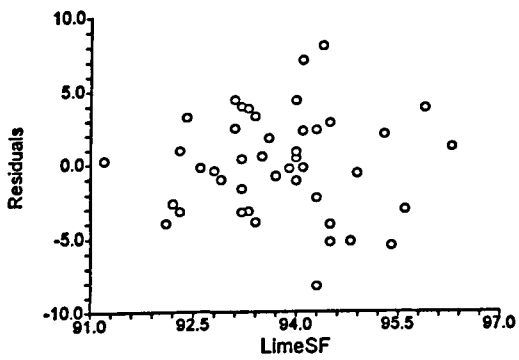
Residuals vs Aratio



Residuals vs Sratio



Residuals vs LimeSF



Appendix 08: Robust Regression of other Kilns

1) Kiln 4 : EL
Andrew's Sine 2.1

Robust Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	40.66003	25.29833	1.6072	0.117254	Accept Ho	0.345502
AvNO	-1.314347	2.575536	-0.5103	0.613125	Accept Ho	0.078633
AvHOURS	0.5713608	4.496013E-02	12.7082	0.000000	Reject Ho	1.000000
PRORATE	-0.6175287	0.1003611	-6.1531	0.000001	Reject Ho	0.999970
AVL	-0.1113055	6.450757E-02	-1.7255	0.093524	Accept Ho	0.388642
Aratio	0.5867348	0.6046091	0.9704	0.338682	Accept Ho	0.156484
Sratio	-15.0595	4.582584	-3.2862	0.002362	Reject Ho	0.891053
LimeSF	0.5151706	0.261001	1.9738	0.056572	Accept Ho	0.483302
R-Squared	0.889237					

Model
40.66003-1.314347*AvNO+ .5713608*AvHOURS-.6175287*PRORATE-.1113055*AVL+ .5867348*Aratio-15.0595*Sratio+ .5151706*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	26220.69	26220.69			
Model	7	249.3645	35.62351	38.9947	0.000000	1.000000
Error	34	31.06063	0.9135481			
Total(Adjusted)	41	280.4252	6.839639			

Root Mean Square Error 0.9557971 R-Squared 0.889237
Mean of Dependent Variable 29.08931 Adj R-Squared 0.866433
Coefficient of Variation 3.285732E-02

2) Kiln 4 : EL
Tukey's Biweight 6.0

Robust Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	71.68401	33.28542	2.1536	0.038449	Reject Ho	0.552771
AvNO	1.114192	3.138523	0.3550	0.724778	Accept Ho	0.063751
AvHOURS	0.545378	5.969881E-02	9.1355	0.000000	Reject Ho	1.000000
PRORATE	-0.7378607	0.1342214	-5.4973	0.000004	Reject Ho	0.999633
AVL	-9.026822E-02	7.966527E-02	-1.1331	0.265102	Accept Ho	0.196356
Aratio	1.105845	0.7687442	1.4385	0.159432	Accept Ho	0.287462
Sratio	-15.27019	5.650391	-2.7025	0.010661	Reject Ho	0.747149
LimeSF	0.192758	0.3441283	0.5601	0.579060	Accept Ho	0.084594
R-Squared	0.814294					

Model

71.68401+ 1.114192*AvNO+ .545378*AvHOURS-.7378607*PRORATE-9.026822E-02*AVL+ 1.105845*Aratio-15.27019*Sratio+ .192758*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	31798.45	31798.45			
Model	7	279.9457	39.99224	21.2979	0.000000	1.000000
Error	34	63.84373	1.877757			
Total(Adjusted)	41	343.7894	8.385108			

Root Mean Square Error	1.370313	R-Squared	0.814294
Mean of Dependent Variable	29.10557	Adj R-Squared	0.776061
Coefficient of Variation	4.708077E-02		

3) Kiln 4 : EL

Least Abs. Dev. 1.0

Robust Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	53.29206	29.59041	1.8010	0.080326	Accept Ho	0.417558
AvNO	0.9004036	2.918934	0.3085	0.759553	Accept Ho	0.060379
AvHOURS	0.5724383	5.234377E-02	10.9361	0.000000	Reject Ho	1.000000
PRORATE	-0.6781944	0.1209523	-5.6071	0.000003	Reject Ho	0.999757
AVL	-6.699578E-02	7.304791E-02	-0.9171	0.365342	Accept Ho	0.144977
Aratio	0.569365	0.6933534	0.8212	0.417105	Accept Ho	0.125693
Sratio	-13.90032	5.306046	-2.6197	0.012926	Reject Ho	0.721506
LimeSF	0.3188286	0.3100276	1.0284	0.310822	Accept Ho	0.170161
R-Squared	0.856053					

Model

53.29206+ .9004036*AvNO+ .5724383*AvHOURS-.6781944*PRORATE-6.699578E-02*AVL+ .569365*Aratio-13.90032*Sratio+ .3188286*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	27360.68	27360.68			
Model	7	271.22	38.74572	29.7350	0.000000	1.000000
Error	35	45.60614	1.303033			
Total(Adjusted)	42	316.8262	7.543481			

Root Mean Square Error	1.141505	R-Squared	0.856053
Mean of Dependent Variable	29.07402	Adj R-Squared	0.827264
Coefficient of Variation	3.926202E-02		

4) Kiln 4 : FUEL

Andrew's Sine 2.1

Robust Regression Report

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 Dependent FUEL

Regression Equation Section

Independent	Regression	Standard	T-Value	Prob	Decision	Power
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Variable	Coefficient	Error	(Ho: B=0)	Level	(5%)	(5%)
Intercept	173.7851	42.10113	4.1278	0.000244	Reject Ho	0.979378
AvNO	31.05059	4.049475	7.6678	0.000000	Reject Ho	1.000000
AvHOURS	-0.1714061	7.838666E-02	-2.1867	0.036192	Reject Ho	0.563903
PRORATE	-1.463926	0.1843193	-7.9423	0.000000	Reject Ho	1.000000
AVL	0.5868728	8.159506E-02	7.1925	0.000000	Reject Ho	1.000000
Aratio	-1.964703	0.9698282	-2.0258	0.051189	Accept Ho	0.502002
Sratio	-15.90549	6.636363	-2.3967	0.022556	Reject Ho	0.642222
LimeSF	-0.6520774	0.4112929	-1.5854	0.122702	Accept Ho	0.336737
R-Squared	0.871107					

Model

173.7851+ 31.05059*AvNO-.1714061*AvHOURS-1.463926*PRORATE+ .5868728*AVL-1.964703*Aratio-15.90549*Sratio-.6520774*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	245819.4	245819.4			
Model	7	455.6179	65.08826	30.8955	0.000000	1.000000
Error	32	67.41515	2.106724			
Total(Adjusted)	39	523.033	13.4111			

Root Mean Square Error	1.451456	R-Squared	0.871107
Mean of Dependent Variable	93.02953	Adj R-Squared	0.842912
Coefficient of Variation	0.0156021		

**5) Kiln 4 : FUEL
Tukey's Biweight 6.0**

Robust Regression Report

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Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	137.756	53.92725	2.5545	0.015595	Reject Ho	0.697516
AvNO	36.67571	4.825284	7.6007	0.000000	Reject Ho	1.000000
AvHOURS	-0.238045	9.315315E-02	-2.5554	0.015560	Reject Ho	0.697833
PRORATE	-1.111866	0.2149652	-5.1723	0.000012	Reject Ho	0.998863
AVL	0.5834401	0.1072958	5.4377	0.000006	Reject Ho	0.999531
Aratio	-3.348338	1.242252	-2.6954	0.011111	Reject Ho	0.743377
Sratio	-11.5961	8.780118	-1.3207	0.195962	Accept Ho	0.249257
LimeSF	-0.4696321	0.5329604	-0.8812	0.384793	Accept Ho	0.137016
R-Squared	0.802041					

Model

137.756+ 36.67571*AvNO-.238045*AvHOURS-1.111866*PRORATE+ .5834401*AVL-3.348338*Aratio-11.5961*Sratio-.4696321*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	293536.9	293536.9			
Model	7	515.0266	73.57523	18.5214	0.000000	1.000000
Error	32	127.118	3.972438			
Total(Adjusted)	39	642.1447	16.46525			

Root Mean Square Error	1.993098	R-Squared	0.802041
Mean of Dependent Variable	92.88377	Adj R-Squared	0.758738

Coefficient of Variation 2.145798E-02

6) Kiln 4 : FUEL
Least Abs. Dev. 1.0

Robust Regression Report

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Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	101.6708	55.39541	1.8354	0.074961	Accept Ho	0.430633
AvNO	28.22709	5.004728	5.6401	0.000002	Reject Ho	0.999784
AvHOURS	-0.208469	0.1001059	-2.0825	0.044672	Reject Ho	0.526032
PRORATE	-1.296063	0.2302095	-5.6299	0.000002	Reject Ho	0.999776
AVL	0.5310401	0.1047415	5.0700	0.000013	Reject Ho	0.998495
Aratio	-3.615948	1.273083	-2.8403	0.007461	Reject Ho	0.788623
Sratio	-5.559845	8.784399	-0.6329	0.530898	Accept Ho	0.094436
LimeSF	-0.1171465	0.5384897	-0.2175	0.829046	Accept Ho	0.055147
R-Squared	0.787937					

Model

101.6708+ 28.22709*AvNO-.208469*AvHOURS-1.296063*PRORATE+ .5310401*AVL-3.615948*Aratio-5.559845*Sratio-.1171465*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	259765.6	259765.6			
Model	7	482.6758	68.95369	18.5779	0.000000	1.000000
Error	35	129.906	3.7116			
Total(Adjusted)	42	612.5818	14.58528			

Root Mean Square Error 1.926551 R-Squared 0.787937
Mean of Dependent Variable 93.09631 Adj R-Squared 0.745524
Coefficient of Variation 2.069418E-02

7) Kiln 5 : EL
Andrew's Sine 2.1

Robust Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	90.29779	30.25614	2.9844	0.005231	Reject Ho	0.826193
AvNO	0.7753015	0.7201743	1.0765	0.289262	Accept Ho	0.181776
AvHOURS	0.2616146	3.664894E-02	7.1384	0.000000	Reject Ho	1.000000
PRORATE	-0.1969504	2.569955E-02	-7.6636	0.000000	Reject Ho	1.000000
AVL	-0.1626858	0.0277996	-5.8521	0.000001	Reject Ho	0.999901
Aratio	-8.020124	1.414802	-5.6687	0.000002	Reject Ho	0.999802
Sratio	-31.26871	6.728806	-4.6470	0.000049	Reject Ho	0.994648
LimeSF	0.60622	0.1829912	3.3128	0.002199	Reject Ho	0.895795
R-Squared	0.906371					

Model

90.29779+ .7753015*AvNO+ .2616146*AvHOURS-.1969504*PRORATE-.1626858*AVL-8.020124*Aratio-31.26871*Sratio+ .60622*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	29765.78	29765.78			
Model	7	143.8218	20.54598	47.0194	0.000000	1.000000
Error	34	14.85691	0.4369679			
Total(Adjusted)	41	158.6787	3.870213			
Root Mean Square Error		0.6610355	R-Squared	0.906371		
Mean of Dependent Variable		32.80536	Adj R-Squared	0.887095		
Coefficient of Variation		2.015023E-02				

8) Kiln 5 : EL
Tukey's Biweight 6.0

Robust Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	110.254	50.26417	2.1935	0.034813	Reject Ho	0.569399
AvNO	1.829416	1.292324	1.4156	0.165486	Accept Ho	0.280701
AvHOURS	0.336508	6.412642E-02	5.2476	0.000007	Reject Ho	0.999165
PRORATE	-0.2239108	4.488416E-02	-4.9886	0.000016	Reject Ho	0.998085
AVL	-0.1914524	4.631915E-02	-4.1333	0.000204	Reject Ho	0.980339
Aratio	-7.712717	2.428693	-3.1757	0.003061	Reject Ho	0.870747
Sratio	-32.58261	11.15725	-2.9203	0.006001	Reject Ho	0.811016
LimeSF	0.4640177	0.3171772	1.4630	0.152155	Accept Ho	0.296360
R-Squared	0.824929					

Model
110.254+ 1.829416*AvNO+ .336508*AvHOURS-.2239108*PRORATE-.1914524*AVL-7.712717*Aratio-32.58261*Sratio+ .4640177*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	44267.44	44267.44			
Model	7	296.783	42.39757	24.2330	0.000000	1.000000
Error	36	62.98483	1.749579			
Total(Adjusted)	43	359.7678	8.366693			
Root Mean Square Error		1.322716	R-Squared	0.824929		
Mean of Dependent Variable		33.31602	Adj R-Squared	0.790888		
Coefficient of Variation		3.970211E-02				

9) Kiln 5 : EL
Least Abs. Dev. 1.0

Robust Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	97.29821	39.63538	2.4548	0.019060	Reject Ho	0.666038
AvNO	1.286284	0.9913285	1.2975	0.202700	Accept Ho	0.243565

AvHOURS	0.3104494	0.0495411	6.2665	0.000000	Reject Ho	0.999982
PRORATE	-0.2129223	3.408162E-02	-6.2474	0.000000	Reject Ho	0.999981
AVL	-0.1972076	0.0361639	-5.4532	0.000004	Reject Ho	0.999586
Aratio	-6.999886	1.948838	-3.5918	0.000973	Reject Ho	0.937546
Sratio	-32.948	8.811368	-3.7393	0.000640	Reject Ho	0.953307
LimeSF	0.5982946	0.2483512	2.4091	0.021235	Reject Ho	0.649693
R-Squared	0.862344					

Model

97.29821+ 1.286284*AvNO+ .3104494*AvHOURS-.2129223*PRORATE-.1972076*AVL-6.999886*Aratio-32.948*Sratio+ .5982946*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	35185.52	35185.52			
Model	7	206.9792	29.56845	32.2174	0.000000	1.000000
Error	36	33.04002	0.9177783			
Total(Adjusted)	43	240.0192	5.581841			

Root Mean Square Error	0.9580075	R-Squared	0.862344
Mean of Dependent Variable	32.97818	Adj R-Squared	0.835578
Coefficient of Variation	2.904974E-02		

10) Kiln 5 : FUEL Andrew's Sine 2.1

Robust Regression Report

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Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-42.885	100.7567	-0.4256	0.673141	Accept Ho	0.069795
AvNO	4.417364	3.094345	1.4276	0.162814	Accept Ho	0.283456
AvHOURS	1.266695	0.1343782	9.4263	0.000000	Reject Ho	1.000000
PRORATE	6.395721E-02	9.665405E-02	0.6617	0.512750	Accept Ho	0.098491
AVL	-0.4595352	8.865228E-02	-5.1836	0.000011	Reject Ho	0.998922
Aratio	-14.93584	4.514532	-3.3084	0.002274	Reject Ho	0.894483
Sratio	-19.15377	20.49258	-0.9347	0.356749	Accept Ho	0.148401
LimeSF	2.551334	0.6488841	3.9319	0.000408	Reject Ho	0.968210
R-Squared	0.899866					

Model

-42.885+ 4.417364*AvNO+ 1.266695*AvHOURS+ 6.395721E-02*PRORATE-.4595352*AVL-14.93584*Aratio-19.15377*Sratio+ 2.551334*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	271639	271639			
Model	7	1226.254	175.1792	42.3657	0.000000	1.000000
Error	33	136.4528	4.134933			
Total(Adjusted)	40	1362.707	34.06768			

Root Mean Square Error	2.033453	R-Squared	0.899866
Mean of Dependent Variable	97.47288	Adj R-Squared	0.878626
Coefficient of Variation	2.086173E-02		

11) Kiln 5 : FUEL

Tukey's Biweight 6.0

Robust Regression Report

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 Database E:\DATA\K5.S0
 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	232.1143	146.0095	1.5897	0.120891	Accept Ho	0.339739
AvNO	4.943233	3.92586	1.2591	0.216311	Accept Ho	0.231829
AvHOURS	0.817874	0.2081679	3.9289	0.000383	Reject Ho	0.968489
PRORATE	-3.751131E-02	0.1594441	-0.2353	0.815376	Accept Ho	0.056022
AVL	-0.4739273	0.1379938	-3.4344	0.001545	Reject Ho	0.916019
Aratio	-25.07257	6.891542	-3.6382	0.000877	Reject Ho	0.942565
Sratio	-60.24696	31.71378	-1.8997	0.065736	Accept Ho	0.455305
LimeSF	0.9887499	0.9286785	1.0647	0.294309	Accept Ho	0.179030
R-Squared	0.740185					

Model

232.1143+ 4.943233*AvNO+ .817874*AvHOURS-3.751131E-02*PRORATE-.4739273*AVL-25.07257*Aratio-60.24696*Sratio+ .9887499*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	358010.1	358010.1			
Model	7	1329.524	189.9319	14.2444	0.000000	1.000000
Error	35	466.6815	13.33376			
Total(Adjusted)	42	1796.205	42.76679			

Root Mean Square Error 3.651542 R-Squared 0.740185
 Mean of Dependent Variable 97.31854 Adj R-Squared 0.688222
 Coefficient of Variation 3.752154E-02

12) Kiln 5 : FUEL
 Least Abs. Dev. 1.0

Robust Regression Report

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 Database E:\DATA\K5.S0
 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	197.8339	156.6001	1.2633	0.214600	Accept Ho	0.233341
AvNO	7.686724	4.217793	1.8225	0.076701	Accept Ho	0.426255
AvHOURS	0.8233584	0.2089613	3.9402	0.000359	Reject Ho	0.969476
PRORATE	-0.128106	0.1510521	-0.8481	0.401991	Accept Ho	0.131000
AVL	-0.4697443	0.1365182	-3.4409	0.001484	Reject Ho	0.917397
Aratio	-19.30831	6.834122	-2.8253	0.007658	Reject Ho	0.785015
Sratio	-50.35358	31.94404	-1.5763	0.123703	Accept Ho	0.335422
LimeSF	1.035823	1.01794	1.0176	0.315673	Accept Ho	0.167766
R-Squared	0.750143					

Model

197.8339+ 7.686724*AvNO+ .8233584*AvHOURS-.128106*PRORATE-.4697443*AVL-19.30831*Aratio-50.35358*Sratio+ 1.035823*LimeSF

Analysis of Variance Section

Sum of Mean Prob Power

Source	DF	Squares	Square	F-Ratio	Level	(5%)
Intercept	1	323036.7	323036.7			
Model	7	1288.738	184.1054	15.4404	0.000000	1.000000
Error	36	429.2508	11.92363			
Total(Adjusted)	43	1717.989	39.95322			

Root Mean Square Error	3.453061	R-Squared	0.750143
Mean of Dependent Variable	97.42745	Adj R-Squared	0.701560
Coefficient of Variation	3.544239E-02		

13) Kiln 6 : EL
Andrew's Sine 2.1

Robust Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-59.40908	19.47815	-3.0500	0.004570	Reject Ho	0.840710
AvNO	-6.034978	1.100233	-5.4852	0.000005	Reject Ho	0.999603
AvHOURS	0.3517462	3.234082E-02	10.8762	0.000000	Reject Ho	1.000000
PRORATE	-0.1913321	2.138275E-02	-8.9480	0.000000	Reject Ho	1.000000
AVL	-0.1742463	2.678939E-02	-6.5043	0.000000	Reject Ho	0.999993
Aratio	2.031039	1.748288	1.1617	0.253937	Accept Ho	0.203462
Sratio	8.29473	1.914395	4.3328	0.000136	Reject Ho	0.987439
LimeSF	1.093266	0.1854232	5.8961	0.000001	Reject Ho	0.999912
R-Squared	0.944461					

Model
-59.40908-6.034978*AvNO+ .3517462*AvHOURS-.1913321*PRORATE-.1742463*AVL+ 2.031039*Aratio+ 8.29473*Sratio+ 1.093266*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	22811.93	22811.93			
Model	7	214.2629	30.60899	77.7383	0.000000	1.000000
Error	32	12.59981	0.3937441			
Total(Adjusted)	39	226.8628	5.816994			

Root Mean Square Error	0.6274903	R-Squared	0.944461
Mean of Dependent Variable	28.62222	Adj R-Squared	0.932311
Coefficient of Variation	2.192318E-02		

14) Kiln 6 : EL
Tukey's Biweight 6.0

Robust Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-31.18934	28.52746	-1.0933	0.282420	Accept Ho	0.185519
AvNO	-6.512522	1.668263	-3.9038	0.000459	Reject Ho	0.965938
AvHOURS	0.3234505	4.902506E-02	6.5977	0.000000	Reject Ho	0.999995
PRORATE	-0.2244572	3.301203E-02	-6.7993	0.000000	Reject Ho	0.999998

AVL	-0.1840171	3.810304E-02	-4.8295	0.000033	Reject Ho	0.996738
Aratio	1.825766	2.5535	0.7150	0.479790	Accept Ho	0.106699
Sratio	4.973931	3.055612	1.6278	0.113375	Accept Ho	0.351822
LimeSF	0.9335542	0.2649122	3.5240	0.001305	Reject Ho	0.927367
R-Squared	0.875090					

Model

-31.18934-6.512522*AvNO+ .3234505*AvHOURS-.2244572*PRORATE-.1840171*AVL+ 1.825766*Aratio+ 4.973931*Sratio+ .9335542*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	29111.8	29111.8			
Model	7	268.0894	38.29849	32.0264	0.000000	1.000000
Error	32	38.26692	1.195841			
Total(Adjusted)	39	306.3563	7.85529			

Root Mean Square Error	1.093545	R-Squared	0.875090
Mean of Dependent Variable	28.63894	Adj R-Squared	0.847766
Coefficient of Variation	3.818386E-02		

15) Kiln 6 : EL Least Abs. Dev. 1.0

Robust Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-40.44762	29.1986	-1.3853	0.174497	Accept Ho	0.270890
AvNO	-7.340042	1.674539	-4.3833	0.000097	Reject Ho	0.989381
AvHOURS	0.3617401	4.939982E-02	7.3227	0.000000	Reject Ho	1.000000
PRORATE	-0.2036795	3.377624E-02	-6.0303	0.000001	Reject Ho	0.999953
AVL	-0.1845125	3.894434E-02	-4.7379	0.000033	Reject Ho	0.995954
Aratio	0.6159818	2.599736	0.2369	0.814046	Accept Ho	0.056118
Sratio	7.34926	2.988942	2.4588	0.018880	Reject Ho	0.667447
LimeSF	0.970364	0.2741733	3.5392	0.001128	Reject Ho	0.931013
R-Squared	0.876003					

Model

-40.44762-7.340042*AvNO+ .3617401*AvHOURS-.2036795*PRORATE-.1845125*AVL+ .6159818*Aratio+ 7.34926*Sratio+ .970364*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	25162.1	25162.1			
Model	7	261.1275	37.30394	36.3328	0.000000	1.000000
Error	36	36.96228	1.02673			
Total(Adjusted)	43	298.0898	6.932322			

Root Mean Square Error	1.013277	R-Squared	0.876003
Mean of Dependent Variable	28.70391	Adj R-Squared	0.851892
Coefficient of Variation	3.530101E-02		

16) Kiln 6 : FUEL Andrew's Sine 2.1

Robust Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	186.4518	55.55975	3.3559	0.001876	Reject Ho	0.904076
AvNO	-3.565976	3.902061	-0.9139	0.366866	Accept Ho	0.144430
AvHOURS	-0.2126591	0.1129153	-1.8834	0.067751	Accept Ho	0.449581
PRORATE	-0.5789794	7.655729E-02	-7.5627	0.000000	Reject Ho	1.000000
AVL	-0.4618095	8.283644E-02	-5.5750	0.000003	Reject Ho	0.999731
Aratio	-5.825606	5.915082	-0.9849	0.331260	Accept Ho	0.160124
Sratio	-6.663563	6.760683	-0.9856	0.330891	Accept Ho	0.160299
LimeSF	0.4008127	0.4920978	0.8145	0.420715	Accept Ho	0.124553
R-Squared	0.767835					

Model

186.4518-3.565976*AvNO-.2126591*AvHOURS-.5789794*PRORATE-.4618095*AVL-5.825606*Aratio-6.663563*Sratio+ .4008127*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	239493.3	239493.3			
Model	7	630.4985	90.07121	17.0089	0.000000	1.000000
Error	36	190.6395	5.29554			
Total(Adjusted)	43	821.1379	19.09623			

Root Mean Square Error 2.301204 R-Squared 0.767835
 Mean of Dependent Variable 86.78879 Adj R-Squared 0.722692
 Coefficient of Variation 2.651499E-02

17) Kiln 6 : FUEL
Tukey's Biweight 6.0

Robust Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	163.3226	71.67377	2.2787	0.028719	Reject Ho	0.601682
AvNO	-5.510615	4.826716	-1.1417	0.261120	Accept Ho	0.199125
AvHOURS	-3.052024E-02	0.130707	-0.2335	0.816695	Accept Ho	0.055941
PRORATE	-0.5798768	9.678291E-02	-5.9915	0.000001	Reject Ho	0.999945
AVL	-0.4498698	0.1037423	-4.3364	0.000112	Reject Ho	0.988032
Aratio	-6.983239	7.137125	-0.9784	0.334387	Accept Ho	0.158650
Sratio	-0.6270468	8.716022	-0.0719	0.943046	Accept Ho	0.050562
LimeSF	0.5031241	0.6329465	0.7949	0.431886	Accept Ho	0.120919
R-Squared	0.717617					

Model

163.3226-5.510615*AvNO-3.052024E-02*AvHOURS-.5798768*PRORATE-.4498698*AVL-6.983239*Aratio-.6270468*Sratio+ .5031241*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	306743.2	306743.2			

Model	7	971.8384	138.8341	13.0695	0.000000	1.000000
Error	36	382.4189	10.62275			
Total(Adjusted)	43	1354.257	31.49436			
Root Mean Square Error		3.259256	R-Squared	0.717617		
Mean of Dependent Variable		87.44059	Adj R-Squared	0.662709		
Coefficient of Variation		3.727394E-02				

18) Kiln 6 : FUEL
Least Abs. Dev. 1.0

Robust Regression Report

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Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	162.2183	63.69703	2.5467	0.015294	Reject Ho	0.697896
AvNO	-4.102204	4.358995	-0.9411	0.352931	Accept Ho	0.150300
AvHOURS	-0.0974346	0.1230897	-0.7916	0.433794	Accept Ho	0.120314
PRORATE	-0.5711285	8.656763E-02	-6.5975	0.000000	Reject Ho	0.999996
AVL	-0.4466748	9.479631E-02	-4.7119	0.000036	Reject Ho	0.995642
Aratio	-7.649513	6.469446	-1.1824	0.244795	Accept Ho	0.210205
Sratio	-2.406976	7.730452	-0.3114	0.757321	Accept Ho	0.060592
LimeSF	0.5569151	0.5629706	0.9892	0.329147	Accept Ho	0.161130
R-Squared	0.743333					

Model
162.2183-4.102204*AvNO-.0974346*AvHOURS-.5711285*PRORATE-.4466748*AVL-7.649513*Aratio-2.406976*Sratio+ .5569151*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	278765.1	278765.1			
Model	7	830.4045	118.6292	14.8942	0.000000	1.000000
Error	36	286.7322	7.964782			
Total(Adjusted)	43	1117.137	25.97992			
Root Mean Square Error		2.822195	R-Squared	0.743333		
Mean of Dependent Variable		87.14892	Adj R-Squared	0.693425		
Coefficient of Variation		3.238359E-02				

Appendix 9: Screening of Transformed Data of other Kilns

Data Screening Report

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 Database E:\CH7\DATA\K4.S0

Normality Tests Section

Variable	----- Skewness Test -----			----- Kurtosis Test -----			- Omnibus Test -		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	0.64	1.85	0.0640	3.81	1.44	0.1489	5.51	0.0635	Yes
FUEL	0.67	1.92	0.0553	2.12	-1.62	0.1054	6.30	0.0430	No
LNEL	0.20	0.60	0.5471	3.92	1.55	0.1215	2.76	0.2515	Yes
LNFU	0.62	1.78	0.0749	2.04	-1.93	0.0534	6.90	0.0317	No
SQEL	0.43	1.28	0.2017	3.81	1.44	0.1505	3.70	0.1575	Yes
SQFU	0.64	1.85	0.0644	2.08	-1.78	0.0757	6.57	0.0374	No
IEL	0.32	0.97	0.3300	4.64	2.11	0.0346	5.41	0.0667	No
IFU	-0.56	-1.64	0.1000	1.97	-2.24	0.0253	7.71	0.0212	No

Data Screening Report

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Normality Tests Section

Variable	----- Skewness Test -----			----- Kurtosis Test -----			- Omnibus Test -		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	6.34	7.87	0.0000	41.47	6.13	0.0000	99.55	0.0000	No
FUEL	1.31	3.32	0.0009	6.44	3.04	0.0024	20.28	0.0000	No
LNEL	5.68	7.53	0.0000	36.02	5.97	0.0000	92.43	0.0000	No
LNFU	0.89	2.46	0.0137	4.75	2.19	0.0285	10.87	0.0044	No
SQEL	6.16	7.78	0.0000	39.98	6.09	0.0000	97.68	0.0000	No
SQFU	1.09	2.89	0.0038	5.52	2.63	0.0085	15.29	0.0005	No
IEL	-3.56	-6.12	0.0000	19.88	5.20	0.0000	64.44	0.0000	No
IFU	-0.56	-1.62	0.1042	3.62	1.25	0.2114	4.20	0.1224	Yes

Data Screening Report

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 Database E:\CH7\Data\k6.S0

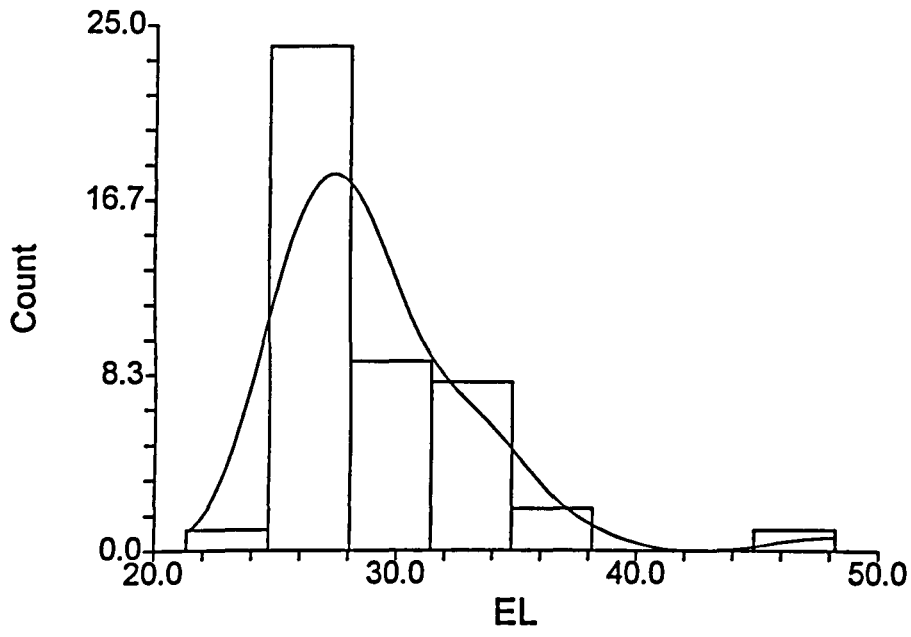
Normality Tests Section

Variable	----- Skewness Test -----			----- Kurtosis Test -----			- Omnibus Test -		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	2.11	4.62	0.0000	9.85	4.01	0.0001	37.46	0.0000	No
FUEL	1.21	3.16	0.0016	3.61	1.24	0.2150	11.54	0.0031	No
LNEL	1.33	3.39	0.0007	6.48	3.07	0.0021	20.89	0.0000	No
LNFU	1.10	2.94	0.0033	3.34	0.92	0.3581	9.47	0.0088	No
SQEL	1.70	4.04	0.0001	7.93	3.55	0.0004	28.93	0.0000	No
SQFU	1.15	3.05	0.0023	3.47	1.08	0.2793	10.48	0.0053	No
IEL	-0.63	-1.82	0.0684	4.89	2.29	0.0222	8.55	0.0139	No
IFU	-0.99	-2.70	0.0069	3.09	0.58	0.5621	7.65	0.0219	No

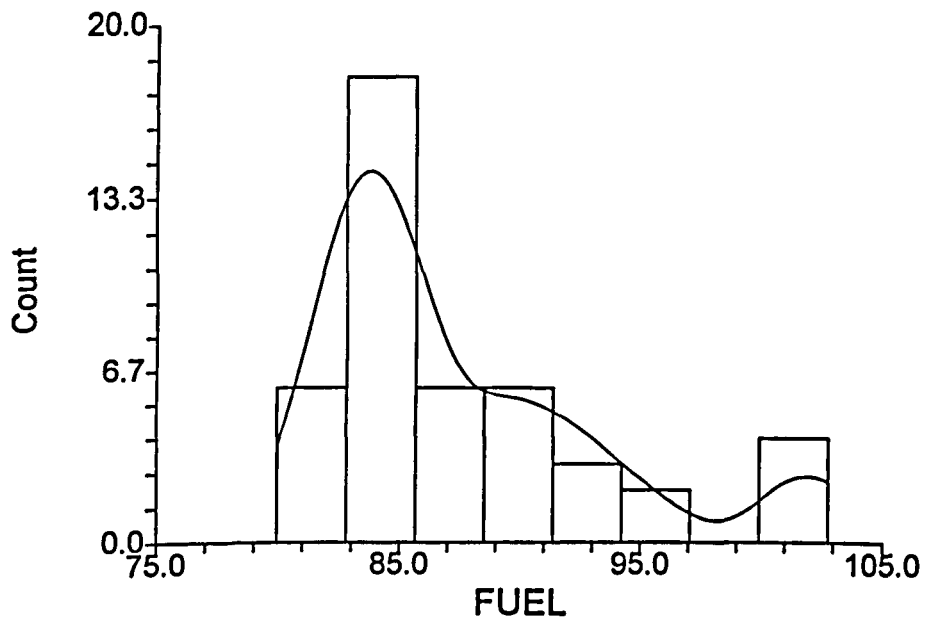
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Histogram Section

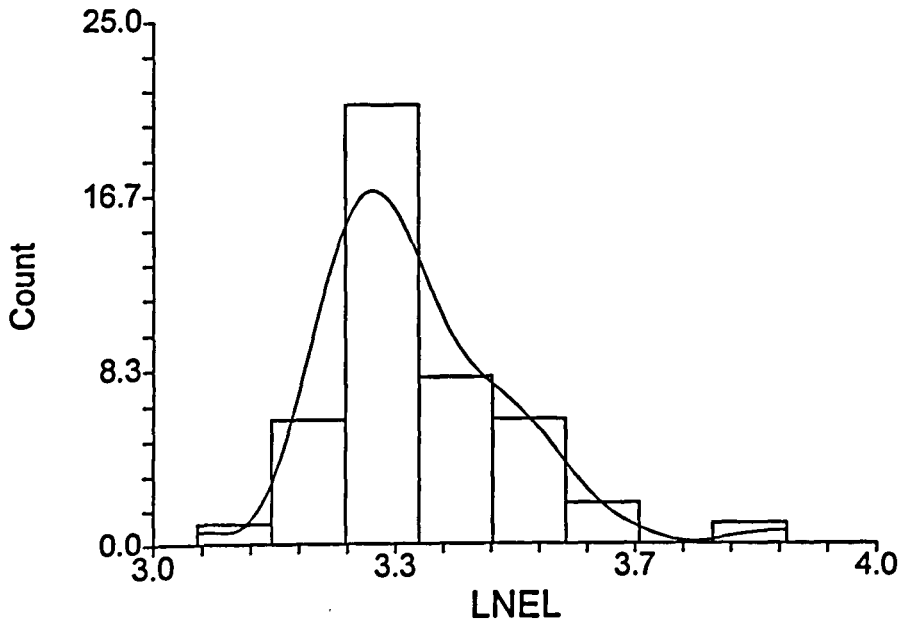
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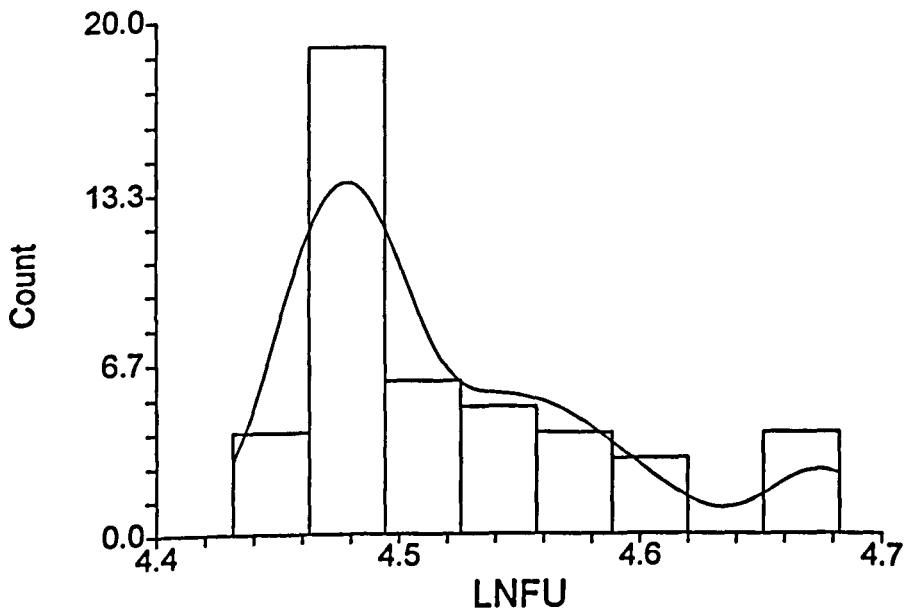
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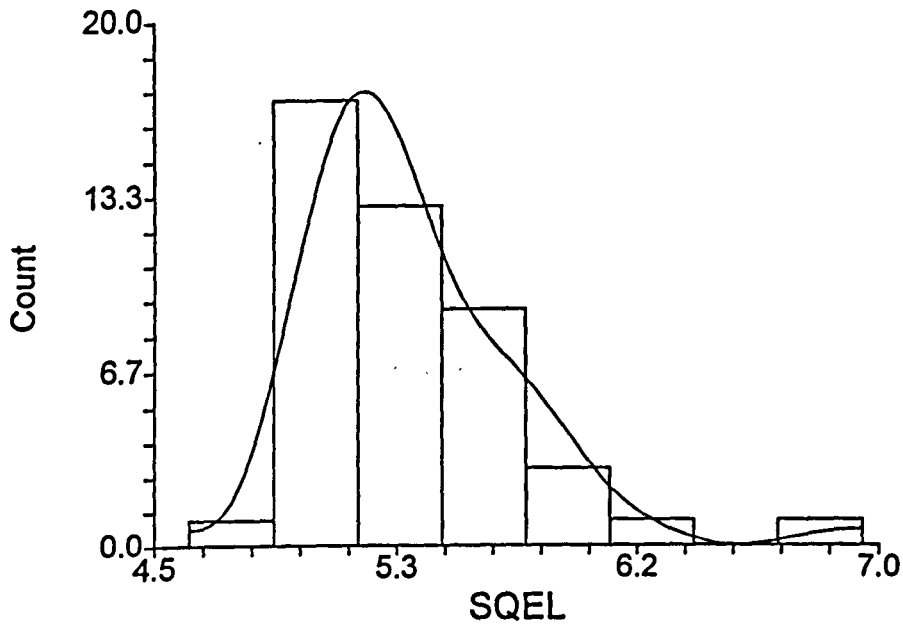
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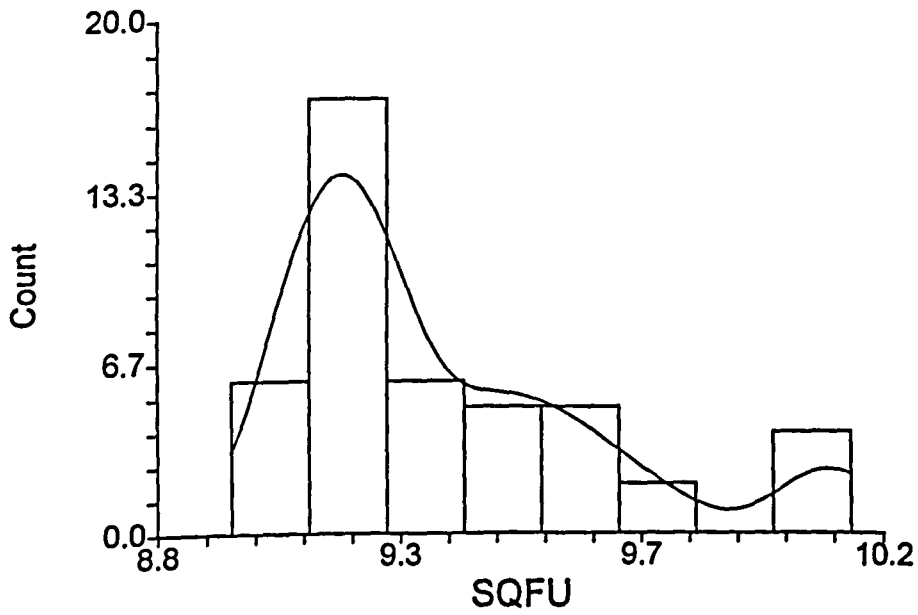
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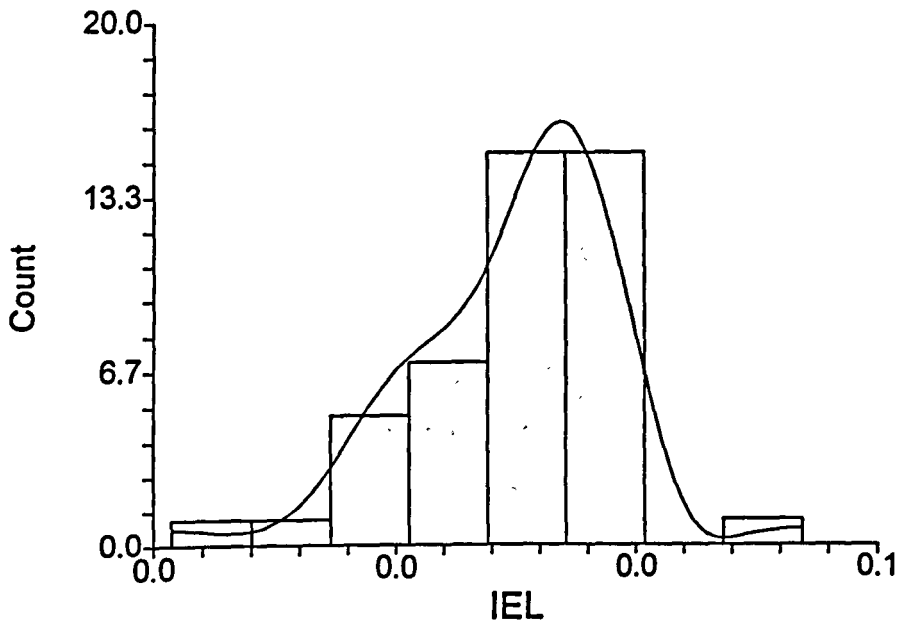
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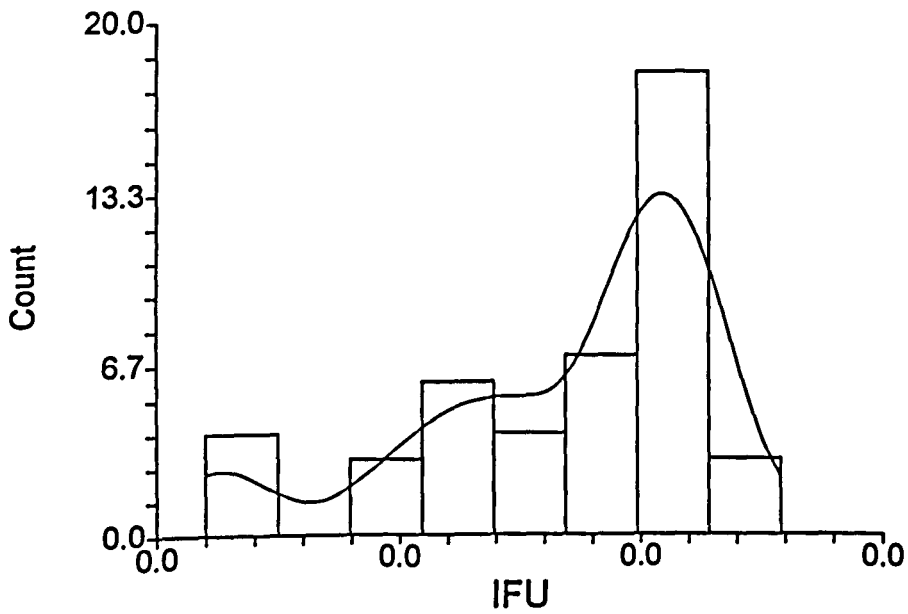
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Histogram

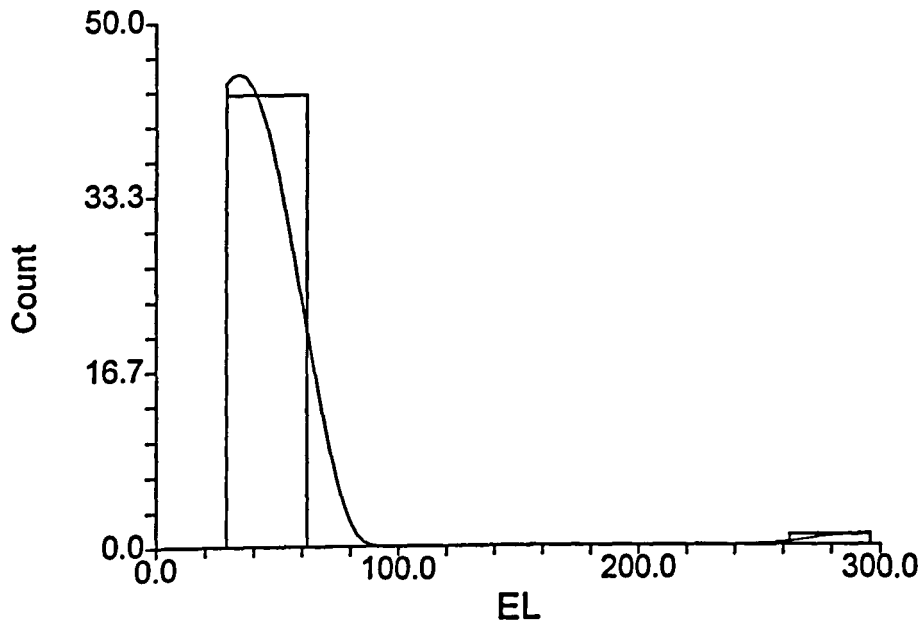


Histogram

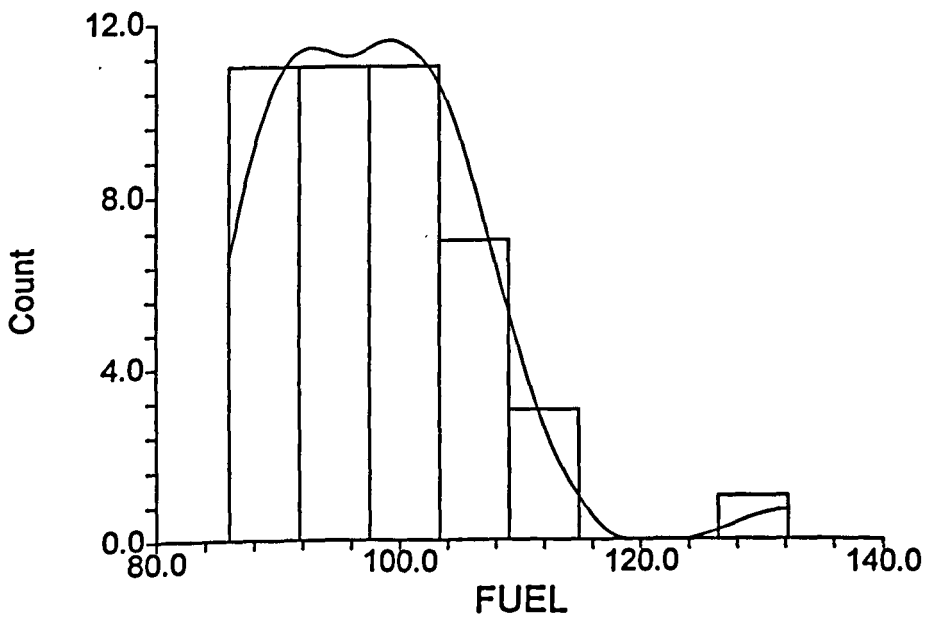


Histogram Section

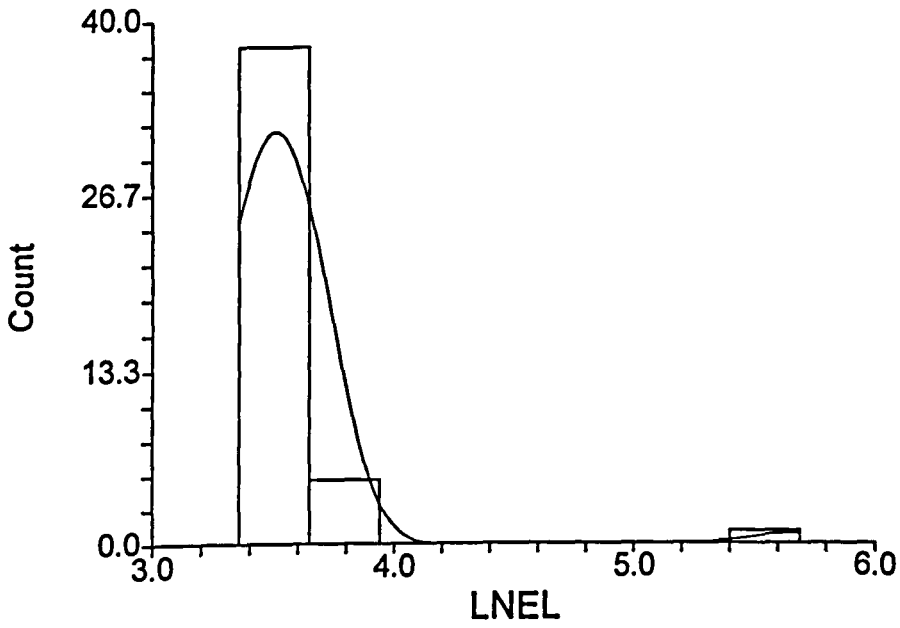
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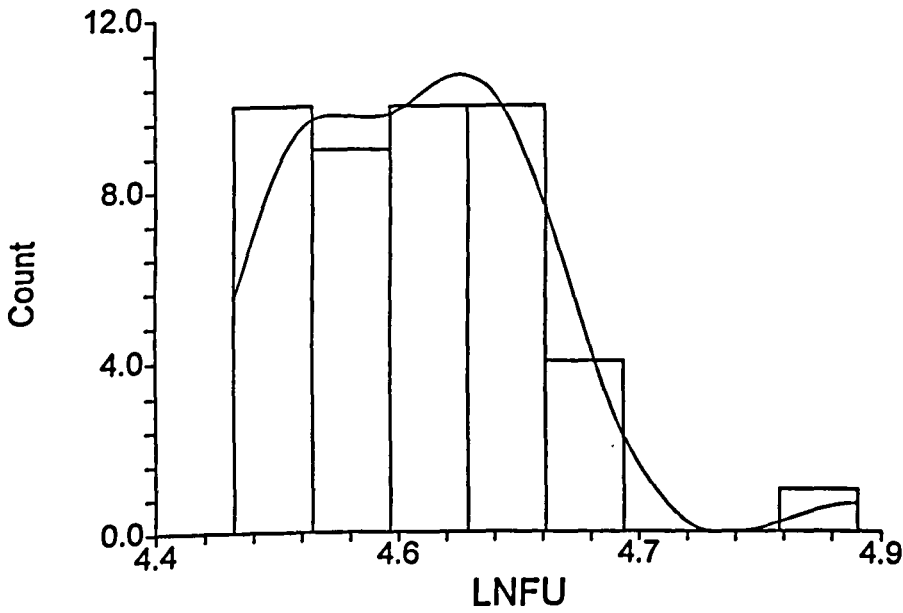
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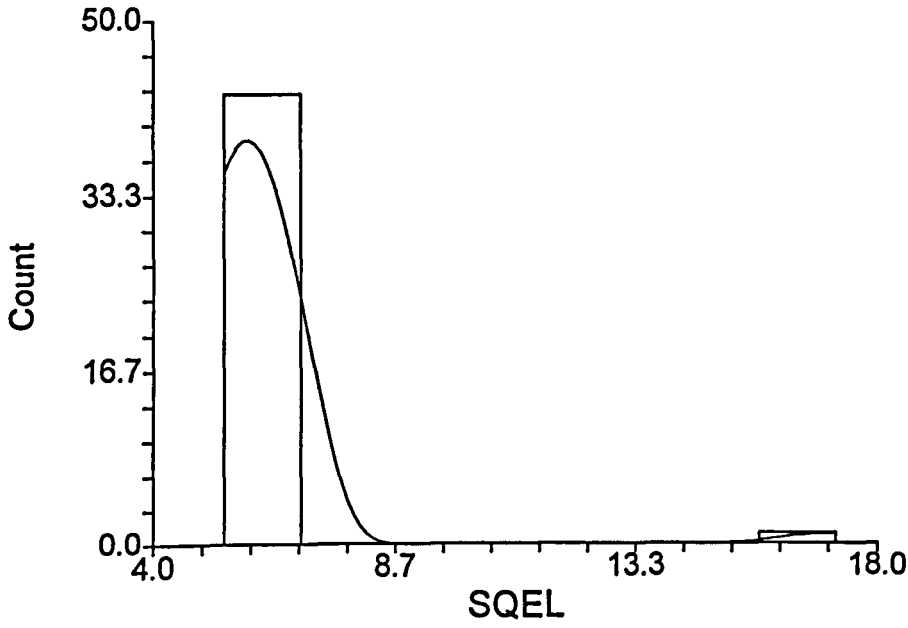
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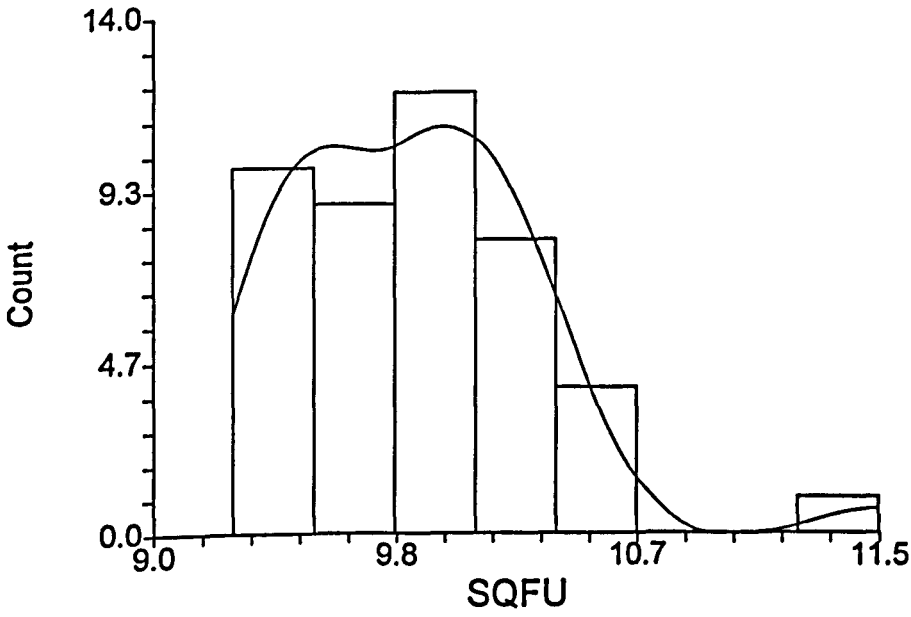
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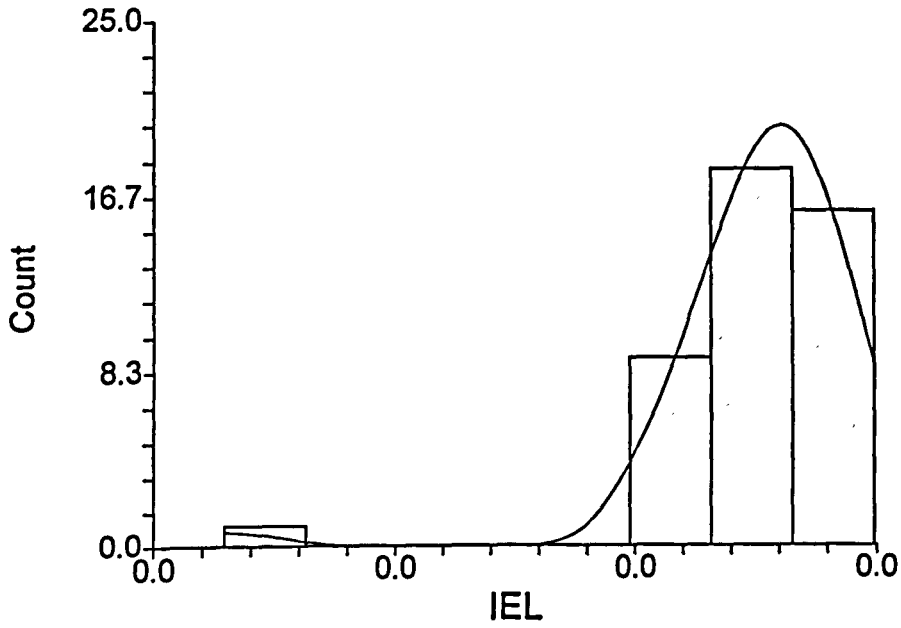
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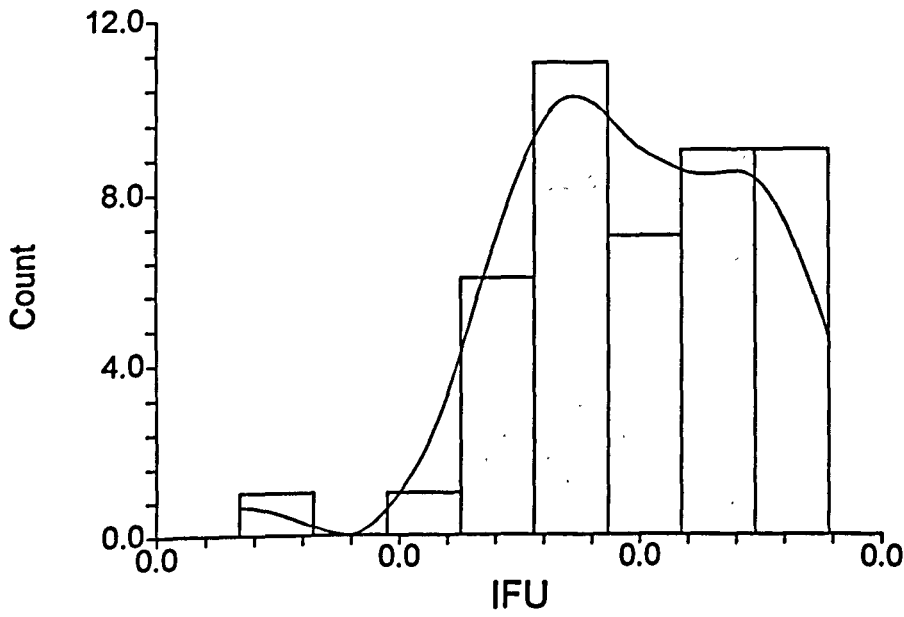
Histogram



Histogram

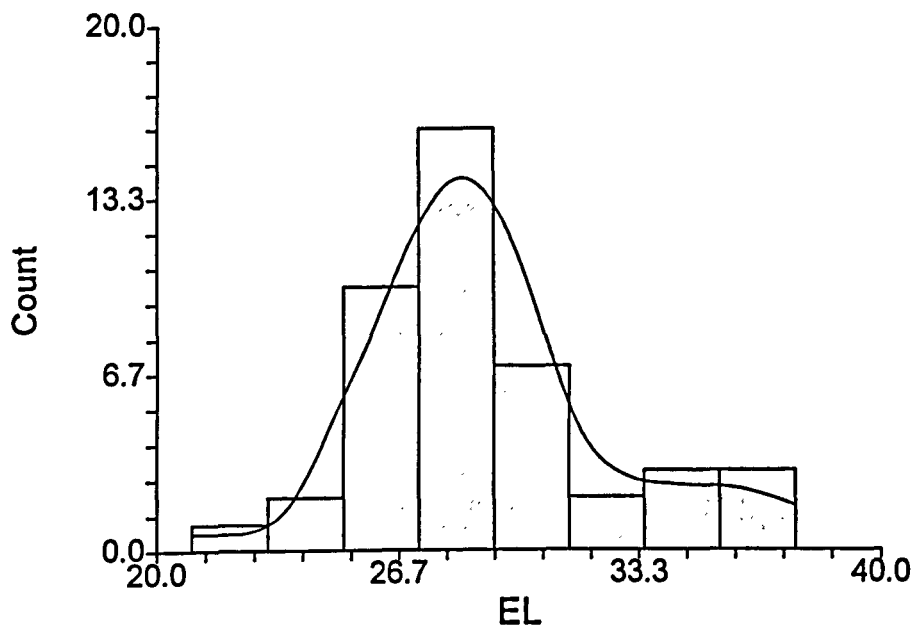


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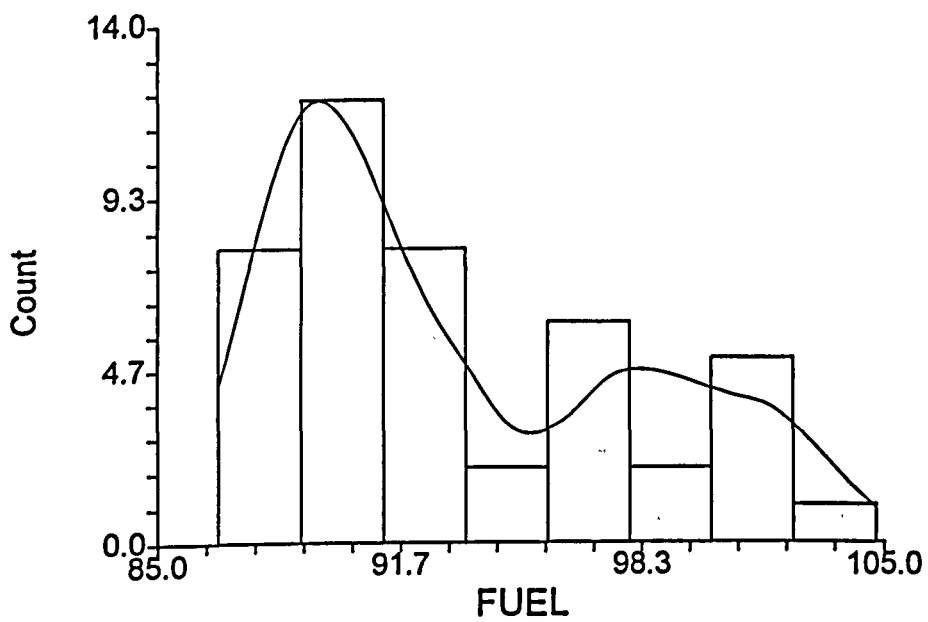


Histogram Section

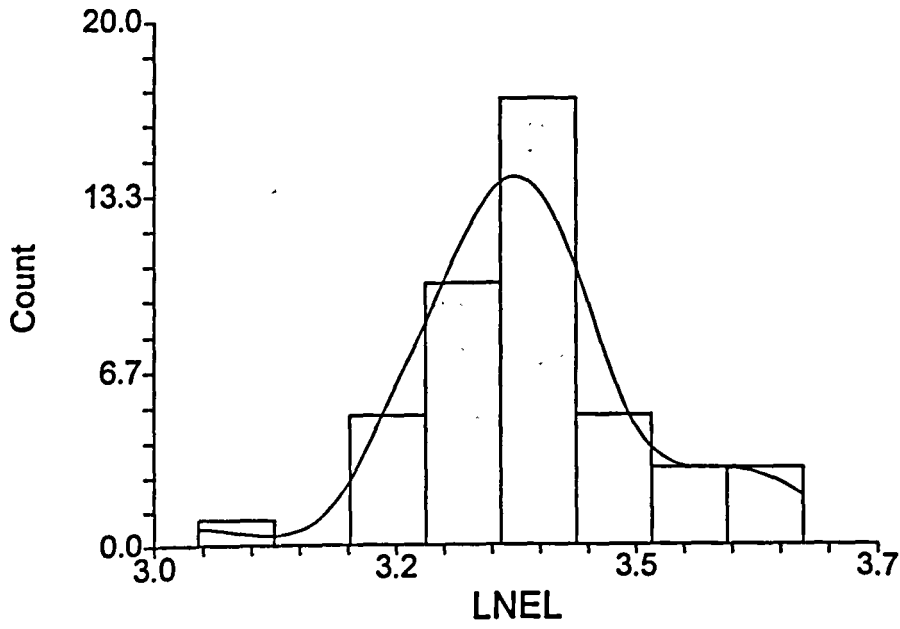
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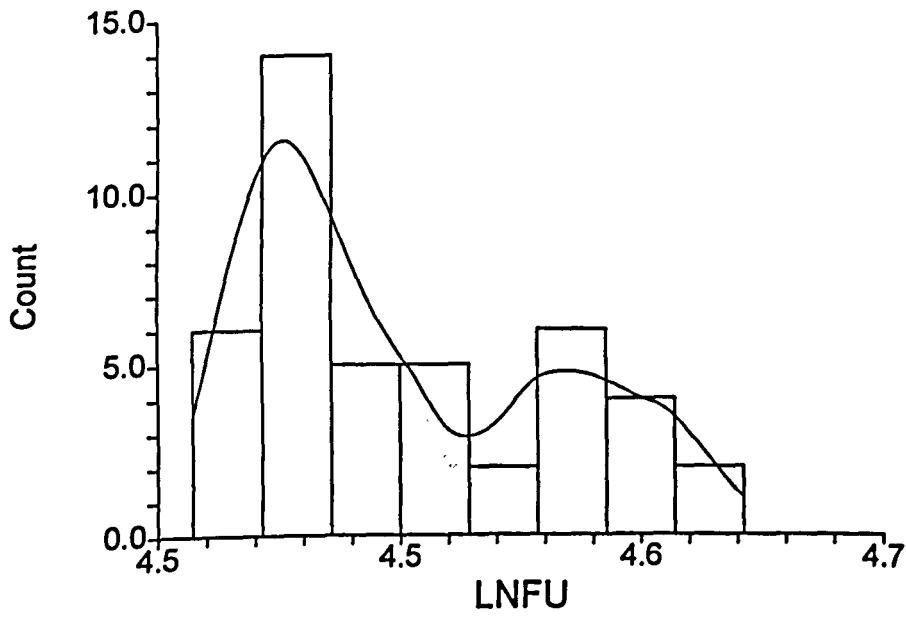
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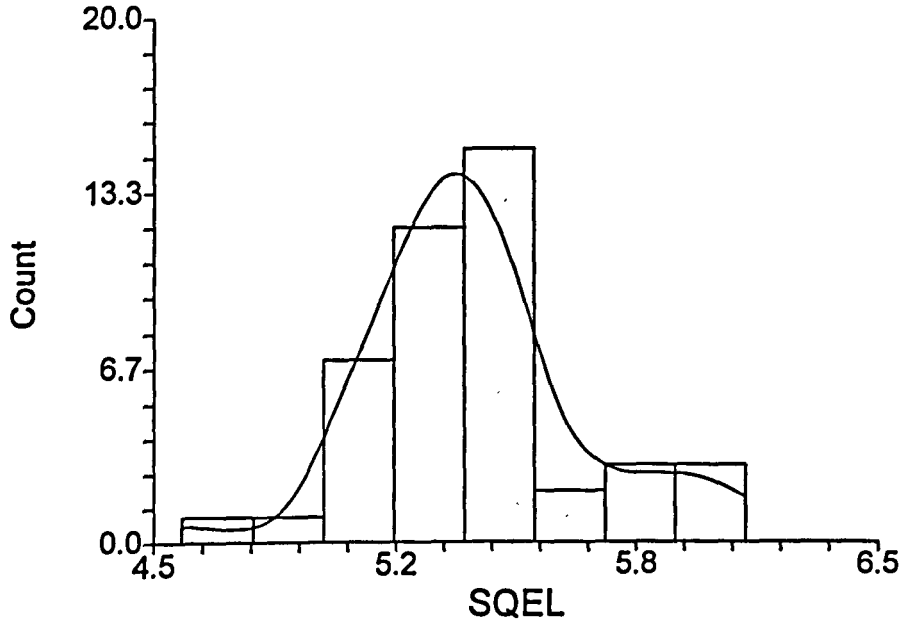
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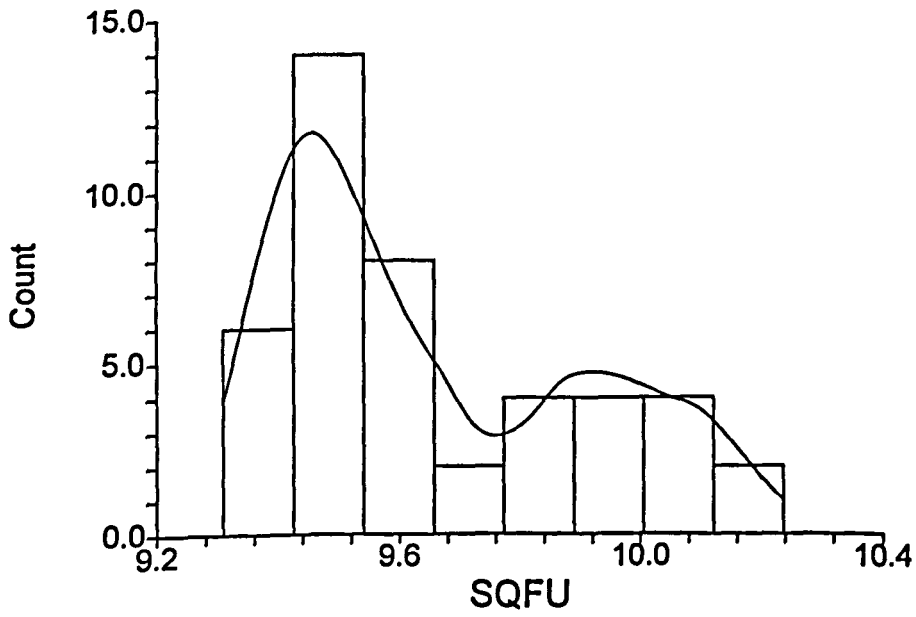
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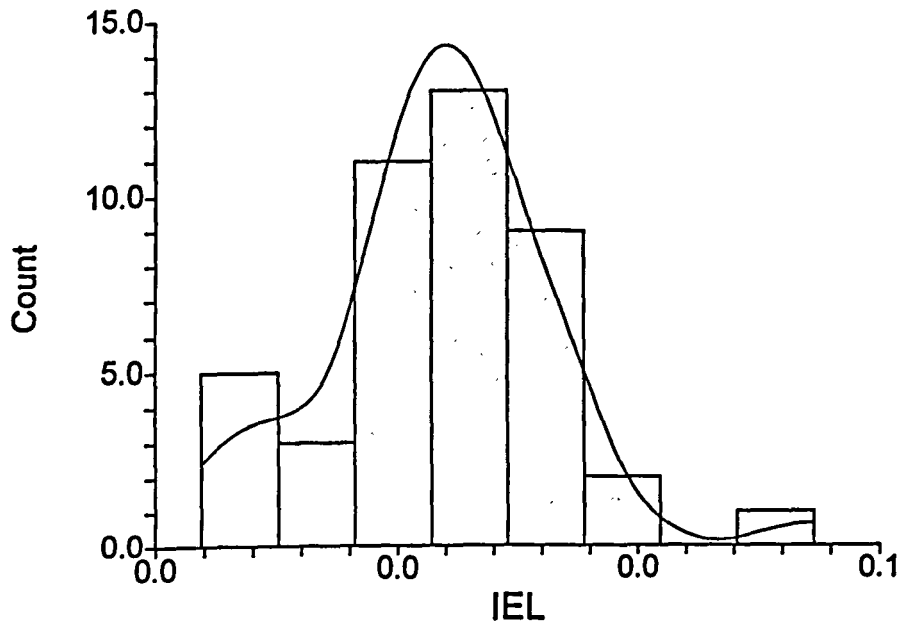
Histogram



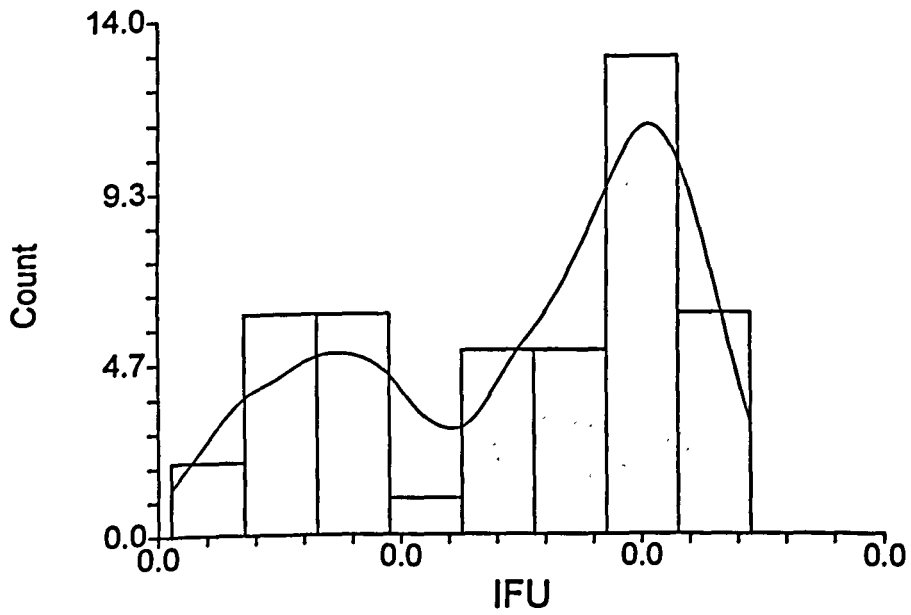
Histogram



Histogram



Histogram



Appendix 10: Multiple Regression of Transformed Data of other Kilns

Transformations of Variables in Kiln 4

Multiple Regression Report

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 Database E:\CH7\Data\k4.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	75.61887	47.44071	1.5940	0.119936	Accept Ho	0.341248
AvNO	5.187671	4.247473	1.2214	0.230115	Accept Ho	0.220890
AvHOURS	0.55143	8.520374E-02	6.4719	0.000000	Reject Ho	0.999992
PRORATE	-0.7566346	0.1932724	-3.9149	0.000399	Reject Ho	0.967509
AVL	4.551072E-02	0.1042206	0.4367	0.665028	Accept Ho	0.070919
Aratio	0.3384248	1.064001	0.3181	0.752323	Accept Ho	0.061039
Sratio	-10.14092	7.810555	-1.2984	0.202654	Accept Ho	0.243510
LimeSF	-0.1101761	0.4877494	-0.2259	0.822604	Accept Ho	0.055550
R-Squared	0.676991					

Model

75.61887+ 5.187671*AvNO+ .55143*AvHOURS-.7566346*PRORATE+ 4.551072E-02*AVL+ .3384248*Aratio-10.14092*Sratio-.1101761*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	36084.4	36084.4			
Model	7	309.0338	44.14769	10.4794	0.000001	0.999997
Error	35	147.4479	4.212798			
Total(Adjusted)	42	456.4818	10.86861			

Root Mean Square Error	2.05251	R-Squared	0.6770
Mean of Dependent	28.96847	Adj R-Squared	0.6124
Coefficient of Variation	7.085326E-02	Press Value	221.0091
Sum Press Residuals	72.56765	Press R-Squared	0.5158

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	-1.9810	0.047596	Rejected
Kurtosis	2.5248	0.011577	Rejected
Omnibus	10.2987	0.005803	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.183980	9	-0.047588	17	-0.142460
2	-0.031104	10	0.070691	18	-0.120068
3	-0.008690	11	0.030232	19	-0.088530
4	-0.133463	12	0.147400	20	-0.059140
5	-0.210998	13	0.274202	21	-0.005781
6	-0.171593	14	0.103588	22	0.038586
7	-0.262954	15	-0.062663	23	0.167171
8	-0.064966	16	-0.130072	24	0.019727

Above serial correlations significant if their absolute values are greater than 0.304997

Durbin-Watson Value 1.6598

Multiple Regression Report

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 Database E:\CH7\Data\k4.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.935519	0.483343	0.516657	4.282434
AvHOURS	1.068870	0.064432	0.935568	1.723244E-03
PRORATE	1.329202	0.247669	0.752331	8.866843E-03
AVL	2.091195	0.521804	0.478196	2.578317E-03
Aratio	1.662361	0.398446	0.601554	0.2687283
Sratio	1.508043	0.336889	0.663111	14.48082
LimeSF	1.154744	0.134007	0.865993	5.647067E-02

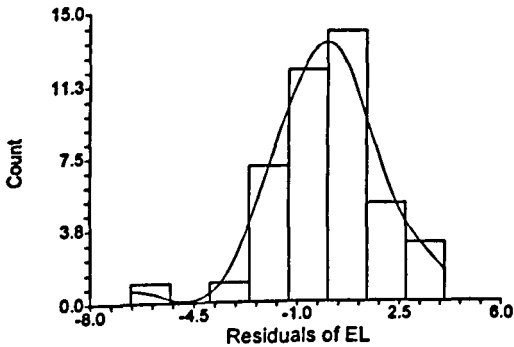
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.803427	25.76	25.76	1.00
2	1.529425	21.85	47.61	1.18
3	1.358021	19.40	67.01	1.33
4	0.983388	14.05	81.06	1.83
5	0.673014	9.61	90.68	2.68
6	0.380639	5.44	96.11	4.74
7	0.272085	3.89	100.00	6.63

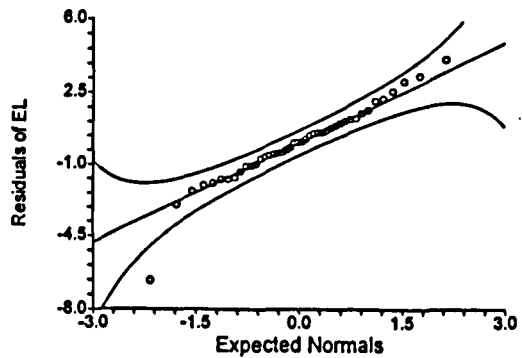
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

Histogram of Residuals of EL



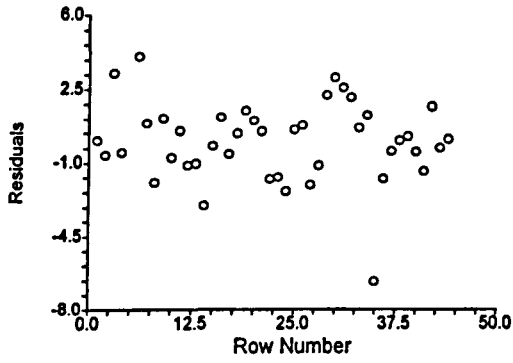
Normal Probability Plot of Residuals of EL



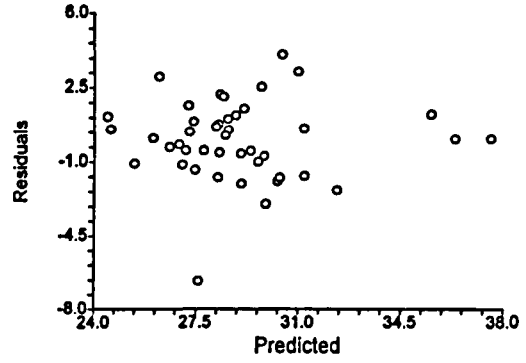
Multiple Regression Report

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Database E:\CH7\Data\k4.S0
Dependent EL

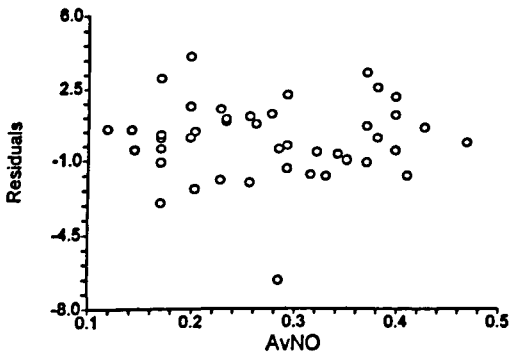
Residuals vs Row



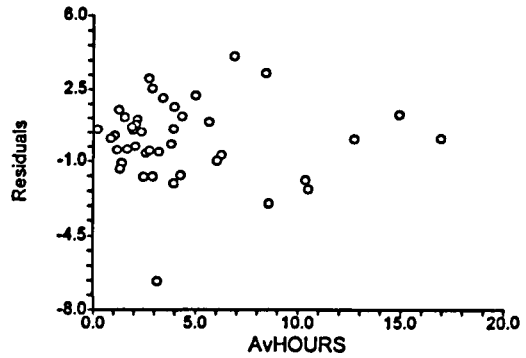
Residuals vs Predicted



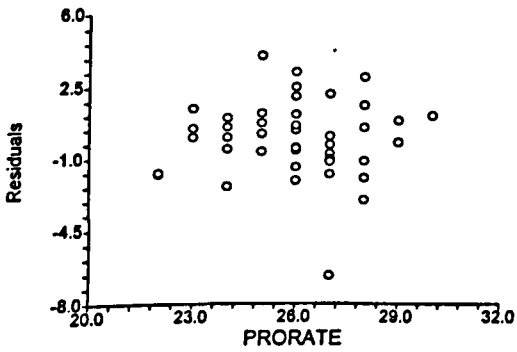
Residuals vs AvNO



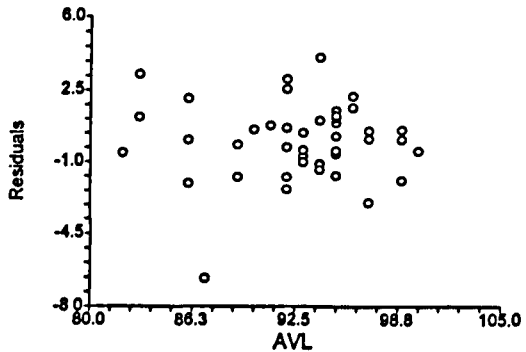
Residuals vs AvHOURS



Residuals vs PRORATE

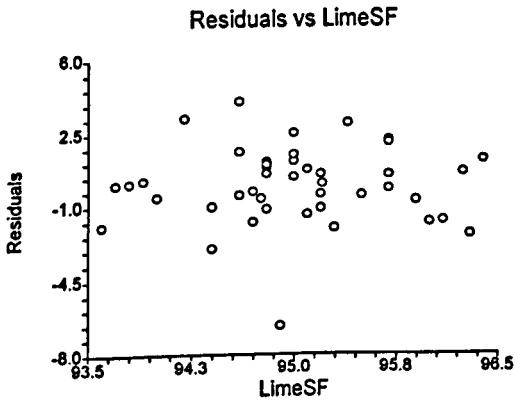
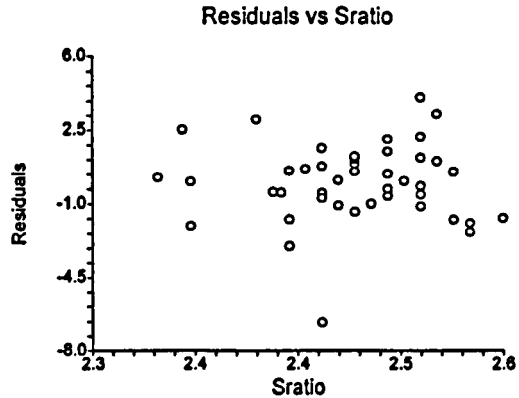
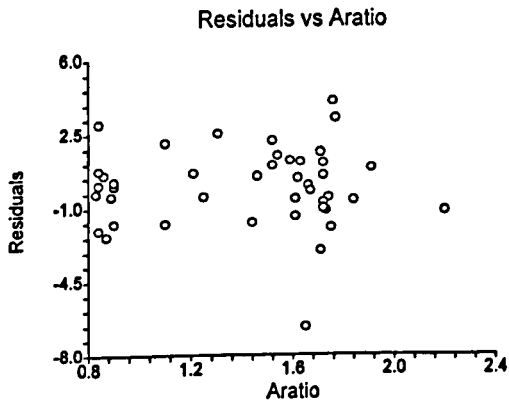


Residuals vs AVL



Multiple Regression Report

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 Database E:\CH7\Data\k4.S0
 Dependent EL



Multiple Regression Report

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 Database E:\CH7\Data\k4.S0
 Dependent LNEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	4.77421	1.706049	2.7984	0.008296	Reject Ho	0.776653
AvNO	0.2024955	0.1527464	1.3257	0.193528	Accept Ho	0.251847
AvHOURS	1.763479E-02	3.064073E-03	5.7553	0.000002	Reject Ho	0.999859
PRORATE	-2.551681E-02	6.950407E-03	-3.6713	0.000799	Reject Ho	0.946173
AVL	2.328013E-03	3.747951E-03	0.6211	0.538530	Accept Ho	0.092767
Aratio	3.16699E-03	0.0382633	0.0828	0.934507	Accept Ho	0.050743
Sratio	-0.2896077	0.280881	-1.0311	0.309581	Accept Ho	0.170805
LimeSF	-4.075852E-03	1.754031E-02	-0.2324	0.817604	Accept Ho	0.055875
R-Squared	0.635236					

Model

$$4.77421 + .2024955 \cdot \text{AvNO} + 1.763479\text{E-}02 \cdot \text{AvHOURS} - 2.551681\text{E-}02 \cdot \text{PRORATE} + 2.328013\text{E-}03 \cdot \text{AVL} + 3.16699\text{E-}03 \cdot \text{Aratio} - 0.2896077 \cdot \text{Sratio} - 4.075852\text{E-}03 \cdot \text{LimeSF}$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	485.4724	485.4724			
Model	7	0.3320802	4.744003E-02	8.7075	0.000004	0.999948
Error	35	0.1906863	5.448181E-03			
Total(Adjusted)	42	0.5227665	1.244682E-02			

Root Mean Square Error	7.381179E-02	R-Squared	0.6352
Mean of Dependent	3.360068	Adj R-Squared	0.5623
Coefficient of Variation	2.196735E-02	Press Value	0.2806146
Sum Press Residuals	2.534	Press R-Squared	0.4632

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	-2.8564	0.004285	Rejected
Kurtosis	3.2552	0.001133	Rejected
Omnibus	18.7554	0.000085	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.205829	9	-0.050618	17	-0.136078
2	-0.027519	10	0.063008	18	-0.115507
3	-0.016390	11	0.053248	19	-0.116630
4	-0.155082	12	0.155442	20	-0.055098
5	-0.229357	13	0.278634	21	0.022569
6	-0.185129	14	0.083506	22	0.037676
7	-0.231531	15	-0.062040	23	0.178386
8	-0.047270	16	-0.114339	24	0.040807

Above serial correlations significant if their absolute values are greater than 0.304997

Durbin-Watson Value 1.6021

Multiple Regression Report

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 Database E:\CH7\Data\k4.S0
 Dependent LNEL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.935519	0.483343	0.516657	4.282434
AvHOURS	1.068870	0.064432	0.935568	1.723244E-03
PRORATE	1.329202	0.247669	0.752331	8.866843E-03
AVL	2.091195	0.521804	0.478196	2.578317E-03
Aratio	1.662361	0.398446	0.601554	0.2687283
Sratio	1.508043	0.336889	0.663111	14.48082
LimeSF	1.154744	0.134007	0.865993	5.647067E-02

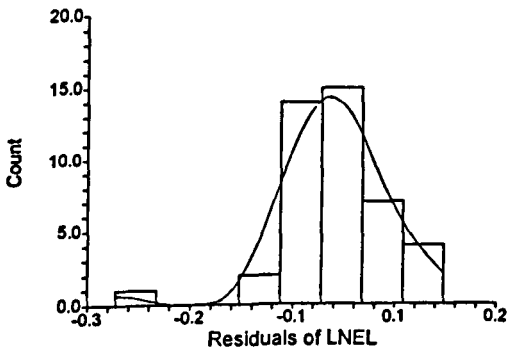
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.803427	25.76	25.76	1.00
2	1.529425	21.85	47.61	1.18
3	1.358021	19.40	67.01	1.33
4	0.983388	14.05	81.06	1.83
5	0.673014	9.61	90.68	2.68
6	0.380639	5.44	96.11	4.74
7	0.272085	3.89	100.00	6.63

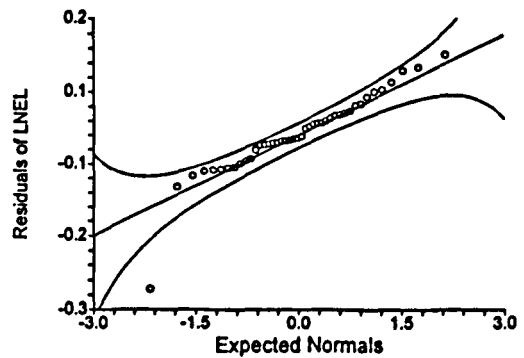
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

Histogram of Residuals of LNEL

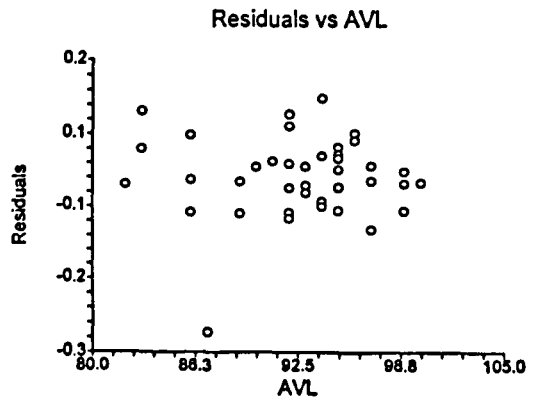
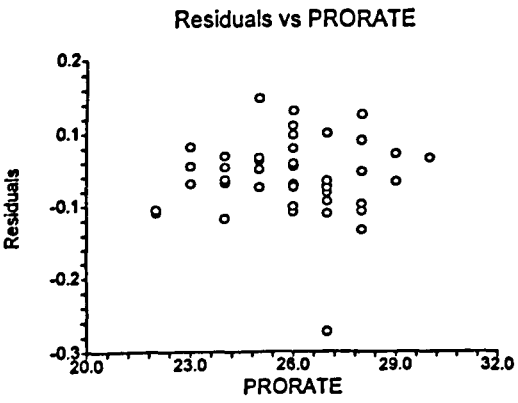
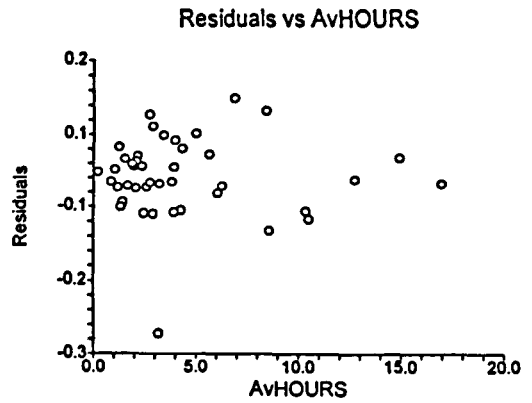
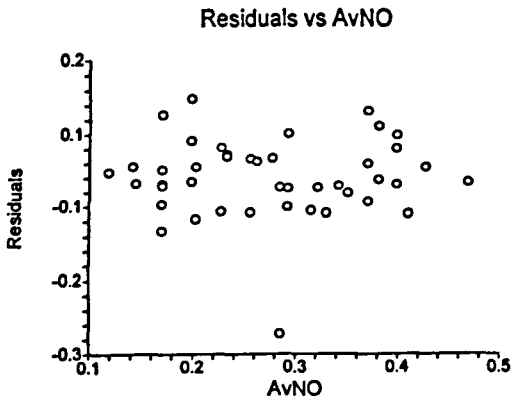
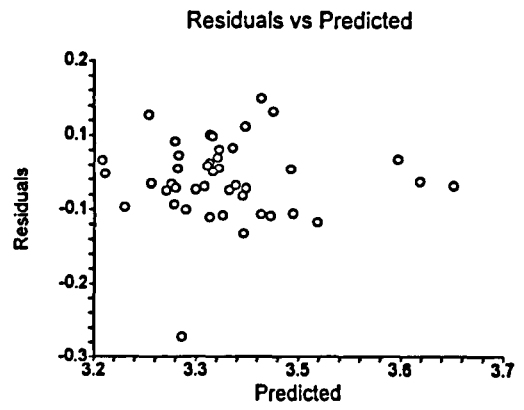
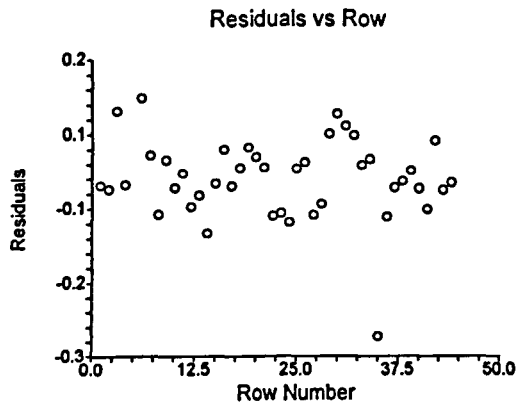


Normal Probability Plot of Residuals of LNEL



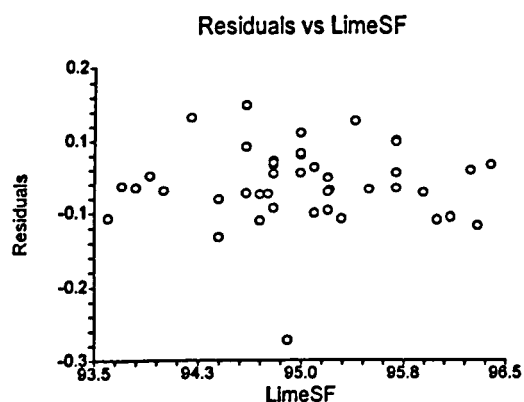
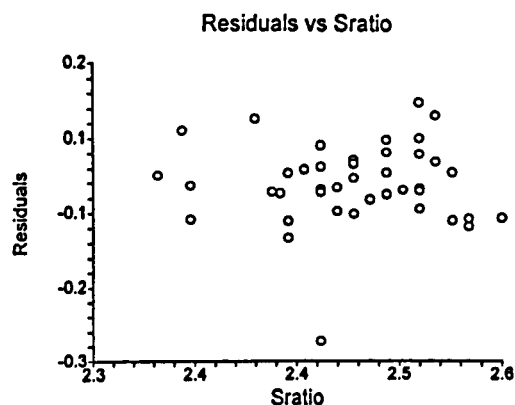
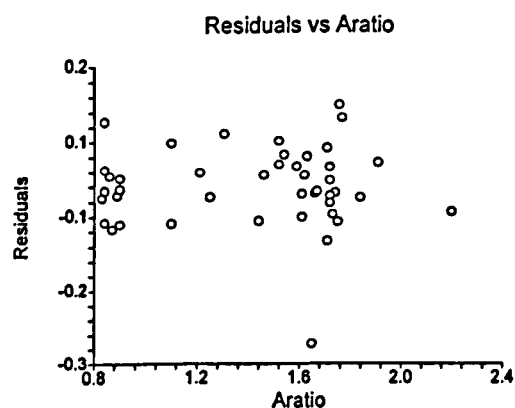
Multiple Regression Report

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Database E:\CH7\Data\k4.S0
Dependent LNEL



Multiple Regression Report

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 Database E:\CH7\Data\k4.S0
 Dependent LNEL



Multiple Regression Report

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 Database E:\CH7\Data\k4.S0
 Dependent SQEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	9.438126	4.480672	2.1064	0.042410	Reject Ho	0.535278
AvNO	0.5118743	0.4011647	1.2760	0.210369	Accept Ho	0.236800
AvHOURS	4.923125E-02	8.04731E-03	6.1177	0.000001	Reject Ho	0.999966
PRORATE	-6.939315E-02	1.825416E-02	-3.8015	0.000552	Reject Ho	0.958656
AVL	5.192084E-03	9.843408E-03	0.5275	0.601197	Accept Ho	0.080670
Aratio	2.019827E-02	0.1004926	0.2010	0.841868	Accept Ho	0.054391
Sratio	-0.85966	0.73769	-1.1653	0.251762	Accept Ho	0.205268
LimeSF	-1.053615E-02	4.606688E-02	-0.2287	0.820422	Accept Ho	0.055691
R-Squared	0.657320					

Model

9.438126+ .5118743*AvNO+ 4.923125E-02*AvHOURS-6.939315E-02*PRORATE+ 5.192084E-03*AVL+ 2.019827E-02*Aratio-.85966*Sratio-1.053615E-02*LimeSF

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	1241.806	1241.806			
Model	7	2.522958	0.3604225	9.5909	0.000001	0.999987
Error	35	1.315294	3.757982E-02			
Total(Adjusted)	42	3.838251	9.138694E-02			

Root Mean Square Error	0.1938552	R-Squared	0.6573
Mean of Dependent	5.373938	Adj R-Squared	0.5888
Coefficient of Variation	0.0360732	Press Value	1.952322
Sum Press Residuals	6.742262	Press R-Squared	0.4914

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	-2.4076	0.016060	Rejected
Kurtosis	2.9032	0.003694	Rejected
Omnibus	14.2249	0.000815	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.196320	9	-0.050027	17	-0.139630
2	-0.029141	10	0.066234	18	-0.117519
3	-0.013291	11	0.041981	19	-0.103028
4	-0.144989	12	0.152028	20	-0.057143
5	-0.220920	13	0.278076	21	0.009403
6	-0.180325	14	0.093519	22	0.038466
7	-0.247451	15	-0.062590	23	0.173730
8	-0.056264	16	-0.122515	24	0.030975

Above serial correlations significant if their absolute values are greater than 0.304997

Durbin-Watson Value 1.6282

Multiple Regression Report

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 Database E:\CH7\Data\k4.S0
 Dependent SQEL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.935519	0.483343	0.516657	4.282434
AvHOURS	1.068870	0.064432	0.935568	1.723244E-03
PRORATE	1.329202	0.247669	0.752331	8.866843E-03
AVL	2.091195	0.521804	0.478196	2.578317E-03
Aratio	1.662361	0.398446	0.601554	0.2687283
Sratio	1.508043	0.336889	0.663111	14.48082
LimeSF	1.154744	0.134007	0.865993	5.647067E-02

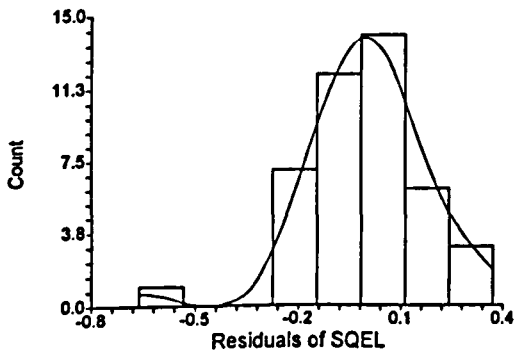
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.803427	25.76	25.76	1.00
2	1.529425	21.85	47.61	1.18
3	1.358021	19.40	67.01	1.33
4	0.983388	14.05	81.06	1.83
5	0.673014	9.61	90.68	2.68
6	0.380639	5.44	96.11	4.74
7	0.272085	3.89	100.00	6.63

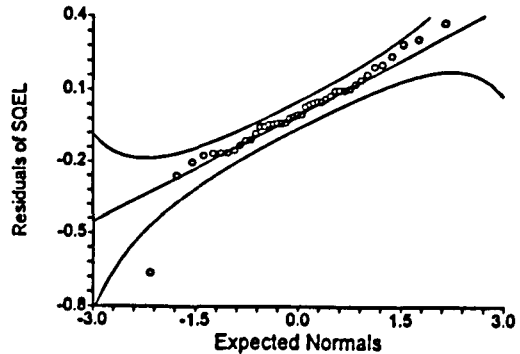
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

Histogram of Residuals of SQEL

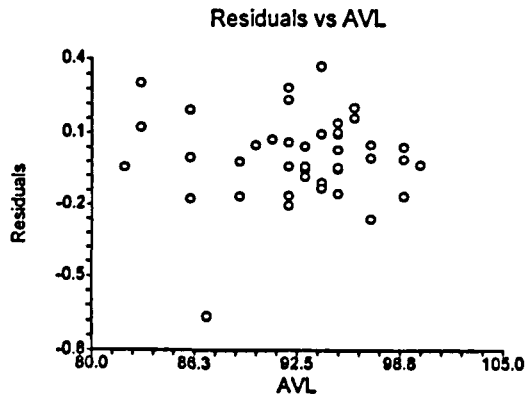
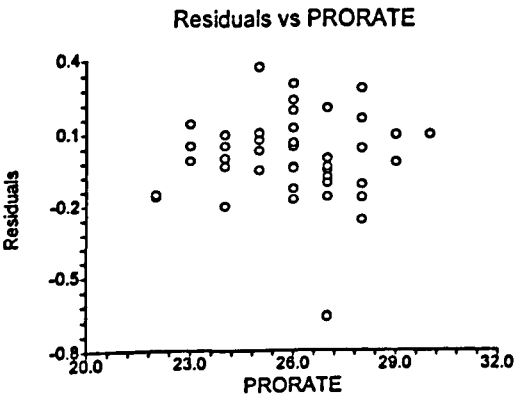
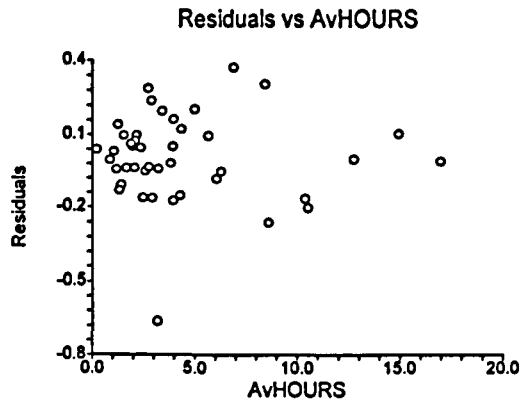
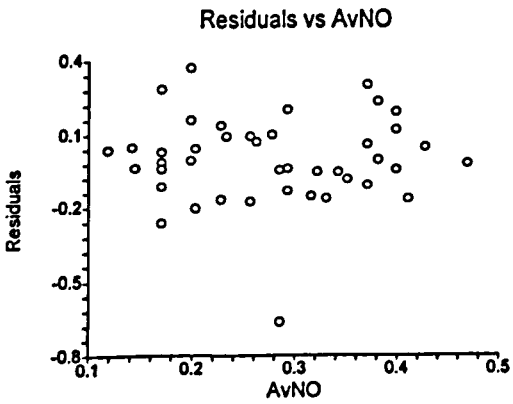
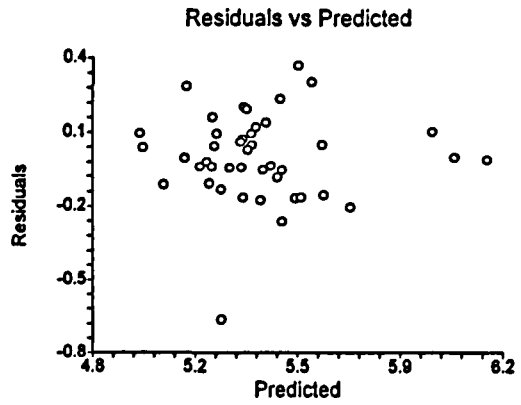
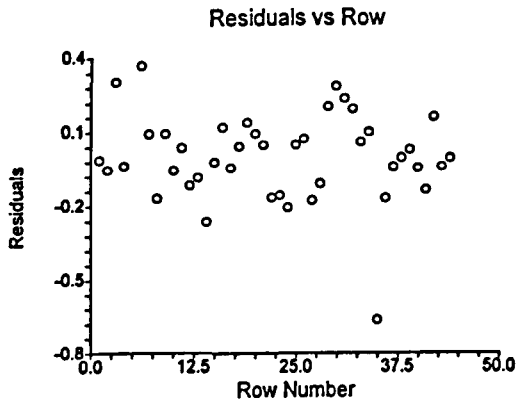


Normal Probability Plot of Residuals of SQEL



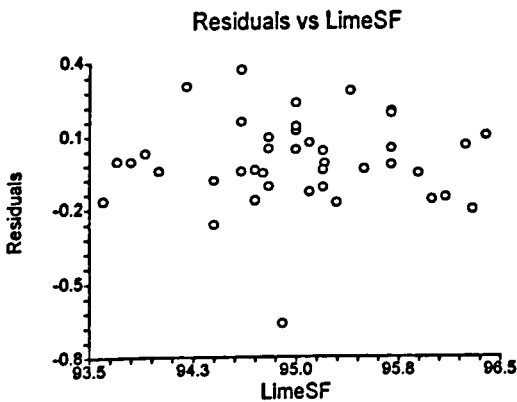
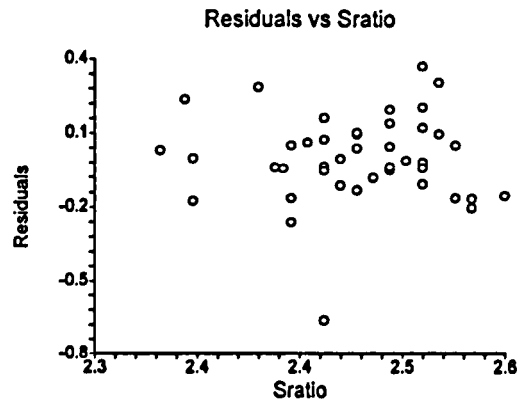
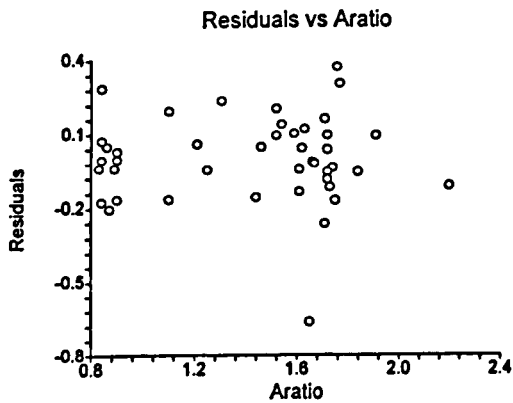
Multiple Regression Report

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Database E:\CH7\Data\k4.S0
Dependent SQEL



Multiple Regression Report

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 Dependent SQEL



Transformations of Variables in Kiln 5

Multiple Regression Report

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 Database E:\CH7\Data\k5.S0
 Dependent IFU

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	6.556412E-03	2.785406E-02	0.2354	0.815244	Accept Ho	0.056038
AvNO	2.45725E-03	7.219267E-04	3.4037	0.001645	Reject Ho	0.911758
AvHOURS	-8.586627E-06	3.569638E-05	-0.2405	0.811272	Accept Ho	0.056307
PRORATE	3.10509E-05	2.477993E-05	1.2531	0.218259	Accept Ho	0.230332
AVL	6.052565E-05	2.611944E-05	2.3173	0.026290	Reject Ho	0.616084
Aratio	-1.262644E-03	1.347766E-03	-0.9368	0.355083	Accept Ho	0.149372
Sratio	-7.36982E-03	6.216746E-03	-1.1855	0.243595	Accept Ho	0.211057
LimeSF	1.641698E-04	1.76021E-04	0.9327	0.357203	Accept Ho	0.148465
R-Squared	0.318068					

Model

$$6.556412E-03 + 2.45725E-03 \cdot AvNO - 8.586627E-06 \cdot AvHOURS + 3.10509E-05 \cdot PRORATE + 6.052565E-05 \cdot AVL - 1.262644E-03 \cdot Aratio - 7.36982E-03 \cdot Sratio + 1.641698E-04 \cdot LimeSF$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	4.650114E-03	4.650114E-03			
Model	7	9.83474E-06	1.404963E-06	2.3987	0.040190	0.785159

Error	36	2.108549E-05	5.857079E-07
Total(Adjusted)	43	3.092023E-05	7.19075E-07
Root Mean Square Error	7.653155E-04	R-Squared	0.3181
Mean of Dependent	1.028029E-02	Adj R-Squared	0.1855
Coefficient of Variation	7.444493E-02	Press Value	3.092E-05
Sum Press Residuals	2.846375E-02	Press R-Squared	0.0000

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	-2.6730	0.007518	Rejected
Kurtosis	2.5651	0.010313	Rejected
Omnibus	13.7249	0.001046	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.556539	9	0.092925	17	-0.132019
2	0.351111	10	0.099724	18	0.002951
3	0.219109	11	-0.026231	19	-0.123403
4	0.063087	12	-0.194850	20	-0.099609
5	0.045986	13	-0.213579	21	-0.092675
6	-0.015279	14	-0.312391	22	-0.228610
7	0.111037	15	-0.336042	23	-0.158846
8	0.064649	16	-0.246968	24	-0.115115

Above serial correlations significant if their absolute values are greater than 0.301511

Durbin-Watson Value 0.8861

Multiple Regression Report

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 Dependent IFU

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
AvNO	1.655389	0.395912	0.604088	0.8898261
AvHOURS	1.145893	0.127318	0.872682	2.175541E-03
PRORATE	1.149692	0.130202	0.869798	1.04838E-03
AVL	1.624852	0.384559	0.615441	1.164788E-03
Aratio	1.382770	0.276814	0.723186	3.101331
Sratio	1.451070	0.310853	0.689147	65.98499
LimeSF	1.285144	0.221877	0.778123	5.289902E-02

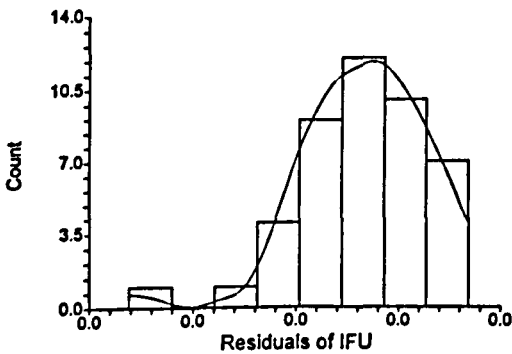
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.978944	28.27	28.27	1.00
2	1.335159	19.07	47.34	1.48
3	1.203796	17.20	64.54	1.64
4	1.022407	14.61	79.15	1.94
5	0.682403	9.75	88.90	2.90
6	0.412968	5.90	94.80	4.79
7	0.364323	5.20	100.00	5.43

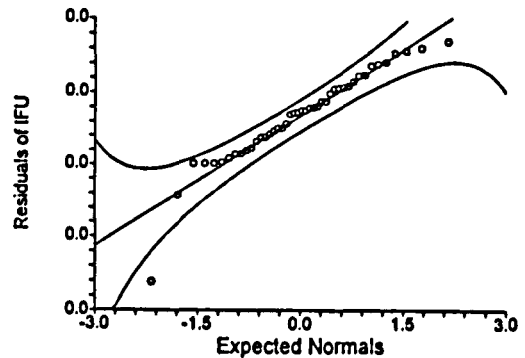
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

Histogram of Residuals of IFU

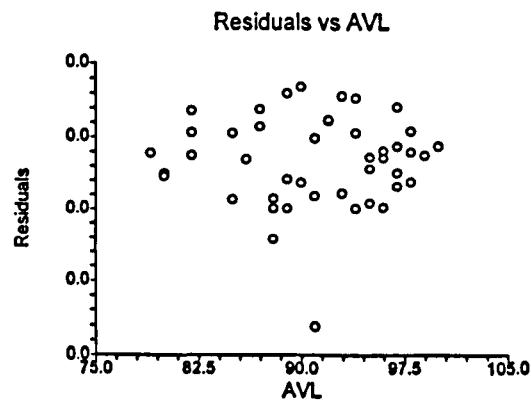
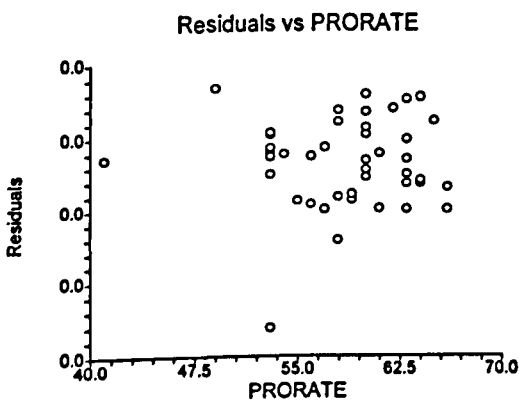
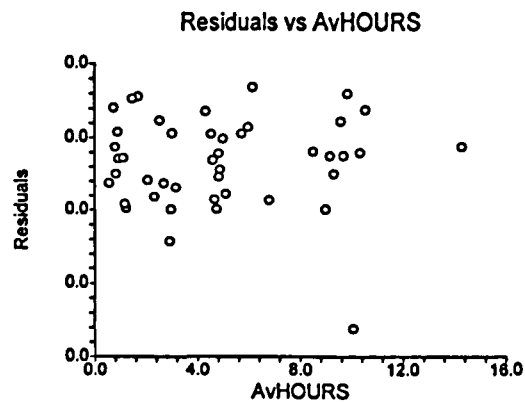
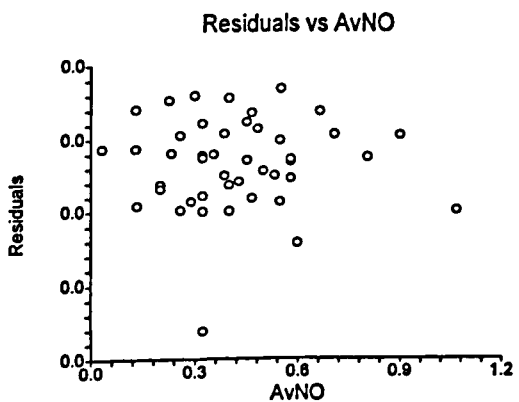
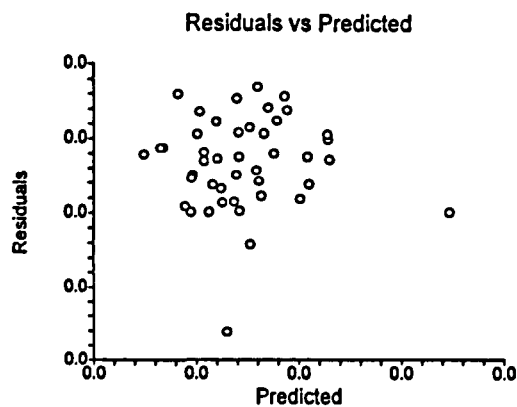
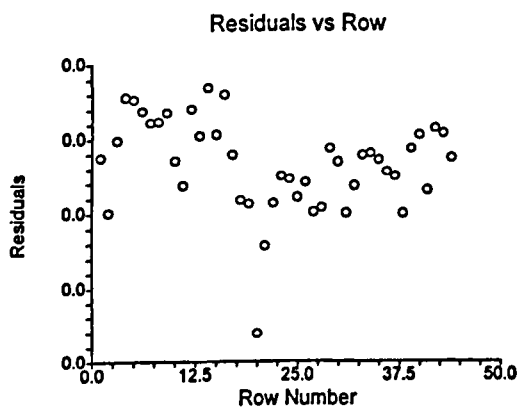


Normal Probability Plot of Residuals of IFU



Multiple Regression Report

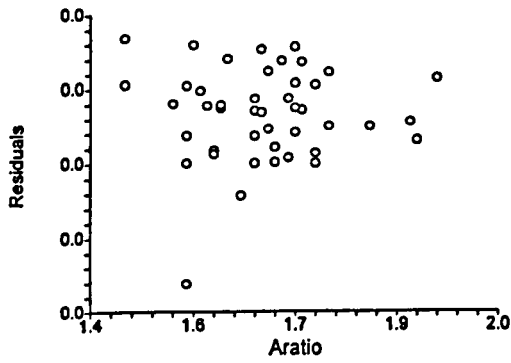
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Database E:\CH7\Data\k5.S0
Dependent IFU



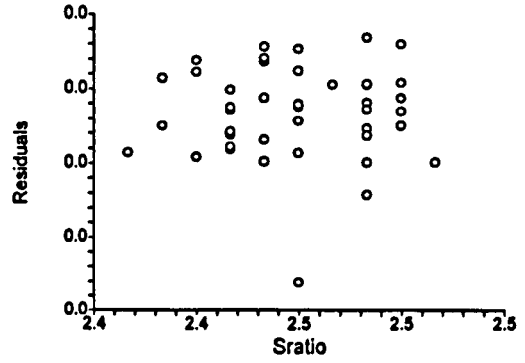
Multiple Regression Report

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Dependent IFU

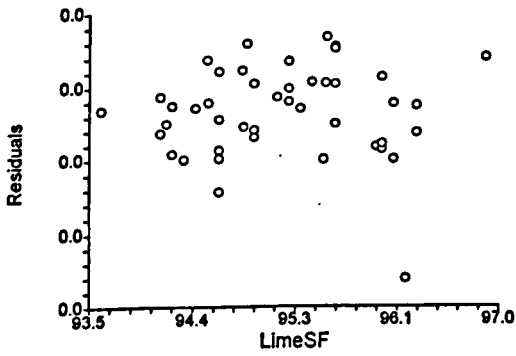
Residuals vs Aratio



Residuals vs Sratio



Residuals vs LimeSF



Appendix 11: Multiplicative Models of other Kilns

Nonlinear Regression Report

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 Dependent EL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)	Prob Level
B1	AvNO	1.412698E-02	3.468125E-02	0.4073	0.686172
B2	AvHOURS	0.082738	1.452885E-02	5.6947	0.000002
B3	PRORATE	-0.7015304	0.1687064	-4.1583	0.000189
B4	AVL	0.190868	0.3383522	0.5641	0.576177
B5	Aratio	3.424781E-02	5.034229E-02	0.6803	0.500667
B6	Sratio	-1.198057	0.6774231	-1.7686	0.085442
B7	LimeSF	1.267604	0.3974946	3.1890	0.002954

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	1.412698E-02	3.468125E-02	-5.620985E-02	8.446382E-02
B2	AvHOURS	0.082738	1.452885E-02	5.327214E-02	0.1122039
B3	PRORATE	-0.7015304	0.1687064	-1.043683	-0.359378
B4	AVL	0.190868	0.3383522	-0.4953421	0.8770782
B5	Aratio	3.424781E-02	5.034229E-02	-6.785109E-02	0.1363467
B6	Sratio	-1.198057	0.6774231	-2.571935	0.1758209
B7	LimeSF	1.267604	0.3974946	0.4614476	2.07376

R-Squared 0.619473

Iterations 21

Model

$AvNO^{(B1)} * AvHOURS^{(B2)} * PRORATE^{(B3)} * AVL^{(B4)} * Aratio^{(B5)} * Sratio^{(B6)} * LimeSF^{(B7)}$

Estimated Model

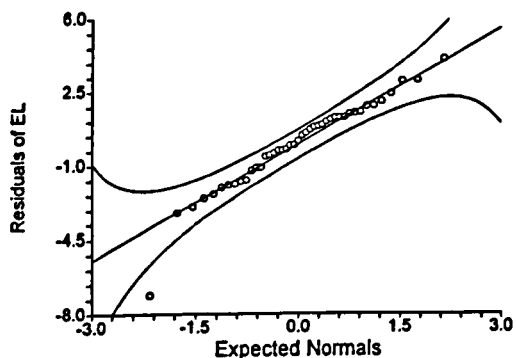
$AvNO^{(1.412698E-02)} * AvHOURS^{(0.082738)} * PRORATE^{(-0.7015304)} * AVL^{(0.190868)} * Aratio^{(3.424781E-02)} * Sratio^{(-1.198057)} * LimeSF^{(1.267604)}$

Nonlinear Regression Report

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Plot Section

Normal Probability Plot of Residuals of EL



Nonlinear Regression Report

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 Database C:\My Documents\DATA\K4.S0
 Dependent FUEL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)	Prob Level
B1	AvNO	4.421016E-02	1.765733E-02	2.5038	0.016959
B2	AvHOURS	-1.230873E-02	7.674535E-03	-1.6038	0.117488
B3	PRORATE	-0.3485591	0.0874137	-3.9875	0.000313
B4	AVL	0.2189038	0.175062	1.2504	0.219207
B5	Aratio	-5.789635E-02	2.517795E-02	-2.2995	0.027386
B6	Sratio	0.2196004	0.3590491	0.6116	0.544635
B7	LimeSF	1.005484	0.2052633	4.8985	0.000020

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	4.421016E-02	1.765733E-02	8.399436E-03	8.002087E-02
B2	AvHOURS	-1.230873E-02	7.674535E-03	-2.787341E-02	3.255945E-03
B3	PRORATE	-0.3485591	0.0874137	-0.5258422	-0.1712758
B4	AVL	0.2189038	0.175062	-0.1361384	0.573946
B5	Aratio	-5.789635E-02	2.517795E-02	-0.1089596	-6.833112E-03
B6	Sratio	0.2196004	0.3590491	-0.5085848	0.9477857
B7	LimeSF	1.005484	0.2052633	0.5891908	1.421777

R-Squared 0.534143

Iterations 16

Model

AvNO^(B1) *AvHOURS^(B2) *PRORATE^(B3) *AVL^(B4) *Aratio^(B5) *Sratio^(B6) *LimeSF^(B7)

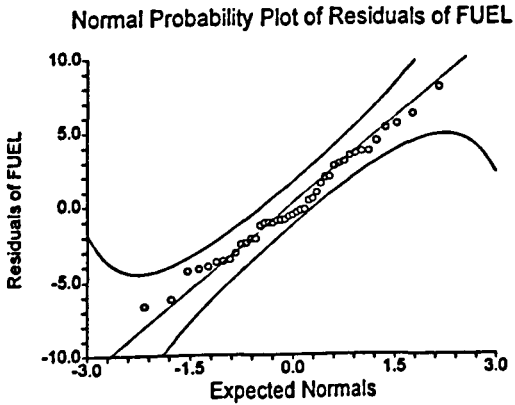
Estimated Model

AvNO^(4.421016E-02) *AvHOURS^(-1.230873E-02) *PRORATE^(-0.3485591) *AVL^(0.2189038) *Aratio^(-5.789635E-02) *Sratio^(0.2196004) *LimeSF^(1.005484)

Nonlinear Regression Report

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 Dependent FUEL

Plot Section



Nonlinear Regression Report

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 Database C:\My Documents\DATA\K5.S0
 Dependent EL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)	Prob Level
B1	AvNO	1.554337E-02	1.428933E-02	1.0878	0.283736
B2	AvHOURS	4.705557E-02	8.577317E-03	5.4860	0.000003
B3	PRORATE	-0.4052387	7.769537E-02	-5.2157	0.000007
B4	AVL	-0.3485646	0.1337082	-2.6069	0.013093
B5	Aratio	-0.4467981	0.1217052	-3.6712	0.000758
B6	Sratio	-2.372304	0.7887408	-3.0077	0.004713
B7	LimeSF	1.984661	0.1922042	10.3258	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	1.554337E-02	1.428933E-02	-1.340956E-02	4.449629E-02
B2	AvHOURS	4.705557E-02	8.577317E-03	2.967628E-02	6.443487E-02
B3	PRORATE	-0.4052387	7.769537E-02	-0.5626645	-0.2478129
B4	AVL	-0.3485646	0.1337082	-0.6194832	-7.764602E-02
B5	Aratio	-0.4467981	0.1217052	-0.6933962	-0.2001999
B6	Sratio	-2.372304	0.7887408	-3.970445	-0.7741638
B7	LimeSF	1.984661	0.1922042	1.595219	2.374104

R-Squared 0.806814
 Iterations 19

Model

$$\text{AvNO}^{(B1)} * \text{AvHOURS}^{(B2)} * \text{PRORATE}^{(B3)} * \text{AVL}^{(B4)} * \text{Aratio}^{(B5)} * \text{Sratio}^{(B6)} * \text{LimeSF}^{(B7)}$$

Estimated Model

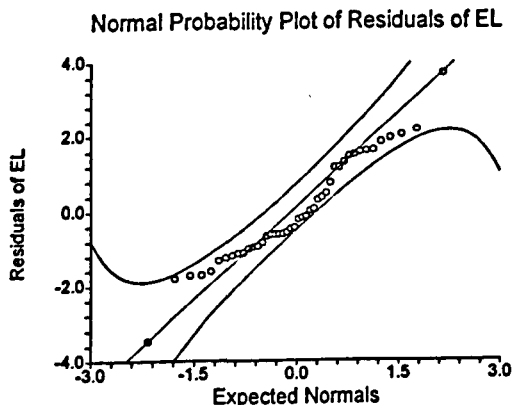
$$\text{AvNO}^{(1.554337E-02)} * \text{AvHOURS}^{(4.705557E-02)} * \text{PRORATE}^{(-0.4052387)} * \text{AVL}^{(-0.3485646)} * \text{Aratio}^{(-0.4467981)} * \text{Sratio}^{(-2.372304)} * \text{LimeSF}^{(1.984661)}$$

Nonlinear Regression Report

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Dependent EL

Plot Section



Nonlinear Regression Report

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 Database C:\My Documents\DATAK5.S0
 Dependent FUEL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)	Prob Level
B1	AvNO	5.511214E-02	2.043694E-02	2.6967	0.010480
B2	AvHOURS	8.93405E-03	1.182593E-02	0.7555	0.454754
B3	PRORATE	-0.5123753	0.1016508	-5.0405	0.000012
B4	AVL	-6.641965E-02	0.1898299	-0.3499	0.728405
B5	Aratio	-0.1550902	0.1670553	-0.9284	0.359230
B6	Sratio	-1.163263	1.09394	-1.0634	0.294505
B7	LimeSF	1.785298	0.2689447	6.6382	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	5.511214E-02	2.043694E-02	1.370297E-02	9.652131E-02
B2	AvHOURS	8.93405E-03	1.182593E-02	-1.502757E-02	3.289567E-02
B3	PRORATE	-0.5123753	0.1016508	-0.7183393	-0.3064112
B4	AVL	-6.641965E-02	0.1898299	-0.4510515	0.3182122
B5	Aratio	-0.1550902	0.1670553	-0.4935763	0.183396
B6	Sratio	-1.163263	1.09394	-3.379796	1.053269
B7	LimeSF	1.785298	0.2689447	1.240364	2.330232

R-Squared 0.577327
 Iterations 20

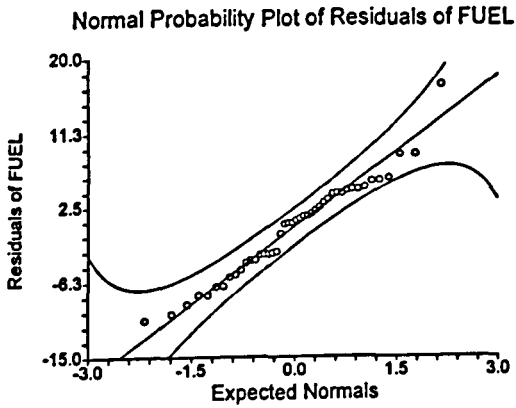
Model
 $AvNO^{(B1)} * AvHOURS^{(B2)} * PRORATE^{(B3)} * AVL^{(B4)} * Aratio^{(B5)} * Sratio^{(B6)} * LimeSF^{(B7)}$

Estimated Model
 $AvNO^{(5.511214E-02)} * AvHOURS^{(8.93405E-03)} * PRORATE^{(-0.5123753)} * AVL^{(-6.641965E-02)} * Aratio^{(-0.1550902)} * Sratio^{(-1.163263)} * LimeSF^{(1.785298)}$

Nonlinear Regression Report

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 Dependent FUEL

Plot Section



Nonlinear Regression Report

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 Database C:\My Documents\DATA\K6.S0
 Dependent EL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)	Prob Level
B1	AvNO	-0.1193172	3.452745E-02	-3.4557	0.001394
B2	AvHOURS	4.851277E-02	1.782855E-02	2.7211	0.009859
B3	PRORATE	-0.8777823	0.2690126	-3.2630	0.002375
B4	AVL	-0.6237986	0.2274484	-2.7426	0.009339
B5	Aratio	-0.4507635	0.3035514	-1.4850	0.146024
B6	Sratio	0.3744851	0.5153995	0.7266	0.472048
B7	LimeSF	2.210583	0.4008537	5.5147	0.000003

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	-0.1193172	3.452745E-02	-0.1892765	-4.935794E-02
B2	AvHOURS	4.851277E-02	1.782855E-02	0.0123887	8.463684E-02
B3	PRORATE	-0.8777823	0.2690126	-1.422854	-0.3327111
B4	AVL	-0.6237986	0.2274484	-1.084653	-0.1629444
B5	Aratio	-0.4507635	0.3035514	-1.065817	0.16429
B6	Sratio	0.3744851	0.5153995	-0.6698135	1.418784
B7	LimeSF	2.210583	0.4008537	1.398376	3.02279

R-Squared 0.639052
 Iterations 23

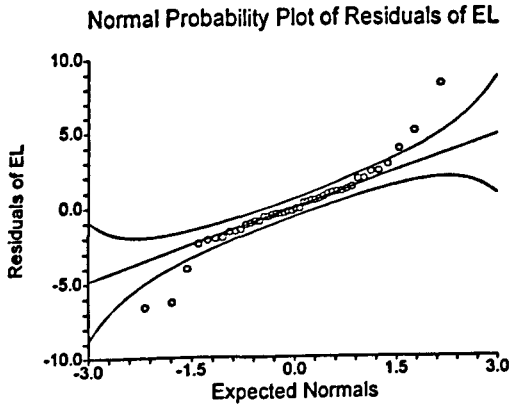
Model
 $AvNO^{(B1)} * AvHOURS^{(B2)} * PRORATE^{(B3)} * AVL^{(B4)} * Aratio^{(B5)} * Sratio^{(B6)} * LimeSF^{(B7)}$

Estimated Model
 $AvNO^{(-0.1193172)} * AvHOURS^{(4.851277E-02)} * PRORATE^{(-0.8777823)} * AVL^{(-0.6237986)} * Aratio^{(-0.4507635)} * Sratio^{(0.3744851)} * LimeSF^{(2.210583)}$

Nonlinear Regression Report

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 Dependent EL

Plot Section



Nonlinear Regression Report

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 Dependent FUEL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)	Prob Level
B1	AvNO	-3.932112E-03	1.724161E-02	-0.2281	0.820856
B2	AvHOURS	-3.311373E-03	8.64594E-03	-0.3830	0.703913
B3	PRORATE	-0.6115279	0.1328969	-4.6015	0.000048
B4	AVL	-0.4379416	0.1118083	-3.9169	0.000372
B5	Aratio	-0.1310681	0.152536	-0.8593	0.395730
B6	Sratio	0.3071666	0.2490379	1.2334	0.225200
B7	LimeSF	2.013965	0.199655	10.0872	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	-3.932112E-03	1.724161E-02	-3.886693E-02	3.100271E-02
B2	AvHOURS	-3.311373E-03	8.64594E-03	-2.082971E-02	1.420696E-02
B3	PRORATE	-0.6115279	0.1328969	-0.8808026	-0.3422531
B4	AVL	-0.4379416	0.1118083	-0.6644867	-0.2113965
B5	Aratio	-0.1310681	0.152536	-0.4401355	0.1779993
B6	Sratio	0.3071666	0.2490379	-0.1974321	0.8117653
B7	LimeSF	2.013965	0.199655	1.609426	2.418504

R-Squared 0.626226
 Iterations 38

Model
 $AvNO^{(B1)} * AvHOURS^{(B2)} * PRORATE^{(B3)} * AVL^{(B4)} * Aratio^{(B5)} * Sratio^{(B6)} * LimeSF^{(B7)}$

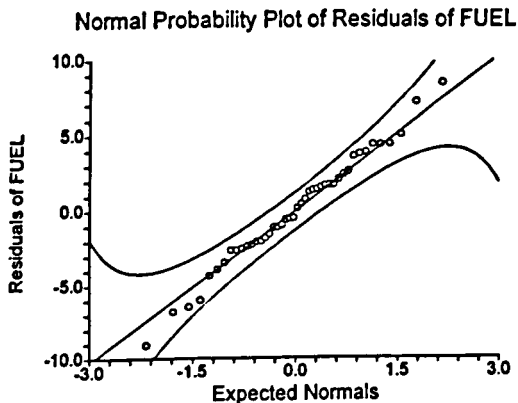
Estimated Model

AvNO^(-3.932112E-03) *AvHOURS^(-3.311373E-03) *PRORATE^(-0.6115279) *AVL^(-0.4379416) *Aratio^(-0.1310681) *Sratio^(0.3071666) *LimeSF^(2.013965)

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 Dependent FUEL

Plot Section



Final Runs of Multiplicative Models

Nonlinear Regression Report

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 Dependent EL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: B1=0)	Prob Level
B1	AvNO	6.982025E-02	2.313456E-02	3.0180	0.004361
B2	AvHOURS	4.398347E-02	9.296416E-03	4.7312	0.000027
B3	AVL	0.6735674	8.380882E-03	80.3695	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	6.982025E-02	2.313456E-02	2.309906E-02	0.1165414
B2	AvHOURS	4.398347E-02	9.296416E-03	2.520898E-02	6.275796E-02
B3	AVL	0.6735674	8.380882E-03	0.6566419	0.690493

R-Squared 0.304715
 Iterations 10

Model

AvNO^(B1) *AvHOURS^(B2) *AVL^(B3)

Estimated Model

AvNO^(6.982025E-02) *AvHOURS^(4.398347E-02) *AVL^(0.6735674)

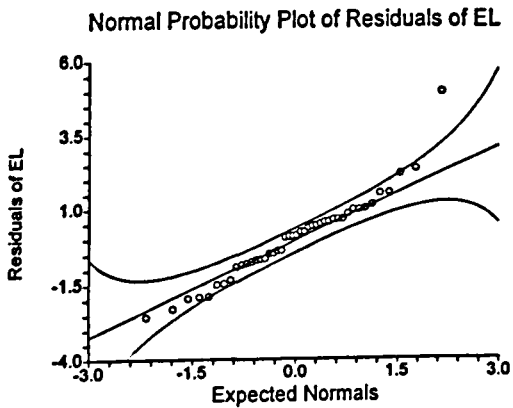
Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
Mean	1	18212.03	18212.03		
Model	3	18247.64	6082.547		
Model (Adjusted)	2	35.61045	17.80522	8.9843	0.000581
Error	41	81.25425	1.981811		
Total (Adjusted)	43	116.8647			
Total	44	18328.89			

Nonlinear Regression Report

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 Dependent EL

Plot Section



Nonlinear Regression Report

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 Dependent EL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)	Prob Level
B1	AvNO	0.07906	1.555391E-02	5.0830	0.000008
B2	AvHOURS	8.611979E-02	9.052542E-03	9.5133	0.000000
B3	PRORATE	0.614341	5.197566E-03	118.1978	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	0.07906	1.555391E-02	4.769256E-02	0.1104275
B2	AvHOURS	8.611979E-02	9.052542E-03	0.0678636	0.104376
B3	PRORATE	0.614341	5.197566E-03	0.6038591	0.6248229

R-Squared 0.553153

Iterations 10

Model

$AvNO^{(B1)} * AvHOURS^{(B2)} * PRORATE^{(B3)}$

Estimated Model

$AvNO^{(0.07906)} * AvHOURS^{(8.611979E-02)} * PRORATE^{(0.614341)}$

Analysis of Variance Table

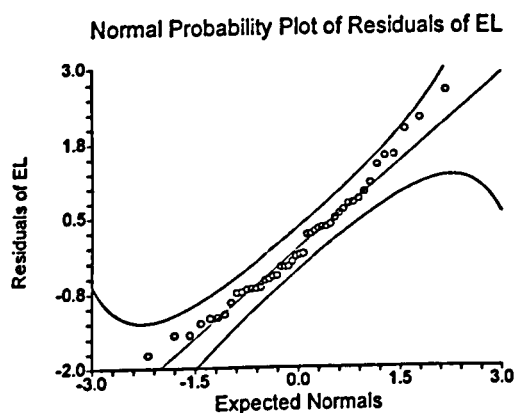
Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
Mean	1	17363.04	17363.04		
Model	3	17418.87	5806.29		
Model (Adjusted)	2	55.83154	27.91577	26.6149	0.000000
Error	43	45.10172	1.048877		

Total (Adjusted)	45	100.9333
Total	46	17463.97

Nonlinear Regression Report

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Plot Section



Nonlinear Regression Report

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 Dependent EL

Initial Specification Section

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: B1=0)	Prob Level
B1	AvHOURS	8.102614E-02	1.395312E-02	5.8070	0.000001
B2	PRORATE	-0.597735	0.1505626	-3.9700	0.000291
B3	LimeSF	1.144716	0.1073477	10.6636	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvHOURS	8.102614E-02	1.395312E-02	5.282583E-02	0.1092264
B2	PRORATE	-0.597735	0.1505626	-0.9020333	-0.2934368
B3	LimeSF	1.144716	0.1073477	0.9277577	1.361673

R-Squared 0.583113

Iterations 14

Model

$AvHOURS^{(B1)} * PRORATE^{(B2)} * LimeSF^{(B3)}$

Estimated Model

$AvHOURS^{(8.102614E-02)} * PRORATE^{(-0.597735)} * LimeSF^{(1.144716)}$

Analysis of Variance Table

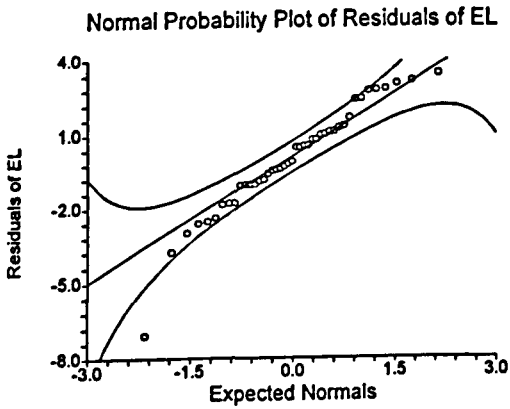
Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
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Mean	1	35989.21	35989.21		
Model	3	36253.24	12084.41		
Model (Adjusted)	2	264.028	132.014	27.9746	0.000000
Error	40	188.7627	4.719068		
Total (Adjusted)	42	452.7907			
Total	43	36442			

Nonlinear Regression Report

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Plot Section



Nonlinear Regression Report

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 Dependent FUEL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: B1=0)	Prob Level
B1	AvNO	2.441024E-02	1.340417E-02	1.8211	0.076271
B2	PRORATE	-0.3465203	8.255561E-02	-4.1974	0.000151
B3	Aratio	-4.770764E-02	2.096696E-02	-2.2754	0.028459
B4	LimeSF	1.254849	5.845435E-02	21.4672	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	2.441024E-02	1.340417E-02	-2.702251E-03	5.152273E-02
B2	PRORATE	-0.3465203	8.255561E-02	-0.5135048	-0.1795358
B3	Aratio	-4.770764E-02	2.096696E-02	-9.011733E-02	-5.297961E-03
B4	LimeSF	1.254849	5.845435E-02	1.136614	1.373084

R-Squared 0.471138
 Iterations 9

Model

$$\text{AvNO}^{(B1)} * \text{PRORATE}^{(B2)} * \text{Aratio}^{(B3)} * \text{LimeSF}^{(B4)}$$

Estimated Model

$$\text{AvNO}^{(2.441024E-02)} * \text{PRORATE}^{(-0.3465203)} * \text{Aratio}^{(-4.770764E-02)} * \text{LimeSF}^{(1.254849)}$$

Analysis of Variance Table

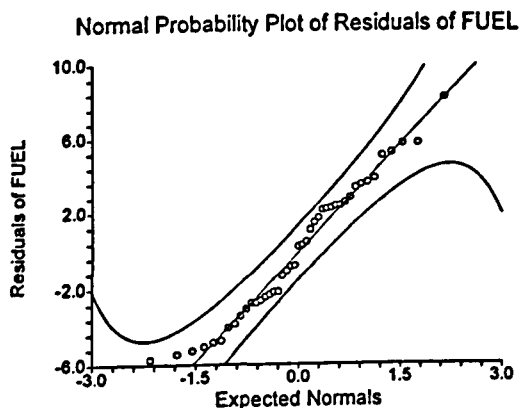
Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
Mean	1	375075.7	375075.7		

Model	4	375561.1	93890.28		
Model (Adjusted)	3	485.4032	161.8011	11.5811	0.000014
Error	39	544.8759	13.97118		
Total (Adjusted)	42	1030.279			
Total	43	376106			

Nonlinear Regression Report

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Plot Section



Nonlinear Regression Report

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 Dependent EL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)	Prob Level
B1	AvHOURS	4.663016E-02	8.567656E-03	5.4426	0.000003
B2	PRORATE	-0.4084042	7.811858E-02	-5.2280	0.000006
B3	AVL	-0.432225	0.1095786	-3.9444	0.000333
B4	Aratio	-0.4455258	0.1222534	-3.6443	0.000799
B5	Sratio	-2.1859	0.7725065	-2.8296	0.007404
B6	LimeSF	2.030025	0.1879485	10.8010	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvHOURS	4.663016E-02	8.567656E-03	2.928585E-02	6.397448E-02
B2	PRORATE	-0.4084042	7.811858E-02	-0.566547	-0.2502614
B3	AVL	-0.432225	0.1095786	-0.6540552	-0.2103947
B4	Aratio	-0.4455258	0.1222534	-0.6930149	-0.1980367
B5	Sratio	-2.1859	0.7725065	-3.749758	-0.6220426
B6	LimeSF	2.030025	0.1879485	1.649544	2.410507

R-Squared 0.800617
 Iterations 20

Model

$AvHOURS^{(B1)} * PRORATE^{(B2)} * AVL^{(B3)} * Aratio^{(B4)} * Sratio^{(B5)} * LimeSF^{(B6)}$

Estimated Model

$AvHOURS^{(4.663016E-02)} * PRORATE^{(-0.4084042)} * AVL^{(-0.432225)} * Aratio^{(-0.4455258)} * Sratio^{(-2.1859)} * LimeSF^{(2.030025)}$

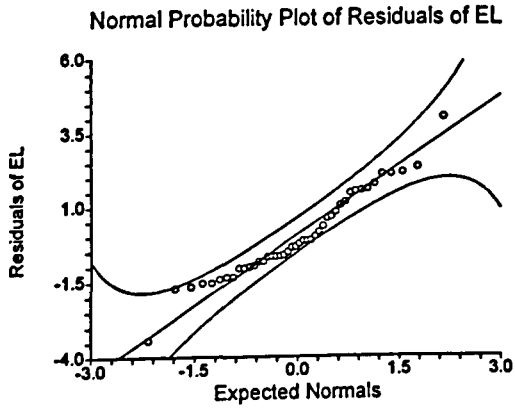
Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
Mean	1	49379	49379		
Model	6	49730.47	8288.412		
Model (Adjusted)	5	351.4708	70.29417	30.5176	0.000000
Error	38	87.52916	2.303399		
Total (Adjusted)	43	439			
Total	44	49818			

Nonlinear Regression Report

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 Dependent EL

Plot Section



Nonlinear Regression Report

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 Dependent FUEL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: B1=0)	Prob Level
B1	AvNO	6.208962E-02	1.644145E-02	3.7764	0.000506
B2	PRORATE	-0.5214719	9.629223E-02	-5.4155	0.000003
B3	LimeSF	1.484882	8.456159E-02	17.5598	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	6.208962E-02	1.644145E-02	2.888543E-02	0.0952938
B2	PRORATE	-0.5214719	9.629223E-02	-0.715938	-0.3270058
B3	LimeSF	1.484882	8.456159E-02	1.314107	1.655658

R-Squared 0.540164
 Iterations 10

Model

$$\text{AvNO}^{(B1)} * \text{PRORATE}^{(B2)} * \text{LimeSF}^{(B3)}$$

Estimated Model

$$\text{AvNO}^{(6.208962E-02)} * \text{PRORATE}^{(-0.5214719)} * \text{LimeSF}^{(1.484882)}$$

Analysis of Variance Table

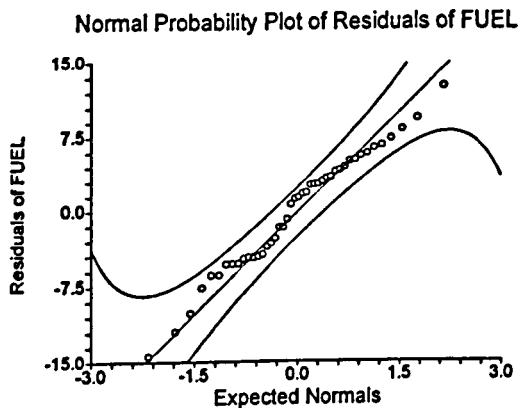
Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
Mean	1	422576	422576		
Model	3	424356.4	141452.1		
Model (Adjusted)	2	1780.379	890.1895	24.0811	0.000000

Error	41	1515.621	36.96637
Total (Adjusted)	43	3296	
Total	44	425872	

Nonlinear Regression Report

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Plot Section



Nonlinear Regression Report

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 Dependent EL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)	Prob Level
B1	AvNO	-0.1184801	3.422447E-02	-3.4619	0.001316
B2	AvHOURS	4.532456E-02	1.781149E-02	2.5447	0.015009
B3	PRORATE	-1.100501	0.225224	-4.8863	0.000018
B4	AVL	-0.6302096	0.2254807	-2.7950	0.008011
B5	LimeSF	2.467599	0.3485726	7.0792	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	AvNO	-0.1184801	3.422447E-02	-0.1877056	-4.925454E-02
B2	AvHOURS	4.532456E-02	1.781149E-02	9.297421E-03	0.0813517
B3	PRORATE	-1.100501	0.225224	-1.556059	-0.6449425
B4	AVL	-0.6302096	0.2254807	-1.086287	-0.1741319
B5	LimeSF	2.467599	0.3485726	1.762545	3.172654

R-Squared 0.616105
 Iterations 18

Model

$$AvNO^{(B1)} * AvHOURS^{(B2)} * PRORATE^{(B3)} * AVL^{(B4)} * LimeSF^{(B5)}$$

Estimated Model

$$AvNO^{(-0.1184801)} * AvHOURS^{(4.532456E-02)} * PRORATE^{(-1.100501)} * AVL^{(-0.6302096)} * LimeSF^{(2.467599)}$$

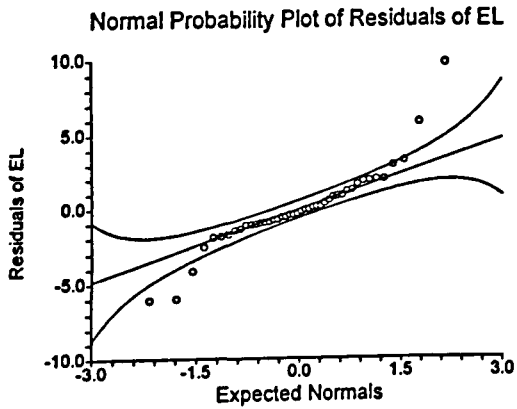
Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
Mean	1	36772.36	36772.36		
Model	5	37241.61	7448.322		
Model (Adjusted)	4	469.2483	117.3121	15.6476	0.000000
Error	39	292.388	7.497129		
Total (Adjusted)	43	761.6364			
Total	44	37534			

Nonlinear Regression Report

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 Dependent EL

Plot Section



Nonlinear Regression Report

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 Database E:\Hatem\DATA\K6.S0
 Dependent FUEL

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: B _i =0)	Prob Level
B1	PRORATE	-0.6590492	9.711163E-02	-6.7865	0.000000
B2	AVL	-0.4208373	8.868771E-02	-4.7452	0.000025
B3	LimeSF	2.089969	0.1313088	15.9164	0.000000

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.
B1	PRORATE	-0.6590492	9.711163E-02	-0.8551701	-0.4629282
B2	AVL	-0.4208373	8.868771E-02	-0.5999458	-0.2417289
B3	LimeSF	2.089969	0.1313088	1.824785	2.355153

R-Squared 0.603876

Iterations 15

Model

$PRORATE^{(B1)} * AVL^{(B2)} * LimeSF^{(B3)}$

Estimated Model

$PRORATE^{(-0.6590492)} * AVL^{(-0.4208373)} * LimeSF^{(2.089969)}$

Analysis of Variance Table

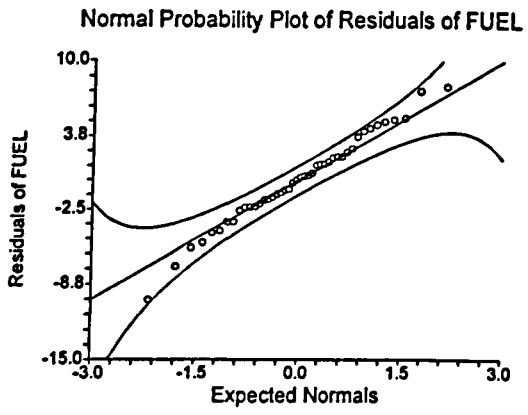
Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level
Mean	1	337575.4	337575.4		
Model	3	338525	112841.7		
Model (Adjusted)	2	949.678	474.839	31.2515	0.000000
Error	41	622.9583	15.19411		

Total (Adjusted)	43	1572.636
Total	44	339148

Nonlinear Regression Report

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Dependent FUEL

Plot Section



Appendix 12: Polynomial Regression with Interaction Terms for other Kilns

Response-Surface Regression Report for EL of K4

Response-Surface Regression Report

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 Database E:\CH7\Data\k4.S0
 Response EL

Sequential ANOVA Section

Source	df	Sequential Sum-Squares	Mean Square	F-Ratio	Prob Level	Incremental R-Squa
Regression	27	424.6832	15.72901	7.42	0.000097	0.93034
Linear	6	308.8189	51.46981	24.28	0.000001	0.67652
Quadratic	6	5.093343	0.8488905	0.40	0.867310	0.01115
Lin x Lin	15	110.771	7.384734	3.48	0.010525	0.24266
Total Error	15	31.79853	2.119902			0.06966

ANOVA Section

Factor	df	Last Sum-Squares	Mean Square	F-Ratio	Prob Level	Term R-Squa
AvNO	7	34.17651	4.882359	2.30	0.082924	0.07486
AvHOURS	7	177.3121	25.3303	11.95	0.000040	0.38843
PRORATE	7	35.35602	5.050859	2.38	0.074922	0.07745
AVL	7	72.67667	10.38238	4.90	0.004769	0.15921
Aratio	7	86.05094	12.29299	5.80	0.002138	0.18850
Sratio	7	48.37738	6.911054	3.26	0.025968	0.10597
Total Error	15	31.79853	2.119902			0.06966

Estimation Section

Parameter	df	Regression Coefficient	Standard Error	T-Ratio	Prob Level	Last R-Squa
Intercept	1	-2202.774				
AvNO	1	943.0732	612.7947	1.54	0.144638	0.01099
AvHOURS	1	15.48865	8.428785	1.84	0.086012	0.01568
PRORATE	1	-32.81001	25.19109	-1.30	0.212408	0.00787
AVL	1	37.26715	12.89402	2.89	0.011214	0.03879
Aratio	1	-343.6725	133.0329	-2.58	0.020775	0.03099
Sratio	1	821.0182	814.3071	1.01	0.329327	0.00472
AvNO^2	1	26.53497	83.93662	0.32	0.756259	0.00046
AvHOURS^2	1	-4.182069E-02	2.843941E-02	-1.47	0.162086	0.01004
PRORATE^2	1	0.1592641	0.1160112	1.37	0.189981	0.00875
AVL^2	1	-1.399782E-02	5.549745E-02	-0.25	0.804291	0.00029
Aratio^2	1	-8.006664	3.723753	-2.15	0.048260	0.02147
Sratio^2	1	64.08004	152.5627	0.42	0.680422	0.00081
AvNO*AvHOURS	1	-0.4004682	2.193353	-0.18	0.857570	0.00015
AvNO*PRORATE	1	-3.481627	5.082554	-0.69	0.503783	0.00217
AvNO*AVL	1	1.533286	4.614361	0.33	0.744272	0.00051
AvNO*Aratio	1	36.78454	20.63743	1.78	0.094928	0.01475
AvNO*Sratio	1	-430.9107	127.7416	-3.37	0.004181	0.05284
AvHOURS*PRORATE	1	-0.1501063	7.184462E-02	-2.09	0.054132	0.02027
AvHOURS*AVL	1	-4.886306E-02	4.856081E-02	-1.01	0.330265	0.00470
AvHOURS*Aratio	1	1.213537	0.4596637	2.64	0.018556	0.03236
AvHOURS*Sratio	1	-3.115589	2.899731	-1.07	0.299605	0.00536
PRORATE*AVL	1	-3.015663E-03	0.2010899	-0.01	0.988233	0.00000
PRORATE*Aratio	1	-0.9065633	1.148631	-0.79	0.442260	0.00289
PRORATE*Sratio	1	10.89091	6.614147	1.65	0.120424	0.01259
AVL*Aratio	1	1.693133	0.4970878	3.41	0.003909	0.05387
AVL*Sratio	1	-15.13243	4.427003	-3.42	0.003813	0.05426
Aratio*Sratio	1	88.76015	39.43472	2.25	0.039826	0.02352

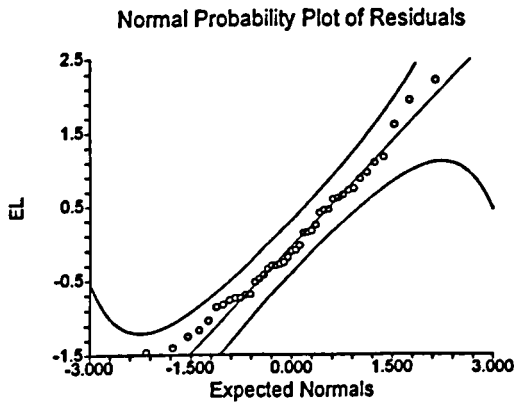
Model

-2202.774+ 943.0732*AvNO+ 15.48865*AvHOURS-32.81001*PRORATE+ 37.26715*AVL-
343.6725*Aratio+ 821.0182*Sratio+ 26.53497*AvNO^2-4.182069E-02*AvHOURS^2+
.1592641*PRORATE^2-1.399782E-02*AVL^2-8.006664*Aratio^2+ 64.08004*Sratio^2-
.4004682*AvNO*AvHOURS-3.481627*AvNO*PRORATE+ 1.533286*AvNO*AVL+
36.78454*AvNO*Aratio-430.9107*AvNO*Sratio-.1501063*AvHOURS*PRORATE-4.886306E-
02*AvHOURS*AVL+ 1.213537*AvHOURS*Aratio-3.115589*AvHOURS*Sratio-3.015663E-
03*PRORATE*AVL-.9065633*PRORATE*Aratio+ 10.89091*PRORATE*Sratio+
1.693133*AVL*Aratio-15.13243*AVL*Sratio+ 88.76015*Aratio*Sratio

Response-Surface Regression Report

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 Response EL

Plots Section



Response-Surface Regression Report for FUEL of K4

Response-Surface Regression Report

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 Database E:\CH7\Data\k4.S0
 Response FUEL

Sequential ANOVA Section

Source	df	Sequential Sum-Squares	Mean Square	F-Ratio	Prob Level	Increm R-Squa
Regression	27	904.7825	33.51046	3.14	0.011863	0.84955
Linear	6	571.6063	95.26771	8.92	0.000297	0.53671
Quadratic	6	135.7276	22.62127	2.12	0.111780	0.12744
Lin x Lin	15	197.4486	13.16324	1.23	0.345516	0.18539
Total Error	15	160.2284	10.68189			0.15044

ANOVA Section

Factor	df	Last Sum-Squares	Mean Square	F-Ratio	Prob Level	Term R-Squa
AvNO	7	121.8153	17.40219	1.63	0.202085	0.11437
AvHOURS	7	133.3406	19.04865	1.78	0.164209	0.12520
PRORATE	7	153.3575	21.90821	2.05	0.115055	0.14399
AVL	7	88.05019	12.5786	1.18	0.371356	0.08267
Aratio	7	168.243	24.03472	2.25	0.088780	0.15797
Sratio	7	84.20809	12.02973	1.13	0.397468	0.07906
Total Error	15	160.2284	10.68189			0.15044

Estimation Section

Parameter	df	Regression Coefficient	Standard Error	T-Ratio	Prob Level	Last R-Squa
Intercept	1	-2223.794				
AvNO	1	2619.935	1375.565	1.90	0.076187	0.03638
AvHOURS	1	21.33983	18.92044	1.13	0.277092	0.01275
PRORATE	1	94.84282	56.54745	1.68	0.114208	0.02821
AVL	1	59.18035	28.94374	2.04	0.058850	0.04193
Aratio	1	-502.2038	298.6244	-1.68	0.113318	0.02836
Sratio	1	-1443.526	1827.908	-0.79	0.442000	0.00625
AvNO^2	1	-160.9577	188.4159	-0.85	0.406394	0.00732
AvHOURS^2	1	0.1326756	6.383911E-02	2.08	0.055265	0.04332

PRORATE^2	1	-0.3335448	0.260415	-1.28	0.219707	0.01645
AVL^2	1	-0.1363124	0.1245774	-1.09	0.291128	0.01200
Aratio^2	1	-21.7219	8.358859	-2.60	0.020152	0.06773
Sratio^2	1	339.8348	342.4637	0.99	0.336779	0.00987
AvNO*AvHOURS	1	-9.137507	4.923509	-1.86	0.083223	0.03454
AvNO*PRORATE	1	-21.2224	11.40902	-1.86	0.082587	0.03470
AvNO*AVL	1	-11.67297	10.35804	-1.13	0.277471	0.01273
AvNO*Aratio	1	80.52467	46.32567	1.74	0.102649	0.03030
AvNO*Sratio	1	-395.2062	286.7468	-1.38	0.188341	0.01905
AvHOURS*PRORATE	1	0.3655464	0.1612725	2.27	0.038632	0.05153
AvHOURS*AVL	1	-0.1941723	0.1090064	-1.78	0.095119	0.03182
AvHOURS*Aratio	1	-0.4470543	1.031826	-0.43	0.670988	0.00188
AvHOURS*Sratio	1	-4.750415	6.509143	-0.73	0.476752	0.00534
PRORATE*AVL	1	-0.9659107	0.4513948	-2.14	0.049213	0.04592
PRORATE*Aratio	1	6.403206	2.578378	2.48	0.025320	0.06185
PRORATE*Sratio	1	3.097963	14.84704	0.21	0.837522	0.00043
AVL*Aratio	1	1.401634	1.115833	1.26	0.228281	0.01582
AVL*Sratio	1	-2.763742	9.937473	-0.28	0.784722	0.00077
Aratio*Sratio	1	96.44257	88.52072	1.09	0.293131	0.01190

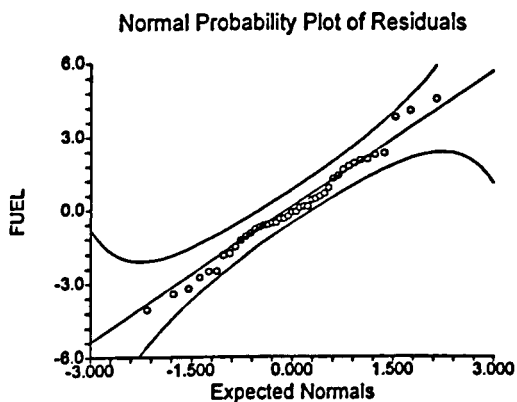
Model

-2223.794+ 2619.935*AvNO+ 21.33983*AvHOURS+ 94.84282*PRORATE+ 59.18035*AVL-
502.2038*Aratio-1443.526*Sratio-160.9577*AvNO^2+ .1326756*AvHOURS^2-
.3335448*PRORATE^2-.1363124*AVL^2-21.7219*Aratio^2+ 339.8348*Sratio^2-
9.137507*AvNO*AvHOURS-21.2224*AvNO*PRORATE-11.67297*AvNO*AVL+
80.52467*AvNO*Aratio-395.2062*AvNO*Sratio+ .3655464*AvHOURS*PRORATE-
.1941723*AvHOURS*AVL-.4470543*AvHOURS*Aratio-4.750415*AvHOURS*Sratio-
.9659107*PRORATE*AVL+ 6.403206*PRORATE*Aratio+ 3.097963*PRORATE*Sratio+
1.401634*AVL*Aratio-2.763742*AVL*Sratio+ 96.44257*Aratio*Sratio

Response-Surface Regression Report

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 Response FUEL

Plots Section



Response-Surface Regression Report for EL of K5

Response-Surface Regression Report

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 Response EL

Sequential ANOVA Section

Source	df	Sequential Sum-Squares	Mean Square	F-Ratio	Prob Level	Increm R-Squa
Regression	27	25526.27	945.4174	0.36	0.990670	0.37795
Linear	6	7937.106	1322.851	0.50	0.796570	0.11752
Quadratic	6	2768.626	461.4376	0.18	0.979590	0.04099
Lin x Lin	15	14820.54	988.0358	0.38	0.967295	0.21944
Total Error	16	42011.54	2625.721			0.62204

ANOVA Section

Factor	df	Last Sum-Squares	Mean Square	F-Ratio	Prob Level	Term R-Squa
AvNO	7	12977.94	1853.991	0.71	0.667574	0.19215
AvHOURS	7	7073.315	1010.474	0.38	0.897837	0.10473
PRORATE	7	4378.688	625.5269	0.24	0.969031	0.06483
AVL	7	3322.282	474.6118	0.18	0.985600	0.04919
Aratio	7	8657.861	1236.837	0.47	0.841531	0.12819
Sratio	7	3701.034	528.7192	0.20	0.980460	0.05479
Total Error	16	42011.54	2625.721			0.62204

Estimation Section

Parameter	df	Regression Coefficient	Standard Error	T-Ratio	Prob Level	Last R-Squa
Intercept	1	-54938.78				
AvNO	1	-15404.61	13347.17	-1.15	0.265388	0.05178
AvHOURS	1	-283.8473	523.2662	-0.54	0.594982	0.01144
PRORATE	1	-229.3756	532.4271	-0.43	0.672353	0.00721
AVL	1	-537.2712	515.9141	-1.04	0.313173	0.04216
Aratio	1	4881.889	20748.17	0.24	0.816967	0.00215
Sratio	1	70035.97	127373.7	0.55	0.590018	0.01175
AvNO^2	1	176.0034	301.4972	0.58	0.567518	0.01324
AvHOURS^2	1	-0.6803198	1.437985	-0.47	0.642527	0.00870

PRORATE^2	1	4.763393E-02	0.4432454	0.11	0.915755	0.00044
AVL^2	1	0.1598354	0.4320867	0.37	0.716296	0.00532
Aratio^2	1	-762.2698	1422.868	-0.54	0.599516	0.01115
Sratio^2	1	-18403.57	26549.48	-0.69	0.498136	0.01868
AvNO*AvHOURS	1	1.248267	27.31367	0.05	0.964114	0.00008
AvNO*PRORATE	1	-12.05168	17.30491	-0.70	0.496153	0.01885
AvNO*AVL	1	-7.215167	21.76361	-0.33	0.744551	0.00427
AvNO*Aratio	1	1816.359	1351.19	1.34	0.197613	0.07025
AvNO*Sratio	1	5520.157	5200.764	1.06	0.304262	0.04380
AvHOURS*PRORATE	1	0.7153124	1.269283	0.56	0.580869	0.01234
AvHOURS*AVL	1	-0.7055495	1.252423	-0.56	0.581008	0.01233
AvHOURS*Aratio	1	81.47862	72.0164	1.13	0.274564	0.04976
AvHOURS*Sratio	1	73.68005	184.9802	0.40	0.695664	0.00616
PRORATE*AVL	1	-0.6172012	0.8278787	-0.75	0.466769	0.02160
PRORATE*Aratio	1	44.35056	59.69677	0.74	0.468292	0.02145
PRORATE*Sratio	1	86.54126	185.9619	0.47	0.647937	0.00842
AVL*Aratio	1	29.804	38.28637	0.78	0.447664	0.02355
AVL*Sratio	1	204.9194	196.2124	1.04	0.311835	0.04240
Aratio*Sratio	1	-3664.207	8106.77	-0.45	0.657341	0.00794

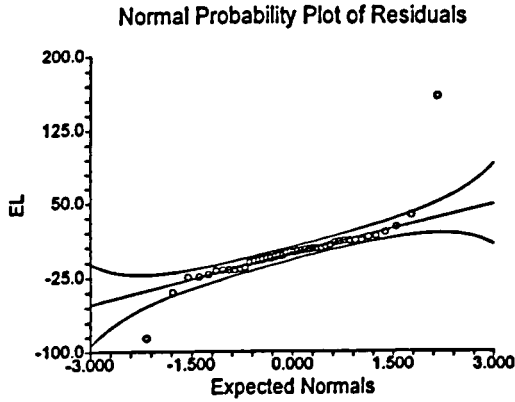
Model

-54938.78-15404.61*AvNO-283.8473*AvHOURS-229.3756*PRORATE-537.2712*AVL+
4881.889*Aratio+ 70035.97*Sratio+ 176.0034*AvNO^2-.6803198*AvHOURS^2+ 4.763393E-
02*PRORATE^2+ .1598354*AVL^2-762.2698*Aratio^2-18403.57*Sratio^2+
1.248267*AvNO*AvHOURS-12.05168*AvNO*PRORATE-7.215167*AvNO*AVL+
1816.359*AvNO*Aratio+ 5520.157*AvNO*Sratio+ .7153124*AvHOURS*PRORATE-
.7055495*AvHOURS*AVL+ 81.47862*AvHOURS*Aratio+ 73.68005*AvHOURS*Sratio-
.6172012*PRORATE*AVL+ 44.35056*PRORATE*Aratio+ 86.54126*PRORATE*Sratio+
29.804*AVL*Aratio+ 204.9194*AVL*Sratio-3664.207*Aratio*Sratio

Response-Surface Regression Report

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 Response EL

Plots Section



Response-Surface Regression Report for FUEL of K5

Response-Surface Regression Report

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 Database E:\CH7\Data\k5.S0
 Response FUEL

Sequential ANOVA Section

Source	df	Sequential Sum-Squares	Mean Square	F-Ratio	Prob Level	Incremental R-Square
Regression	27	2277.966	84.3691	1.36	0.262165	0.69690
Linear	6	853.6842	142.2807	2.30	0.086047	0.26116
Quadratic	6	137.3996	22.89994	0.37	0.887490	0.04203
Lin x Lin	15	1286.882	85.79213	1.39	0.262225	0.39369
Total Error	16	990.7397	61.92123			0.30309

ANOVA Section

Factor	df	Last Sum-Squares	Mean Square	F-Ratio	Prob Level	Term R-Square
AvNO	7	847.0427	121.0061	1.95	0.126523	0.25913
AvHOURS	7	455.7996	65.11423	1.05	0.435838	0.13944
PRORATE	7	881.2336	125.8905	2.03	0.113665	0.26959
AVL	7	855.8998	122.2714	1.97	0.123051	0.26184
Aratio	7	774.0744	110.5821	1.79	0.159338	0.23681
Sratio	7	712.5596	101.7942	1.64	0.193818	0.21799
Total Error	16	990.7397	61.92123			0.30309

Estimation Section

Parameter	df	Regression Coefficient	Standard Error	T-Ratio	Prob Level	Last R-Square
Intercept	1	23306.15				
AvNO	1	950.5981	2049.674	0.46	0.649052	0.00407
AvHOURS	1	129.4414	80.35597	1.61	0.126761	0.04915
PRORATE	1	29.93794	81.76279	0.37	0.719045	0.00254
AVL	1	157.0492	79.22695	1.98	0.064894	0.07443
Aratio	1	-7045.4	3186.217	-2.21	0.041924	0.09262
Sratio	1	-21114.97	19560.29	-1.08	0.296378	0.02207
AvNO^2	1	-10.32766	46.29977	-0.22	0.826311	0.00094
AvHOURS^2	1	0.2167589	0.2208258	0.98	0.340916	0.01825

PRORATE^2	1	-1.569202E-02	6.806749E-02	-0.23	0.820597	0.00100
AVL^2	1	-0.1747818	6.635389E-02	-2.63	0.018045	0.13143
Aratio^2	1	472.5143	218.5043	2.16	0.046070	0.08858
Sratio^2	1	4393.055	4077.102	1.08	0.297237	0.02199
AvNO*AvHOURS	1	3.979668	4.194456	0.95	0.356838	0.01705
AvNO*PRORATE	1	3.187607	2.657449	1.20	0.247796	0.02725
AvNO*AVL	1	0.1266962	3.342155	0.04	0.970230	0.00002
AvNO*Aratio	1	-303.2546	207.497	-1.46	0.163243	0.04046
AvNO*Sratio	1	-286.1519	798.6613	-0.36	0.724810	0.00243
AvHOURS*PRORATE	1	-0.3945559	0.1949189	-2.02	0.059977	0.07762
AvHOURS*AVL	1	0.3194822	0.1923299	1.66	0.116156	0.05227
AvHOURS*Aratio	1	-28.68677	11.05928	-2.59	0.019582	0.12746
AvHOURS*Sratio	1	-37.96671	28.4067	-1.34	0.200069	0.03384
PRORATE*AVL	1	0.2126654	0.1271341	1.67	0.113810	0.05300
PRORATE*Aratio	1	-17.67701	9.167404	-1.93	0.071763	0.07043
PRORATE*Sratio	1	-8.108575	28.55745	-0.28	0.780099	0.00152
AVL*Aratio	1	-8.636652	5.87949	-1.47	0.161234	0.04087
AVL*Sratio	1	-51.71198	30.13159	-1.72	0.105419	0.05579
Aratio*Sratio	1	3103.545	1244.925	2.49	0.024012	0.11773

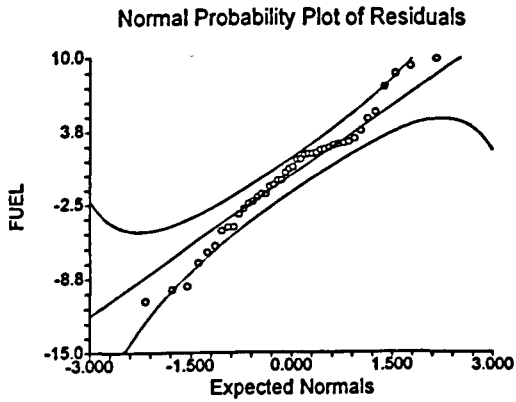
Model

23306.15+ 950.5981*AvNO+ 129.4414*AvHOURS+ 29.93794*PRORATE+ 157.0492*AVL-
7045.4*Aratio-21114.97*Sratio-10.32766*AvNO^2+ .2167589*AvHOURS^2-1.569202E-
02*PRORATE^2-.1747818*AVL^2+ 472.5143*Aratio^2+ 4393.055*Sratio^2+
3.979668*AvNO*AvHOURS+ 3.187607*AvNO*PRORATE+ .1266962*AvNO*AVL-
303.2546*AvNO*Aratio-286.1519*AvNO*Sratio-.3945559*AvHOURS*PRORATE+
.3194822*AvHOURS*AVL-28.68677*AvHOURS*Aratio-37.96671*AvHOURS*Sratio+
.2126654*PRORATE*AVL-17.67701*PRORATE*Aratio-8.108575*PRORATE*Sratio-
8.636652*AVL*Aratio-51.71198*AVL*Sratio+ 3103.545*Aratio*Sratio

Response-Surface Regression Report

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 Database E:\CH7\Data\k5.S0
 Response FUEL

Plots Section



Response-Surface Regression Report for EL of K6

Response-Surface Regression Report

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 Database E:\CH7\Data\k6.S0
 Response EL

Sequential ANOVA Section

Source	df	Sequential Sum-Squares	Mean Square	F-Ratio	Prob Level	Incremental R-Square
Regression	27	738.6767	27.3584	8.77	0.000020	0.93670
Linear	6	536.4764	89.41273	28.66	0.000000	0.68029
Quadratic	6	143.7748	23.96247	7.68	0.000521	0.18231
Lin x Lin	15	58.42552	3.895035	1.25	0.331628	0.07408
Total Error	16	49.91249	3.11953			0.06329

ANOVA Section

Factor	df	Last Sum-Squares	Mean Square	F-Ratio	Prob Level	Term R-Square
AvNO	7	22.32566	3.189381	1.02	0.452859	0.02831
AvHOURS	7	126.4972	18.07103	5.79	0.001772	0.16040
PRORATE	7	47.31022	6.758604	2.17	0.094960	0.05999
AVL	7	90.24296	12.89185	4.13	0.008916	0.11443
Aratio	7	12.12648	1.732354	0.56	0.780748	0.01537
Sratio	7	9.956443	1.422349	0.46	0.851925	0.01262
Total Error	16	49.91249	3.11953			0.06329

Estimation Section

Parameter	df	Regression Coefficient	Standard Error	T-Ratio	Prob Level	Last R-Square
Intercept	1	2108.426				
AvNO	1	-210.1779	253.3069	-0.83	0.418896	0.00272
AvHOURS	1	-10.12671	6.857143	-1.48	0.159137	0.00862
PRORATE	1	-18.5175	7.998412	-2.32	0.034210	0.02120
AVL	1	-9.957789	6.605163	-1.51	0.151153	0.00899
Aratio	1	174.3739	379.3478	0.46	0.651939	0.00083
Sratio	1	-527.6801	712.271	-0.74	0.469523	0.00217
AvNO^2	1	48.67654	26.05777	1.87	0.080184	0.01380
AvHOURS^2	1	0.1144793	3.043968E-02	3.76	0.001708	0.05595

PRORATE^2	1	2.670294E-02	0.0118	2.26	0.037901	0.02025
AVL^2	1	1.717338E-02	1.103871E-02	1.56	0.139326	0.00957
Aratio^2	1	-5.703529	73.36155	-0.08	0.938994	0.00002
Sratio^2	1	66.87022	112.7494	0.59	0.561413	0.00139
AvNO*AvHOURS	1	-0.1667829	0.8408193	-0.20	0.845264	0.00015
AvNO*PRORATE	1	0.8719192	0.713142	1.22	0.239169	0.00591
AvNO*AVL	1	1.027456	0.8536326	1.20	0.246240	0.00573
AvNO*Aratio	1	36.3926	35.20787	1.03	0.316672	0.00422
AvNO*Sratio	1	-33.73803	81.93288	-0.41	0.685967	0.00067
AvHOURS*PRORATE	1	4.61115E-03	2.182314E-02	0.21	0.835324	0.00017
AvHOURS*AVL	1	6.634694E-02	2.895381E-02	2.29	0.035841	0.02077
AvHOURS*Aratio	1	0.7858013	1.037897	0.76	0.459989	0.00226
AvHOURS*Sratio	1	0.2906102	1.363027	0.21	0.833857	0.00018
PRORATE*AVL	1	0.04151	1.701918E-02	2.44	0.026754	0.02353
PRORATE*Aratio	1	0.4829712	0.9654965	0.50	0.623723	0.00099
PRORATE*Sratio	1	3.051886	2.170997	1.41	0.178919	0.00781
AVL*Aratio	1	0.1655733	1.074237	0.15	0.879434	0.00009
AVL*Sratio	1	0.3907412	2.09223	0.19	0.854198	0.00013
Aratio*Sratio	1	-101.1285	127.4642	-0.79	0.439160	0.00249

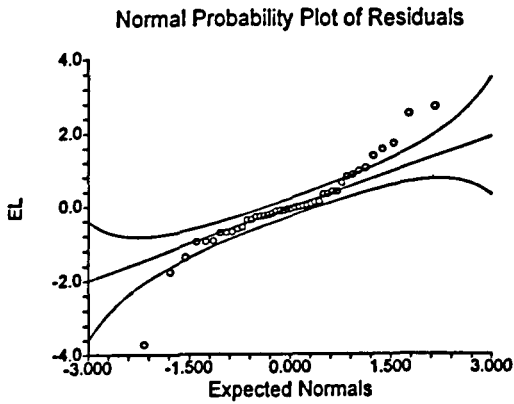
Model

2108.426-210.1779*AvNO-10.12671*AvHOURS-18.5175*PRORATE-9.957789*AVL+
 174.3739*Aratio-527.6801*Sratio+ 48.67654*AvNO^2+ .1144793*AvHOURS^2+ 2.670294E-
 02*PRORATE^2+ 1.717338E-02*AVL^2-5.703529*Aratio^2+ 66.87022*Sratio^2-
 .1667829*AvNO*AvHOURS+ .8719192*AvNO*PRORATE+ 1.027456*AvNO*AVL+
 36.3926*AvNO*Aratio-33.73803*AvNO*Sratio+ 4.61115E-03*AvHOURS*PRORATE+
 6.634694E-02*AvHOURS*AVL+ .7858013*AvHOURS*Aratio+ .2906102*AvHOURS*Sratio+
 .04151*PRORATE*AVL+ .4829712*PRORATE*Aratio+ 3.051886*PRORATE*Sratio+
 .1655733*AVL*Aratio+ .3907412*AVL*Sratio-101.1285*Aratio*Sratio

Response-Surface Regression Report

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 Response EL

Plots Section



Response-Surface Regression Report for FUEL of K6

Response-Surface Regression Report

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 Response FUEL

Sequential ANOVA Section

Source	df	Sequential Sum-Squares	Mean Square	F-Ratio	Prob Level	Incremental R-Square
Regression	27	1421.321	52.64153	6.99	0.000091	0.92184
Linear	6	1031.046	171.841	22.82	0.000001	0.66871
Quadratic	6	71.66521	11.9442	1.59	0.214929	0.04648
Lin x Lin	15	318.61	21.24067	2.82	0.023770	0.20664
Total Error	16	120.5025	7.531405			0.07815

ANOVA Section

Factor	df	Last Sum-Squares	Mean Square	F-Ratio	Prob Level	Term R-Square
AvNO	7	98.40946	14.05849	1.87	0.142602	0.06382
AvHOURS	7	139.5533	19.93619	2.65	0.050649	0.09051
PRORATE	7	251.8804	35.98291	4.78	0.004591	0.16336
AVL	7	322.759	46.10843	6.12	0.001330	0.20933
Aratio	7	200.2239	28.60341	3.80	0.012842	0.12986
Sratio	7	60.42941	8.632773	1.15	0.384198	0.03919
Total Error	16	120.5025	7.531405			0.07815

Estimation Section

Parameter	df	Regression Coefficient	Standard Error	T-Ratio	Prob Level	Last R-Square
Intercept	1	5061.524				
AvNO	1	-660.5926	393.5867	-1.68	0.112692	0.01376
AvHOURS	1	-19.08915	10.65459	-1.79	0.092123	0.01568
PRORATE	1	-42.68261	12.42788	-3.43	0.003404	0.05761
AVL	1	-27.17948	10.26306	-2.65	0.017531	0.03425
Aratio	1	798.4591	589.4283	1.35	0.194356	0.00896
Sratio	1	-1474.256	1106.722	-1.33	0.201494	0.00866
AvNO^2	1	37.09405	40.4884	0.92	0.373183	0.00410
AvHOURS^2	1	0.1028953	4.729699E-02	2.18	0.044926	0.02311

PRORATE^2	1	5.065521E-02	1.833477E-02	2.76	0.013864	0.03728
AVL^2	1	3.689226E-02	1.715188E-02	2.15	0.047109	0.02259
Aratio^2	1	-227.3792	113.9887	-1.99	0.063393	0.01943
Sratio^2	1	122.3217	175.1893	0.70	0.495060	0.00238
AvNO*AvHOURS	1	-1.122099	1.30646	-0.86	0.403088	0.00360
AvNO*PRORATE	1	0.7143236	1.108076	0.64	0.528288	0.00203
AvNO*AVL	1	1.443004	1.326369	1.09	0.292741	0.00578
AvNO*Aratio	1	147.1409	54.70578	2.69	0.016109	0.03533
AvNO*Sratio	1	73.39966	127.3068	0.58	0.572261	0.00162
AvHOURS*PRORATE	1	-9.144343E-03	3.390866E-02	-0.27	0.790857	0.00035
AvHOURS*AVL	1	0.1207906	4.498826E-02	2.68	0.016266	0.03521
AvHOURS*Aratio	1	2.902847	1.612677	1.80	0.090740	0.01582
AvHOURS*Sratio	1	1.148339	2.117863	0.54	0.595142	0.00143
PRORATE*AVL	1	6.199981E-02	0.0264443	2.34	0.032282	0.02685
PRORATE*Aratio	1	2.372974	1.500183	1.58	0.133261	0.01222
PRORATE*Sratio	1	8.639091	3.373281	2.56	0.020931	0.03203
AVL*Aratio	1	2.728571	1.669143	1.63	0.121627	0.01305
AVL*Sratio	1	3.015254	3.250894	0.93	0.367440	0.00420
Aratio*Sratio	1	-246.5596	198.0531	-1.24	0.231088	0.00757

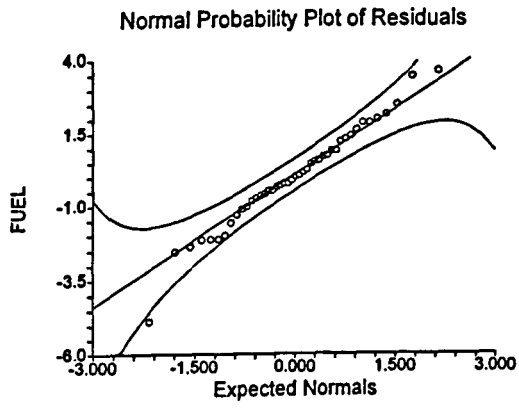
Model

5061.524-660.5926*AvNO-19.08915*AvHOURS-42.68261*PRORATE-27.17948*AVL+
798.4591*Aratio-1474.256*Sratio+ 37.09405*AvNO^2+ .1028953*AvHOURS^2+ 5.065521E-
02*PRORATE^2+ 3.689226E-02*AVL^2-227.3792*Aratio^2+ 122.3217*Sratio^2-
1.122099*AvNO*AvHOURS+ .7143236*AvNO*PRORATE+ 1.443004*AvNO*AVL+
147.1409*AvNO*Aratio+ 73.39966*AvNO*Sratio-9.144343E-03*AvHOURS*PRORATE+
.1207906*AvHOURS*AVL+ 2.902847*AvHOURS*Aratio+ 1.148339*AvHOURS*Sratio+
6.199981E-02*PRORATE*AVL+ 2.372974*PRORATE*Aratio+ 8.639091*PRORATE*Sratio+
2.728571*AVL*Aratio+ 3.015254*AVL*Sratio-246.5596*Aratio*Sratio

Response-Surface Regression Report

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Response FUEL

Plots Section



Appendix 13: Quadratic and Linear Models with Four Variables for other Kilns

A) Quadratic Models with Four Variables

Nonlinear Regression Report

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 Database E:\Hatem\DATA\K4.S0
 Dependent EL

Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	-46.27842	129.7297	-309.6438	217.0869
B	-15.17287	14.77861	-45.17505	14.8293
C	0.4540867	0.3042944	-0.1636638	1.071837
D	2.282687	3.839384	-5.511677	10.07705
E	1.137616	2.629253	-4.200051	6.475282
F	38.93983	25.2649	-12.35065	90.23031
G	7.113259E-03	1.949993E-02	-3.247371E-02	4.670022E-02
H	-5.803699E-02	7.445683E-02	-0.2091924	9.311841E-02
I	-5.974612E-03	1.454034E-02	-3.549308E-02	2.354385E-02

Model EL =
 $A + B \cdot AVNO + C \cdot AVHOURS + D \cdot PRORATE + E \cdot AVL + F \cdot AVNO^2 + G \cdot AVHOURS^2 + H \cdot PRORATE^2 + I \cdot AVL^2$
 R-Squared 0.700341
 Iterations 11
 Estimated Model
 $(-46.27842) + (-15.17287) \cdot (AVNO) + (0.4540867) \cdot (AVHOURS) + (2.282687) \cdot (PRORATE) + (1.137616) \cdot (AVL) + (38.93983) \cdot (AVNO)^2 + (7.113259E-03) \cdot (AVHOURS)^2 + (-5.803699E-02) \cdot (PRORATE)^2 + (-5.974612E-03) \cdot (AVL)^2$

Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square
Mean	1	37062.02	37062.02
Model	9	37390.46	4154.496
Model (Adjusted)	8	328.4439	41.05549
Error	35	140.5334	4.015239
Total (Adjusted)	43	468.9773	
Total	44	37531	

Nonlinear Regression Report

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 Dependent FUEL

Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	20.23838	266.2288	-520.2348	560.7116
B	21.02734	30.32838	-40.54254	82.59722
C	-0.4026444	0.624467	-1.67038	0.865091
D	-14.43289	7.879109	-30.42834	1.562547
E	6.094311	5.395701	-4.859543	17.04817
F	-25.57089	51.84814	-130.8282	79.68642
G	1.357699E-02	4.001738E-02	-6.766261E-02	9.481658E-02
H	0.2508575	0.1527988	-5.934062E-02	0.5610557

I -3.359178E-02 2.983941E-02 -0.094169 2.698543E-02

Model FUEL =
 A+B*AVNO+C*AVHOURS+D*PRORATE+E*AVL+F*AVNO^2+G*AVHOURS^2+H*PRORATE^2+I*AVL^2
 R-Squared 0.440981
 Iterations 11
 Estimated Model
 (20.23838)+(21.02734)*(AVNO)+(-.4026444)*(AVHOURS)+(-14.43289)*(PRORATE)+(6.094311)*(AVL)+(-
 25.57089)*(AVNO)^2+(1.357699E-02)*(AVHOURS)^2+(.2508575)*(PRORATE)^2+(-3.359178E-02)*(AVL)^2

Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square
Mean	1	382791.3	382791.3
Model	9	383258.2	42584.24
Model (Adjusted)	8	466.8789	58.35986
Error	35	591.8484	16.90995
Total (Adjusted)	43	1058.727	
Total	44	383850	

Nonlinear Regression Report

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 Dependent EL

Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	-2.278244	88.70548	-182.36	177.8035
B	-0.5797629	5.936154	-12.6308	11.47127
C	0.3193076	0.4104741	-0.5139992	1.152614
D	0.2025297	0.9578454	-1.742	2.147059
E	1.05235	1.862584	-2.728896	4.833596
F	2.040956	4.979707	-8.068387	12.1503
G	1.40277E-03	3.233354E-02	-0.0642378	6.704334E-02
H	-4.067565E-03	8.587351E-03	-2.150081E-02	1.336568E-02
I	-7.176426E-03	1.049222E-02	-2.847677E-02	1.412392E-02

Model EL =
 A+B*AVNO+C*AVHOURS+D*PRORATE+E*AVL+F*AVNO^2+G*AVHOURS^2+H*PRORATE^2+I*AVL^2
 R-Squared 0.707052
 Iterations 10
 Estimated Model
 (-2.278244)+(-
 .5797629)*(AVNO)+(0.3193076)*(AVHOURS)+(0.2025297)*(PRORATE)+(1.05235)*(AVL)+(2.040956)*(AVNO)^2+(
 277E-03)*(AVHOURS)^2+(-4.067565E-03)*(PRORATE)^2+(-7.176426E-03)*(AVL)^2

Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square
Mean	1	49379	49379
Model	9	49689.39	5521.044
Model (Adjusted)	8	310.3957	38.79946
Error	35	128.6043	3.674408
Total (Adjusted)	43	439	
Total	44	49818	

Nonlinear Regression Report

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 Dependent FUEL

Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	183.4438	237.3914	-298.4863	665.374
B	15.66885	15.88619	-16.58182	47.91952
C	-0.4492985	1.0985	-2.679373	1.780776
D	-12.34315	2.563362	-17.54705	-7.139244
E	6.812568	4.9846	-3.306709	16.93184
F	-8.377396	13.32657	-35.43177	18.67697
G	9.157371E-02	8.653019E-02	-8.409192E-02	0.2672394
H	0.103116	2.298125E-02	5.646158E-02	0.1497704
I	-4.146066E-02	2.807902E-02	-9.846411E-02	1.554279E-02

Model FUEL =
 $A+B*AVNO+C*AVHOURS+D*PRORATE+E*AVL+F*AVNO^2+G*AVHOURS^2+H*PRORATE^2+I*AVL^2$
 R-Squared 0.720554
 Iterations 10

Estimated Model
 $(183.4438)+(15.66885)*(AVNO)+(-.4492985)*(AVHOURS)+(-12.34315)*(PRORATE)+(6.812568)*(AVL)+(-8.377396)*(AVNO)^2+(9.157371E-02)*(AVHOURS)^2+(.103116)*(PRORATE)^2+(-4.146066E-02)*(AVL)^2$

Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square
Mean	1	422576	422576
Model	9	424950.9	47216.77
Model (Adjusted)	8	2374.947	296.8684
Error	35	921.0526	26.31579
Total (Adjusted)	43	3296	
Total	44	425872	

Nonlinear Regression Report

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 Dependent EL

Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	253.6892	98.64854	53.62068	453.7577
B	-7.165046	11.59047	-30.6716	16.34151
C	-1.373337	0.3000213	-1.981808	-0.7648655
D	-3.674182	1.46988	-6.655236	-0.6931273
E	0.3153645	0.9300712	-1.570907	2.201636
F	4.386411	16.16499	-28.3977	37.17052
G	0.1095243	1.788336E-02	7.325512E-02	0.1457934
H	1.525757E-02	6.61388E-03	1.843999E-03	2.867114E-02
I	-3.598767E-03	5.38823E-03	-0.0145266	7.32907E-03

Model EL =
 $A+B*AVNO+C*AVHOURS+D*PRORATE+E*AVL+F*AVNO^2+G*AVHOURS^2+H*PRORATE^2+I*AVL^2$
 R-Squared 0.826737
 Iterations 10

Estimated Model

$$(253.6892)+(-7.165046)*(AVNO)+(-1.373337)*(AVHOURS)+(-3.674182)*(PRORATE)+(.3153645)*(AVL)+(4.386411)*(AVNO)^2+(.1095243)*(AVHOURS)^2+(1.525757E-02)*(PRORATE)^2+(-3.598767E-03)*(AVL)^2$$

Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square
Mean	1	37903.02	37903.02
Model	9	38553.64	4283.738
Model (Adjusted)	8	650.6238	81.32797
Error	36	136.354	3.787611
Total (Adjusted)	44	786.9778	
Total	45	38690	

Nonlinear Regression Report

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 Dependent FUEL

Model Estimation Section

Parameter Name	Parameter Estimate	Asymptotic Standard Error	Lower 95% C.L.	Upper 95% C.L.
A	647.4175	187.0357	268.0914	1026.744
B	12.49744	21.9753	-32.07054	57.06542
C	-0.2508456	0.5688346	-1.404496	0.9028044
D	-6.086556	2.786864	-11.73858	-0.4345343
E	-3.942066	1.763397	-7.518401	-0.3657312
F	-21.03104	30.6485	-83.18908	41.127
G	1.626884E-02	3.390651E-02	-5.249676E-02	8.503444E-02
H	2.461071E-02	1.253979E-02	-8.211643E-04	5.004258E-02
I	0.0205289	1.021598E-02	-1.900699E-04	4.124787E-02

Model FUEL =
 $A+B*AVNO+C*AVHOURS+D*PRORATE+E*AVL+F*AVNO^2+G*AVHOURS^2+H*PRORATE^2+I*AVL^2$
 R-Squared 0.690800
 Iterations 10
 Estimated Model
 $(647.4175)+(12.49744)*(AVNO)+(-.2508456)*(AVHOURS)+(-6.086556)*(PRORATE)+(-3.942066)*(AVL)+(-21.03104)*(AVNO)^2+(1.626884E-02)*(AVHOURS)^2+(2.461071E-02)*(PRORATE)^2+(.0205289)*(AVL)^2$

Analysis of Variance Table

Source	DF	Sum of Squares	Mean Square
Mean	1	344618.8	344618.8
Model	9	345713.8	38412.65
Model (Adjusted)	8	1095.087	136.8859
Error	36	490.1575	13.61549
Total (Adjusted)	44	1585.244	
Total	45	346204	

B) Linear Models with Four Variables

Multiple Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	38.70381	10.25832	3.7729	0.000536	Reject Ho	0.957149
AvNO	6.390174	3.698973	1.7276	0.091981	Accept Ho	0.391814
AvHOURS	0.5384284	8.083641E-02	6.6607	0.000000	Reject Ho	0.999997
PRORATE	-0.7211595	0.1640495	-4.3960	0.000082	Reject Ho	0.989976
AVL	5.453775E-02	9.304859E-02	0.5861	0.561171	Accept Ho	0.088219
R-Squared	0.672695					

Model

38.70381+ 6.390174*AvNO+ .5384284*AvHOURS-.7211595*PRORATE+ 5.453775E-02*AVL

Multiple Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	120.767	21.42768	5.6360	0.000002	Reject Ho	0.999794
AvNO	9.987237	7.726451	1.2926	0.203754	Accept Ho	0.242892
AvHOURS	-0.2390319	0.1688519	-1.4156	0.164820	Accept Ho	0.281679
PRORATE	-1.544284	0.3426682	-4.5066	0.000059	Reject Ho	0.992517
AVL	0.1192536	0.1943608	0.6136	0.543063	Accept Ho	0.091952
R-Squared	0.367416					

Model

120.767+ 9.987237*AvNO-.2390319*AvHOURS-1.544284*PRORATE+ .1192536*AVL

Multiple Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	65.50809	7.065725	9.2712	0.000000	Reject Ho	1.000000
AvNO	1.852652	1.675634	1.1056	0.275655	Accept Ho	0.190237
AvHOURS	0.3555826	8.325098E-02	4.2712	0.000121	Reject Ho	0.986235
PRORATE	-0.2380254	5.775321E-02	-4.1214	0.000190	Reject Ho	0.980205
AVL	-0.2266939	6.131594E-02	-3.6971	0.000669	Reject Ho	0.949984
R-Squared	0.700189					

Model

65.50809+ 1.852652*AvNO+ .3555826*AvHOURS-.2380254*PRORATE-.2266939*AVL

Multiple Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	168.3733	24.92384	6.7555	0.000000	Reject Ho	0.999998
AvNO	12.10725	5.910678	2.0484	0.047297	Reject Ho	0.515132
AvHOURS	0.1380734	0.2936619	0.4702	0.640846	Accept Ho	0.074433
PRORATE	-0.8266422	0.2037203	-4.0577	0.000230	Reject Ho	0.977031

AVL -0.3063281 0.2162876 -1.4163 0.164626 Accept Ho 0.281898
R-Squared 0.503132

Model
168.3733+ 12.10725*AvNO+ .1380734*AvHOURS-.8266422*PRORATE-.3063281*AVL

Multiple Regression Report

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Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	73.75043	11.87232	6.2120	0.000000	Reject Ho	0.999979
AvNO	-10.0027	3.673549	-2.7229	0.009542	Reject Ho	0.757118
AvHOURS	0.417057	9.524225E-02	4.3789	0.000084	Reject Ho	0.989601
PRORATE	-0.2481208	6.610345E-02	-3.7535	0.000554	Reject Ho	0.955623
AVL	-0.1714019	7.626729E-02	-2.2474	0.030199	Reject Ho	0.592233
R-Squared	0.617841					

Model
73.75043-10.0027*AvNO+ .417057*AvHOURS-.2481208*PRORATE-.1714019*AVL

Multiple Regression Report

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Database E:\Hatem\DATA\K6.S0
Dependent FUEL

Regression Equation Section

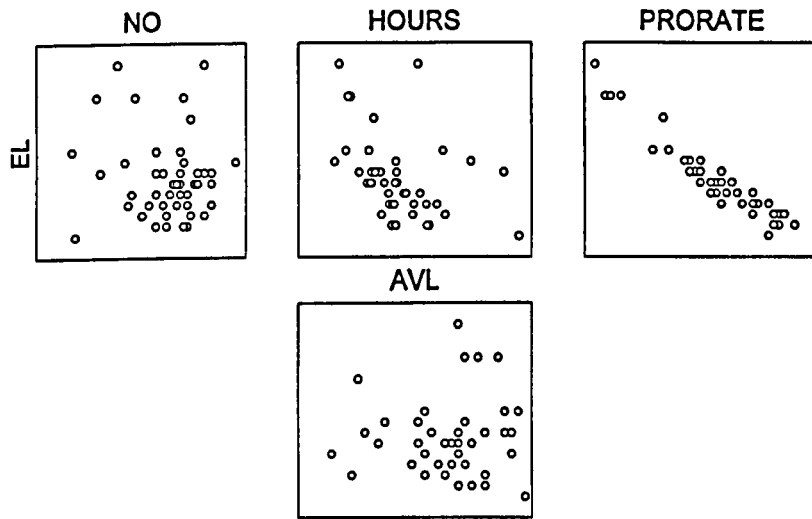
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	194.3126	16.49035	11.7834	0.000000	Reject Ho	1.000000
AvNO	-4.600764	5.102466	-0.9017	0.372627	Accept Ho	0.142370
AvHOURS	-4.512198E-02	0.1322891	-0.3411	0.734824	Accept Ho	0.062795
PRORATE	-0.6230913	9.181601E-02	-6.7863	0.000000	Reject Ho	0.999998
AVL	-0.3723566	0.1059333	-3.5150	0.001109	Reject Ho	0.929147
R-Squared	0.633985					

Model
194.3126-4.600764*AvNO-4.512198E-02*AvHOURS-.6230913*PRORATE-.3723566*AVL

Appendix 14: Screening of Mills Data

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 Database E:\Data\Rm4.S0

Plot Section



Correlation Report

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 Database E:\Data\Rm4.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.097361 0.524610	-0.459154 0.001511	-0.957280 0.000000	0.044168 0.773279
NO	-0.097361 0.524610	1.000000 0.000000	-0.577019 0.000033	0.122662 0.422132	-0.402372 0.006142
HOURS	-0.459154 0.001511	-0.577019 0.000033	1.000000 0.000000	0.492470 0.000589	0.213447 0.159179
PRORATE	-0.957280 0.000000	0.122662 0.422132	0.492470 0.000589	1.000000 0.000000	-0.113726 0.456968
AVL	0.044168 0.773279	-0.402372 0.006142	0.213447 0.159179	-0.113726 0.456968	1.000000 0.000000

Data Screening Report

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 Database E:\Data\Rm4.S0

Normality Tests Section

Variable	----- Skewness Test -----			----- Kurtosis Test -----			- Omnibus Test -		V N
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	1.16	3.07	0.0021	3.95	1.57	0.1157	11.91	0.0026	N

Multivariate Outlier Section For EL

Row	T2 Value	T2 Prob	Outlier?
1	0.01	0.9044	
2	0.16	0.6935	
3	0.43	0.5156	
4	1.38	0.2471	
5	1.38	0.2471	
6	0.84	0.3656	
7	0.84	0.3656	
8	2.05	0.1593	
9	0.84	0.3656	
10	1.38	0.2471	
11	0.43	0.5156	
12	0.14	0.7061	
13	0.01	0.9044	
14	0.01	0.9044	
15	0.16	0.6935	
16	0.43	0.5156	
17	0.16	0.6935	
18	0.01	0.9044	
19	0.02	0.8909	
20	0.16	0.6935	
21	0.01	0.9044	
22	7.33	0.0096	Yes
23	3.73	0.0598	
24	3.73	0.0598	
25	7.33	0.0096	Yes
26	3.73	0.0598	
27	0.41	0.5266	
28	0.02	0.8909	
29	0.43	0.5156	
30	0.43	0.5156	
31	1.38	0.2471	
32	0.14	0.7061	
33	0.41	0.5266	
34	2.00	0.1643	
35	0.41	0.5266	
36	0.01	0.9044	
37	0.02	0.8909	
38	0.01	0.9044	
39	0.14	0.7061	
40	0.02	0.8909	
41	0.02	0.8909	
42	0.43	0.5156	
43	0.16	0.6935	
44	0.84	0.3656	

Data Screening Report

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Database E:\Data\Rm4.S0

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
45	0.02	0.8909	

Data Screening Report

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Database E:\Data\Rm4.S0

Multivariate Outlier Section For NO

Row	T2 Value	T2 Prob	Outlier?
1	3.45	0.0700	
2	0.10	0.7490	
3	0.26	0.6099	
4	0.10	0.7490	
5	0.29	0.5908	
6	0.00	0.9729	
7	1.04	0.3126	
8	6.40	0.0151	Yes
9	0.50	0.4840	
10	0.20	0.6580	
11	0.29	0.5908	
12	3.55	0.0660	
13	0.12	0.7282	
14	1.04	0.3126	
15	0.99	0.3258	
16	1.47	0.2315	
17	0.12	0.7282	
18	1.47	0.2315	
19	0.54	0.4671	
20	0.29	0.5908	
21	0.10	0.7490	
22	1.04	0.3126	
23	3.82	0.0572	
24	0.81	0.3742	
25	1.90	0.1753	
26	0.20	0.6580	
27	0.10	0.7490	
28	0.02	0.8753	
29	0.02	0.8971	
30	1.19	0.2818	
31	0.00	0.9729	
32	0.20	0.6580	
33	0.12	0.7282	
34	0.41	0.5270	
35	6.89	0.0119	Yes
36	0.69	0.4113	
37	0.12	0.7282	
38	0.02	0.8971	
39	1.41	0.2421	
40	0.06	0.8009	
41	0.69	0.4113	
42	0.06	0.8009	

43	0.00	0.9510
44	0.41	0.5270
45	1.47	0.2315

Data Screening Report

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 Database E:\Data\Rm4.S0

Multivariate Outlier Section For HOURS

Row	T2 Value	T2 Prob	Outlier?
1	7.22	0.0101	Yes
2	0.02	0.8777	
3	0.99	0.3264	
4	0.63	0.4307	
5	0.56	0.4596	
6	1.44	0.2368	
7	0.15	0.7047	
8	9.50	0.0035	Yes
9	1.46	0.2330	
10	0.02	0.8809	
11	0.53	0.4714	
12	2.56	0.1169	
13	0.96	0.3332	
14	0.00	0.9743	
15	0.31	0.5791	
16	0.05	0.8272	
17	0.06	0.8119	
18	0.19	0.6646	
19	0.11	0.7370	
20	0.05	0.8195	
21	0.45	0.5045	
22	2.16	0.1483	
23	1.55	0.2199	
24	1.41	0.2422	
25	0.27	0.6060	
26	1.57	0.2163	
27	1.73	0.1958	
28	0.00	0.9821	
29	0.02	0.8964	
30	0.17	0.6830	
31	0.00	0.9587	
32	0.00	0.9587	
33	0.54	0.4680	
34	0.36	0.5490	
35	1.30	0.2603	
36	0.20	0.6576	
37	0.60	0.4445	
38	0.33	0.5686	
39	3.42	0.0711	
40	0.43	0.5170	
41	0.01	0.9431	
42	0.01	0.9275	
43	0.04	0.8392	
44	0.17	0.6861	
45	0.47	0.4983	

Data Screening Report

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Database

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Multivariate Outlier Section For PRORATE

Row	T2 Value	T2 Prob	Outlier?
1	0.03	0.8666	
2	0.58	0.4503	
3	0.03	0.8666	
4	2.41	0.1278	
5	1.58	0.2159	
6	1.58	0.2159	
7	1.34	0.2536	
8	1.12	0.2958	
9	1.83	0.1825	
10	2.41	0.1278	
11	1.12	0.2958	
12	0.18	0.6739	
13	0.18	0.6739	
14	0.11	0.7468	
15	0.00	0.9443	
16	0.32	0.5755	
17	0.00	0.9774	
18	0.18	0.6739	
19	0.00	0.9443	
20	0.07	0.7901	
21	0.11	0.7468	
22	4.85	0.0330	Yes
23	4.02	0.0512	
24	3.63	0.0633	
25	4.85	0.0330	Yes
26	2.92	0.0947	
27	1.24	0.2708	
28	0.00	0.9774	
29	0.32	0.5755	
30	0.74	0.3942	
31	1.34	0.2536	
32	0.27	0.6040	
33	0.67	0.4173	
34	0.84	0.3638	
35	1.24	0.2708	
36	0.05	0.8222	
37	0.05	0.8222	
38	0.18	0.6739	
39	0.05	0.8222	
40	0.13	0.7157	
41	0.03	0.8666	
42	0.58	0.4503	
43	0.22	0.6440	
44	0.58	0.4503	
45	0.03	0.8666	

Data Screening Report

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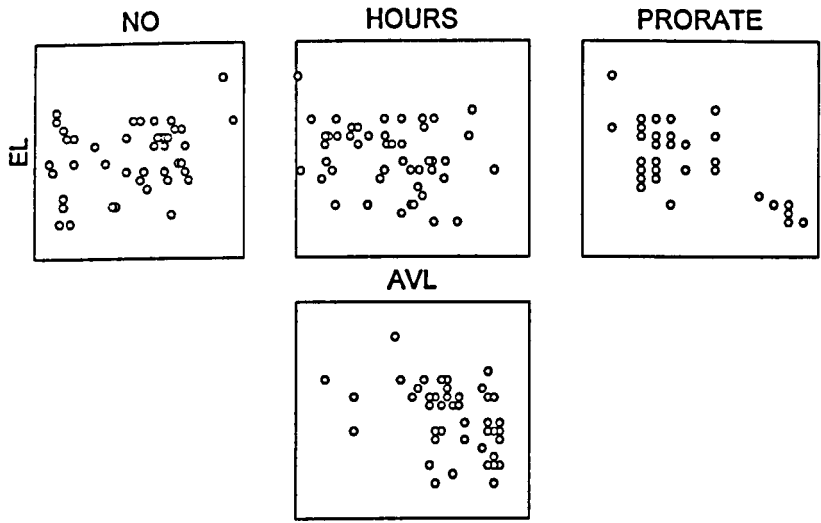
Multivariate Outlier Section For AVL

Row	T2 Value	T2 Prob	Outlier?
-----	-------------	------------	----------

1	1.79	0.1876	
2	6.61	0.0136	Yes
3	0.11	0.7467	
4	0.58	0.4516	
5	0.03	0.8578	
6	0.01	0.9134	
7	0.30	0.5893	
8	2.65	0.1106	
9	0.58	0.4516	
10	0.22	0.6408	
11	0.00	0.9719	
12	0.11	0.7467	
13	0.03	0.8578	
14	1.43	0.2389	
15	1.79	0.1876	
16	0.69	0.4091	
17	0.03	0.8578	
18	0.58	0.4516	
19	0.47	0.4947	
20	0.30	0.5893	
21	1.43	0.2389	
22	0.03	0.8578	
23	0.11	0.7467	
24	0.38	0.5420	
25	0.03	0.8578	
26	1.10	0.2999	
27	2.20	0.1451	
28	0.22	0.6408	
29	0.06	0.8005	
30	0.06	0.8005	
31	0.58	0.4516	
32	2.00	0.1648	
33	0.30	0.5893	
34	3.97	0.0526	
35	1.43	0.2389	
36	3.41	0.0715	
37	0.00	0.9719	
38	0.16	0.6918	
39	0.47	0.4947	
40	0.01	0.9134	
41	0.03	0.8578	
42	0.69	0.4091	
43	0.03	0.8578	
44	4.57	0.0382	Yes
45	2.43	0.1265	

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 Database E:\Data\Cm4.S0

Plot Section



Correlation Report

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 Database E:\Data\Cm4.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	0.324617 0.024381	-0.239314 0.101377	-0.652720 0.000000	-0.430373 0.002264
NO	0.324617 0.024381	1.000000 0.000000	-0.637440 0.000001	-0.475141 0.000644	-0.482498 0.000515
HOURS	-0.239314 0.101377	-0.637440 0.000001	1.000000 0.000000	0.286950 0.047991	0.595551 0.000008
PRORATE	-0.652720 0.000000	-0.475141 0.000644	0.286950 0.047991	1.000000 0.000000	0.256731 0.078162
AVL	-0.430373 0.002264	-0.482498 0.000515	0.595551 0.000008	0.256731 0.078162	1.000000 0.000000

Data Screening Report

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 Database E:\Data\Cm4.S0

Normality Tests Section

Variable	----- Skewness Test -----			----- Kurtosis Test -----			- Omnibus Test -		V
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	-0.19	-0.60	0.5497	2.58	-0.39	0.6973	0.51	0.7752	Y

Multivariate Outlier Section For EL

Row	T2 Value	T2 Prob	Outlier?
1	0.37	0.5433	
2	1.96	0.1683	
3	0.37	0.5433	
4	0.76	0.3862	

5	1.29	0.2613
6	0.76	0.3862
7	0.37	0.5433
8	0.12	0.7280
9	0.03	0.8619
10	0.37	0.5433
11	0.37	0.5433
12	0.37	0.5433
13	0.19	0.6639
14	0.19	0.6639
15	0.03	0.8619
16	0.93	0.3409
17	0.03	0.8619
18	0.49	0.4876
19	0.19	0.6639
20	0.49	0.4876
21	0.49	0.4876
22	0.19	0.6639
23	0.19	0.6639
24	2.21	0.1437
25	0.19	0.6639
26	0.03	0.8619
27	1.29	0.2613
28	1.29	0.2613
29	6.00	0.0181
30	1.29	0.2613
31	0.03	0.8619
32	2.21	0.1437
33	2.21	0.1437
34	0.12	0.7280
35	2.21	0.1437
36	4.05	0.0500
37	4.05	0.0500
38	1.50	0.2269
39	3.06	0.0868
40	0.37	0.5433
41	0.12	0.7280
42	1.29	0.2613
43	0.19	0.6639
44	1.29	0.2613

Yes

Data Screening Report

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Multivariate Outlier Section For NO

Row	T2 Value	T2 Prob	Outlier?
1	1.55	0.2200	
2	2.09	0.1546	
3	1.23	0.2739	
4	1.72	0.1962	
5	2.09	0.1546	
6	0.75	0.3922	
7	0.35	0.5568	
8	0.44	0.5126	
9	0.87	0.3563	
10	0.27	0.6029	
11	0.44	0.5126	
12	0.01	0.9304	

13	2.29	0.1365
14	1.14	0.2912
15	0.25	0.6226
16	0.10	0.7504
17	1.00	0.3227
18	0.03	0.8548
19	0.01	0.9304
20	1.29	0.2620
21	0.53	0.4704
22	0.44	0.5126
23	0.06	0.8021
24	0.09	0.7718
25	2.29	0.1365
26	1.23	0.2739
27	0.03	0.8548
28	4.08	0.0492
29	3.29	0.0759
30	0.21	0.6506
31	2.51	0.1202
32	1.72	0.1962
33	1.72	0.1962
34	0.49	0.4878
35	0.13	0.7208
36	1.90	0.1744
37	1.38	0.2459
38	1.72	0.1962
39	0.63	0.4302
40	0.53	0.4704
41	1.14	0.2912
42	0.00	0.9618
43	0.44	0.5126
44	0.63	0.4302
45	1.00	0.3227
46	0.21	0.6506
47	0.27	0.6029
48	0.44	0.5126

Yes

Data Screening Report

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 Database E:\Data\Cm4.S0

Multivariate Outlier Section For HOURS

Row	T2 Value	T2 Prob	Outlier?
1	2.47	0.1230	
2	2.69	0.1077	
3	2.49	0.1212	
4	0.47	0.4982	
5	0.78	0.3815	
6	0.57	0.4548	
7	1.48	0.2297	
8	1.68	0.2019	
9	1.60	0.2127	
10	1.10	0.3004	
11	1.66	0.2046	
12	0.18	0.6752	
13	4.33	0.0430	Yes
14	0.18	0.6764	
15	1.23	0.2738	

16	0.32	0.5736
17	0.73	0.3983
18	1.18	0.2838
19	0.71	0.4025
20	0.04	0.8501
21	1.84	0.1816
22	1.32	0.2570
23	3.17	0.0814
24	0.18	0.6708
25	0.35	0.5581
26	0.61	0.4376
27	0.01	0.9168
28	2.45	0.1244
29	3.37	0.0729
30	1.13	0.2934
31	0.07	0.7917
32	1.18	0.2831
33	0.19	0.6640
34	0.00	0.9534
35	0.23	0.6322
36	1.81	0.1845
37	0.78	0.3815
38	0.42	0.5178
39	0.06	0.8155
40	0.01	0.9290
41	0.40	0.5317
42	0.42	0.5178
43	0.01	0.9168
44	0.06	0.8155
45	0.41	0.5267
46	0.00	0.9608
47	0.62	0.4366
48	0.06	0.8095

Data Screening Report

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 Database E:\Data\Cm4.S0

Multivariate Outlier Section For PRORATE

Row	T2 Value	T2 Prob	Outlier?
1	0.63	0.4321	
2	0.63	0.4321	
3	0.01	0.9377	
4	0.43	0.5129	
5	0.43	0.5129	
6	0.43	0.5129	
7	0.43	0.5129	
8	0.14	0.7138	
9	0.14	0.7138	
10	0.43	0.5129	
11	0.14	0.7138	
12	0.43	0.5129	
13	0.04	0.8332	
14	0.14	0.7138	
15	0.43	0.5129	
16	0.43	0.5129	
17	0.43	0.5129	
18	0.43	0.5129	

19	0.43	0.5129	
20	0.14	0.7138	
21	0.43	0.5129	
22	0.43	0.5129	
23	0.43	0.5129	
24	0.01	0.9377	
25	0.43	0.5129	
26	0.43	0.5129	
27	0.14	0.7138	
28	0.14	0.7138	
29	1.54	0.2211	
30	0.43	0.5129	
31	0.63	0.4321	
32	5.04	0.0296	Yes
33	3.82	0.0567	
34	0.04	0.8332	
35	3.82	0.0567	
36	5.04	0.0296	Yes
37	6.42	0.0146	Yes
38	2.77	0.1029	
39	5.04	0.0296	Yes
40	0.01	0.9377	
41	0.01	0.9377	
42	0.43	0.5129	
43	0.63	0.4321	
44	0.01	0.9377	
45	1.54	0.2211	
46	0.14	0.7138	
47	0.43	0.5129	
48	0.01	0.9377	

Data Screening Report

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 Database E:\Data\Cm4.S0

Multivariate Outlier Section For AVL

Row	T2 Value	T2 Prob	Outlier?
1	0.70	0.4062	
2	0.70	0.4062	
3	0.95	0.3336	
4	0.49	0.4877	
5	0.02	0.8948	
6	0.02	0.8948	
7	0.17	0.6834	
8	0.00	0.9954	
9	0.08	0.7782	
10	5.54	0.0229	Yes
11	0.02	0.8857	
12	0.02	0.8948	
13	1.24	0.2702	
14	1.24	0.2702	
15	1.24	0.2702	
16	0.49	0.4877	
17	1.24	0.2702	
18	1.24	0.2702	
19	0.95	0.3336	
20	0.08	0.7782	
21	0.17	0.6834	

22	5.54	0.0229	Yes
23	0.07	0.7871	
24	1.24	0.2702	
25	0.70	0.4062	
26	0.70	0.4062	
27	9.28	0.0038	Yes
28	1.54	0.2201	
29	1.91	0.1736	
30	1.54	0.2201	
31	0.70	0.4062	
32	0.95	0.3336	
33	0.30	0.5855	
34	0.02	0.8857	
35	0.70	0.4062	
36	0.95	0.3336	
37	0.17	0.6834	
38	0.95	0.3336	
39	0.00	0.9954	
40	0.93	0.3393	
41	0.07	0.7871	
42	0.47	0.4949	
43	0.17	0.6834	
44	0.07	0.7871	
45	0.68	0.4126	
46	0.07	0.7871	
47	0.30	0.5855	
48	0.30	0.5855	

Data Screening Report

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 Database E:\Data\Cm4.S0

Multivariate Outlier Section

Row	T2 Value	T2 Prob	Outlier?
45	0.76	0.3862	
46	0.12	0.7280	
47	0.37	0.5433	
48	0.12	0.7280	

Correlation Report

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 Database E:\Data\Cm4.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	0.324617 0.024381	-0.239314 0.101377	-0.652720 0.000000	-0.430373 0.002264
NO	0.324617 0.024381	1.000000 0.000000	-0.637440 0.000001	-0.475141 0.000644	-0.482498 0.000515
HOURS	-0.239314 0.101377	-0.637440 0.000001	1.000000 0.000000	0.286950 0.047991	0.595551 0.000008
PRORATE	-0.652720 0.000000	-0.475141 0.000644	0.286950 0.047991	1.000000 0.000000	0.256731 0.078162
AVL	-0.430373 0.002264	-0.482498 0.000515	0.595551 0.000008	0.256731 0.078162	1.000000 0.000000

Correlation Report

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 Database E:\Data\Cm5.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.315311 0.034875	0.172945 0.255918	-0.751329 0.000000	0.065829 0.667461
NO	-0.315311 0.034875	1.000000 0.000000	-0.480373 0.000839	0.026139 0.864662	-0.594690 0.000016
HOURS	0.172945 0.255918	-0.480373 0.000839	1.000000 0.000000	0.149019 0.328575	0.089998 0.556578
PRORATE	-0.751329 0.000000	0.026139 0.864662	0.149019 0.328575	1.000000 0.000000	0.047018 0.759070

AVL	0.065829	-0.594690	0.089998	0.047018	1.000000
	0.667461	0.000016	0.556578	0.759070	0.000000

Correlation Report

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 Database E:\Data\Cm6.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.159398 0.301362	0.302331 0.046080	-0.884784 0.000000	0.168210 0.275072
NO	-0.159398 0.301362	1.000000 0.000000	-0.773979 0.000000	0.089185 0.564815	-0.643119 0.000003
HOURS	0.302331 0.046080	-0.773979 0.000000	1.000000 0.000000	-0.095856 0.535942	0.476058 0.001089
PRORATE	-0.884784 0.000000	0.089185 0.564815	-0.095856 0.535942	1.000000 0.000000	-0.076769 0.620389
AVL	0.168210 0.275072	-0.643119 0.000003	0.476058 0.001089	-0.076769 0.620389	1.000000 0.000000

Correlation Report

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 Database E:\Data\Cm7.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.213575 0.158923	0.376855 0.010719	-0.714032 0.000000	-0.382836 0.009443
NO	-0.213575 0.158923	1.000000 0.000000	-0.824325 0.000000	-0.214457 0.157169	-0.259944 0.084623
HOURS	0.376855 0.010719	-0.824325 0.000000	1.000000 0.000000	0.203549 0.179884	0.011836 0.938493
PRORATE	-0.714032 0.000000	-0.214457 0.157169	0.203549 0.179884	1.000000 0.000000	0.124060 0.416823
AVL	-0.382836 0.009443	-0.259944 0.084623	0.011836 0.938493	0.124060 0.416823	1.000000 0.000000

Correlation Report

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 Database E:\Data\R-cm2.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.675975 0.000016	0.720641 0.000002	-0.320576 0.068926	0.384521 0.027143

NO	-0.675975 0.000016	1.000000 0.000000	-0.824925 0.000000	-0.150831 0.402111	-0.455676 0.007701
HOURS	0.720641 0.000002	-0.824925 0.000000	1.000000 0.000000	0.064839 0.719979	0.430148 0.012469
PRORATE	-0.320576 0.068926	-0.150831 0.402111	0.064839 0.719979	1.000000 0.000000	-0.001818 0.991987
AVL	0.384521 0.027143	-0.455676 0.007701	0.430148 0.012469	-0.001818 0.991987	1.000000 0.000000

Correlation Report

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Database E:\Data\R-cm3.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.688978 0.000003	0.810277 0.000000	-0.344114 0.039874	0.506687 0.001614
NO	-0.688978 0.000003	1.000000 0.000000	-0.834379 0.000000	0.141582 0.410126	-0.458344 0.004935
HOURS	0.810277 0.000000	-0.834379 0.000000	1.000000 0.000000	-0.208416 0.222536	0.465588 0.004216
PRORATE	-0.344114 0.039874	0.141582 0.410126	-0.208416 0.222536	1.000000 0.000000	-0.055700 0.746957
AVL	0.506687 0.001614	-0.458344 0.004935	0.465588 0.004216	-0.055700 0.746957	1.000000 0.000000

Correlation Report

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Database E:\Data\R-cm4.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.628324 0.000041	0.621093 0.000053	0.244342 0.150950	0.258564 0.127843
NO	-0.628324 0.000041	1.000000 0.000000	-0.529388 0.000900	-0.485686 0.002675	-0.260555 0.124831
HOURS	0.621093 0.000053	-0.529388 0.000900	1.000000 0.000000	0.334798 0.045943	0.201331 0.239013
PRORATE	0.244342 0.150950	-0.485686 0.002675	0.334798 0.045943	1.000000 0.000000	0.205594 0.229003
AVL	0.258564 0.127843	-0.260555 0.124831	0.201331 0.239013	0.205594 0.229003	1.000000 0.000000

Correlation Report

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Database E:\Data\Rm4.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.097361 0.524610	-0.459154 0.001511	-0.957280 0.000000	0.044168 0.773279
NO	-0.097361 0.524610	1.000000 0.000000	-0.577019 0.000033	0.122662 0.422132	-0.402372 0.006142
HOURS	-0.459154 0.001511	-0.577019 0.000033	1.000000 0.000000	0.492470 0.000589	0.213447 0.159179
PRORATE	-0.957280 0.000000	0.122662 0.422132	0.492470 0.000589	1.000000 0.000000	-0.113726 0.456968
AVL	0.044168 0.773279	-0.402372 0.006142	0.213447 0.159179	-0.113726 0.456968	1.000000 0.000000

Correlation Report

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Database E:\Data\Rm5.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	0.216944 0.152298	0.100522 0.511172	-0.494211 0.000560	0.092537 0.545452
NO	0.216944 0.152298	1.000000 0.000000	-0.202207 0.182832	0.262090 0.081995	-0.142635 0.349947
HOURS	0.100522 0.511172	-0.202207 0.182832	1.000000 0.000000	0.111378 0.466375	0.102610 0.502392
PRORATE	-0.494211 0.000560	0.262090 0.081995	0.111378 0.466375	1.000000 0.000000	-0.085713 0.575596
AVL	0.092537 0.545452	-0.142635 0.349947	0.102610 0.502392	-0.085713 0.575596	1.000000 0.000000

Correlation Report

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Database E:\Data\Rm6.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.628324 0.000041	0.621093 0.000053	0.244342 0.150950	0.258564 0.127843
NO	-0.628324 0.000041	1.000000 0.000000	-0.529388 0.000900	-0.485686 0.002675	-0.260555 0.124831

HOURS	0.621093 0.000053	-0.529388 0.000900	1.000000 0.000000	0.334798 0.045943	0.201331 0.239013
PRORATE	0.244342 0.150950	-0.485686 0.002675	0.334798 0.045943	1.000000 0.000000	0.205594 0.229003
AVL	0.258564 0.127843	-0.260555 0.124831	0.201331 0.239013	0.205594 0.229003	1.000000 0.000000

Correlation Report

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Database E:\Data\R-rm1.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.119643 0.433731	0.727825 0.000000	-0.146770 0.336009	0.006383 0.966804
NO	-0.119643 0.433731	1.000000 0.000000	-0.512549 0.000319	0.072835 0.634451	-0.469927 0.001126
HOURS	0.727825 0.000000	-0.512549 0.000319	1.000000 0.000000	-0.132350 0.386125	0.131616 0.388788
PRORATE	-0.146770 0.336009	0.072835 0.634451	-0.132350 0.386125	1.000000 0.000000	-0.117657 0.441458
AVL	0.006383 0.966804	-0.469927 0.001126	0.131616 0.388788	-0.117657 0.441458	1.000000 0.000000

Correlation Report

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Database E:\Data\R-rm2.S0

Pearson Correlations Section (Row-Wise Deletion)

	EL	NO	HOURS	PRORATE	AVL
EL	1.000000 0.000000	-0.463037 0.001048	0.656702 0.000001	-0.229585 0.120569	0.062887 0.674529
NO	-0.463037 0.001048	1.000000 0.000000	-0.704405 0.000000	0.461013 0.001109	-0.371236 0.010197
HOURS	0.656702 0.000001	-0.704405 0.000000	1.000000 0.000000	-0.042335 0.777527	0.290877 0.047303
PRORATE	-0.229585 0.120569	0.461013 0.001109	-0.042335 0.777527	1.000000 0.000000	0.011028 0.941350
AVL	0.062887 0.674529	-0.371236 0.010197	0.290877 0.047303	0.011028 0.941350	1.000000 0.000000

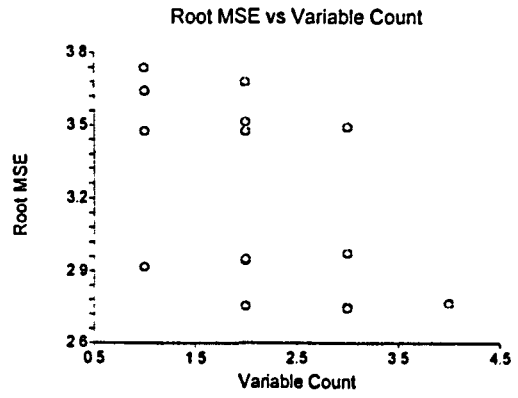
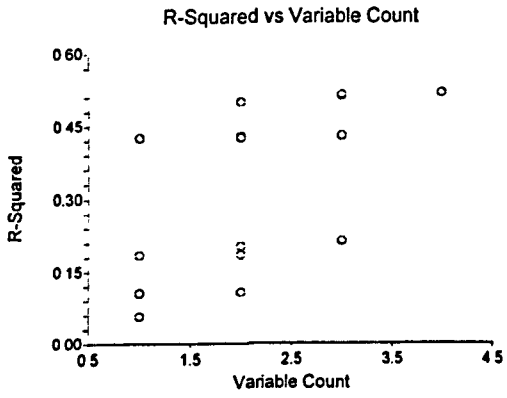
Appendix 15: All Possible Regression of Mills

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Database E:\Data\Cm4.S0
Dependent EL

All Possible Results Section

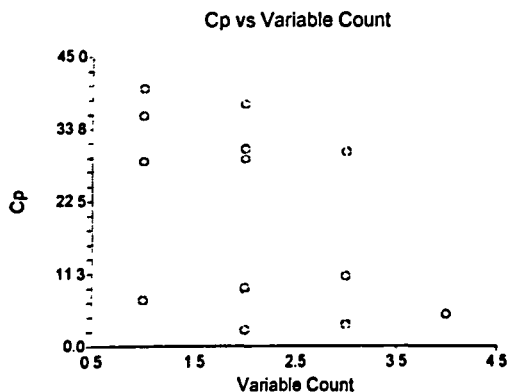
Model Size	R-Squared	Root MSE	Cp	Model
1	0.426044	2.918535	7.187878	C (PRORATE)
1	0.185221	3.477326	28.665501	D (AVL)
1	0.105376	3.643726	35.786379	A (NO)
1	0.057271	3.740407	40.076578	B (HOURS)
2	0.499980	2.754176	2.593886	CD
2	0.428992	2.943196	8.924928	BC
2	0.426314	2.950089	9.163718	AC
2	0.203052	3.477067	29.075207	AD
2	0.185668	3.514785	30.625584	BD
2	0.107143	3.680349	37.628775	AB
3	0.514338	2.745016	3.313365	BCD
3	0.511883	2.751946	3.532327	ACD
3	0.429379	2.975445	10.890402	ABC
3	0.213250	3.493787	30.165742	ABD
4	0.517852	2.766688	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\Cm4.S0
 Dependent EL



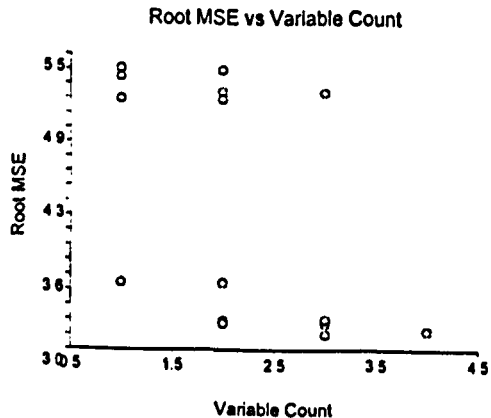
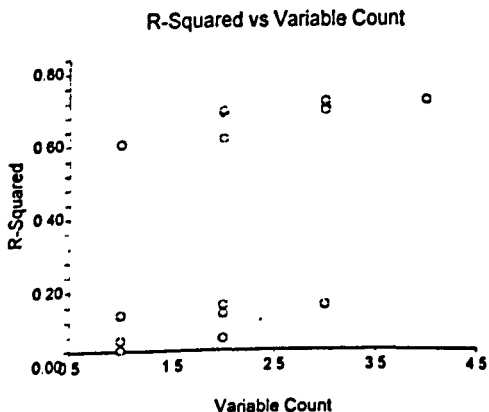
All Possible Regression Report

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 Database E:\Data\Cm5.S0
 Dependent EL

All Possible Results Section

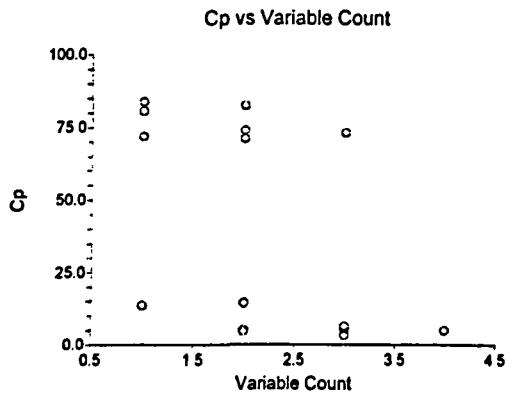
Model Size	R-Squared	Root MSE	Cp	Model
1	0.564495	3.560937	13.638724	C (PRORATE)
1	0.099421	5.120693	71.987277	A (NO)
1	0.029910	5.314641	80.708210	B (HOURS)
1	0.004333	5.384246	83.917070	D (AVL)
2	0.651977	3.22093	4.663183	AC
2	0.647511	3.24153	5.223488	BC
2	0.574751	3.560405	14.352112	CD
2	0.122330	5.114971	71.113147	AD
2	0.100021	5.17957	73.912038	AB
2	0.032457	5.370474	82.388643	BD
3	0.678969	3.131006	3.276837	ABC
3	0.660771	3.218524	5.559923	ACD
3	0.653492	3.252873	6.473199	BCD
3	0.122662	5.175992	73.071456	ABD
4	0.681175	3.15899	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\Cm5.S0
 Dependent EL



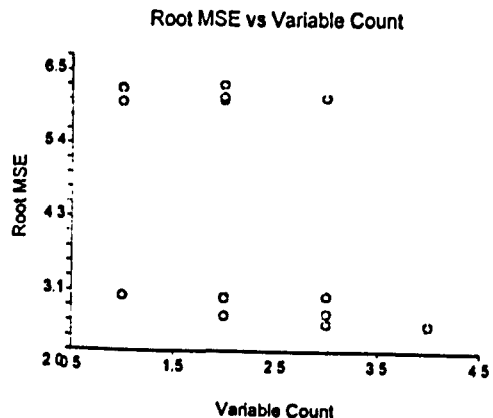
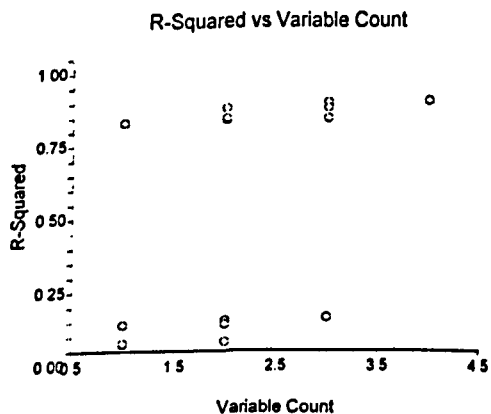
All Possible Regression Report

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 Database E:\Data\Cm6.S0
 Dependent EL

All Possible Results Section

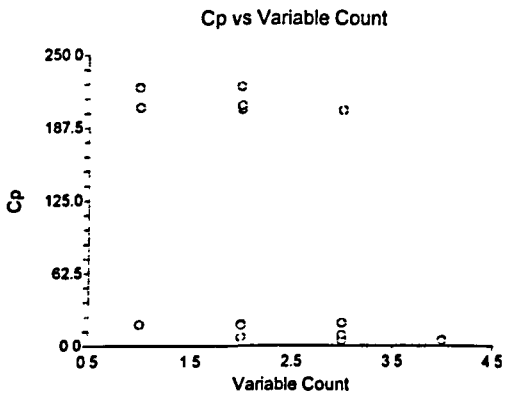
Model Size	R-Squared	Root MSE	Cp	Model
1	0.782843	2.837124	18.544071	C (PRORATE)
1	0.091404	5.803319	204.950923	B (HOURS)
1	0.028295	6.001481	221.964858	D (AVL)
1	0.025408	6.010389	222.743100	A (NO)
2	0.830596	2.536211	7.670066	BC
2	0.792960	2.803828	17.816621	CD
2	0.789373	2.828009	18.783512	AC
2	0.105284	5.82863	203.209081	AB
2	0.092167	5.8712	206.745376	BD
2	0.032768	6.06023	222.758751	AD
3	0.849724	2.418413	4.513301	ABC
3	0.830605	2.567652	9.667687	BCD
3	0.793414	2.835543	19.694115	ACD
3	0.114994	5.868928	202.591220	ABD
4	0.855337	2.403043	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\Cm6.S0
 Dependent EL



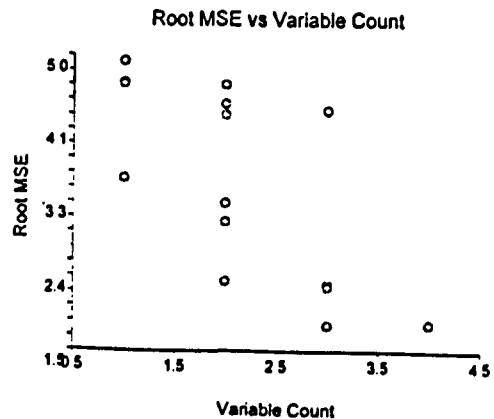
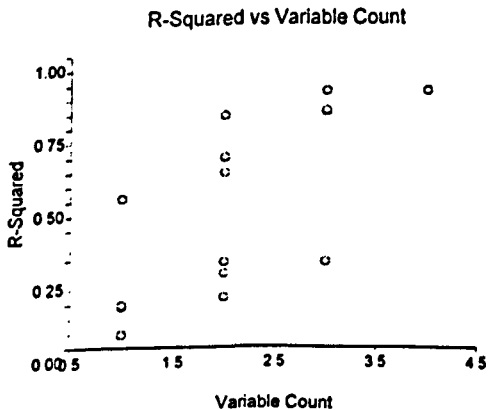
All Possible Regression Report

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 Database E:\Data\Cm7.S0
 Dependent EL

All Possible Results Section

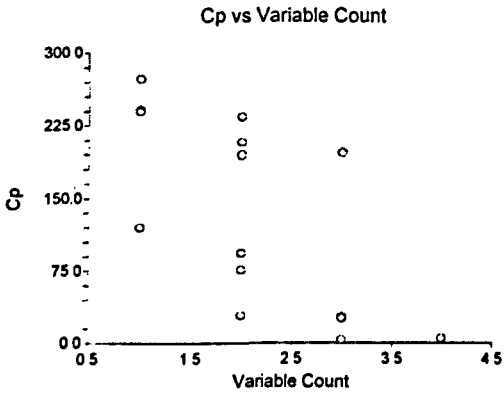
Model Size	R-Squared	Root MSE	Cp	Model
1	0.509841	3.540466	120.467027	C (PRORATE)
1	0.146563	4.671729	240.137216	D (AVL)
1	0.142020	4.684147	241.633853	B (HOURS)
1	0.045614	4.940306	273.391519	A (NO)
2	0.794316	2.320609	28.756039	BC
2	0.650796	3.023717	76.034016	AC
2	0.597779	3.245142	93.498653	CD
2	0.292039	4.305327	194.214887	BD
2	0.251693	4.426306	207.505642	AD
2	0.171424	4.657658	233.947521	AB
3	0.877955	1.809229	3.203644	BCD
3	0.809725	2.259045	25.679883	ACD
3	0.805100	2.286338	27.203615	ABC
3	0.292039	4.357514	196.214852	ABD
4	0.878574	1.827059	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\Cm7.S0
 Dependent EL



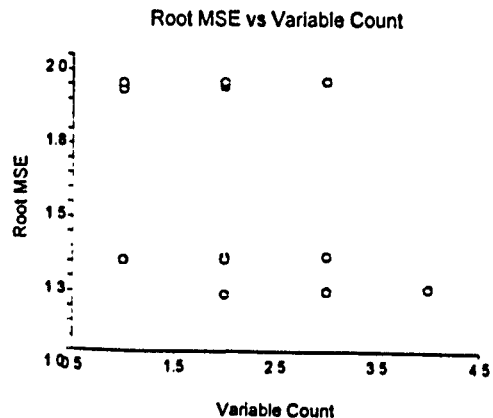
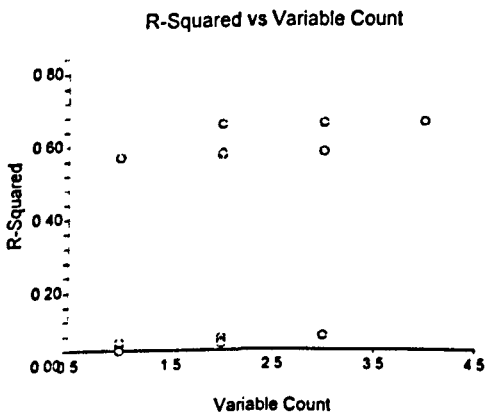
All Possible Regression Report

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 Database E:\Data\R-rm1.S0
 Dependent EL

All Possible Results Section

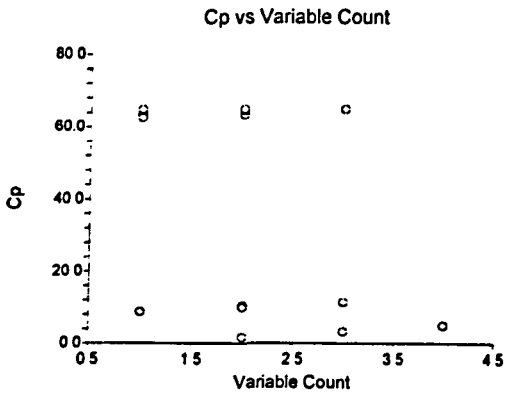
Model Size	R-Squared	Root MSE	Cp	Model
1	0.529729	1.307437	8.781341	B (HOURS)
1	0.021541	1.885896	62.576383	C (PRORATE)
1	0.014314	1.892848	63.341405	A (NO)
1	0.000041	1.906504	64.852376	D (AVL)
2	0.616822	1.194144	1.561985	AB
2	0.537864	1.311418	9.920194	BD
2	0.532319	1.319262	10.507191	BC
2	0.033476	1.896542	63.313077	AC
2	0.021662	1.908098	64.563664	CD
2	0.017503	1.912149	65.003927	AD
3	0.619958	1.203663	3.230013	ABD
3	0.619591	1.204243	3.268832	ABC
3	0.541513	1.322064	11.533927	BCD
3	0.038361	1.914674	64.795924	ACD
4	0.622131	1.215127	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\R-rm1.S0
 Dependent EL



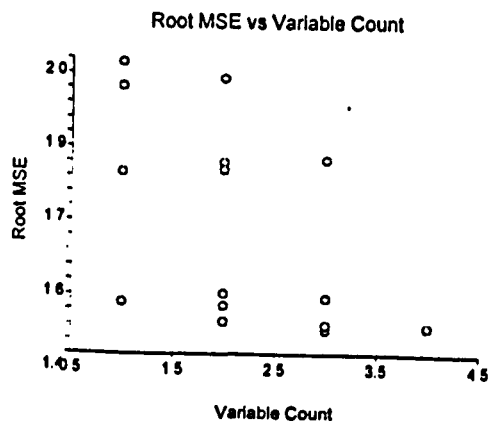
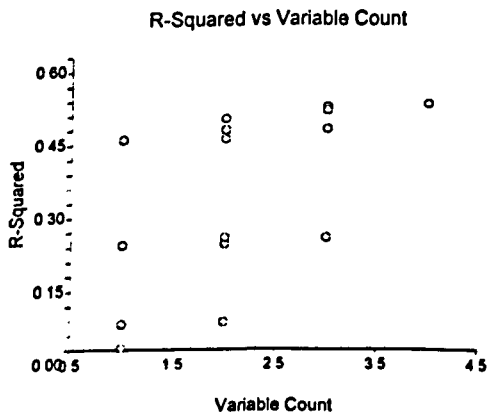
All Possible Regression Report

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 Dependent EL

All Possible Results Section

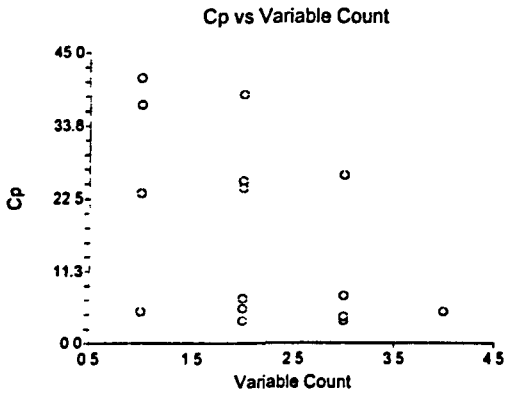
Model Size	R-Squared	Root MSE	Cp	Model
1	0.431258	1.505877	5.029450	B (HOURS)
1	0.214403	1.769831	23.342497	A (NO)
1	0.052709	1.94345	36.997291	C (PRORATE)
1	0.003955	1.992835	41.114541	D (AVL)
2	0.472047	1.467267	3.584807	BC
2	0.449193	1.498689	5.514830	BD
2	0.431258	1.522893	7.029415	AB
2	0.228185	1.77406	24.178603	AD
2	0.214733	1.789453	25.314633	AC
2	0.056990	1.960966	38.635835	CD
3	0.495725	1.450566	3.585260	ABC
3	0.488696	1.460641	4.178849	BCD
3	0.450383	1.514377	7.414367	ABD
3	0.228249	1.794496	26.173214	ACD
4	0.502656	1.457612	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\R-rm2.S0
 Dependent EL



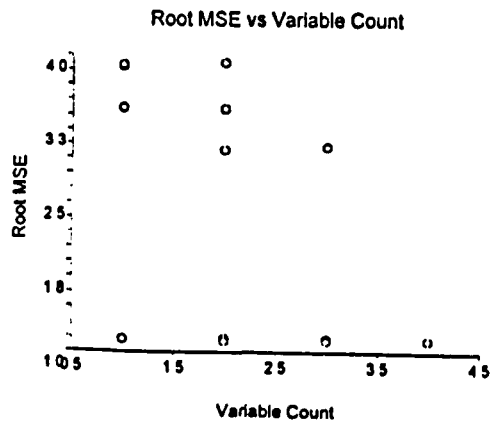
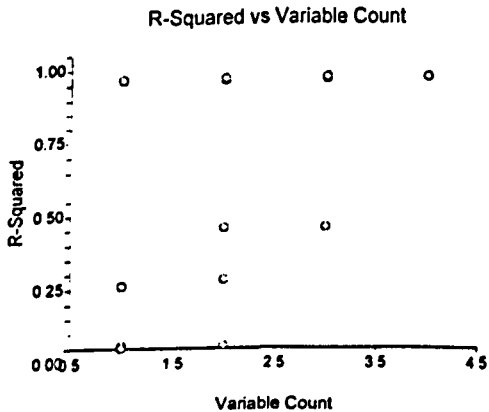
All Possible Regression Report

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 Database E:\Data\Rm4.S0
 Dependent EL

All Possible Results Section

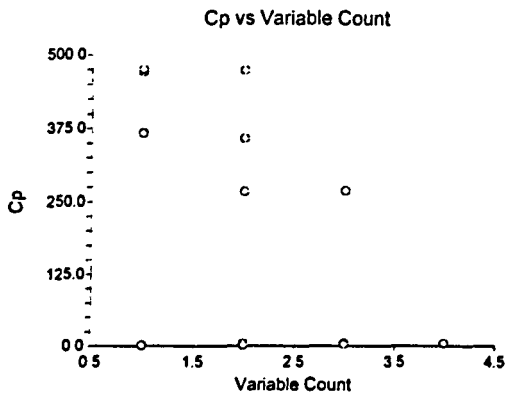
Model Size	R-Squared	Root MSE	Cp	Model
1	0.916385	1.130464	2.266551	C (PRORATE)
1	0.210823	3.472976	367.359164	B (HOURS)
1	0.009479	3.890867	471.544223	A (NO)
1	0.001951	3.905625	475.439823	D (AVL)
2	0.920626	1.114458	2.072069	CD
2	0.916794	1.141045	4.055129	AC
2	0.916584	1.142481	4.163577	BC
2	0.407604	3.044599	267.534683	AB
2	0.232001	3.466606	358.400633	BD
2	0.009509	3.936855	473.528836	AD
3	0.921937	1.118615	3.393866	BCD
3	0.920661	1.127718	4.053940	ACD
3	0.918643	1.141967	5.097978	ABC
3	0.407712	3.081225	269.479195	ABD
4	0.922698	1.126977	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\Rm4.S0
 Dependent EL



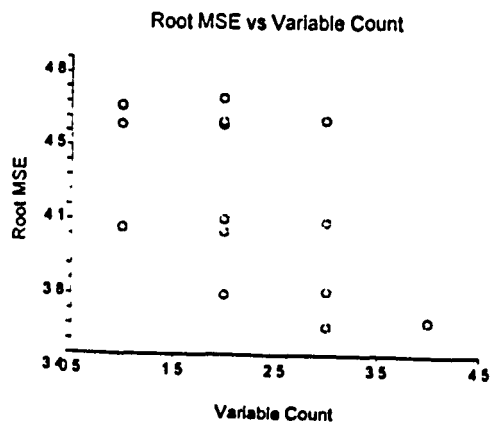
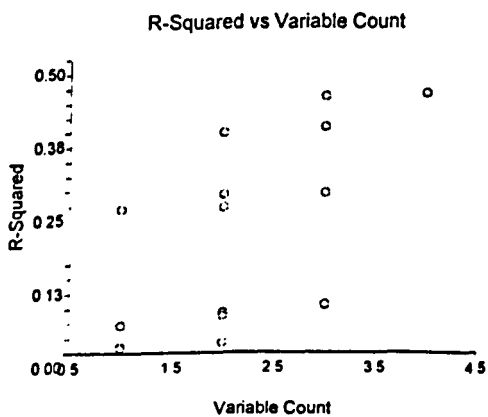
All Possible Regression Report

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 Database E:\Data\Rm5.S0
 Dependent EL

All Possible Results Section

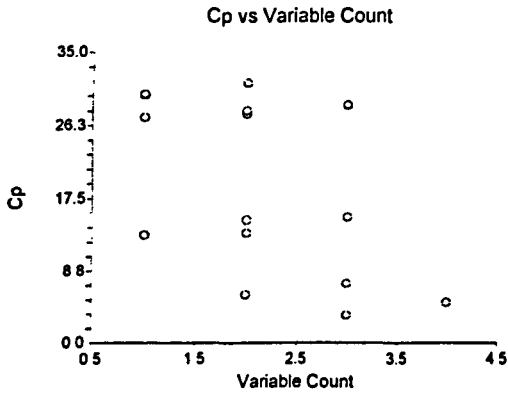
Model Size	R-Squared	Root MSE	Cp	Model
1	0.244244	3.996111	13.127123	C (PRORATE)
1	0.047065	4.487233	27.249123	A (NO)
1	0.010105	4.573424	29.896185	B (HOURS)
1	0.008563	4.576983	30.006589	D (AVL)
2	0.373141	3.682488	5.895565	AC
2	0.268749	3.977311	13.372094	BC
2	0.246781	4.036613	14.945468	CD
2	0.068802	4.488255	27.692313	AB
2	0.062629	4.503107	28.134416	AD
2	0.016937	4.611551	31.406841	BD
3	0.435925	3.535553	3.398950	ABC
3	0.382355	3.699634	7.235694	ACD
3	0.269828	4.022553	15.294847	BCD
3	0.081767	4.510924	28.763716	ABD
4	0.441496	3.561757	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\Rm5.S0
 Dependent EL



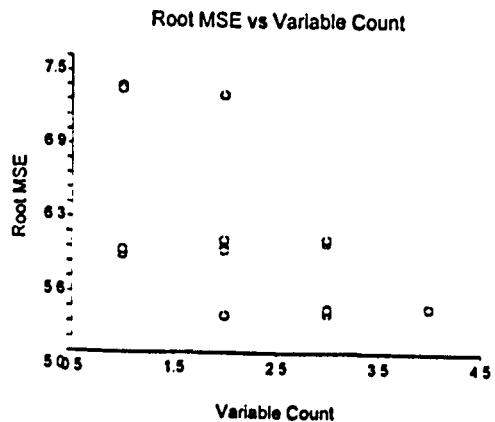
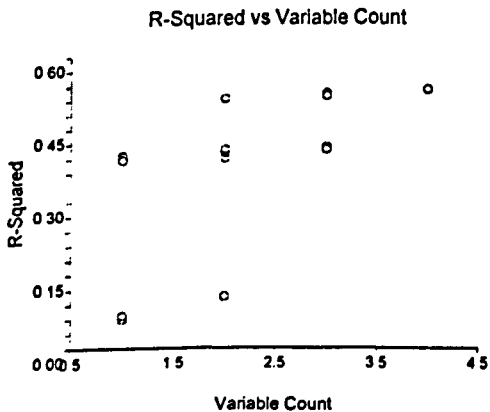
All Possible Regression Report

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 Database E:\Data\Rm6.S0
 Dependent EL

All Possible Results Section

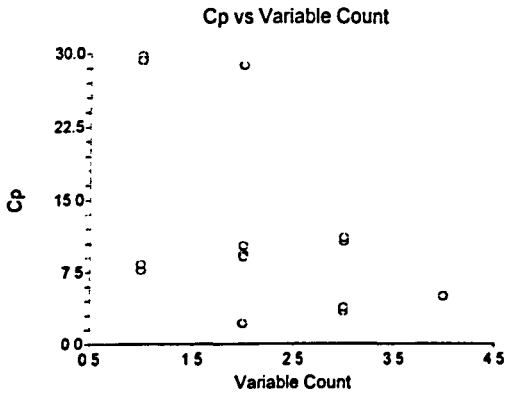
Model Size	R-Squared	Root MSE	Cp	Model
1	0.394791	5.814415	7.769908	A (NO)
1	0.385757	5.857652	8.363575	B (HOURS)
1	0.066856	7.219845	29.319452	D (AVL)
1	0.059703	7.247463	29.789479	C (PRORATE)
2	0.510405	5.308289	2.172632	AB
2	0.404443	5.854603	9.135648	AD
2	0.404338	5.855123	9.142598	BD
2	0.399633	5.878198	9.451724	AC
2	0.387249	5.938515	10.265514	BC
2	0.105019	7.176996	28.811603	CD
3	0.521595	5.328632	3.437293	ABC
3	0.515609	5.361863	3.830615	ABD
3	0.410706	5.914038	10.724137	ACD
3	0.404677	5.944211	11.120279	BCD
4	0.528250	5.376111	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\Rm6.S0
 Dependent EL



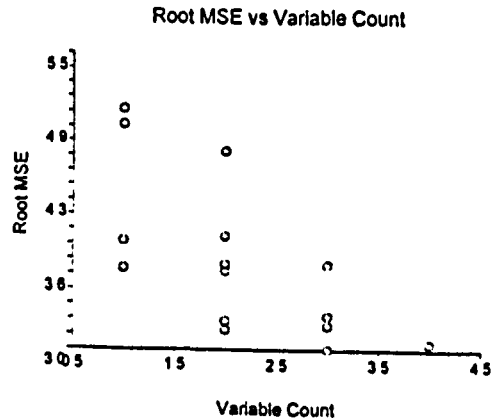
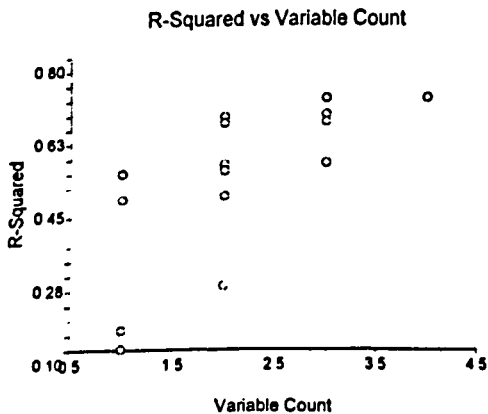
All Possible Regression Report

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 Database E:\Data\R-cm2.S0
 Dependent EL

All Possible Results Section

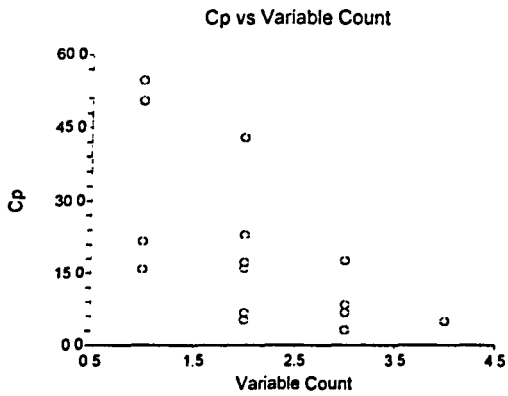
Model Size	R-Squared	Root MSE	Cp	Model
1	0.519323	3.678505	15.867403	B (HOURS)
1	0.456943	3.909916	21.690102	A (NO)
1	0.147856	4.897801	50.540915	D (AVL)
1	0.102769	5.025702	54.749409	C (PRORATE)
2	0.654803	3.168824	5.221379	BC
2	0.639634	3.2377	6.637295	AC
2	0.540113	3.657551	15.926805	AB
2	0.526140	3.712699	17.231055	BD
2	0.464328	3.947431	23.000784	AD
2	0.250178	4.670292	42.989982	CD
3	0.699271	3.008251	3.070654	ABC
3	0.659769	3.199731	6.757876	BCD
3	0.642321	3.280751	8.386501	ACD
3	0.543156	3.70775	17.642778	ABD
4	0.700028	3.057643	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\R-cm2.S0
 Dependent EL



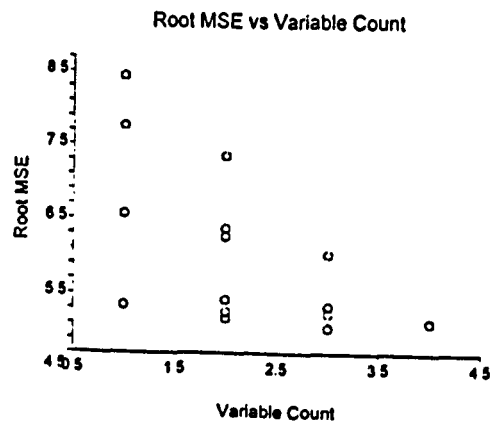
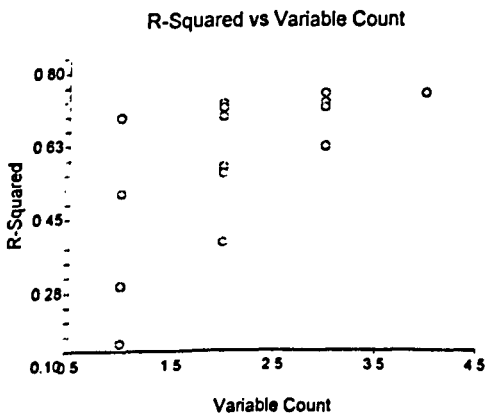
All Possible Regression Report

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 Database E:\Data\R-cm3.S0
 Dependent EL

All Possible Results Section

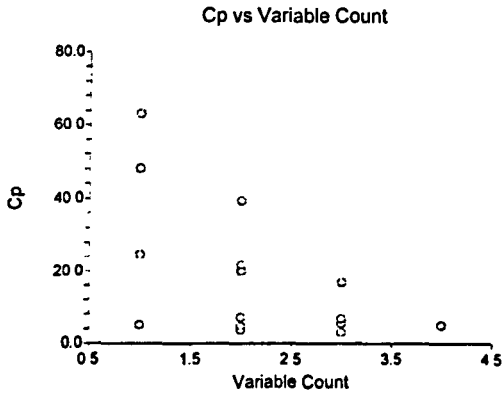
Model Size	R-Squared	Root MSE	Cp	Model
1	0.656548	5.148615	5.075408	B (HOURS)
1	0.474691	6.36744	24.706753	A (NO)
1	0.256732	7.574084	48.235282	D (AVL)
1	0.118414	8.248779	63.166589	C (PRORATE)
2	0.688651	4.975805	3.609871	BC
2	0.677937	5.060693	4.766435	BD
2	0.657096	5.221873	7.016278	AB
2	0.536730	6.069558	20.009698	AC
2	0.520825	6.172868	21.726624	AD
2	0.356830	7.151593	39.429771	CD
3	0.712672	4.854127	3.016901	BCD
3	0.689822	5.04345	5.483562	ABC
3	0.677944	5.139109	6.765769	ABD
3	0.583994	5.840793	16.907589	ACD
4	0.712828	4.930454	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\R-cm3.S0
 Dependent EL



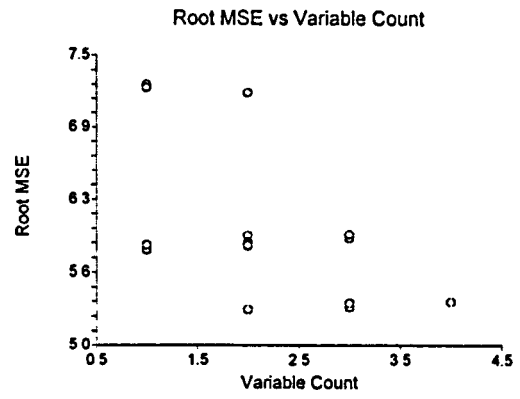
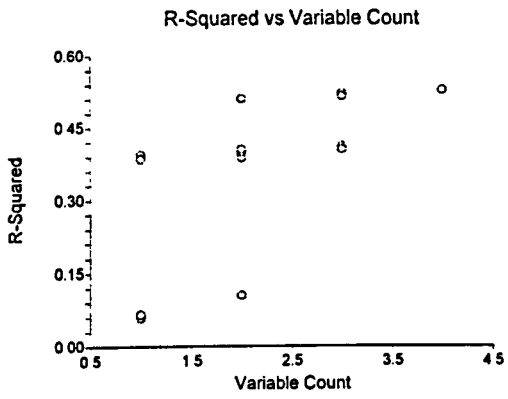
All Possible Regression Report

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 Database E:\Data\R-cm4.S0
 Dependent EL

All Possible Results Section

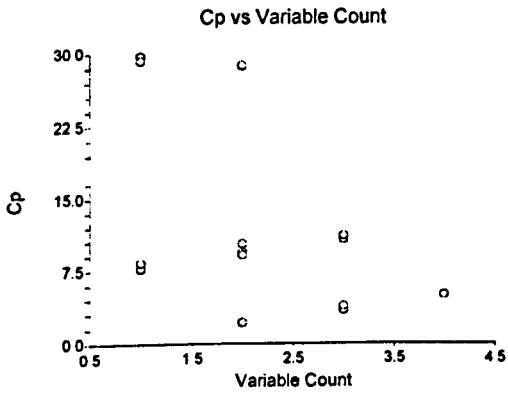
Model Size	R-Squared	Root MSE	Cp	Model
1	0.394791	5.814415	7.769908	A (NO)
1	0.385757	5.857652	8.363575	B (HOURS)
1	0.066856	7.219845	29.319452	D (AVL)
1	0.059703	7.247463	29.789479	C (PRORATE)
2	0.510405	5.308289	2.172632	AB
2	0.404443	5.854603	9.135648	AD
2	0.404338	5.855123	9.142598	BD
2	0.399633	5.878198	9.451724	AC
2	0.387249	5.938515	10.265514	BC
2	0.105019	7.176996	28.811603	CD
3	0.521595	5.328632	3.437293	ABC
3	0.515609	5.361863	3.830615	ABD
3	0.410706	5.914038	10.724137	ACD
3	0.404677	5.944211	11.120279	BCD
4	0.528250	5.376111	5.000000	ABCD

Plots Section



All Possible Regression Report

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 Database E:\Data\R-cm4.S0
 Dependent EL



Appendix 16 : Stepwise Regression of Mills

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 Database E:\Data\Cm4.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	3.811145	0.000000
1	Added	PRORATE	0.426044	2.918535	0.000000
2	Added	AVL	0.499980	2.754176	0.065911
3	Unchanged		0.499980	2.754176	0.065911

List of Variables Selected
 PRORATE, AVL

Stepwise Regression Report

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 Database E:\Data\Cm5.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	5.33428	0.000000
1	Added	PRORATE	0.564495	3.560937	0.000000
2	Added	NO	0.651977	3.22093	0.000683
3	Added	HOURS	0.678969	3.131006	0.256882
4	Unchanged		0.678969	3.131006	0.256882

List of Variables Selected
 NO, HOURS, PRORATE

Stepwise Regression Report

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 Database E:\Data\Cm6.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	6.017021	0.000000
1	Added	PRORATE	0.782843	2.837124	0.000000
2	Added	HOURS	0.830596	2.536211	0.009188
3	Added	NO	0.849724	2.418413	0.599769
4	Unchanged		0.849724	2.418413	0.599769

List of Variables Selected
 NO, HOURS, PRORATE

Stepwise Regression Report

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 Database E:\Data\Cm7.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.999192	0.000000
1	Added	PRORATE	0.509841	3.540466	0.000000
2	Added	HOURS	0.794316	2.320609	0.041432
3	Added	AVL	0.877955	1.809229	0.056233
4	Unchanged		0.877955	1.809229	0.056233

List of Variables Selected
HOURS, PRORATE, AVL

Stepwise Regression Report

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Database E:\Data\R-rm1.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	1.884753	0.000000
1	Added	HOURS	0.529729	1.307437	0.000000
2	Added	NO	0.616822	1.194144	0.262707
3	Unchanged		0.616822	1.194144	0.262707

List of Variables Selected
NO, HOURS

Stepwise Regression Report

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Database E:\Data\R-rm2.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	1.974964	0.000000
1	Added	HOURS	0.431258	1.505877	0.000000
2	Added	PRORATE	0.472047	1.467267	0.001792
3	Unchanged		0.472047	1.467267	0.001792

List of Variables Selected
HOURS, PRORATE

Stepwise Regression Report

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Database E:\Data\Rm4.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	3.864759	0.000000
1	Added	PRORATE	0.916385	1.130464	0.000000
2	Unchanged		0.916385	1.130464	0.000000

List of Variables Selected
PRORATE

Stepwise Regression Report

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 Database E:\Data\Rm5.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	4.544171	0.000000
1	Added	PRORATE	0.244244	3.996111	0.000000
2	Added	NO	0.373141	3.682488	0.068691
3	Added	HOURS	0.435925	3.535553	0.122909
4	Unchanged		0.435925	3.535553	0.122909

List of Variables Selected
 NO, HOURS, PRORATE

Stepwise Regression Report

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 Database E:\Data\Rm6.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	7.366461	0.000000
1	Added	NO	0.394791	5.814415	0.000000
2	Added	HOURS	0.510405	5.308289	0.280252
3	Unchanged		0.510405	5.308289	0.280252

List of Variables Selected
 NO, HOURS

Stepwise Regression Report

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 Database E:\Data\R-cm2.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	5.222165	0.000000
1	Added	HOURS	0.519323	3.678505	0.000000
2	Added	PRORATE	0.654803	3.168824	0.004204
3	Added	NO	0.699271	3.008251	0.690016
4	Unchanged		0.699271	3.008251	0.690016

List of Variables Selected
 NO, HOURS, PRORATE

Stepwise Regression Report

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 Database E:\Data\R-cm3.S0
 Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	8.658903	0.000000

1	Added	HOURS	0.656548	5.148615	0.000000
2	Added	PRORATE	0.688651	4.975805	0.043437
3	Added	AVL	0.712672	4.854127	0.250175
4	Unchanged		0.712672	4.854127	0.250175

List of Variables Selected
HOURS, PRORATE, AVL

Stepwise Regression Report

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Database E:\Data\R-cm4.S0
Dependent EL

Iteration Detail Section

Iter. No.	Action	Variable	R-Squared	Sqrt(MSE)	Max R-Squared Other X's
0	Unchanged		0.000000	7.366461	0.000000
1	Added	NO	0.394791	5.814415	0.000000
2	Added	HOURS	0.510405	5.308289	0.280252
3	Unchanged		0.510405	5.308289	0.280252

List of Variables Selected
NO, HOURS

Appendix 17: Multiple Regression of Mills

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 Database E:\Data\Cm4.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	86.5362	7.770097	11.1371	0.000000	Reject Ho	1.000000
NO	-2.189396E-02	3.911103E-02	-0.5598	0.578527	Accept Ho	0.084972
HOURS	3.265867E-03	4.476197E-03	0.7296	0.469586	Accept Ho	0.110038
PRORATE	-0.6951737	0.1333775	-5.2121	0.000005	Reject Ho	0.999134
AVL	-0.19879	0.0707693	-2.8090	0.007447	Reject Ho	0.784007
R-Squared	0.517852					

Model

$$86.5362 - 2.189396E-02 * NO + 3.265867E-03 * HOURS - 0.6951737 * PRORATE - 0.19879 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	104533.3	104533.3			
Model	4	353.5204	88.3801	11.5461	0.000002	0.999881
Error	43	329.1463	7.654565			
Total(Adjusted)	47	682.6667	14.52482			

Root Mean Square Error	2.766688	R-Squared	0.5179
Mean of Dependent	46.66667	Adj R-Squared	0.4730
Coefficient of Variation	5.928618E-02	Press Value	407.8818
Sum Press Residuals	110.3596	Press R-Squared	0.4025

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.7777	0.436760	Accepted
Kurtosis	0.8568	0.391561	Accepted
Omnibus	1.3389	0.511998	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.605185	9	-0.068842	17	-0.141809
2	0.464702	10	-0.078954	18	-0.218119
3	0.369067	11	-0.109437	19	-0.291855
4	0.203807	12	-0.070204	20	-0.310685
5	0.062707	13	-0.138547	21	-0.204370
6	0.108970	14	-0.166722	22	-0.241428
7	-0.152610	15	-0.079976	23	-0.103792
8	-0.172390	16	-0.171121	24	-0.088038

Above serial correlations significant if their absolute values are greater than 0.288675

Durbin-Watson Value 0.7310

Multiple Regression Report

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 Database E:\Data\Cm4.S0
 Dependent EL

Multicollinearity Section

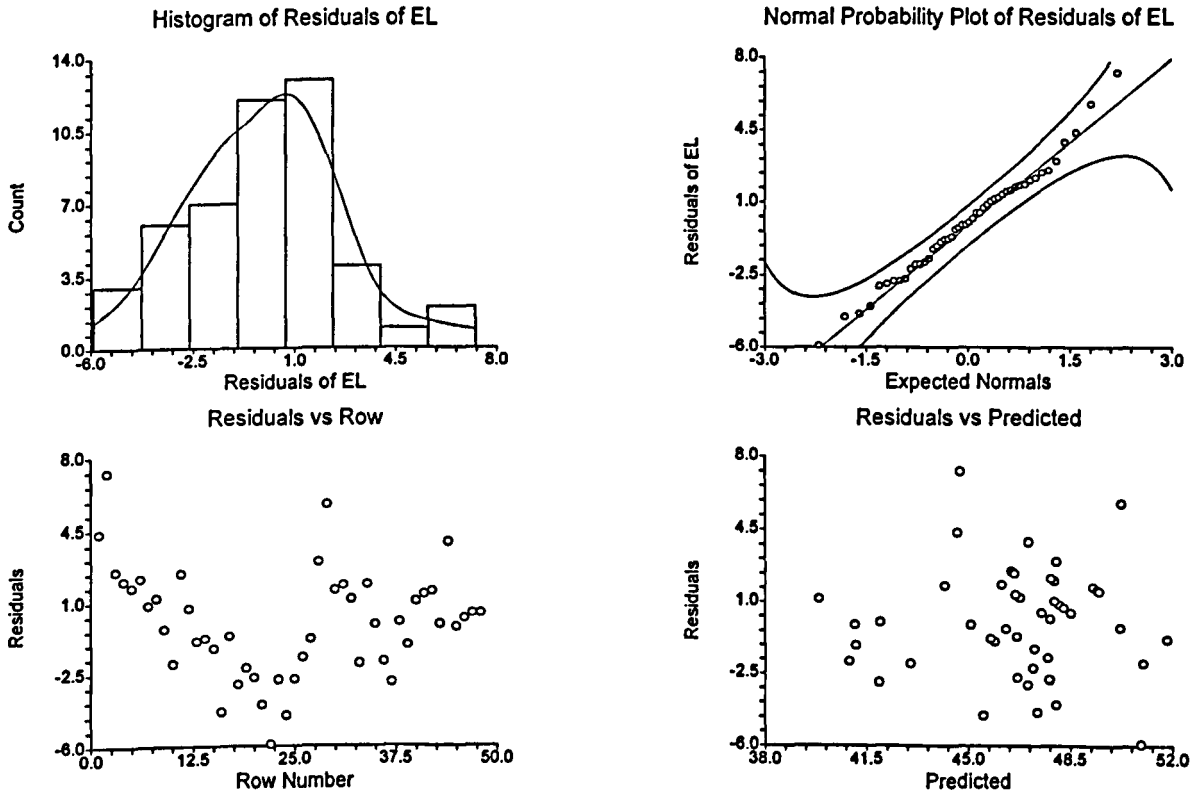
Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	2.033935	0.508342	0.491658	1.99838E-04
HOURS	2.063233	0.515324	0.484676	2.617567E-06
PRORATE	1.295607	0.228161	0.771839	2.324045E-03
AVL	1.597718	0.374107	0.625893	6.542885E-04

Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	2.395827	59.90	59.90	1.00
2	0.822428	20.56	80.46	2.91
3	0.473679	11.84	92.30	5.06
4	0.308066	7.70	100.00	7.78

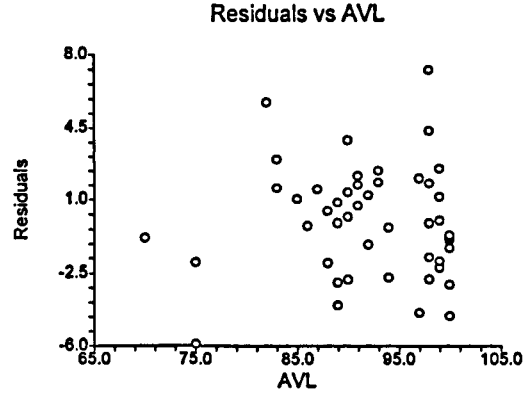
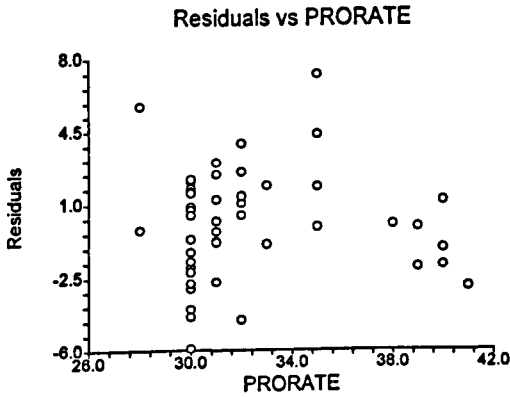
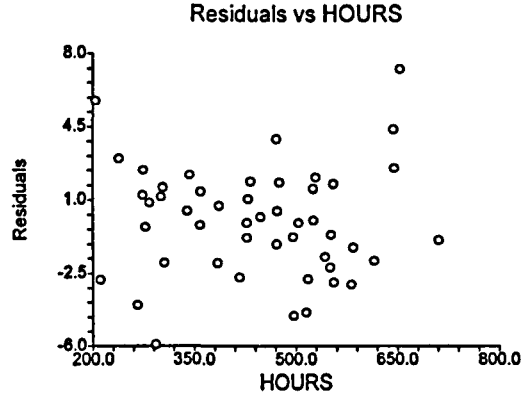
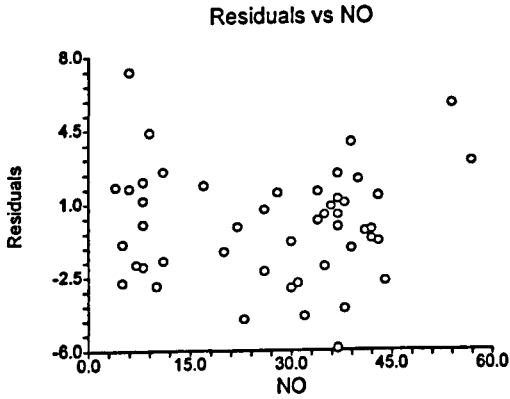
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section



Multiple Regression Report

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 Database E:\Data\Cm4.S0
 Dependent EL



Multiple Regression Report

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 Database E:\Data\Cm5.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	99.98349	9.955576	10.0430	0.000000	Reject Ho	1.000000
NO	-9.710928E-02	5.210698E-02	-1.8637	0.069723	Accept Ho	0.443976
HOURS	1.066445E-02	6.665381E-03	1.6000	0.117474	Accept Ho	0.345398
PRORATE	-0.3905506	4.665591E-02	-8.3709	0.000000	Reject Ho	1.000000
AVL	-3.984165E-02	7.572249E-02	-0.5262	0.601687	Accept Ho	0.080730
R-Squared	0.681175					

Model

$$99.98349 - 9.710928E-02 * NO + 1.066445E-02 * HOURS - 0.3905506 * PRORATE - 3.984165E-02 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	134480	134480			
Model	4	852.8314	213.2078	21.3652	0.000000	1.000000
Error	40	399.1687	9.979217			
Total(Adjusted)	44	1252	28.45455			

Root Mean Square Error	3.15899	R-Squared	0.6812
Mean of Dependent	54.66667	Adj R-Squared	0.6493
Coefficient of Variation	0.0577864	Press Value	509.5753
Sum Press Residuals	110.5298	Press R-Squared	0.5930

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	1.2392	0.215268	Accepted
Kurtosis	1.2260	0.220214	Accepted
Omnibus	3.0386	0.218864	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.234810	9	0.073476	17	-0.023224
2	0.181899	10	0.012651	18	-0.021183
3	0.197361	11	-0.001975	19	0.009174
4	-0.172640	12	0.044816	20	0.006413
5	-0.049392	13	-0.208991	21	0.035961
6	-0.034645	14	-0.179332	22	0.064650
7	-0.116018	15	-0.176048	23	0.147710
8	-0.075552	16	-0.115690	24	0.014436

Above serial correlations significant if their absolute values are greater than 0.298142

Durbin-Watson Value 1.4526

Multiple Regression Report

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 Database E:\Data\Cm5.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	2.228268	0.551221	0.448779	2.720792E-04
HOURS	1.476677	0.322804	0.677196	4.451983E-06
PRORATE	1.055559	0.052635	0.947365	2.181308E-04
AVL	1.708123	0.414562	0.585438	5.745838E-04

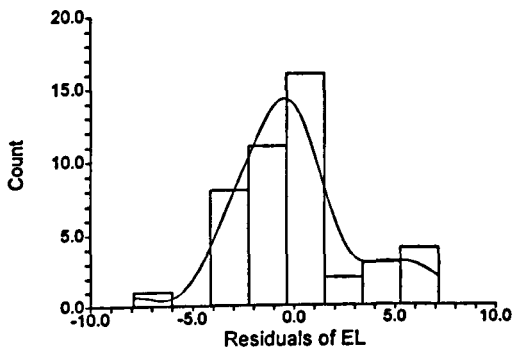
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.817540	45.44	45.44	1.00
2	1.058583	26.46	71.90	1.72
3	0.861628	21.54	93.44	2.11
4	0.262248	6.56	100.00	6.93

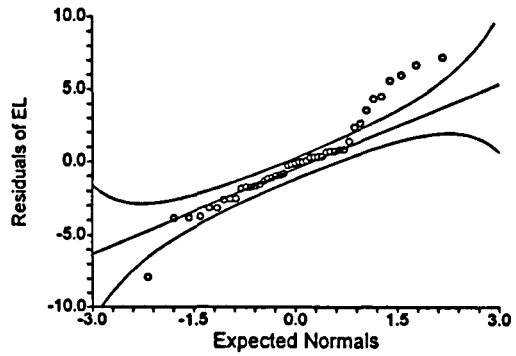
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

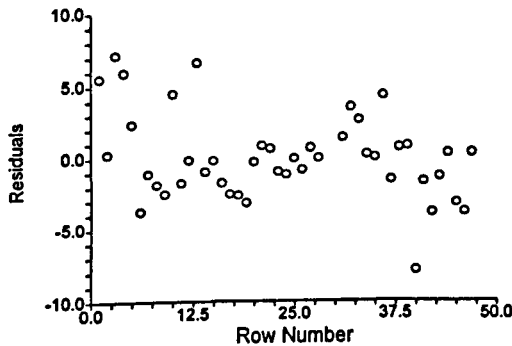
Histogram of Residuals of EL



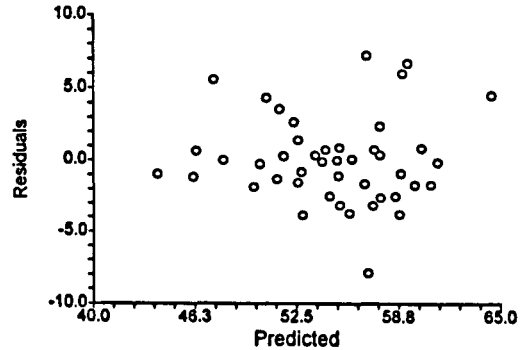
Normal Probability Plot of Residuals of EL



Residuals vs Row

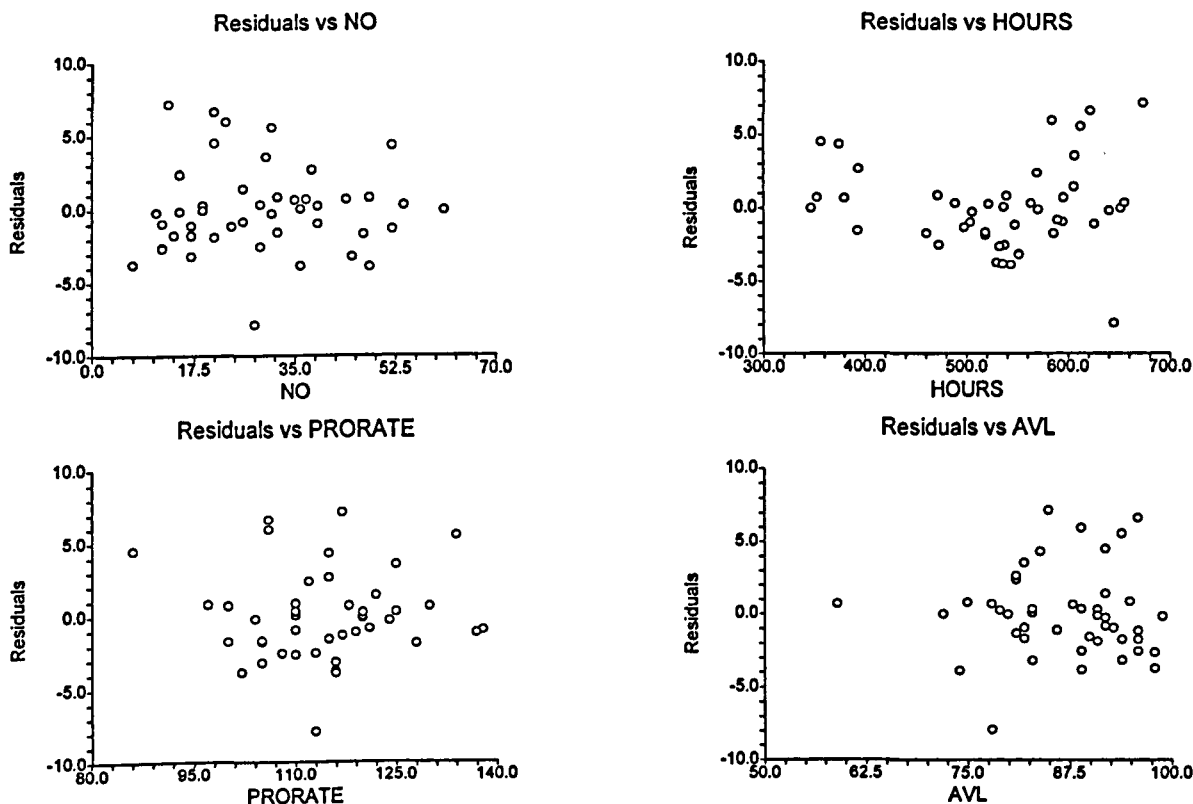


Residuals vs Predicted



Multiple Regression Report

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 Database E:\Data\Cm5.S0
 Dependent EL



Multiple Regression Report

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 Database E:\Data\Cm6.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	95.7845	8.138915	11.7687	0.000000	Reject Ho	1.000000
NO	8.543237E-02	3.308528E-02	2.5822	0.013688	Reject Ho	0.711653
HOURS	2.048144E-02	5.012783E-03	4.0858	0.000212	Reject Ho	0.978482
PRORATE	-0.3379107	2.391835E-02	-14.1277	0.000000	Reject Ho	1.000000
AVL	7.696187E-02	6.256233E-02	1.2302	0.226005	Accept Ho	0.224426
R-Squared	0.855337					

Model
 $95.7845 + 8.543237E-02 \cdot NO + 2.048144E-02 \cdot HOURS - 0.3379107 \cdot PRORATE + 7.696187E-02 \cdot AVL$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	155414.2	155414.2			
Model	4	1331.585	332.8964	57.6482	0.000000	1.000000
Error	39	225.21	5.774616			
Total(Adjusted)	43	1556.795	36.20454			

Root Mean Square Error	2.403043	R-Squared	0.8553
Mean of Dependent	59.43182	Adj R-Squared	0.8405
Coefficient of Variation	4.043361E-02	Press Value	299.5562
Sum Press Residuals	83.08313	Press R-Squared	0.8076

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.7191	0.472093	Accepted
Kurtosis	1.8535	0.063818	Accepted
Omnibus	3.9524	0.138598	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.142758	9	-0.103545	17	0.003080
2	-0.078027	10	-0.210580	18	-0.085231
3	0.168573	11	-0.006620	19	-0.083934
4	0.234567	12	-0.003055	20	-0.028998
5	0.155956	13	-0.071115	21	0.058894
6	-0.076627	14	-0.234226	22	-0.026611
7	-0.106590	15	-0.246949	23	-0.045279
8	0.164410	16	0.112311	24	-0.047813

Above serial correlations significant if their absolute values are greater than 0.301511

Durbin-Watson Value 1.5701

Multiple Regression Report

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 Database E:\Data\Cm6.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	3.296016	0.696603	0.303397	1.895599E-04
HOURS	2.503830	0.600612	0.399388	4.351456E-06
PRORATE	1.010604	0.010493	0.989507	9.906936E-05
AVL	1.710032	0.415216	0.584784	6.778018E-04

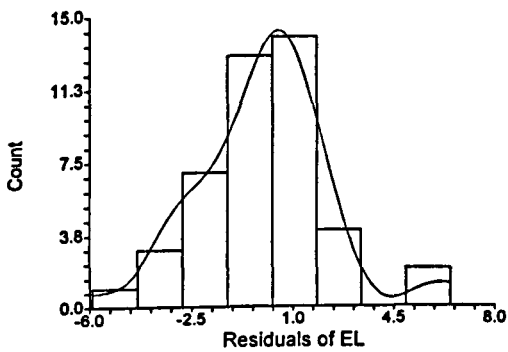
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	2.287647	57.19	57.19	1.00
2	0.982376	24.56	81.75	2.33
3	0.537904	13.45	95.20	4.25
4	0.192073	4.80	100.00	11.91

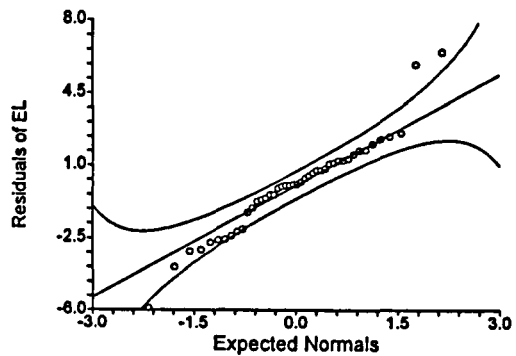
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

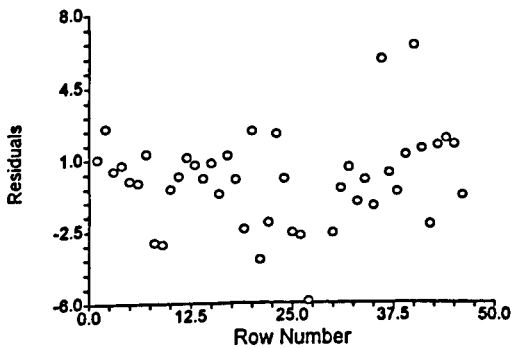
Histogram of Residuals of EL



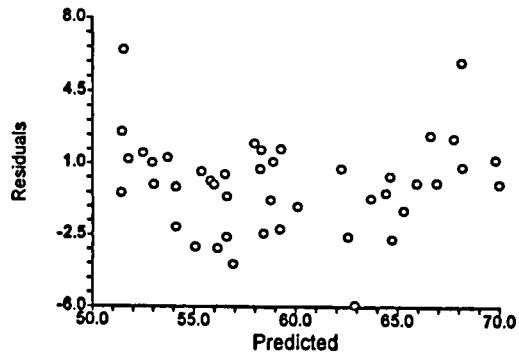
Normal Probability Plot of Residuals of EL



Residuals vs Row

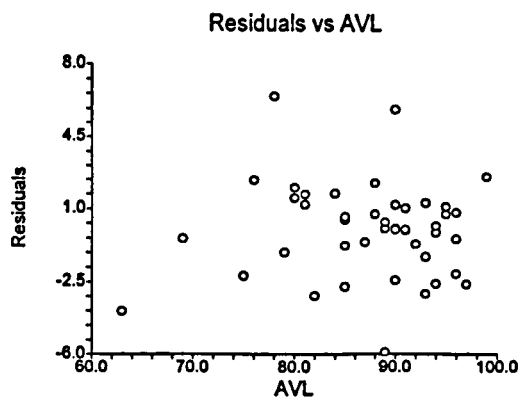
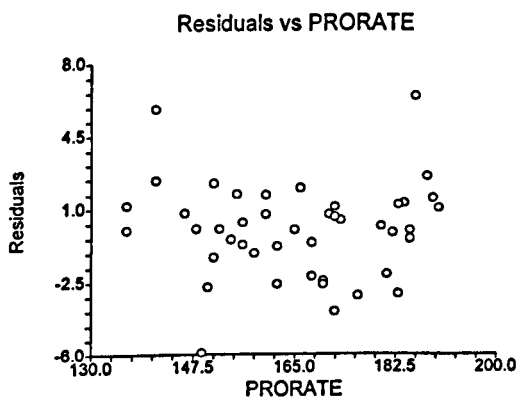
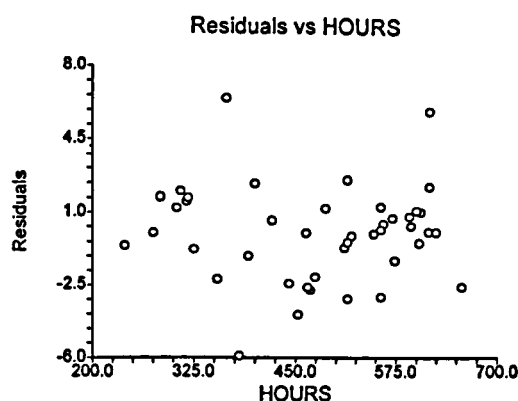
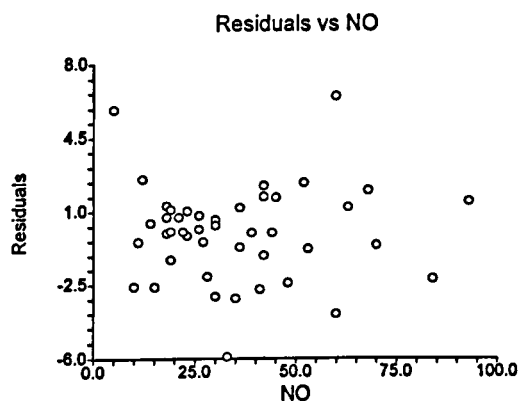


Residuals vs Predicted



Multiple Regression Report

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 Database E:\Data\Cm6.S0
 Dependent EL



Multiple Regression Report

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 Database E:\Data\Cm7.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	117.4437	6.187967	18.9794	0.000000	Reject Ho	1.000000
NO	-1.122708E-02	0.0248789	-0.4513	0.654233	Accept Ho	0.072513
HOURS	2.322111E-02	4.875987E-03	4.7623	0.000025	Reject Ho	0.996377
PRORATE	-0.3259419	2.344876E-02	-13.9002	0.000000	Reject Ho	1.000000
AVL	-0.1681299	0.0341747	-4.9197	0.000015	Reject Ho	0.997735
R-Squared	0.878574					

Model

$$117.4437 - 1.122708E-02 * NO + 2.322111E-02 * HOURS - 0.3259419 * PRORATE - 0.1681299 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	139556.4	139556.4			
Model	4	966.1186	241.5296	72.3544	0.000000	1.000000
Error	40	133.5258	3.338146			
Total(Adjusted)	44	1099.644	24.99192			

Root Mean Square Error	1.827059	R-Squared	0.8786
Mean of Dependent	55.68889	Adj R-Squared	0.8664
Coefficient of Variation	3.280833E-02	Press Value	291.2624
Sum [Press Residuals]	72.21438	Press R-Squared	0.7351

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	1.3437	0.179047	Accepted
Kurtosis	1.8635	0.062392	Accepted
Omnibus	5.2782	0.071427	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.265526	9	0.144466	17	-0.054738
2	0.060336	10	-0.164139	18	0.071550
3	-0.008493	11	0.285894	19	-0.192824
4	-0.058973	12	-0.373263	20	-0.052550
5	-0.004139	13	-0.042581	21	-0.092688
6	-0.011923	14	-0.026066	22	-0.015326
7	0.086801	15	-0.007560	23	-0.138238
8	0.106977	16	0.156989	24	0.124803

Above serial correlations significant if their absolute values are greater than 0.298142

Durbin-Watson Value 2.5226

Multiple Regression Report

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 Database E:\Data\Cm7.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	3.881893	0.742394	0.257606	1.854203E-04
HOURS	3.640184	0.725289	0.274711	7.122293E-06
PRORATE	1.060731	0.057254	0.942746	1.647155E-04
AVL	1.254829	0.203078	0.796922	3.49868E-04

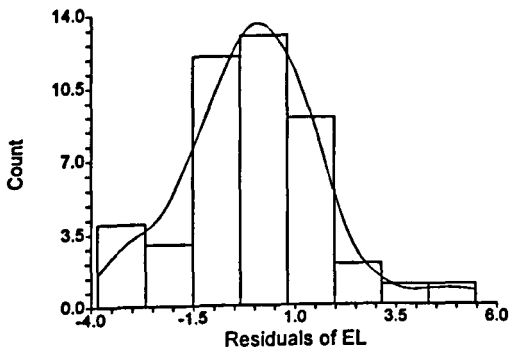
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.970825	49.27	49.27	1.00
2	1.015777	25.39	74.67	1.94
3	0.874555	21.86	96.53	2.25
4	0.138844	3.47	100.00	14.19

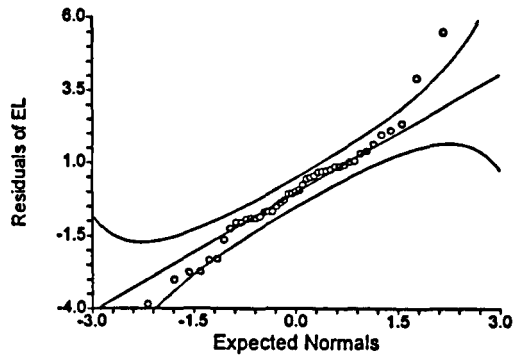
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

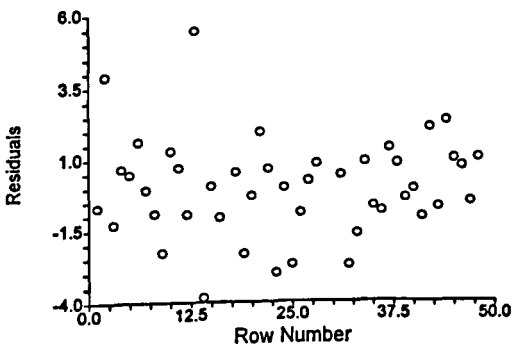
Histogram of Residuals of EL



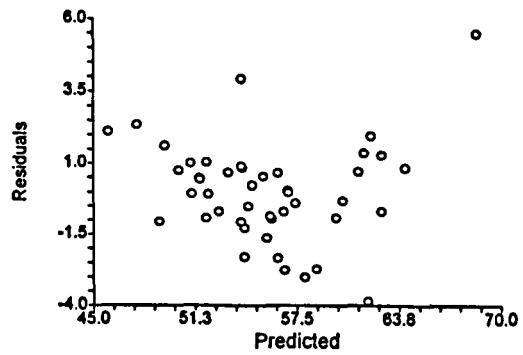
Normal Probability Plot of Residuals of EL



Residuals vs Row

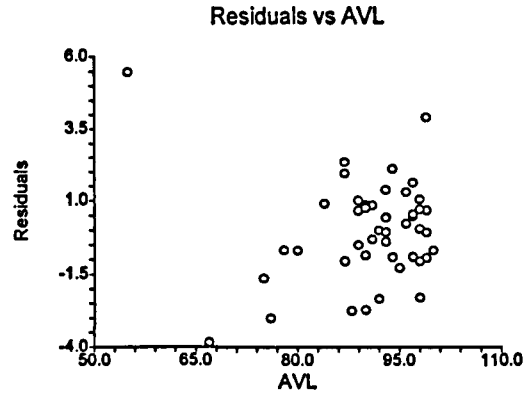
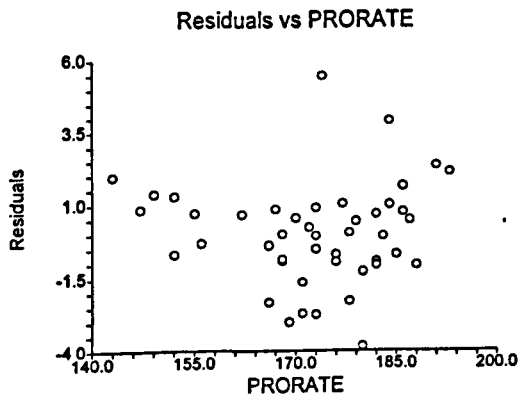
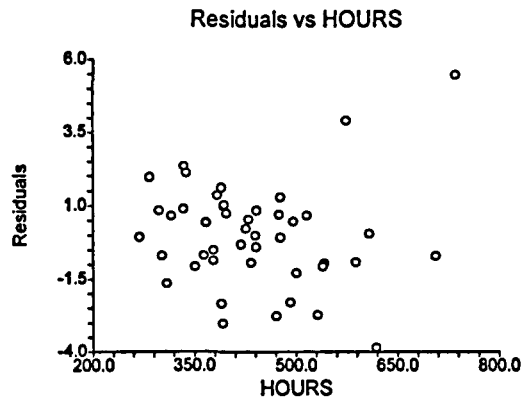
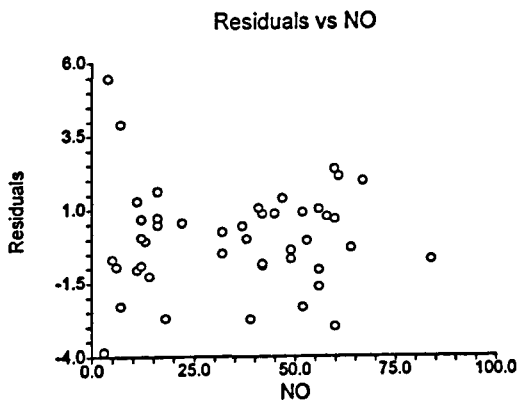


Residuals vs Predicted



Multiple Regression Report

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 Database E:\Data\Cm7.S0
 Dependent EL



Multiple Regression Report

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 Database E:\Data\R-rm1.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	19.57137	9.331139	2.0974	0.042322	Reject Ho	0.534681
NO	4.232518E-02	1.448853E-02	2.9213	0.005706	Reject Ho	0.813411
HOURS	1.143892E-02	1.455141E-03	7.8610	0.000000	Reject Ho	1.000000
PRORATE	-1.505298E-02	3.138673E-02	-0.4796	0.634126	Accept Ho	0.075466
AVL	2.461067E-02	4.746607E-02	0.5185	0.606973	Accept Ho	0.079828
R-Squared	0.622131					

Model

$$19.57137 + 4.232518E-02 * NO + 1.143892E-02 * HOURS - 1.505298E-02 * PRORATE + 2.461067E-02 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	24294.77	24294.77			
Model	4	97.23957	24.30989	16.4642	0.000000	0.999999
Error	40	59.06131	1.476533			
Total(Adjusted)	44	156.3009	3.552293			

Root Mean Square Error	1.215127	R-Squared	0.6221
Mean of Dependent	23.2354	Adj R-Squared	0.5843
Coefficient of Variation	5.229636E-02	Press Value	76.47263
Sum Press Residuals	47.3442	Press R-Squared	0.5107

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	-1.7912	0.073257	Accepted
Kurtosis	0.1295	0.897000	Accepted
Omnibus	3.2253	0.199363	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.436920	9	-0.242939	17	0.160506
2	0.492775	10	-0.249538	18	0.112370
3	0.228067	11	-0.253239	19	0.201752
4	0.292521	12	-0.233979	20	0.062959
5	-0.075367	13	-0.010178	21	0.048904
6	-0.072466	14	-0.035644	22	-0.096946
7	-0.231681	15	0.014898	23	-0.078326
8	-0.241596	16	-0.000823	24	-0.259458

Above serial correlations significant if their absolute values are greater than 0.298142

Durbin-Watson Value 1.0894

Multiple Regression Report

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 Database E:\Data\R-rm1.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	1.750944	0.428879	0.571121	1.421692E-04
HOURS	1.407611	0.289576	0.710424	1.43406E-06
PRORATE	1.030940	0.030012	0.969988	6.67189E-04
AVL	1.327486	0.246696	0.753304	1.525891E-03

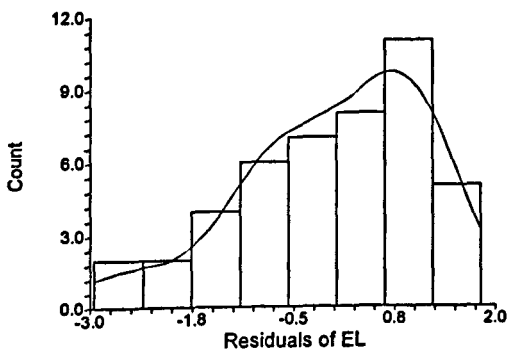
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.804491	45.11	45.11	1.00
2	0.966641	24.17	69.28	1.87
3	0.868804	21.72	91.00	2.08
4	0.360063	9.00	100.00	5.01

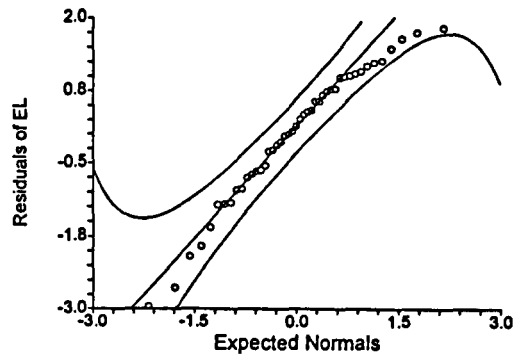
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

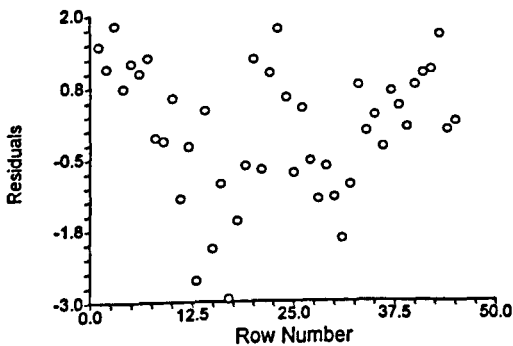
Histogram of Residuals of EL



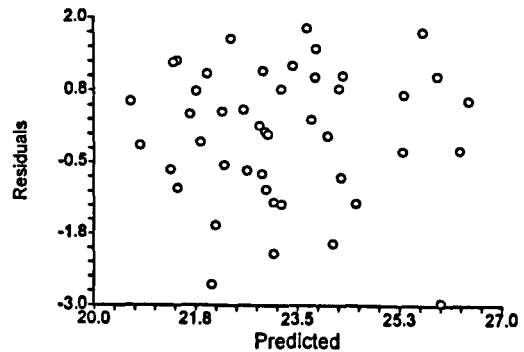
Normal Probability Plot of Residuals of EL



Residuals vs Row

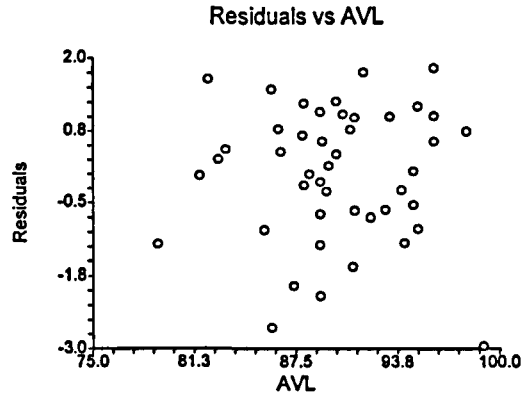
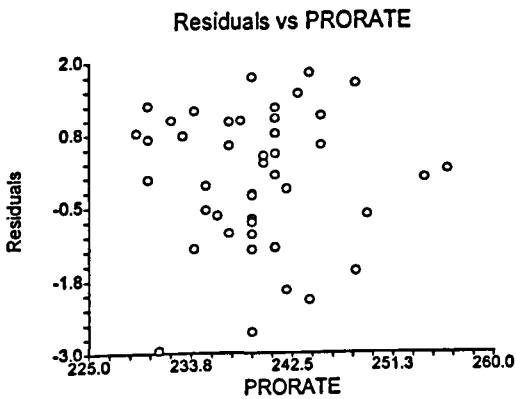
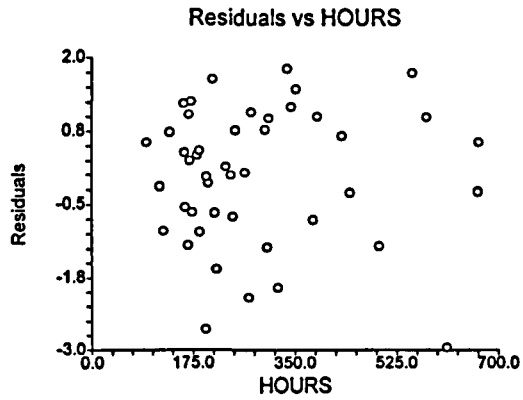
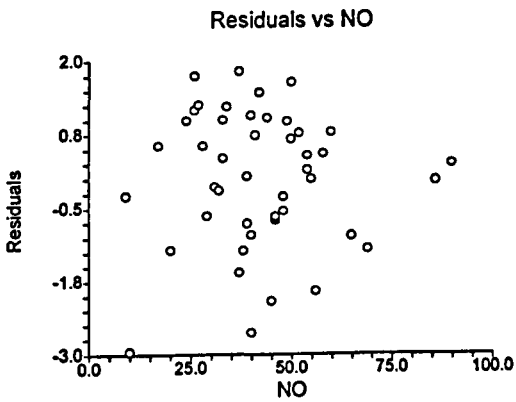


Residuals vs Predicted



Multiple Regression Report

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 Database E:\Data\R-rm1.S0
 Dependent EL



Multiple Regression Report

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 Database E:\Data\R-rm2.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	37.92594	8.013663	4.7327	0.000025	Reject Ho	0.996116
NO	2.744314E-02	2.527579E-02	1.0857	0.283783	Accept Ho	0.185606
HOURS	1.241749E-02	2.579531E-03	4.8139	0.000019	Reject Ho	0.996940
PRORATE	-7.479561E-02	3.559934E-02	-2.1010	0.041679	Reject Ho	0.537041
AVL	-3.502032E-02	4.577681E-02	-0.7650	0.448535	Accept Ho	0.116085
R-Squared	0.502656					

Model

$$37.92594 + 2.744314E-02 * NO + 1.241749E-02 * HOURS - 7.479561E-02 * PRORATE - 3.502032E-02 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	22126.68	22126.68			
Model	4	90.18756	22.54689	10.6121	0.000005	0.999675
Error	42	89.23463	2.124634			
Total(Adjusted)	46	179.4222	3.900482			

Root Mean Square Error	1.457612	R-Squared	0.5027
Mean of Dependent	21.69747	Adj R-Squared	0.4553
Coefficient of Variation	0.0671789	Press Value	119.9309
Sum Press Residuals	55.14522	Press R-Squared	0.3316

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	3.7961	0.000147	Rejected
Kurtosis	3.4977	0.000469	Rejected
Omnibus	26.6443	0.000002	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.281346	9	-0.201311	17	-0.221739
2	0.084927	10	-0.143707	18	-0.234516
3	-0.114572	11	-0.098074	19	-0.203518
4	0.111438	12	0.122383	20	-0.146892
5	0.024840	13	-0.102856	21	-0.023405
6	0.145661	14	-0.267438	22	0.002732
7	-0.020102	15	-0.188615	23	0.075507
8	0.040859	16	-0.051297	24	0.215919

Above serial correlations significant if their absolute values are greater than 0.291730

Durbin-Watson Value 1.3807

Multiple Regression Report

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 Database E:\Data\R-rm2.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	3.526966	0.716470	0.283530	3.006944E-04
HOURS	2.494022	0.599041	0.400959	3.131825E-06
PRORATE	1.674321	0.402743	0.597257	5.964852E-04
AVL	1.224247	0.183172	0.816828	9.862952E-04

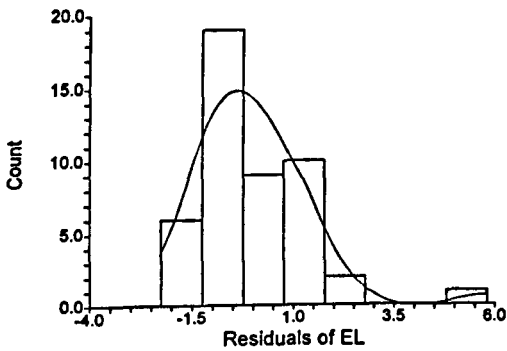
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	2.042311	51.06	51.06	1.00
2	1.068563	26.71	77.77	1.91
3	0.725619	18.14	95.91	2.81
4	0.163507	4.09	100.00	12.49

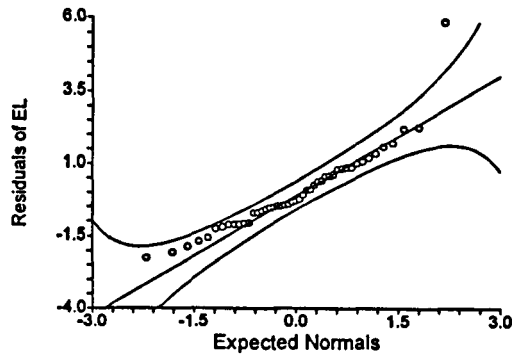
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

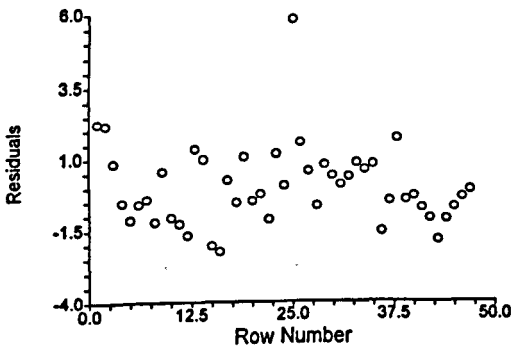
Histogram of Residuals of EL



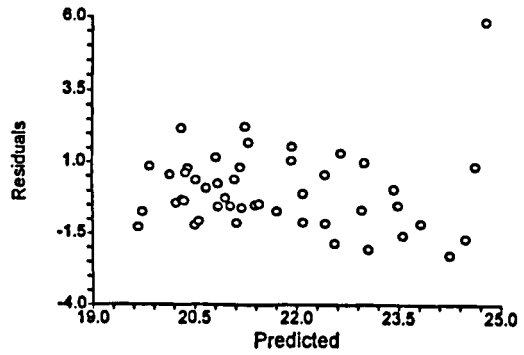
Normal Probability Plot of Residuals of EL



Residuals vs Row

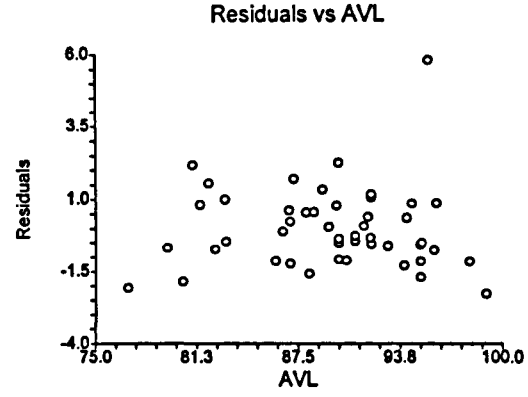
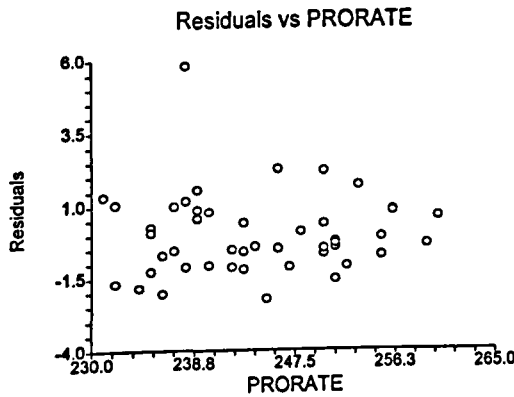
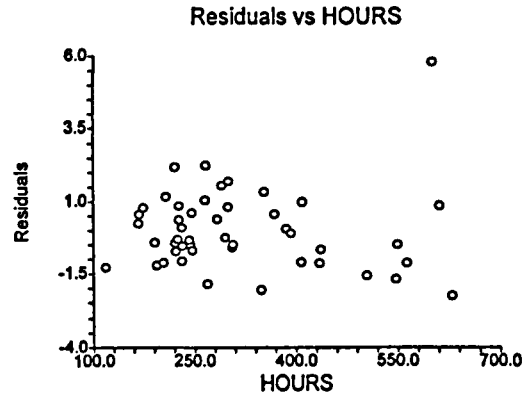
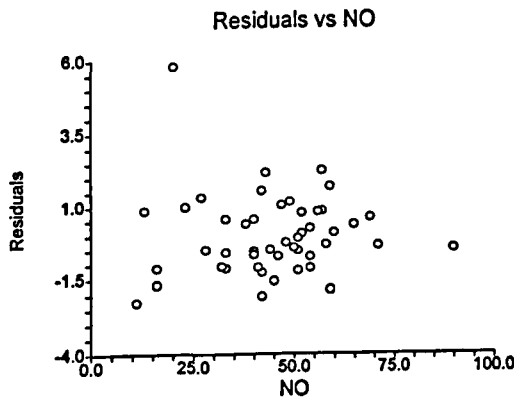


Residuals vs Predicted



Multiple Regression Report

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 Database E:\Data\R-rm2.S0
 Dependent EL



Multiple Regression Report

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 Database E:\Data\Rm4.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	49.07623	3.005285	16.3300	0.000000	Reject Ho	1.000000
NO	1.580269E-02	2.518005E-02	0.6276	0.533841	Accept Ho	0.093985
HOURS	2.92827E-03	2.852352E-03	1.0266	0.310770	Accept Ho	0.170594
PRORATE	-0.3849361	2.358072E-02	-16.3242	0.000000	Reject Ho	1.000000
AVL	-3.904568E-02	2.695706E-02	-1.4484	0.155288	Accept Ho	0.292829
R-Squared	0.922698					

Model

$$49.07623 + 1.580269E-02 * NO + 2.92827E-03 * HOURS - 0.3849361 * PRORATE - 3.904568E-02 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	22848.8	22848.8			
Model	4	606.397	151.5992	119.3623	0.000000	1.000000
Error	40	50.80305	1.270076			
Total(Adjusted)	44	657.2	14.93636			

Root Mean Square Error	1.126977	R-Squared	0.9227
Mean of Dependent	22.53333	Adj R-Squared	0.9150
Coefficient of Variation	5.001375E-02	Press Value	67.90596
Sum Press Residuals	46.51822	Press R-Squared	0.8967

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.7890	0.430085	Accepted
Kurtosis	-1.8407	0.065671	Accepted
Omnibus	4.0106	0.134617	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.188091	9	-0.036144	17	0.031610
2	0.029278	10	-0.125326	18	0.117584
3	0.080485	11	-0.136147	19	0.023142
4	-0.042176	12	0.009759	20	0.149389
5	0.012850	13	-0.112031	21	0.122068
6	-0.163012	14	-0.017806	22	-0.102353
7	-0.303985	15	0.145924	23	-0.064536
8	-0.140060	16	0.075548	24	0.142077

Above serial correlations significant if their absolute values are greater than 0.298142

Durbin-Watson Value 1.6027

Multiple Regression Report

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 Database E:\Data\Rm4.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	2.385382	0.580780	0.419220	4.992103E-04
HOURS	2.902240	0.655439	0.344561	6.405846E-06
PRORATE	1.974186	0.493462	0.506538	4.378086E-04
AVL	1.200563	0.167058	0.832942	5.72157E-04

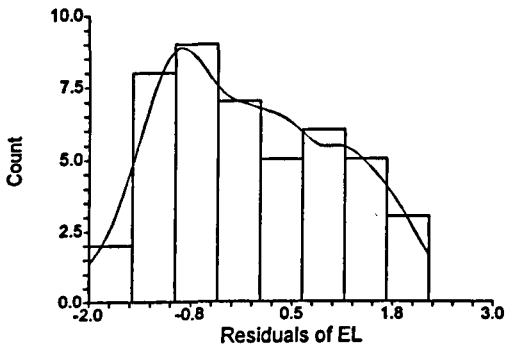
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.850837	46.27	46.27	1.00
2	1.318273	32.96	79.23	1.40
3	0.653363	16.33	95.56	2.83
4	0.177526	4.44	100.00	10.43

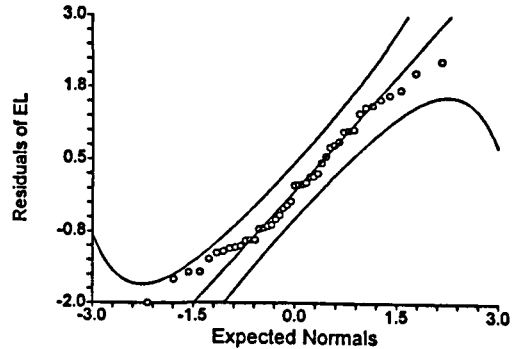
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

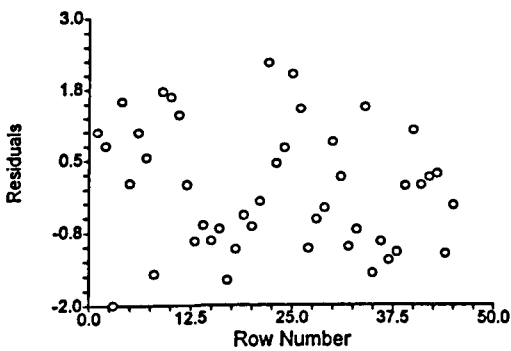
Histogram of Residuals of EL



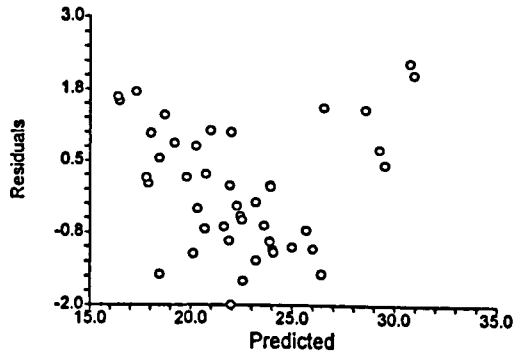
Normal Probability Plot of Residuals of EL



Residuals vs Row

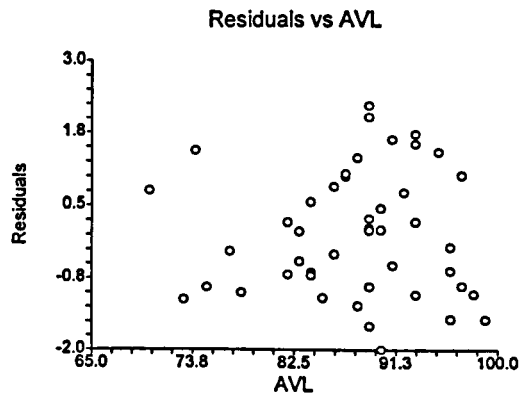
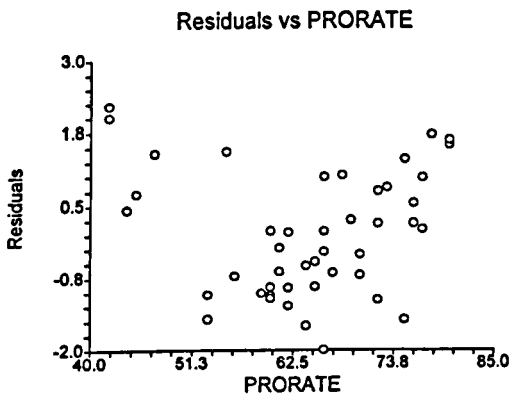
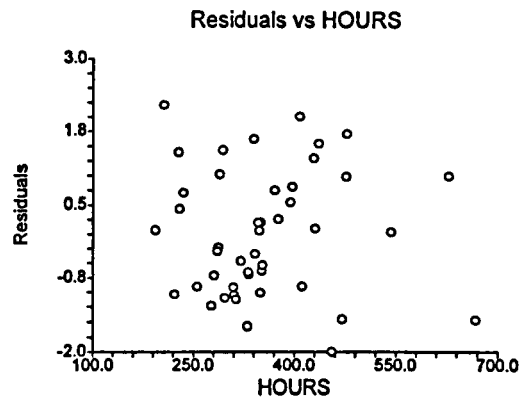
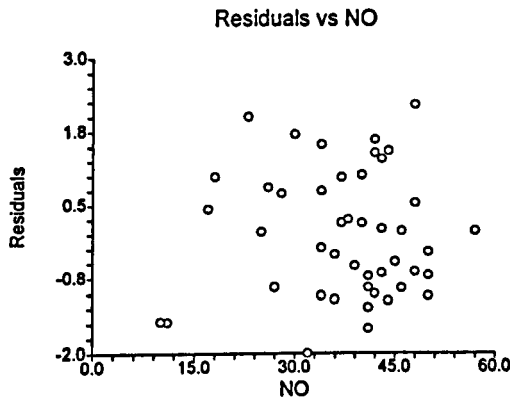


Residuals vs Predicted



Multiple Regression Report

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 Dependent EL



Multiple Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	36.60448	5.13895	7.1229	0.000000	Reject Ho	1.000000
NO	0.1555063	4.434926E-02	3.5064	0.001137	Reject Ho	0.928003
HOURS	9.048937E-03	4.396786E-03	2.0581	0.046139	Reject Ho	0.519411
PRORATE	-0.14174	2.792468E-02	-5.0758	0.000009	Reject Ho	0.998609
AVL	2.288372E-02	3.622993E-02	0.6316	0.531225	Accept Ho	0.094564
R-Squared	0.441496					

Model

$$36.60448 + .1555063*NO + 9.048937E-03*HOURS - .14174*PRORATE + 2.288372E-02*AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	33238.42	33238.42			
Model	4	401.1333	100.2833	7.9050	0.000086	0.995137
Error	40	507.4445	12.68611			
Total(Adjusted)	44	908.5778	20.64949			

Root Mean Square Error	3.561757	R-Squared	0.4415
Mean of Dependent	27.17778	Adj R-Squared	0.3856
Coefficient of Variation	0.131054	Press Value	804.3904
Sum Press Residuals	116.9121	Press R-Squared	0.1147

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	-0.2813	0.778467	Accepted
Kurtosis	3.3417	0.000833	Rejected
Omnibus	11.2460	0.003614	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.282480	9	0.100773	17	-0.088896
2	0.020432	10	0.107180	18	0.109063
3	0.017227	11	0.015898	19	0.166025
4	-0.039579	12	-0.075197	20	-0.041359
5	-0.162976	13	-0.179877	21	0.096508
6	-0.292790	14	-0.140382	22	0.040197
7	0.010100	15	-0.301980	23	0.061635
8	-0.018390	16	-0.093313	24	-0.110980

Above serial correlations significant if their absolute values are greater than 0.298142

Durbin-Watson Value 1.3120

Multiple Regression Report

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 Database E:\Data\Rm5.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	1.151948	0.131905	0.868095	1.550402E-04
HOURS	1.083225	0.076831	0.923169	1.523849E-06
PRORATE	1.111950	0.100679	0.899321	6.146785E-05
AVL	1.031071	0.030135	0.969865	1.034681E-04

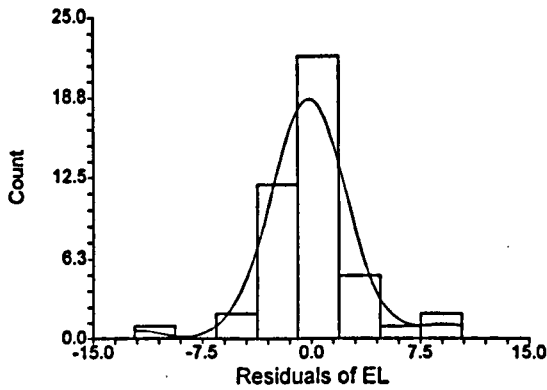
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.379870	34.50	34.50	1.00
2	1.113988	27.85	62.35	1.24
3	0.896539	22.41	84.76	1.54
4	0.609603	15.24	100.00	2.26

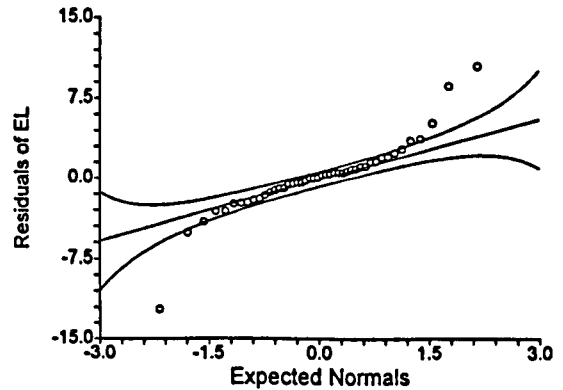
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

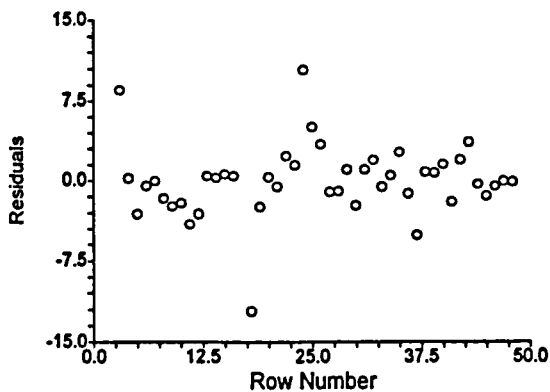
Histogram of Residuals of EL



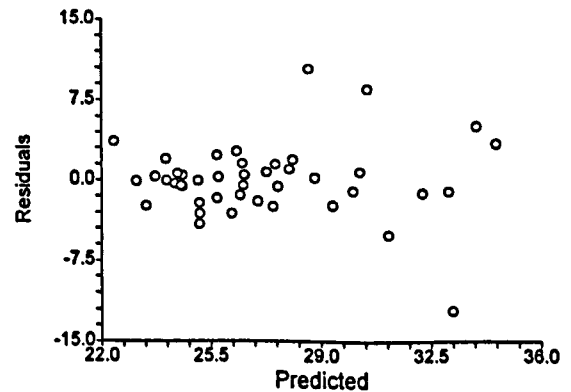
Normal Probability Plot of Residuals of EL



Residuals vs Row

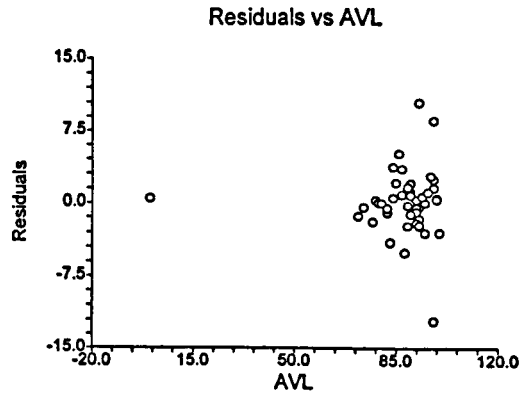
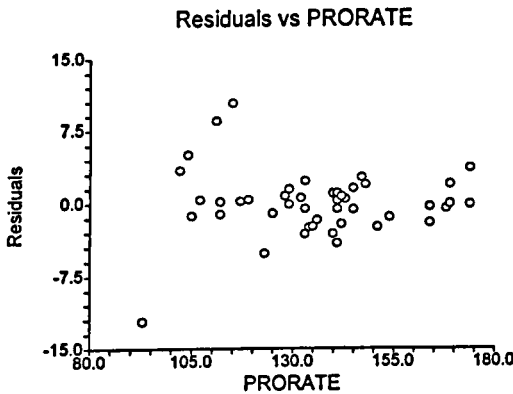
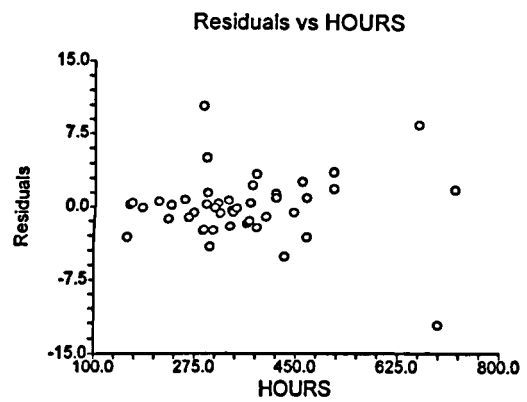
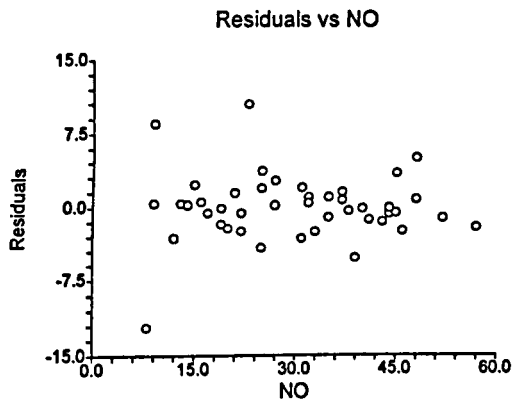


Residuals vs Predicted



Multiple Regression Report

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 Dependent EL



Multiple Regression Report

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 Database E:\Data\Rm6.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	70.93206	26.39486	2.6873	0.011477	Reject Ho	0.740005
NO	-0.1582527	5.553485E-02	-2.8496	0.007712	Reject Ho	0.788261
HOURS	0.0195933	7.049894E-03	2.7792	0.009175	Reject Ho	0.768005
PRORATE	-0.2826918	0.3101797	-0.9114	0.369128	Accept Ho	0.143065
AVL	3.461991E-02	5.235276E-02	0.6613	0.513317	Accept Ho	0.098239
R-Squared	0.528250					

Model

$$70.93206 - .1582527 * NO + .0195933 * HOURS - .2826918 * PRORATE + 3.461991E-02 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	104477.3	104477.3			
Model	4	1003.286	250.8216	8.6782	0.000080	0.996865
Error	31	895.9795	28.90257			
Total(Adjusted)	35	1899.266	54.26474			

Root Mean Square Error	5.376111	R-Squared	0.5282
Mean of Dependent	53.87158	Adj R-Squared	0.4674
Coefficient of Variation	9.979493E-02	Press Value	1104.725
Sum Press Residuals	126.4072	Press R-Squared	0.4183

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	4.8362	0.000001	Rejected
Kurtosis	4.3180	0.000016	Rejected
Omnibus	42.0344	0.000000	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.162462	9	-0.102267	17	0.032749
2	-0.186151	10	-0.148257	18	-0.001923
3	-0.012916	11	0.043835	19	0.132950
4	0.112765	12	-0.219231	20	0.057618
5	0.072632	13	-0.119002	21	0.014275
6	-0.088790	14	0.097860	22	0.037223
7	-0.136139	15	0.059541	23	0.005015
8	-0.069754	16	0.100580	24	-0.033684

Above serial correlations significant if their absolute values are greater than 0.333333

Durbin-Watson Value 1.6506

Multiple Regression Report

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 Database E:\Data\Rm6.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	1.664930	0.399374	0.600626	1.067075E-04
HOURS	1.411366	0.291466	0.708534	1.719605E-06
PRORATE	1.333158	0.249901	0.750099	3.32882E-03
AVL	1.087396	0.080372	0.919628	9.482935E-05

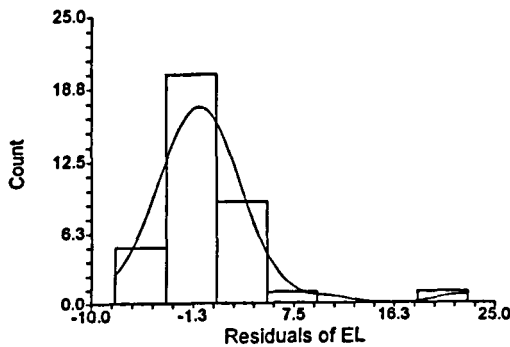
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	2.047908	51.20	51.20	1.00
2	0.858432	21.46	72.66	2.39
3	0.667183	16.68	89.34	3.07
4	0.426477	10.66	100.00	4.80

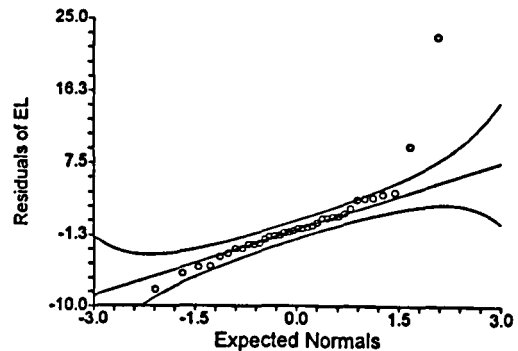
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

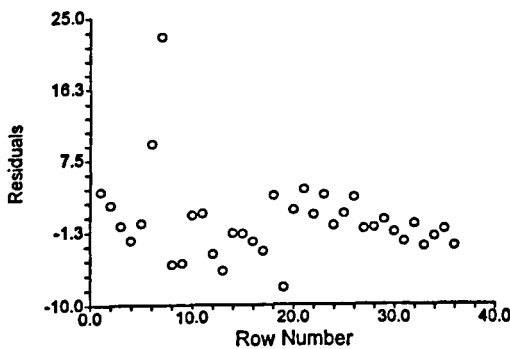
Histogram of Residuals of EL



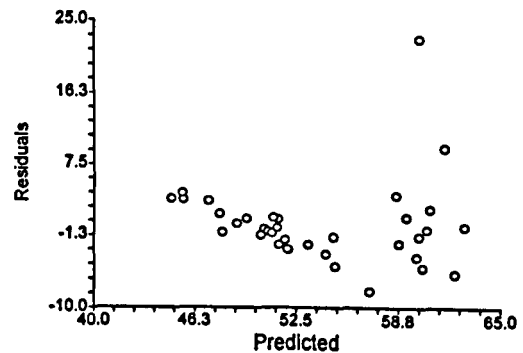
Normal Probability Plot of Residuals of EL



Residuals vs Row

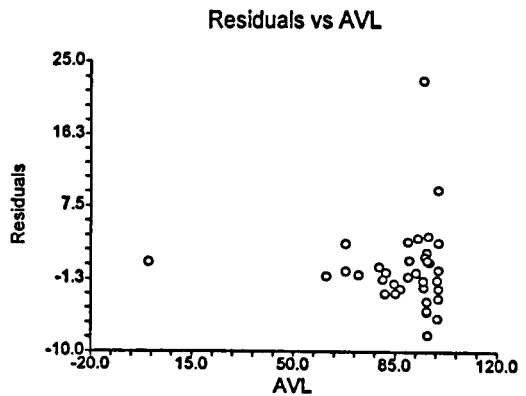
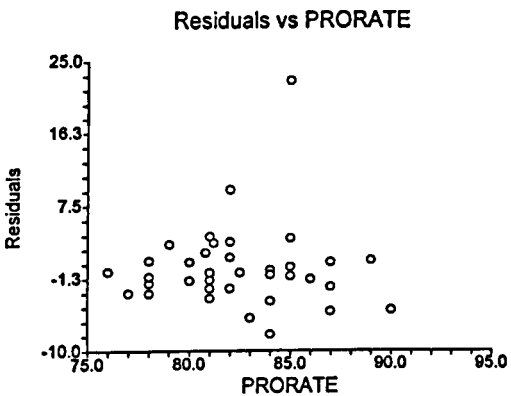
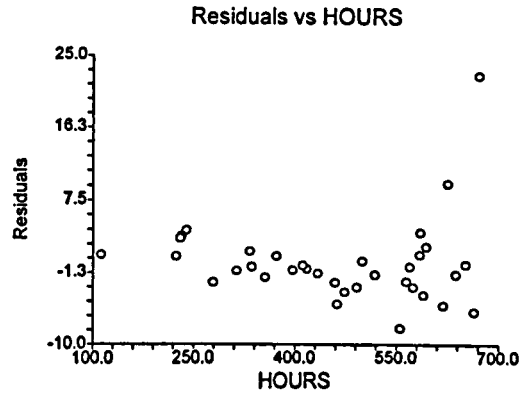
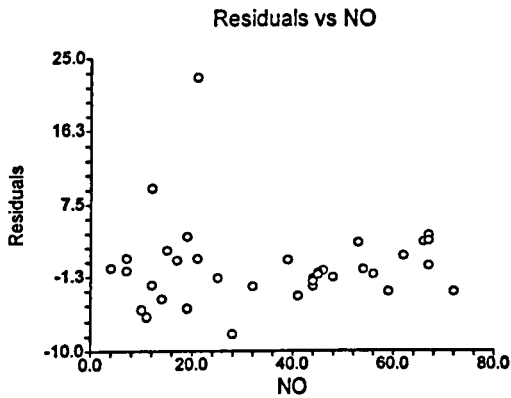


Residuals vs Predicted



Multiple Regression Report

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 Database E:\Data\Rm6.S0
 Dependent EL



Multiple Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	98.00167	15.27461	6.4160	0.000001	Reject Ho	0.999988
NO	-9.234053E-02	4.763445E-02	-1.9385	0.062700	Accept Ho	0.464984
HOURS	0.0125597	5.411604E-03	2.3209	0.027797	Reject Ho	0.610595
PRORATE	-0.6274771	0.1639782	-3.8266	0.000668	Reject Ho	0.958396
AVL	1.484227E-02	5.583826E-02	0.2658	0.792334	Accept Ho	0.057589
R-Squared	0.700028					

Model

$$98.00167 - 9.234053E-02 * NO + .0125597 * HOURS - .6274771 * PRORATE + 1.484227E-02 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	90427.82	90427.82			
Model	4	610.8951	152.7238	16.3355	0.000001	0.999998
Error	28	261.777	9.349179			
Total(Adjusted)	32	872.6721	27.271			

Root Mean Square Error	3.057643	R-Squared	0.7000
Mean of Dependent	52.34727	Adj R-Squared	0.6572
Coefficient of Variation	5.841074E-02	Press Value	347.7271
Sum Press Residuals	77.5249	Press R-Squared	0.6015

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	2.2134	0.026872	Rejected
Kurtosis	1.5581	0.119212	Accepted
Omnibus	7.3267	0.025647	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.343516	9	0.002957	17	-0.176120
2	0.215268	10	-0.042134	18	-0.130434
3	0.091756	11	0.027338	19	-0.106212
4	-0.065758	12	-0.011853	20	-0.130677
5	-0.123528	13	-0.125521	21	-0.061584
6	-0.157088	14	-0.019183	22	-0.048187
7	0.049846	15	-0.144970	23	-0.021579
8	-0.096873	16	-0.058003	24	-0.034088

Above serial correlations significant if their absolute values are greater than 0.348155

Durbin-Watson Value 1.0815

Multiple Regression Report

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 Database E:\Data\R-cm2.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	3.369683	0.703236	0.296764	2.426994E-04
HOURS	3.197980	0.687303	0.312697	3.13241E-06
PRORATE	1.040069	0.038525	0.961475	2.876066E-03
AVL	1.283091	0.220632	0.779368	3.334957E-04

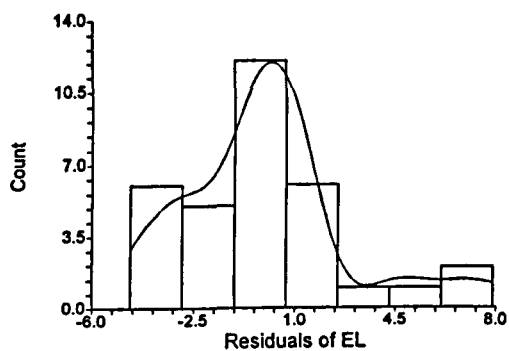
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	2.177713	54.44	54.44	1.00
2	1.004458	25.11	79.55	2.17
3	0.648141	16.20	95.76	3.36
4	0.169687	4.24	100.00	12.83

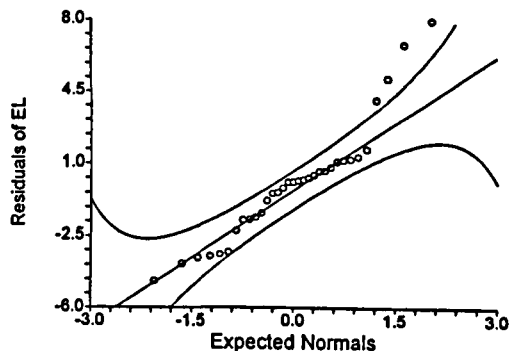
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

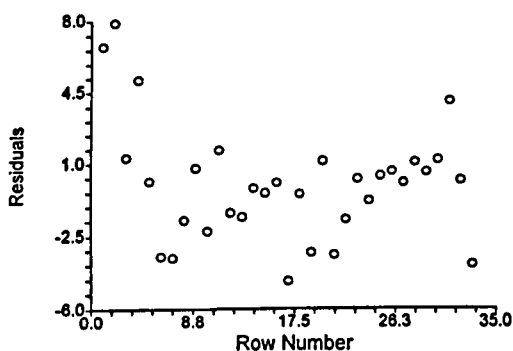
Histogram of Residuals of EL



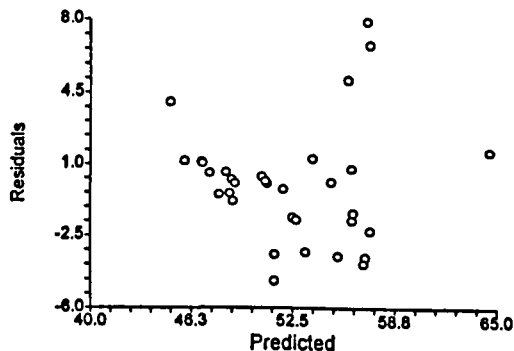
Normal Probability Plot of Residuals of EL



Residuals vs Row

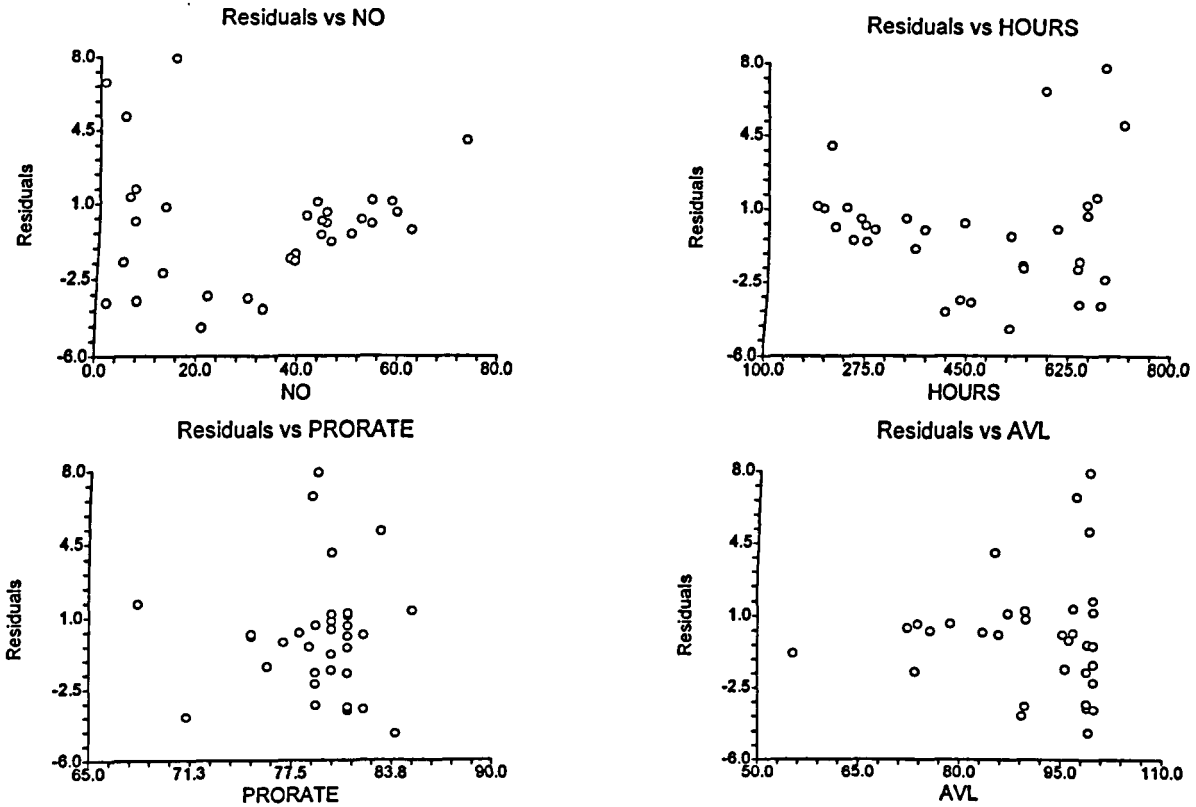


Residuals vs Predicted



Multiple Regression Report

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 Dependent EL



Multiple Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	43.87086	12.53763	3.4991	0.001436	Reject Ho	0.923479
NO	-8.948211E-03	6.883062E-02	-0.1300	0.897404	Accept Ho	0.051821
HOURS	3.663545E-02	9.823712E-03	3.7293	0.000770	Reject Ho	0.950681
PRORATE	-0.1944191	0.1001872	-1.9406	0.061453	Accept Ho	0.468329
AVL	0.1243393	7.889893E-02	1.5759	0.125193	Accept Ho	0.332839
R-Squared	0.712828					

Model

$$43.87086 - 8.948211E-03 * NO + 3.663545E-02 * HOURS - 0.1944191 * PRORATE + 0.1243393 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	110313	110313			
Model	4	1870.59	467.6476	19.2373	0.000000	1.000000
Error	31	753.5906	24.30938			
Total(Adjusted)	35	2624.181	74.9766			

Root Mean Square Error	4.930454	R-Squared	0.7128
Mean of Dependent	55.35567	Adj R-Squared	0.6758
Coefficient of Variation	8.906864E-02	Press Value	1053.711
Sum Press Residuals	145.3975	Press R-Squared	0.5985

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	2.4299	0.015101	Rejected
Kurtosis	1.9707	0.048758	Rejected
Omnibus	9.7883	0.007490	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.293741	9	-0.174791	17	-0.120899
2	-0.173025	10	-0.222214	18	-0.012481
3	-0.292056	11	-0.087411	19	0.091332
4	-0.176315	12	0.193878	20	0.001264
5	-0.041064	13	0.230659	21	-0.046731
6	0.107494	14	-0.094624	22	-0.018572
7	0.236728	15	-0.160611	23	-0.008773
8	-0.009432	16	-0.154488	24	-0.002752

Above serial correlations significant if their absolute values are greater than 0.333333

Durbin-Watson Value 1.3960

Multiple Regression Report

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 Database E:\Data\R-cm3.S0
 Dependent EL

Multicollinearity Section

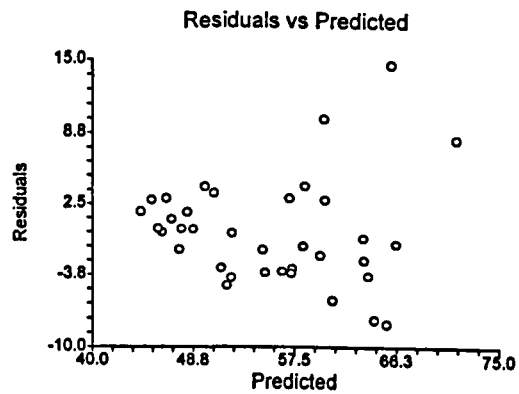
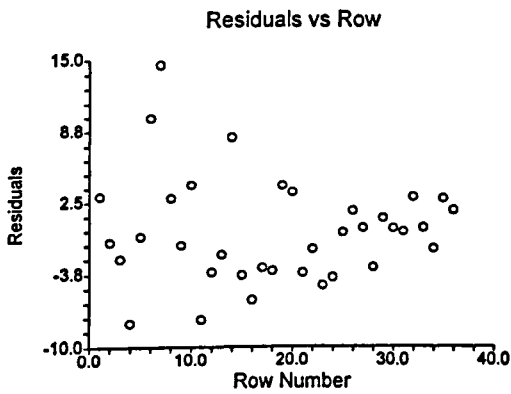
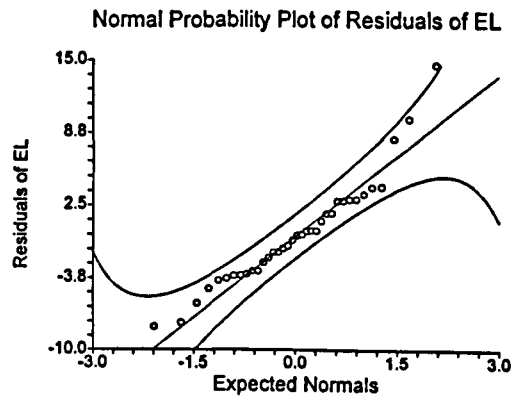
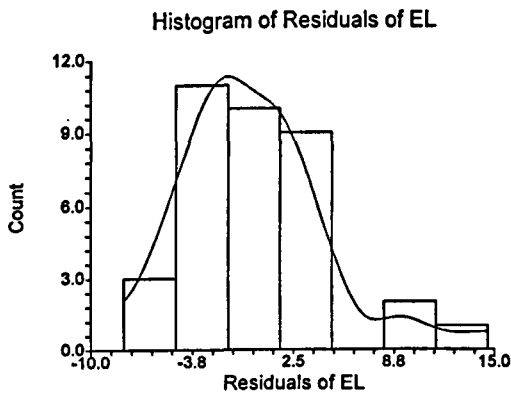
Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	3.370184	0.703280	0.296720	1.9489E-04
HOURS	3.489678	0.713441	0.286559	3.96988E-06
PRORATE	1.050832	0.048373	0.951627	4.129054E-04
AVL	1.305560	0.234045	0.765955	2.560757E-04

Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	2.240453	56.01	56.01	1.00
2	0.969038	24.23	80.24	2.31
3	0.627776	15.69	95.93	3.57
4	0.162733	4.07	100.00	13.77

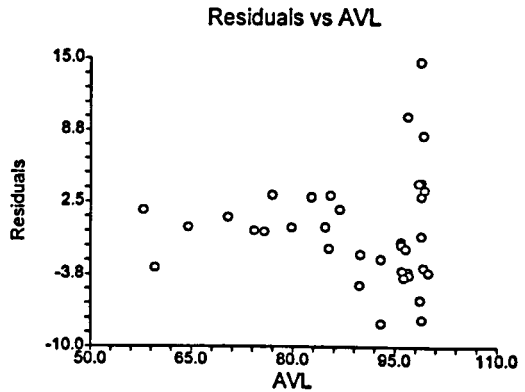
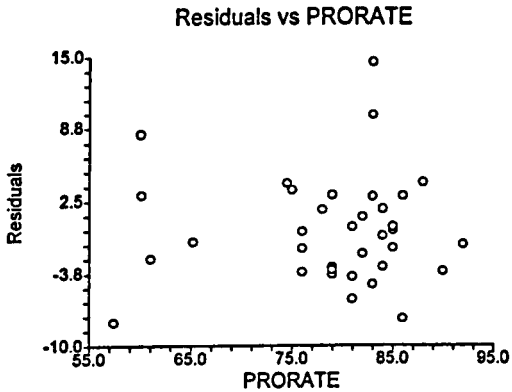
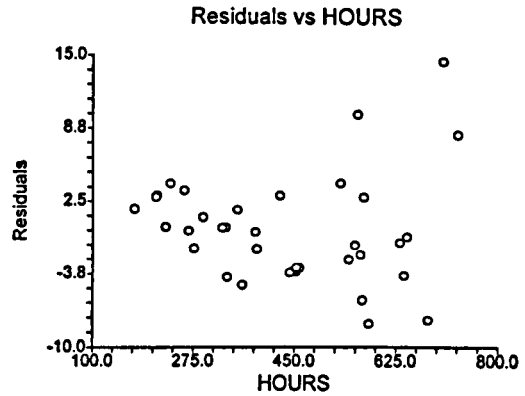
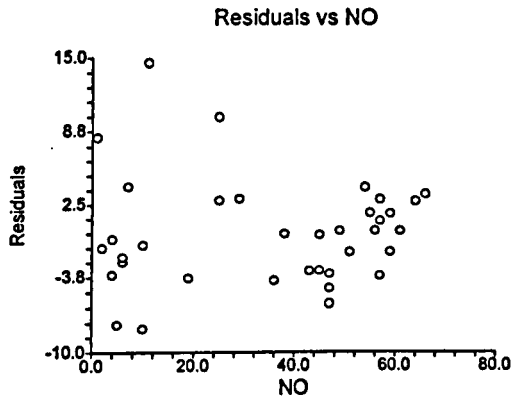
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section



Multiple Regression Report

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 Dependent EL



Multiple Regression Report

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 Database E:\Data\R-cm4.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	70.93206	26.39486	2.6873	0.011477	Reject Ho	0.740005
NO	-0.1582527	5.553485E-02	-2.8496	0.007712	Reject Ho	0.788261
HOURS	0.0195933	7.049894E-03	2.7792	0.009175	Reject Ho	0.768005
PRORATE	-0.2826918	0.3101797	-0.9114	0.369128	Accept Ho	0.143065
AVL	3.461991E-02	5.235276E-02	0.6613	0.513317	Accept Ho	0.098239
R-Squared	0.528250					

Model

$$70.93206 - 0.1582527 \cdot NO + 0.0195933 \cdot HOURS - 0.2826918 \cdot PRORATE + 3.461991E-02 \cdot AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	104477.3	104477.3			
Model	4	1003.286	250.8216	8.6782	0.000080	0.996865
Error	31	895.9795	28.90257			
Total(Adjusted)	35	1899.266	54.26474			

Root Mean Square Error	5.376111	R-Squared	0.5282
Mean of Dependent	53.87158	Adj R-Squared	0.4674
Coefficient of Variation	9.979493E-02	Press Value	1104.725
Sum [Press Residuals]	126.4072	Press R-Squared	0.4183

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	4.8362	0.000001	Rejected
Kurtosis	4.3180	0.000016	Rejected
Omnibus	42.0344	0.000000	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.162462	9	-0.102267	17	0.032749
2	-0.186151	10	-0.148257	18	-0.001923
3	-0.012916	11	0.043835	19	0.132950
4	0.112765	12	-0.219231	20	0.057618
5	0.072632	13	-0.119002	21	0.014275
6	-0.088790	14	0.097860	22	0.037223
7	-0.136139	15	0.059541	23	0.005015
8	-0.069754	16	0.100580	24	-0.033684

Above serial correlations significant if their absolute values are greater than 0.333333

Durbin-Watson Value 1.6506

Multiple Regression Report

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 Database E:\Data\R-cm4.S0
 Dependent EL

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	1.664930	0.399374	0.600626	1.067075E-04
HOURS	1.411366	0.291466	0.708534	1.719605E-06
PRORATE	1.333158	0.249901	0.750099	3.32882E-03
AVL	1.087396	0.080372	0.919628	9.482935E-05

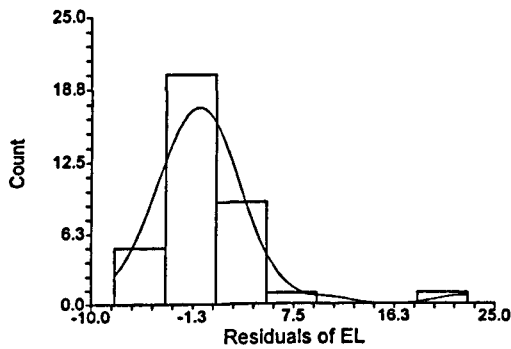
Eigenvalues of Centered Correlations

No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	2.047908	51.20	51.20	1.00
2	0.858432	21.46	72.66	2.39
3	0.667183	16.68	89.34	3.07
4	0.426477	10.66	100.00	4.80

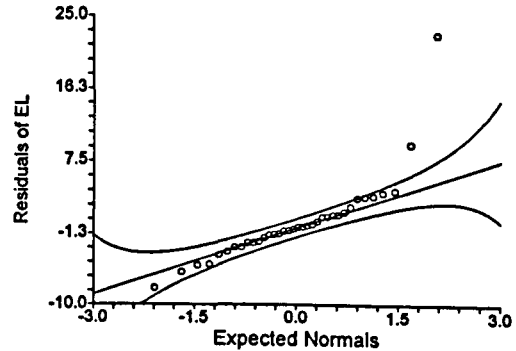
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

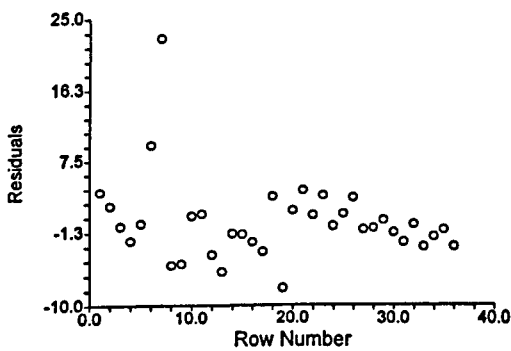
Histogram of Residuals of EL



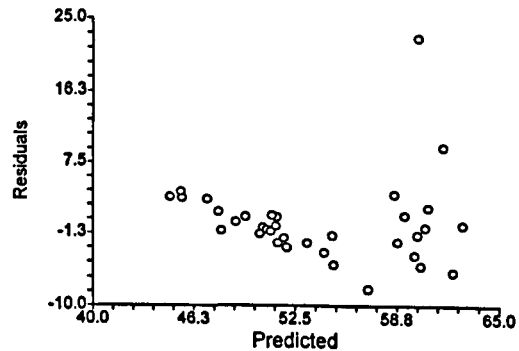
Normal Probability Plot of Residuals of EL



Residuals vs Row

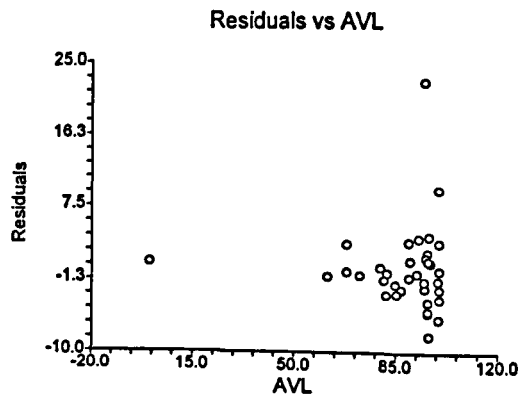
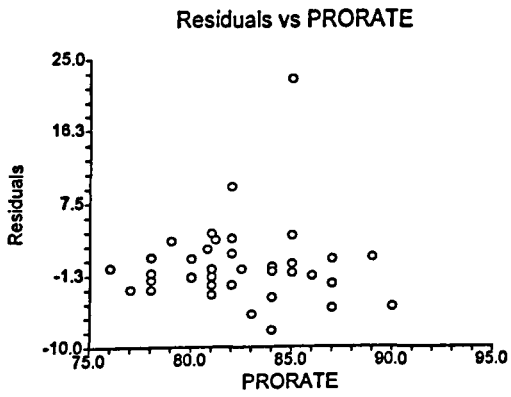
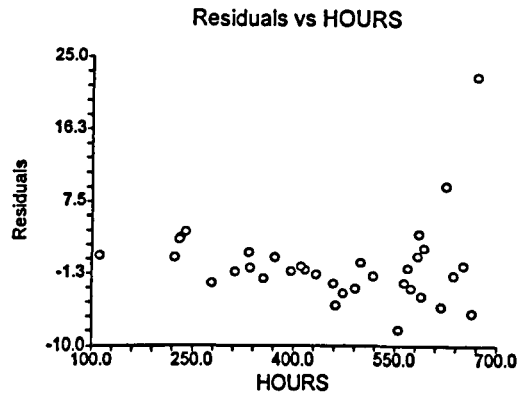
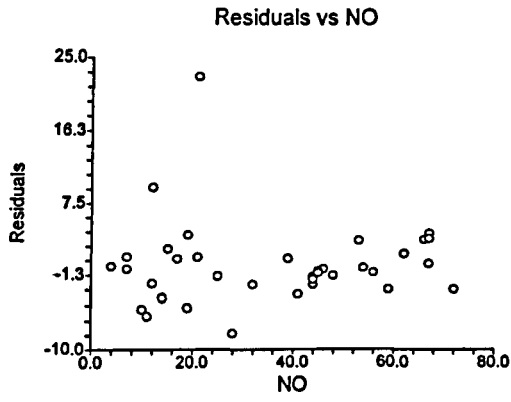


Residuals vs Predicted



Multiple Regression Report

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Database E:\Data\R-cm4.S0
Dependent EL



Appendix 18: Robust Regression of Mills

Robust Regression Report

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 Database E:\Data\Cm4.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	90.53497	4.343868	20.8420	0.000000	Reject Ho	1.000000
NO	-4.979696E-02	2.259437E-02	-2.2040	0.032930	Reject Ho	0.577167
HOURS	-3.311579E-03	2.653429E-03	-1.2480	0.218771	Accept Ho	0.230477
PRORATE	-0.8052055	7.340048E-02	-10.9700	0.000000	Reject Ho	1.000000
AVL	-0.1623507	4.020692E-02	-4.0379	0.000218	Reject Ho	0.976495
R-Squared	0.812713					

Model

90.53497-4.979696E-02*NO-3.311579E-03*HOURS-.8052055*PRORATE-.1623507*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	71189.23	71189.23			
Model	4	344.6455	86.16138	46.6484	0.000000	1.000000
Error	43	79.42263	1.847038			
Total(Adjusted)	47	424.0682	9.022727			

Root Mean Square Error 1.359058 R-Squared 0.812713
 Mean of Dependent Variable 46.50352 Adj R-Squared 0.795291
 Coefficient of Variation 2.922484E-02

Robust Regression Report

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 Database E:\Data\Cm5.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	101.2321	5.736543	17.6469	0.000000	Reject Ho	1.000000
NO	-0.0793353	3.004431E-02	-2.6406	0.011746	Reject Ho	0.731319
HOURS	1.370153E-02	4.041635E-03	3.3901	0.001583	Reject Ho	0.911119
PRORATE	-0.387904	0.0267937	-14.4774	0.000000	Reject Ho	1.000000
AVL	-0.0865309	4.162355E-02	-2.0789	0.044084	Reject Ho	0.527493
R-Squared	0.866787					

Model

101.2321-.0793353*NO+ 1.370153E-02*HOURS-.387904*PRORATE-.0865309*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	91586.96	91586.96			
Model	4	599.2897	149.8224	65.0679	0.000000	1.000000
Error	40	92.1022	2.302555			
Total(Adjusted)	44	691.392	15.71345			

Root Mean Square Error 1.517417 R-Squared 0.866787
 Mean of Dependent Variable 53.94441 Adj R-Squared 0.853466
 Coefficient of Variation 2.812928E-02

Robust Regression Report

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 Database E:\Data\Cm6.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	95.17316	5.192614	18.3286	0.000000	Reject Ho	1.000000
NO	0.1105267	2.053854E-02	5.3814	0.000004	Reject Ho	0.999490
HOURS	0.0233406	3.088966E-03	7.5561	0.000000	Reject Ho	1.000000
PRORATE	-0.3366229	1.468455E-02	-22.9236	0.000000	Reject Ho	1.000000
AVL	5.994438E-02	4.141853E-02	1.4473	0.155808	Accept Ho	0.292140
R-Squared	0.942969					

Model

95.17316+ .1105267*NO+ .0233406*HOURS-.3366229*PRORATE+ 5.994438E-02*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	111266.1	111266.1			
Model	4	1005.44	251.36	161.2106	0.000000	1.000000
Error	39	60.80891	1.559203			
Total(Adjusted)	43	1066.249	24.79649			
Root Mean Square Error		1.24868	R-Squared	0.942969		
Mean of Dependent Variable		59.95951	Adj R-Squared	0.937120		
Coefficient of Variation		2.082539E-02				

Robust Regression Report

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 Database E:\Data\Cm7.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	113.0717	2.766142	40.8770	0.000000	Reject Ho	1.000000
NO	-9.459768E-03	1.060623E-02	-0.8919	0.377913	Accept Ho	0.140211
HOURS	1.718058E-02	2.101502E-03	8.1754	0.000000	Reject Ho	1.000000
PRORATE	-0.347304	1.034992E-02	-33.5562	0.000000	Reject Ho	1.000000
AVL	-5.360653E-02	1.785489E-02	-3.0023	0.004657	Reject Ho	0.833402
R-Squared	0.967995					

Model

113.0717-9.459768E-03*NO+ 1.718058E-02*HOURS-.347304*PRORATE-5.360653E-02*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	99128.89	99128.89			
Model	4	541.087	135.2718	294.8934	0.000000	1.000000
Error	39	17.88985	0.4587141			
Total(Adjusted)	43	558.9769	12.99946			
Root Mean Square Error		0.6772844	R-Squared	0.967995		
Mean of Dependent Variable		55.74606	Adj R-Squared	0.964713		
Coefficient of Variation		1.214946E-02				

Robust Regression Report

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Database R-rm1
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	29.90324	7.287123	4.1036	0.000194	Reject Ho	0.979486
NO	2.779012E-02	1.096219E-02	2.5351	0.015256	Reject Ho	0.696337
HOURS	1.174738E-02	1.034845E-03	11.3518	0.000000	Reject Ho	1.000000
PRORATE	-0.031937	2.219354E-02	-1.4390	0.157924	Accept Ho	0.289691
AVL	-3.668998E-02	4.151949E-02	-0.8837	0.382149	Accept Ho	0.138623
R-Squared	0.782735					

Model
 29.90324+ 2.779012E-02*NO+ 1.174738E-02*HOURS-.031937*PRORATE-3.668998E-02*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	18725.59	18725.59			
Model	4	87.43872	21.85968	36.0268	0.000000	1.000000
Error	40	24.27047	0.6067616			
Total(Adjusted)	44	111.7092	2.538845			
Root Mean Square Error		0.7789491	R-Squared	0.782735		
Mean of Dependent Variable		23.38195	Adj R-Squared	0.761009		
Coefficient of Variation		3.331411E-02				

Robust Regression Report

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 Database E:\Data\R-rm2.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	42.30705	4.715245	8.9724	0.000000	Reject Ho	1.000000
NO	1.991421E-02	1.393626E-02	1.4289	0.160594	Accept Ho	0.286636
HOURS	8.826557E-03	1.472435E-03	5.9945	0.000000	Reject Ho	0.999950
PRORATE	-6.835705E-02	2.018844E-02	-3.3859	0.001575	Reject Ho	0.910795
AVL	-8.741473E-02	2.685884E-02	-3.2546	0.002279	Reject Ho	0.888295
R-Squared	0.640407					

Model
 42.30705+ 1.991421E-02*NO+ 8.826557E-03*HOURS-6.835705E-02*PRORATE-8.741473E-02*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	14503.55	14503.55			
Model	4	30.54609	7.636523	18.2545	0.000000	1.000000
Error	41	17.15182	0.418337			
Total(Adjusted)	45	47.69791	1.059954			
Root Mean Square Error		0.6467897	R-Squared	0.640407		
Mean of Dependent Variable		21.33432	Adj R-Squared	0.605325		
Coefficient of Variation		3.031687E-02				

-8.741473E-02

Robust Regression Report

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Database E:\Data\Rm4.S0
 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	44.00504	1.544979	28.4826	0.000000	Reject Ho	1.000000
NO	-0.0216251	1.327098E-02	-1.6295	0.111927	Accept Ho	0.354441
HOURS	3.414498E-03	1.360642E-03	2.5095	0.016729	Reject Ho	0.685147
PRORATE	-0.3041281	0.013008	-23.3801	0.000000	Reject Ho	1.000000
AVL	-2.896447E-02	1.260502E-02	-2.2979	0.027488	Reject Ho	0.608854
R-Squared	0.953502					

Model
 44.00504-.0216251*NO+ 3.414498E-03*HOURS-.3041281*PRORATE-2.896447E-02*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	13369.23	13369.23			
Model	4	136.6989	34.17474	184.5557	0.000000	1.000000
Error	36	6.666229	0.185173			
Total(Adjusted)	40	143.3652	3.584129			

Root Mean Square Error 0.4303174 R-Squared 0.953502
 Mean of Dependent Variable 21.54259 Adj R-Squared 0.948335
 Coefficient of Variation 0.0199752

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	36.12789	1.885229	19.1637	0.000000	Reject Ho	1.000000
NO	0.1099125	1.826032E-02	6.0192	0.000001	Reject Ho	0.999952
HOURS	1.589599E-02	2.07166E-03	7.6731	0.000000	Reject Ho	1.000000
PRORATE	-0.1468642	1.329009E-02	-11.0507	0.000000	Reject Ho	1.000000
AVL	0.0273312	1.220843E-02	2.2387	0.031110	Reject Ho	0.587839
R-Squared	0.787710					

Model
 36.12789+ .1099125*NO+ 1.589599E-02*HOURS-.1468642*PRORATE+ .0273312*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	21583.47	21583.47			
Model	4	193.4832	48.3708	35.2500	0.000000	1.000000
Error	38	52.14436	1.37222			
Total(Adjusted)	42	245.6276	5.848275			

Root Mean Square Error 1.171418 R-Squared 0.787710
 Mean of Dependent Variable 26.76042 Adj R-Squared 0.765363
 Coefficient of Variation 4.377427E-02

Robust Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	43.328	2.882007	15.0340	0.000000	Reject Ho	1.000000
NO	-5.750638E-03	1.172793E-02	-0.4903	0.626715	Accept Ho	0.076567
HOURS	2.70675E-03	1.396659E-03	1.9380	0.060078	Accept Ho	0.471758
PRORATE	-9.397328E-02	6.802621E-03	-13.8143	0.000000	Reject Ho	1.000000
AVL	-4.355091E-02	0.0268375	-1.6228	0.112908	Accept Ho	0.352852
R-Squared	0.858078					

Model

43.328-5.750638E-03*NO+ 2.70675E-03*HOURS-9.397328E-02*PRORATE-4.355091E-02*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	9224.886	9224.886			
Model	4	91.14042	22.7851	57.4383	0.000000	1.000000
Error	38	15.07416	0.3966883			
Total(Adjusted)	42	106.2146	2.528919			

Root Mean Square Error	0.629832	R-Squared	0.858078
Mean of Dependent Variable	16.69196	Adj R-Squared	0.843139
Coefficient of Variation	3.773266E-02		

Robust Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	100.6041	7.810647	12.8804	0.000000	Reject Ho	1.000000
NO	-0.1147548	2.215182E-02	-5.1804	0.000019	Reject Ho	0.998773
HOURS	8.798144E-03	2.27453E-03	3.8681	0.000627	Reject Ho	0.961406
PRORATE	-0.6338901	8.492537E-02	-7.4641	0.000000	Reject Ho	1.000000
AVL	1.835155E-02	2.246241E-02	0.8170	0.421085	Accept Ho	0.123649
R-Squared	0.897508					

Model

100.6041-.1147548*NO+ 8.798144E-03*HOURS-.6338901*PRORATE+ 1.835155E-02*AVL

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	55920.61	55920.61			
Model	4	312.323	78.08076	59.1088	0.000000	1.000000
Error	27	35.66608	1.320966			
Total(Adjusted)	31	347.9891	11.22546			

Root Mean Square Error	1.149333	R-Squared	0.897508
Mean of Dependent Variable	51.26207	Adj R-Squared	0.882324
Coefficient of Variation	2.242072E-02		

Robust Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	63.75738	5.666245	11.2521	0.000000	Reject Ho	1.000000
NO	-6.033308E-02	2.834813E-02	-2.1283	0.042250	Reject Ho	0.537891
HOURS	1.677138E-02	4.168576E-03	4.0233	0.000395	Reject Ho	0.972688
PRORATE	-0.294803	4.952885E-02	-5.9521	0.000002	Reject Ho	0.999921
AVL	9.251468E-02	3.120078E-02	2.9651	0.006122	Reject Ho	0.816506
R-Squared	0.871942					

Model

$$63.75738 - 6.033308E-02 * NO + 1.677138E-02 * HOURS - .294803 * PRORATE + 9.251468E-02 * AVL$$

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	69337.97	69337.97			
Model	4	600.7863	150.1966	47.6629	0.000000	1.000000
Error	28	88.23432	3.151226			
Total(Adjusted)	32	689.0206	21.53189			

Root Mean Square Error	1.775169	R-Squared	0.871942
Mean of Dependent Variable	52.67492	Adj R-Squared	0.853648
Coefficient of Variation	3.370047E-02		

Robust Regression Report

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 Dependent EL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	60.11334	7.022029	8.5607	0.000000	Reject Ho	1.000000
NO	-0.1143857	1.396954E-02	-8.1882	0.000000	Reject Ho	1.000000
HOURS	6.440092E-03	1.777738E-03	3.6226	0.001144	Reject Ho	0.937713
PRORATE	-0.1012563	8.426312E-02	-1.2017	0.239558	Accept Ho	0.212974
AVL	1.759519E-02	1.189344E-02	1.4794	0.150197	Accept Ho	0.298014
R-Squared	0.813413					

Model

$$60.11334 - .1143857 * NO + 6.440092E-03 * HOURS - .1012563 * PRORATE + 1.759519E-02 * AVL$$

Analysis of Variance Section

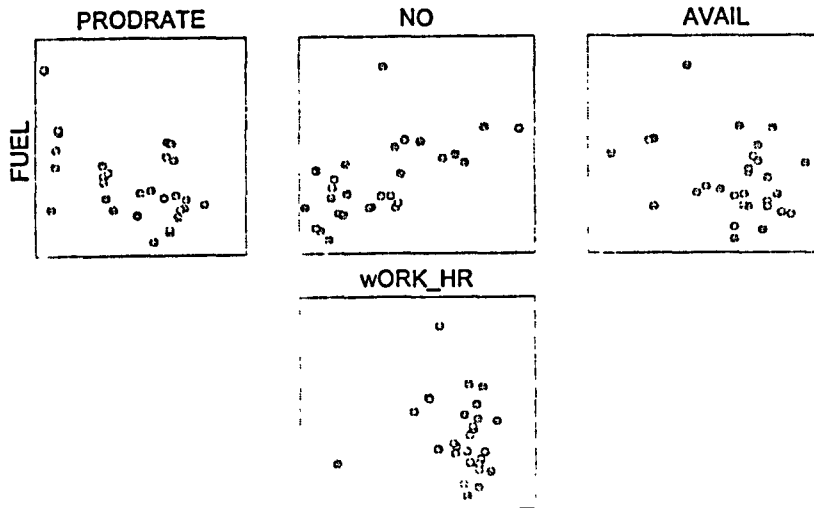
Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	61492.16	61492.16			
Model	4	165.8485	41.46214	30.5160	0.000000	1.000000
Error	28	38.04359	1.3587			
Total(Adjusted)	32	203.8921	6.371629			

Root Mean Square Error	1.165633	R-Squared	0.813413
Mean of Dependent Variable	51.13321	Adj R-Squared	0.786758
Coefficient of Variation	0.022796		

Appendix 19 : Analysis of Reputable Manufacturer's Data

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Plot Section



Data Screening Report

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Multivariate Outlier Section

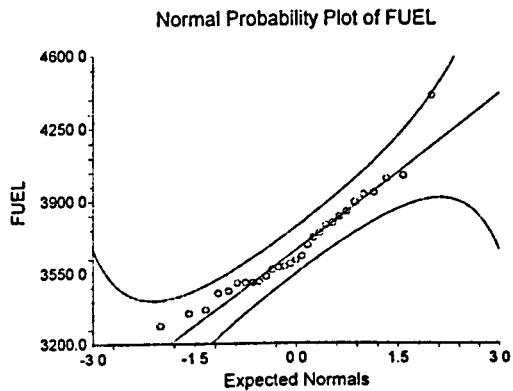
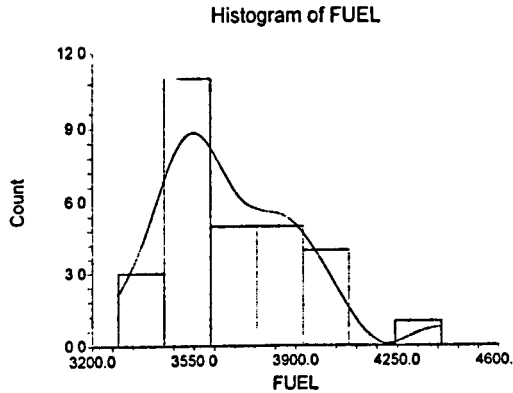
Row	T2 Value	T2 Prob	Outlier?
1	0.79	0.3807	
2	0.20	0.6620	
3	0.51	0.4829	
4	1.86	0.1833	
5	2.02	0.1661	
6	8.92	0.0058	Yes
7	0.17	0.6846	
8	0.51	0.4804	
9	0.04	0.8501	
10	0.23	0.6328	
11	0.00	0.9697	
12	0.07	0.7919	
13	0.03	0.8553	
14	0.16	0.6935	
15	1.82	0.1880	
16	0.78	0.3842	
17	0.48	0.4930	
18	2.56	0.1207	
19	0.08	0.7806	
20	0.86	0.3606	
21	0.35	0.5615	
22	0.20	0.6550	
23	0.52	0.4754	
24	1.62	0.2141	
25	0.36	0.5517	

26	0.12	0.7360
27	1.16	0.2911
28	1.08	0.3077
29	0.49	0.4889

Descriptive Statistics Report

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Plots Section of FUEL



Correlation Report

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Pearson Correlations Section (Row-Wise Deletion)

	FUEL	PRODRATE	NO	AVAIL	
FUEL	1.000000	-0.531545	0.608941	-0.309555	-0.127944
	0.000000	0.003604	0.000584	0.108937	0.516452
PRODRATE	-0.531545	1.000000	-0.202224	-0.102715	0.084899
	0.003604	0.000000	0.302076	0.602982	0.667532
NO	0.608941	-0.202224	1.000000	-0.095991	0.116097
	0.000584	0.302076	0.000000	0.627036	0.556322
AVAIL	-0.309555	-0.102715	-0.095991	1.000000	0.844989
	0.108937	0.602982	0.627036	0.000000	0.000000

wORK_HR	-0.127944	0.084899	0.116097	0.844989	1.000000
	0.516452	0.667532	0.556322	0.000000	0.000000

All Possible Regression Report

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 Dependent FUEL

All Possible Results Section

Model Size	R-Squared	Root MSE	Cp	Model
1	0.370809	199.633	25.731869	B (NO)
1	0.282540	213.1768	32.708710	A (PRODRATE)
1	0.095825	239.3137	47.466906	C (AVAIL)
1	0.016370	249.6072	53.747097	D (wORK_HR)

Variables in Best Model
NO

2	0.544714	173.1809	13.986271	AB
2	0.434448	193.0164	22.701786	BC
2	0.416562	196.0447	24.115512	AC
2	0.410806	197.0094	24.570468	BD
2	0.289449	216.3493	34.162667	AD
2	0.158260	235.4761	44.531942	CD

Variables in Best Model
PRODRATE, NO

3	0.638920	157.4069	8.540098	ABC
3	0.625525	160.3	9.598860	ACD
3	0.568581	172.0567	14.099746	ABD
3	0.435811	196.759	24.594079	BCD

Variables in Best Model
PRODRATE, NO, AVAIL

4	0.709012	144.345	5.000000	ABCD
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Variables in Best Model
PRODRATE, NO, AVAIL, wORK_HR

Stepwise Regression Report

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 Dependent FUEL

Iteration Detail Section

Iter. No.	Max R-Squared Action	Variable	R-Squared	Sqrt(MSE)
0	Unchanged 0.000000		0.000000	246.971
1	Added 0.000000	NO	0.370809	199.633
2	Added 0.040894	PRODRATE	0.544714	173.1809
3	Added 0.055948	AVAIL	0.638920	157.4069
4	Added	wORK_HR	0.709012	144.345

0.801727
 5 Unchanged 0.709012 144.345
 0.801727

Stepwise Regression Report

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 Dependent FUEL

Iteration Detail Section

Iter.	Max R-Squared			
No.	Action	Variable	R-Squared	Sqrt(MSE)
	Other X's			
0	Unchanged		0.709012	144.345
	0.801727			
1	Unchanged		0.709012	144.345
	0.801727			

Stepwise Regression Report

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 Dependent FUEL

Iteration Detail Section

Iter.	Max R-Squared			
No.	Action	Variable	R-Squared	Sqrt(MSE)
	Other X's			
0	Unchanged		0.000000	246.971
	0.000000			
1	Added	NO	0.370809	199.633
	0.000000			
2	Unchanged		0.370809	199.633
	0.000000			
3	Added	PRODRATE	0.544714	173.1809
	0.040894			
4	Unchanged		0.544714	173.1809
	0.040894			
5	Added	AVAIL	0.638920	157.4069
	0.055948			
6	Unchanged		0.638920	157.4069
	0.055948			
7	Added	WORK_HR	0.709012	144.345
	0.801727			
8	Unchanged		0.709012	144.345
	0.801727			

Stepwise Regression Report

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 Dependent FUEL

Iteration Detail Section

Iter.	Max R-Squared			
No.	Action	Variable	R-Squared	Sqrt(MSE)
	Other X's			
0	Unchanged		0.000000	246.971
	0.000000			

1	Added 0.000000	NO	0.370809	199.633
2	Added 0.040894	PRODRATE	0.544714	173.1809
3	Added 0.055948	AVAIL	0.638920	157.4069
4	Added 0.801727	wORK_HR	0.709012	144.345
5	Unchanged 0.801727		0.709012	144.345

Multiple Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Decision Coefficient	Standard Power Error	T-Value (Ho: B=0)	Prob Level	(5%)	(5)
Intercept	4935.27	331.2571	14.8986	0.000000	Reject	
Ho	1.000000					
PRODRATE	-0.3096707	6.663966E-02	-4.6469	0.000112	Reject	
Ho	0.993531					
NO	1.012281	0.3940639	2.5688	0.017164	Reject	
Ho	0.691640					
AVAIL	-20.87037	6.264315	-3.3316	0.002900	Reject	
Ho	0.890591					
wORK_HR	0.1104942	4.694407E-02	2.3537	0.027502	Reject	
Ho	0.615927					
R-Squared	0.709012					

Model

4935.27-.3096707*PRODRATE+ 1.012281*NO-20.87037*AVAIL+ .1104942*wORK_HR

Regression Coefficient Section

Independent Variable	Regression Standardized Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	C.L.
Intercept	4935.27	331.2571	4250.012	5620.527	0.0000
PRODRATE	-0.3096707	6.663966E-02	-0.4475254	-0.1718161	-0.6001
NO	1.012281	0.3940639	0.1970977	1.827464	0.3378
AVAIL	-20.87037	6.264315	-33.82909	-7.911645	-0.8412
wORK_HR	0.1104942	4.694407E-02	1.338299E-02	0.2076054	0.5946
T-Critical	2.068658				

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	3.791872E+08	3.791872E+08			
Model	4	1167640	291910	14.0102	0.000006	0.9999
Error	23	479215.9	20835.47			
Total(Adjusted)	27	1646856	60994.67			
Root Mean Square Error		144.345	R-Squared	0.7090		
Mean of Dependent		3680	Adj R-Squared	0.6584		
Coefficient of Variation		3.922418E-02	Press Value	3378769		
Sum Press Residuals		4925.272	Press R-Squared	-1.0516		

Multiple Regression Report

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 Dependent FUEL

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.5952	0.551721	Accepted
Kurtosis	1.2351	0.216797	Accepted
Omnibus	1.8797	0.390688	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.065183	9	-0.073167	17	-0.088532
2	-0.133902	10	0.011443	18	-0.241222
3	-0.034756	11	0.111115	19	0.116956
4	-0.150925	12	-0.303738	20	-0.016896
5	0.183581	13	-0.033158	21	0.160171
6	0.120821	14	0.053950	22	0.020363
7	-0.196134	15	0.030631	23	-0.109141
8	0.037162	16	0.075147	24	-0.005638

Above serial correlations significant if their absolute values are greater than 0.377964

Durbin-Watson Value 2.0739

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
PRODRATE	1.318198	0.241389	0.758611	2.131387E-07
NO	1.366892	0.268413	0.731587	7.452978E-06
AVAIL	5.038580	0.801531	0.198469	1.883405E-03
WORK_HR	5.043542	0.801727	0.198273	1.057689E-07

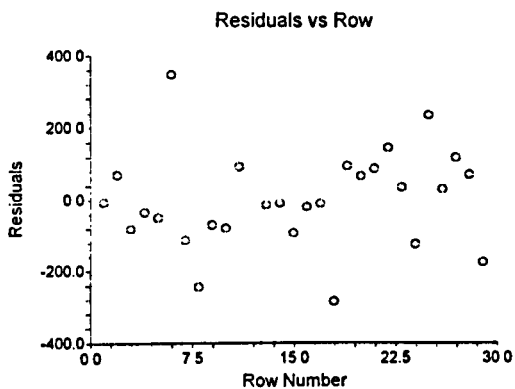
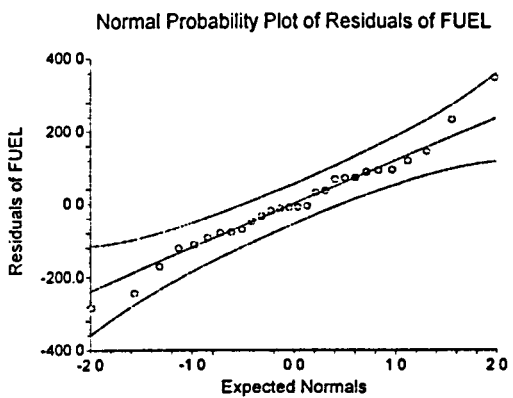
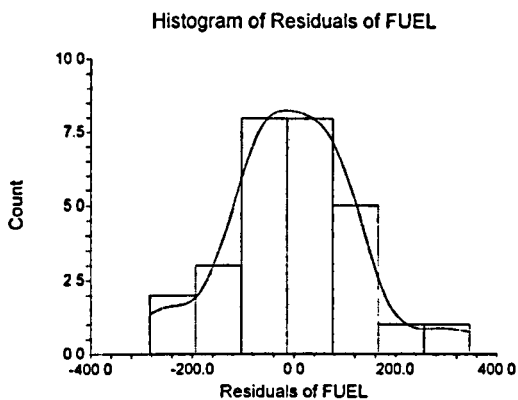
Eigenvalues of Centered Correlations

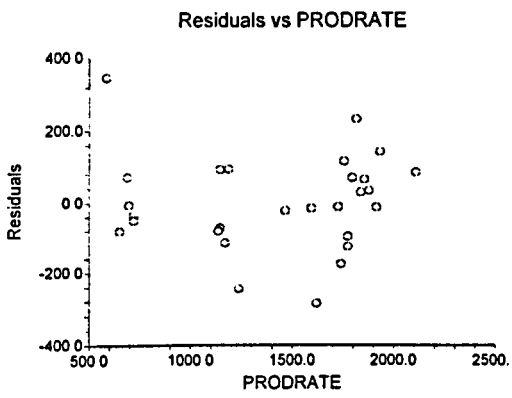
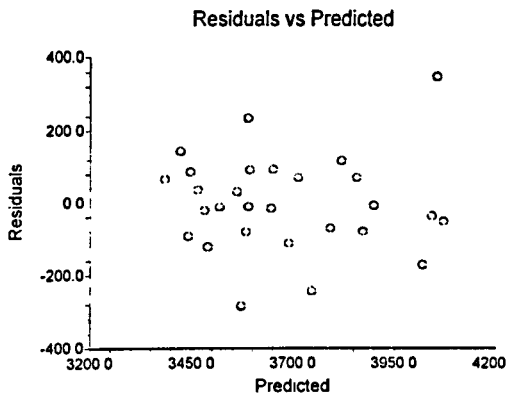
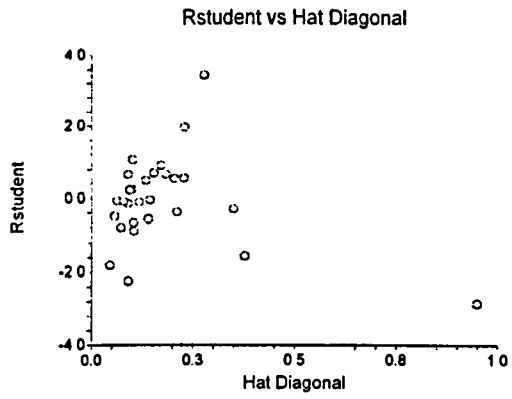
No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.845549	46.14	46.14	1.00
2	1.201822	30.05	76.18	1.54
3	0.854814	21.37	97.55	2.16
4	0.097814	2.45	100.00	18.87

All Condition Numbers less than 100. Multicollinearity is NOT a problem.

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Database F:\DATA\Fuelba~1.S0
Dependent FUEL

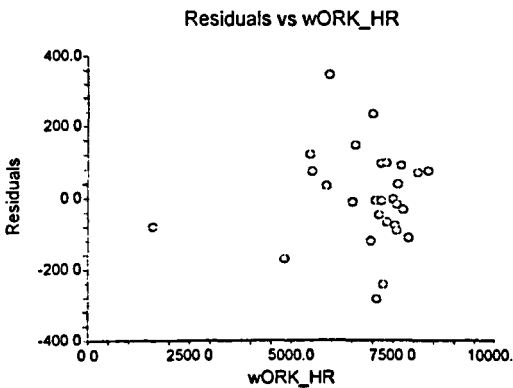
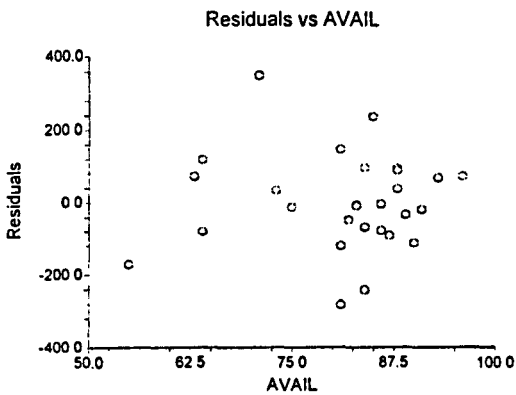
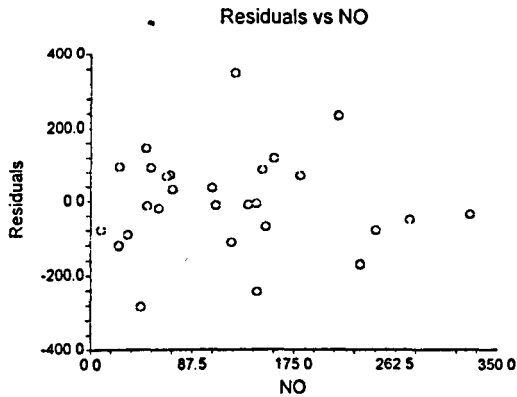
Plots Section





Multiple Regression Report

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Robust Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value	Prob Level	Decision
Intercept	5103.305	241.3416	21.1456	0.000000	Reject
Ho	1.000000				

PRODRATE	-0.2936428	4.496146E-02	-6.5310	0.000001	Reject
Ho	0.999991				
NO	0.8119035	0.2594544	3.1293	0.004709	Reject
Ho	0.849970				
AVAIL	-25.25007	4.339279	-5.8190	0.000006	Reject
Ho	0.999843				
wORK_HR	0.1396625	2.962784E-02	4.7139	0.000095	Reject
Ho	0.994604				
R-Squared	0.843503				

Model

5103.305-.2936428*PRODRATE+ .8119035*NO-25.25007*AVAIL+ .1396625*wORK_HR

Regression Coefficient Section

Independent Variable	Regression Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	
Intercept	5103.305	241.3416	4604.052	5602.558	0.000000
PRODRATE	-0.2936428	4.496146E-02	-0.3866527	-0.200633	-0.678805
NO	0.8119035	0.2594544	0.2751812	1.348626	0.322995
AVAIL	-25.25007	4.339279	-34.22655	-16.27359	-1.117287
wORK_HR	0.1396625	2.962784E-02	7.837261E-02	0.2009523	0.948938
T-Critical	2.068658				

Analysis of Variance Section

Source	Power DF (5%)	Sum of Squares	Mean Square	F-Ratio	Prob Level
Intercept	1	2.709311E+08	2.709311E+08		
Model	4	737511.4	184377.9	30.9919	0.000000
Error	23	136832	5949.219		
Total(Adjusted)	27	874343.5	32383.09		
Root Mean Square Error		77.13118	R-Squared	0.843503	
Mean of Dependent Variable		3681.728	Adj R-Squared	0.816286	
Coefficient of Variation		2.094972E-02			

Robust Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level (5%)	
Intercept	4533.963	278.2276	16.2959	0.000000	Reject
Ho	1.000000				
PRODRATE	-0.2255317	5.534834E-02	-4.0748	0.000467	Reject
Ho	0.973776				
NO	1.159865	0.3037923	3.8180	0.000883	Reject
Ho	0.954889				
AVAIL	-15.34315	5.028167	-3.0514	0.005662	Reject
Ho	0.831954				
wORK_HR	8.188538E-02	3.626541E-02	2.2579	0.033744	Reject
Ho	0.580500				
R-Squared	0.755562				

Model
 4533.963-.2255317*PRODRATE+ 1.159865*NO-15.34315*AVAIL+ 8.188538E-02*WORK_HR

Regression Coefficient Section

Independent Variable	Regression Standardized Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.
Intercept	4533.963	278.2276	3958.406	5109.521
PRODRATE	-0.2255317	5.534834E-02	-0.3400285	-0.111035
NO	1.159865	0.3037923	0.5314232	1.788307
AVAIL	-15.34315	5.028167	-25.74471	-4.941594
WORK_HR	8.188538E-02	3.626541E-02	6.86466E-03	0.1569061
T-Critical	2.068658			0.552720

Analysis of Variance Section

Source	Power DF (5%)	Sum of Squares	Mean Square	F-Ratio	Prob Level
Intercept	1	3.30703E+08	3.30703E+08		
Model	4	745800.5	186450.1	17.7733	0.000001
Error	23	241280.4	10490.45		
Total(Adjusted)	27	987080.9	36558.55		
Root Mean Square Error		102.4229		R-Squared	0.755562
Mean of Dependent Variable		3659.66		Adj R-Squared	0.713051
Coefficient of Variation		0.027987			

Robust Regression Report

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 Dependent FUEL

Regression Equation Section

Independent Variable	Regression Decision Coefficient	Standard Power Error	T-Value (Ho: B=0)	Prob Level (5%)
Intercept	4853.686	252.8258	19.1977	0.000000 Reject
Ho	1.000000			
PRODRATE	-0.2782551	0.0475397	-5.8531	0.000006 Reject
Ho	0.999861			
NO	0.8637481	0.2740045	3.1523	0.004458 Reject
Ho	0.855047			
AVAIL	-20.94327	4.573131	-4.5796	0.000133 Reject
Ho	0.992267			
WORK_HR	0.1196288	3.178086E-02	3.7642	0.001009 Reject
Ho	0.949795			
R-Squared	0.809344			

Model
 4853.686-.2782551*PRODRATE+ .8637481*NO-20.94327*AVAIL+ .1196288*WORK_HR

Regression Coefficient Section

Independent Variable	Regression Standardized Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.
----------------------	-------------------------------------	----------------	----------------	----------------

	Coefficient				
Intercept	4853.686	252.8258	4330.676	5376.696	0.000000
PRODRATE	-0.2782551	0.0475397	-0.3765985	-0.1799118	-
0.658049					
NO	0.8637481	0.2740045	0.2969267	1.43057	0.354793
AVAIL	-20.94327	4.573131	-30.40351	-11.48303	-0.972613
wORK_HR	0.1196288	3.178086E-02	5.388504E-02	0.1853725	0.825683
T-Critical	2.068658				

Analysis of Variance Section

Source	Power DF (5%)	Sum of Squares	Mean Square	F-Ratio	Prob Level
Intercept	1	2.907271E+08	2.907271E+08		
Model	4	721694.1	180423.5	24.4090	0.000000
Error	23	170008.3	7391.666		
Total(Adjusted)	27	891702.4	33026.01		
Root Mean Square Error		85.9748	R-Squared	0.809344	
Mean of Dependent Variable		3674.666	Adj R-Squared	0.776187	
Coefficient of Variation		2.339663E-02			

Nonlinear Regression Report

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 Dependent FUEL

Initial Specification Section

Parameter Name	Variable Type	Variable Name	Lower Bound	Starting Value	Upper Bound
B1	Overall Rate	PRODRATE	-1E+09	1	1E+09
B2	Overall Rate	NO	-1E+09	1	1E+09
B3	Overall Rate	AVAIL	-1E+09	1	1E+09
B4	Overall Rate	wORK_HR	-1E+09	1	1E+09

Parameter Test Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	T-Value (Ho: Bi=0)
B1	PRODRATE 0.830657	-2.197287E-02	0.1016309	-0.2162
B2	NO 0.499058	3.924271E-02	5.717427E-02	0.6864
B3	AVAIL 0.029227	-1.592038	0.6865133	-2.3190
B4	wORK_HR 0.000238	1.715763	0.3977617	4.3135

Model Estimation Section

Parameter Name	Variable Name	Parameter Estimate	Asymptotic Standard Error	Lower 95.0% C.L.	Upper 95.0% C.L.

B1	PRODRATE 0.187783	-2.197287E-02	0.1016309	-0.2317288
B2	NO 0.1572446	3.924271E-02	5.717427E-02	-7.875919E-02
B3	AVAIL -0.175144	-1.592038	0.6865133	-3.008932
B4	wORK_HR 2.536703	1.715763	0.3977617	0.8948228

R-Squared 0.000000

Iterations 35

Model

PRODRATE^(B1) *NO^(B2) *AVAIL^(B3) *wORK_HR^(B4)

Estimated Model

PRODRATE^(-2.197287E-02) *NO^(3.924271E-02) *AVAIL^(-1.592038)
*wORK_HR^(1.715763)

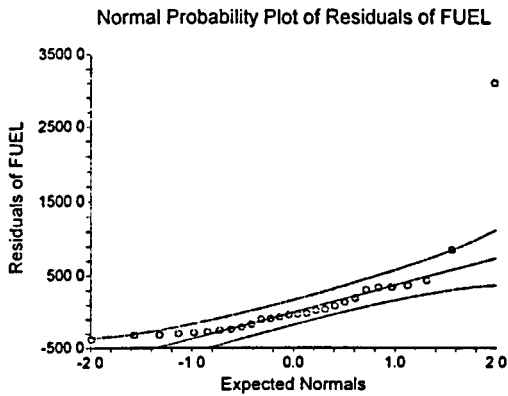
Analysis of Variance Table

Source	Prob DF Level	Sum of Squares	Mean Square	F-Ratio
Mean	1	3.791872E+08	3.791872E+08	
Model	4	3.689524E+08	9.223809E+07	
Model (Adjusted)	3	-1.023485E+07	-3411618	-6.8912
	1.000000			
Error	24	1.188171E+07	495071.2	
Total (Adjusted)	27	1646856		
Total	28	3.80834E+08		

Nonlinear Regression Report

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Plot Section



Multiple Regression Report

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 Dependent LNFU

Regression Equation Section

Independent	Regression Decision Coefficient	Standard Power Error	T-Value (Ho: B=0)	Prob Level	(5%)	(5)
Intercept	8.533221	8.800643E-02	96.9613	0.000000	Reject	
Ho	1.000000					
PRODRATE	-8.079968E-05	1.770443E-05	-4.5638	0.000138	Reject	
Ho	0.991940					
NO	2.83071E-04	1.046926E-04	2.7038	0.012668	Reject	
Ho	0.735523					
AVAIL	-5.401355E-03	1.664266E-03	-3.2455	0.003568	Reject	
Ho	0.874385					
wORK_HR	2.83928E-05	1.247182E-05	2.2766	0.032439	Reject	
Ho	0.587443					
R-Squared	0.709588					

Model

8.533221-8.079968E-05*PRODRATE+ 2.83071E-04*NO-5.401355E-03*AVAIL+ 2.83928E-05*wORK_HR

Regression Coefficient Section

Independent	Regression Standardized Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	
Intercept	8.533221	8.800643E-02	8.351166	8.715276	0.0000
PRODRATE	-8.079968E-05	1.770443E-05	-1.174241E-04	-4.417527E-05	-
NO	2.83071E-04	1.046926E-04	6.649789E-05	4.99644E-04	0.3552
AVAIL	-5.401355E-03	1.664266E-03	-8.844152E-03	-1.958558E-03	-
wORK_HR	2.83928E-05	1.247182E-05	2.592871E-06	5.419274E-05	
T-Critical	0.5745	2.068658			

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	1886.653	1886.653			
Model	4	8.264598E-02	0.0206615	14.0495	0.000006	0.9999
Error	23	3.382437E-02	1.470625E-03			
Total(Adjusted)	27	0.1164704	4.313717E-03			
Root Mean Square Error		3.834872E-02	R-Squared	0.7096		
Mean of Dependent		8.208559	Adj R-Squared	0.6591		
Coefficient of Variation		4.671797E-03	Press Value	0.2373474		
Sum Press Residuals		1.316266	Press R-Squared	-1.0378		

Multiple Regression Report

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 Dependent LNFU

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	-0.0019	0.998486	Accepted
Kurtosis	0.9141	0.360674	Accepted
Omnibus	0.8355	0.658511	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.072608	9	-0.070578	17	-0.091355
2	-0.127078	10	0.008822	18	-0.240047
3	-0.014943	11	0.113104	19	0.098810
4	-0.161581	12	-0.290106	20	-0.014113
5	0.170912	13	-0.028751	21	0.152338
6	0.128081	14	0.058726	22	0.008746
7	-0.208632	15	0.027553	23	-0.092843
8	0.048541	16	0.062498	24	-0.001083

Above serial correlations significant if their absolute values are greater than 0.377964

Durbin-Watson Value 2.0894

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
PRODRATE	1.318198	0.241389	0.758611	2.131387E-07
NO	1.366892	0.268413	0.731587	7.452978E-06
AVAIL	5.038580	0.801531	0.198469	1.883405E-03
WORK_HR	5.043542	0.801727	0.198273	1.057689E-07

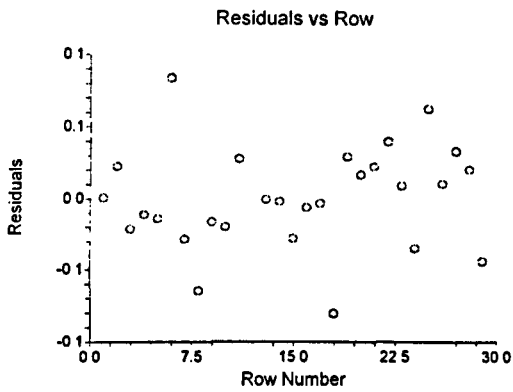
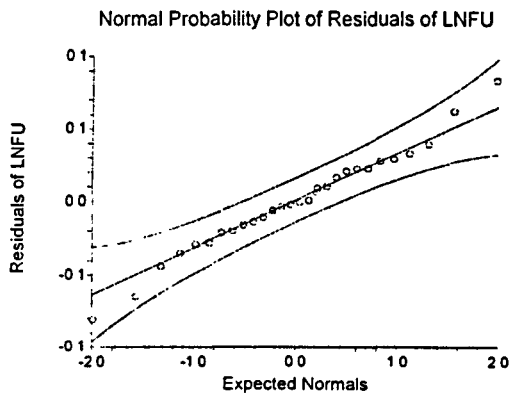
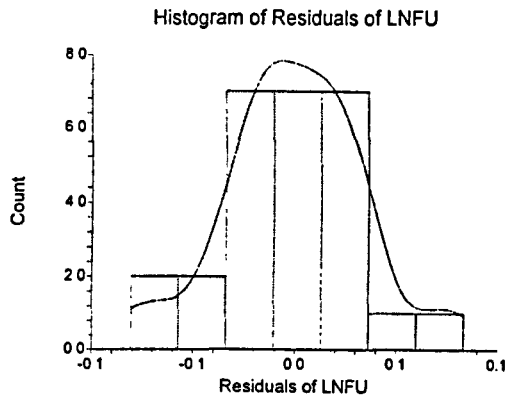
Eigenvalues of Centered Correlations

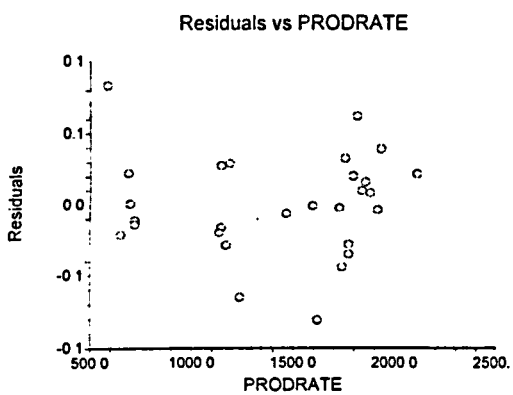
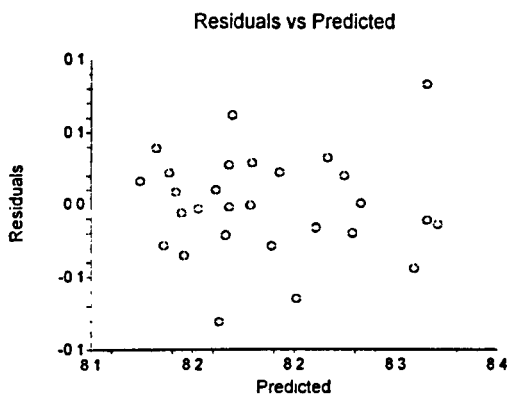
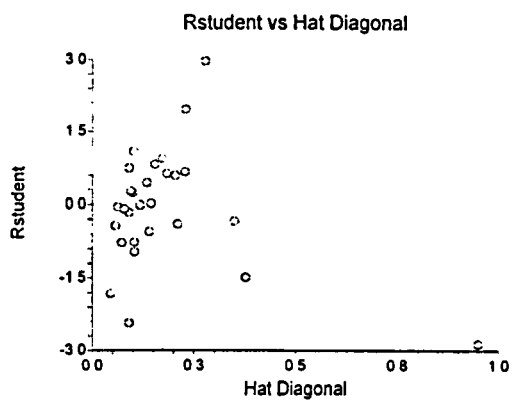
No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.845549	46.14	46.14	1.00
2	1.201822	30.05	76.18	1.54
3	0.854814	21.37	97.55	2.16
4	0.097814	2.45	100.00	18.87

All Condition Numbers less than 100. Multicollinearity is NOT a problem.

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Dependent LNFU

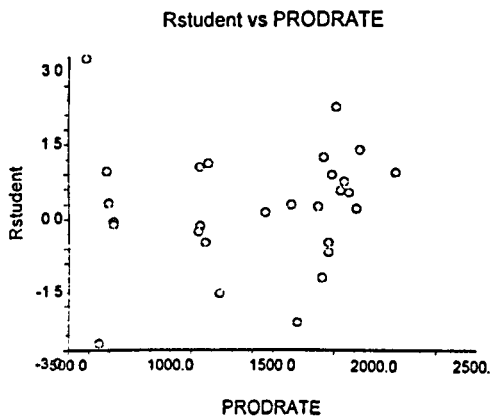
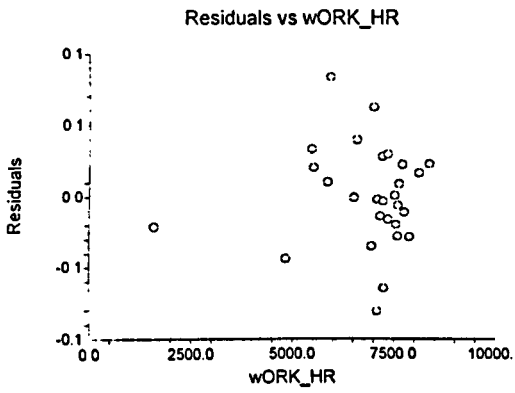
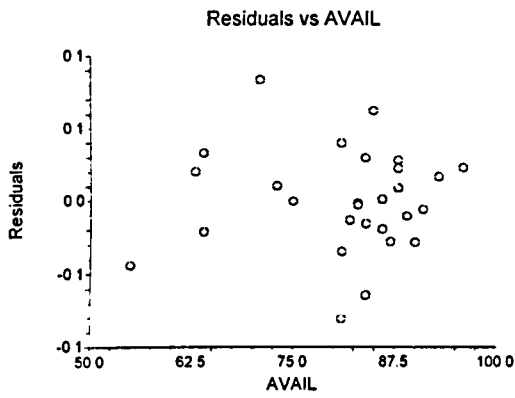
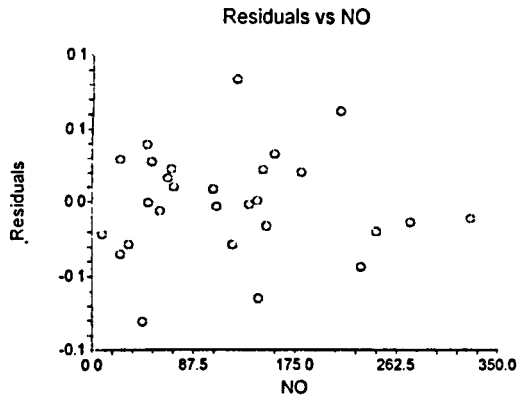
Plots Section

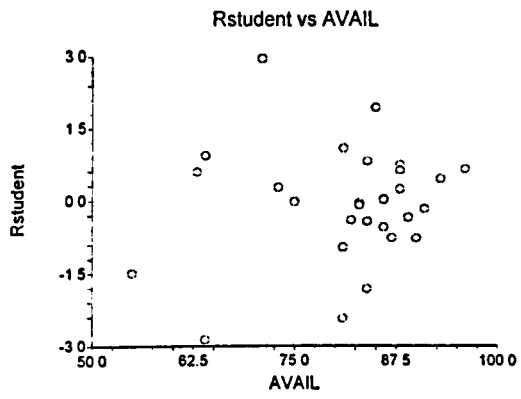
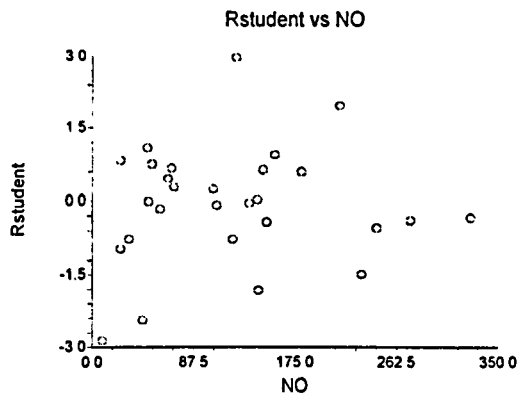




Multiple Regression Report

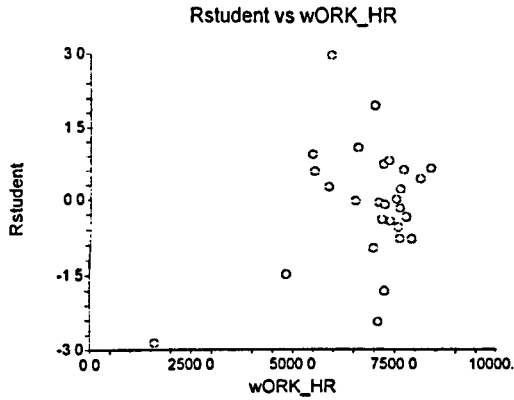
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Dependent LNFU





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 Dependent LNFU



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 Dependent LNFU

Regression Equation Section

Independent	Regression Decision Coefficient	Standard Power Error	T-Value (Ho: B=0)	Prob Level	(5%)	(5)
Intercept	10.51821	0.5381073	19.5467	0.000000	Reject	
Ho	1.000000					
NO	2.606898E-04	1.017948E-04	2.5609	0.017469	Reject	
Ho	0.688979					
wORK_HR	3.048919E-05	1.200995E-05	2.5387	0.018355	Reject	
Ho	0.681415					
LNPR	-0.1025389	2.042602E-02	-5.0200	0.000044	Reject	
Ho	0.997754					
LNAV	-0.41305	0.118883	-3.4744	0.002052	Reject	
Ho	0.914048					
R-Squared	0.734614					

Model

$$10.51821 + 2.606898E-04 * NO + 3.048919E-05 * wORK_HR - 0.1025389 * LNPR - 0.41305 * LNAV$$

Regression Coefficient Section

Independent	Regression Standardized Coefficient	Standard Error	Lower 95% C.L.	Upper 95% C.L.	C.L.
Intercept	10.51821	0.5381073	9.405048	11.63137	0.0000
NO	2.606898E-04	1.017948E-04	5.011115E-05	4.712683E-04	
	0.3271				
wORK_HR	3.048919E-05	1.200995E-05	5.64471E-06	5.533367E-05	
	0.6169				
LNPR	-0.1025389	2.042602E-02	-0.1447933	-6.028444E-02	-
	0.6268				
LNAV	-0.41305	0.118883	-0.6589781	-0.1671218	-0.8380
T-Critical	2.068658				

Analysis of Variance Section

Sum of	Mean	Prob	Power
--------	------	------	-------

Source	DF	Squares	Square	F-Ratio	Level	(5%)
Intercept	1	1886.653	1886.653			
Model	4	8.556076E-02	2.139019E-02	15.9166	0.000002	0.9999
Error	23	3.090958E-02	1.343895E-03			
Total(Adjusted)	27	0.1164704	4.313717E-03			
Root Mean Square Error		3.665917E-02	R-Squared	0.7346		
Mean of Dependent		8.208559	Adj R-Squared	0.6885		
Coefficient of Variation		4.465969E-03	Press Value	0.2123283		
Sum Press Residuals		1.2544	Press R-Squared	-0.8230		

Multiple Regression Report

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 Dependent LNFU

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.0830	0.933867	Accepted
Kurtosis	0.5761	0.564557	Accepted
Omnibus	0.3388	0.844188	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.102646	9	-0.091251	17	-0.082158
2	-0.118376	10	-0.057946	18	-0.263127
3	0.050618	11	0.137488	19	0.067941
4	-0.246481	12	-0.214932	20	-0.040947
5	0.148495	13	0.039978	21	0.139019
6	0.172849	14	0.105279	22	0.011503
7	-0.225292	15	0.032287	23	-0.146235
8	0.062907	16	0.106098	24	-0.029964

Above serial correlations significant if their absolute values are greater than 0.377964
 Durbin-Watson Value 2.1038

Multicollinearity Section

Independent Variable	Variance Inflation	R-Squared Vs Other X's	Tolerance	Diagonal of X'X Inverse
NO	1.414133	0.292853	0.707147	7.71056E-06
wORK_HR	5.117936	0.804609	0.195391	1.073291E-07
LNPR	1.351279	0.259960	0.740040	0.3104575
LNAV	5.041640	0.801652	0.198348	10.51657

Eigenvalues of Centered Correlations

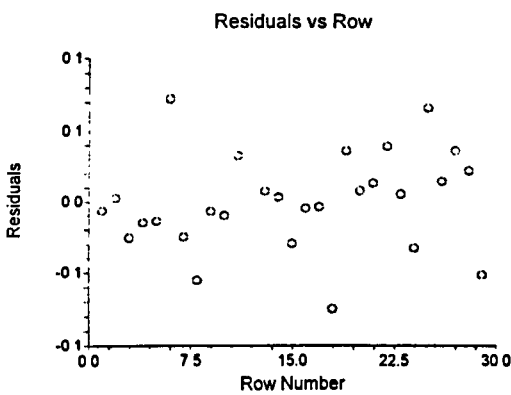
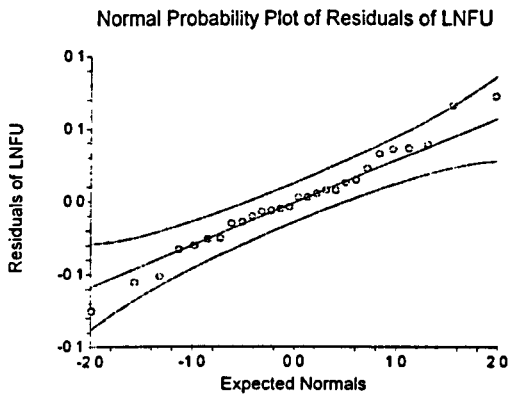
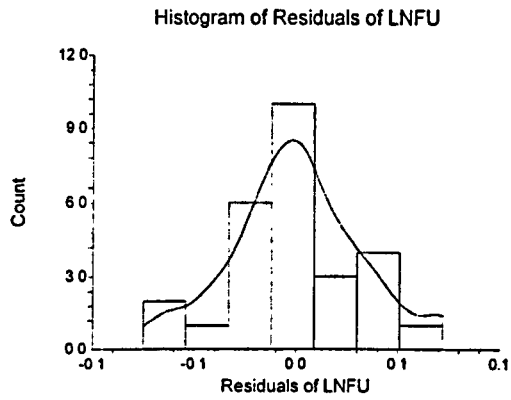
No.	Eigenvalue	Incremental Percent	Cumulative Percent	Condition Number
1	1.841758	46.04	46.04	1.00
2	1.206088	30.15	76.20	1.53
3	0.855857	21.40	97.59	2.15
4	0.096298	2.41	100.00	19.13

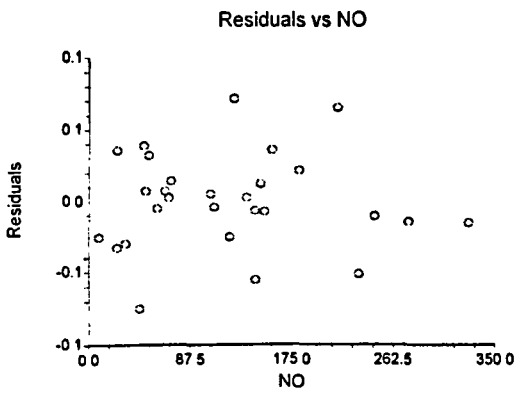
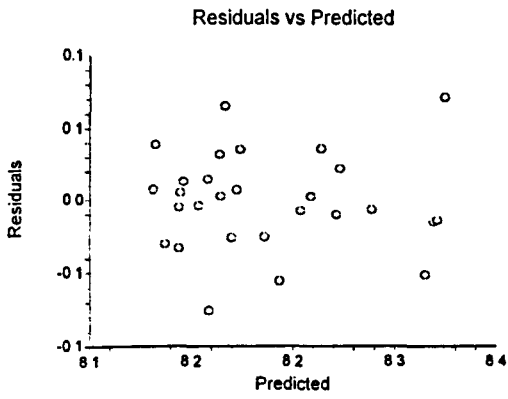
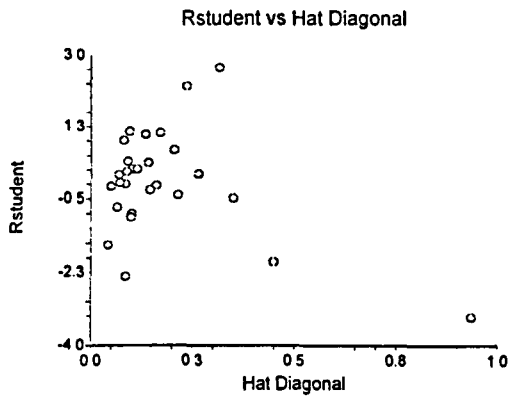
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Multiple Regression Report

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Dependent LNFU

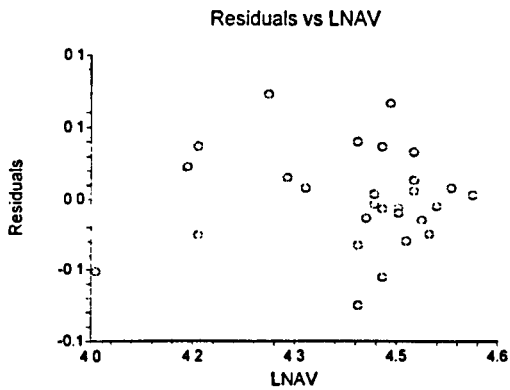
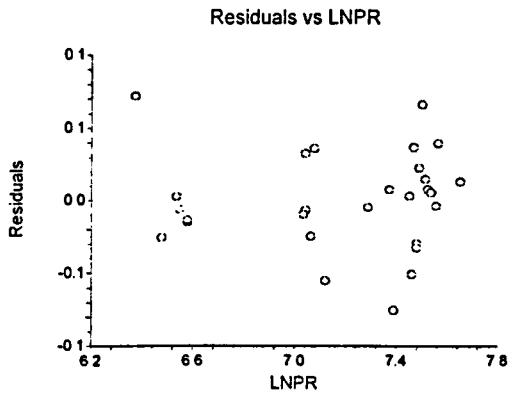
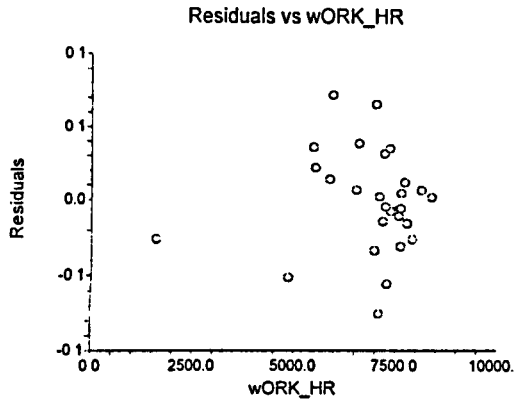
Plots Section





Multiple Regression Report

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 Dependent LNFU



Nonlinear Regression Models for HolderBank Data

1 25/05/01 08:39:56 Page/Date/Time
 E:\CH7\Data\fuelbank29.S0 Database
 FUEL Dependent

Regression Equation Section

Prob Power (5%)	T-Value Decision Level	Standard (Ho: B=0)	Regression Error	Independent Coefficient	Variable
-----------------	------------------------	--------------------	------------------	-------------------------	----------

Reject	0.000000	9.0984	944.3607	8592.207	Intercept
1.000000		Ho			
Reject	0.000003	-6.1984	68.62871	-425.3852	LNPR
0.999963		Ho			
Reject	0.009246	2.8414	37.05204	105.2784	LNNO
0.776702		Ho			
Reject	0.000720	-3.9007	311.0367	-1213.273	LNAV
0.961909		Ho			
Reject	0.037181	2.2119	153.9296	340.4799	LNHR
0.563224		Ho			
0.784159		R-Squared			

Model

$$8592.207 - 425.3852 \cdot \text{LNPR} + 105.2784 \cdot \text{LNNO} - 1213.273 \cdot \text{LNAV} + 340.4799 \cdot \text{LNHR}$$

Analysis of Variance Section

Power (5%)	Prob Level	F-Ratio	Mean Square	Sum of Squares	DF	Source
0.0000	3.791872E+08	3.791872E+08	1	Intercept		
	0.000000	20.8900	322849.3	1291397	4	Model
	15454.74	355459	23	Error		
	60994.67	1646856	27	Total(Adjusted)		

0.7842	R-Squared	124.3171	Root Mean Square Error
0.7466	Adj R-Squared	3680	Mean of Dependent
7708848	Press Value	3.378182E-02	Coefficient of Variation
-3.6809	Press R-Squared	5490.842	Sum Press Residuals

Normality Tests Section

Decision(5%)	Probability	Value	Assumption
Accepted	0.949489	-0.0633	Skewness
Accepted	0.412932	0.8187	Kurtosis
Accepted	0.713781	0.6744	Omnibus

Serial-Correlation Section

Correlation	Lag	Correlation	Lag	Correlation	Lag
-0.08897617		-0.0313939		-0.0708591	
-0.21422318		-0.04539910		-0.0764902	
0.06029719		0.05943611		0.0555433	
-0.09267720		-0.25047612		-0.2288744	
0.14030821		0.05153613		0.0479425	
0.06542222		0.00797814		0.2095846	
-0.11046023		0.01847715		-0.1612877	
-0.03661624		0.08672916		0.0990118	

Above serial correlations significant if their absolute values are greater than 0.377964

2.0382 Durbin-Watson Value

Multicollinearity Section

Diagonal of X'X Inverse	Tolerance	R-Squared Vs Other X's	Variance Inflation	Independent Variable
0.3047543	0.753889	0.246111	1.326456	LNPR
8.883058E-02	0.580510	0.419490	1.722625	LNNO
6.259817	0.333227	0.666773	3.000956	LNAV
1.533142	0.257622	0.742378	3.881661	LNHR

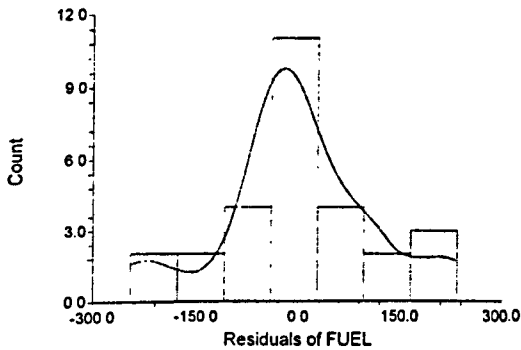
Eigenvalues of Centered Correlations

Condition Number	Cumulative Percent	Incremental Percent	Eigenvalue	No.
45.58	45.58	1.823212	1	
71.61	26.03	1.041317	2	
96.63	25.02	1.000767	3	
100.00	3.37	0.134704	4	

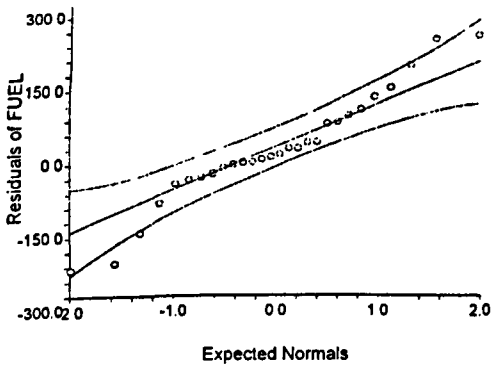
All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section

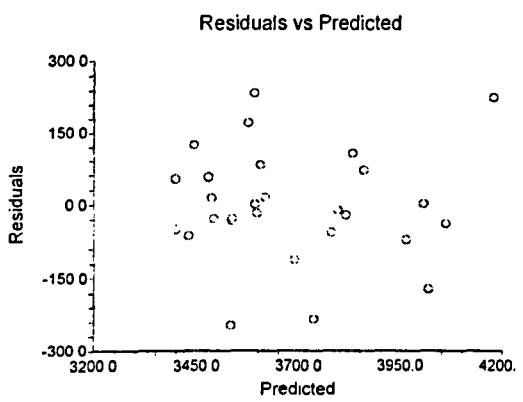
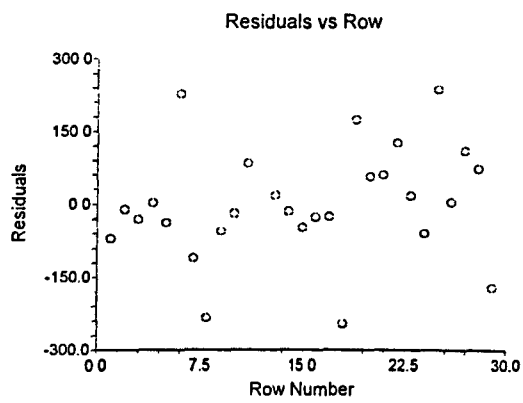
Histogram of Residuals of FUEL

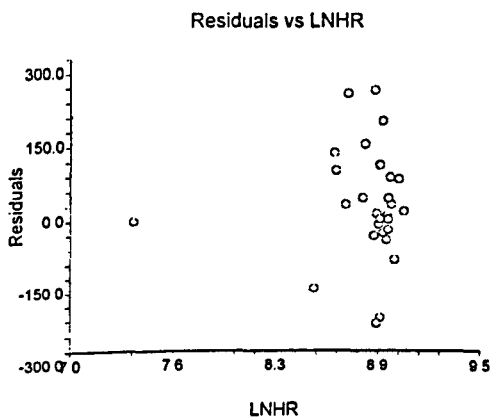
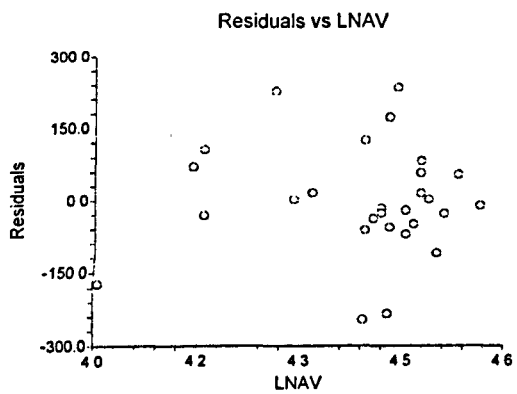
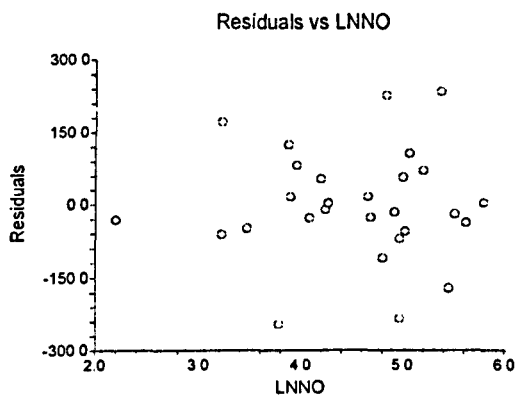
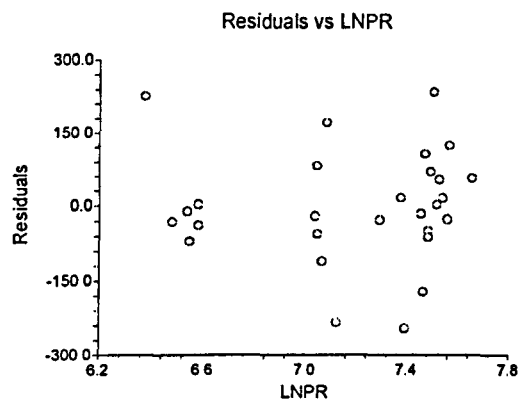


Normal Probability Plot of Residuals of FUEL



0.53





Regression Equation Section

Prob Power (5%) Reject	T-Value Decision Level	Standard (Ho: B=0) Ho	Regression Error	Independent Coefficient	Variable
1.000000	0.000000	37.5876	0.2526022	9.494713	Intercept
0.999932	0.000004	-6.04091	8.35714E-02	-0.110894	LNPR
0.815864	0.006598	2.98649	9.10858E-03	2.959745E-02	LNNO
0.949463	0.001017	-3.76088	3.19761E-02	-0.3128918	LNAV
0.510248	0.049620	2.07244	1.17383E-02	8.532863E-02	LNHR
0.781640			R-Squared		

Model

9.494713-.110894*LNPR+ 2.959745E-02*LNNO-.3128918*LNAV+ 8.532863E-02*LNHR

Analysis of Variance Section

Power (5%) 0.0000	Prob Level	F-Ratio	Mean Square	Sum of Squares	DF	Source
	1886.653	1886.653	1	Intercept		
	0.000000	20.5827	2.275948E-02	9.103791E-02	4	Model
	1.105758E-03	2.543243E-02	23	Error		
	4.313717E-03	0.1164704	27	Total(Adjusted)		

0.7816 R-Squared 3.325294E-02 Root Mean Square Error
 0.7437 Adj R-Squared 8.208559 Mean of Dependent
 0.5373766 Press Value 4.051008E-03 Coefficient of Variation
 -3.6138 Press R-Squared 1.455873 Sum |Press Residuals|

Normality Tests Section

Decision(5%)	Probability	Value	Assumption
Accepted	0.677437	-0.4160	Skewness
Accepted	0.387741	0.8637	Kurtosis
Accepted	0.631587	0.9190	Omnibus

Serial-Correlation Section

Correlation	Lag	Correlation	Lag	Correlation	Lag
-0.08448017		-0.0227089		-0.0840091	
-0.20858718		-0.04599410		-0.0630822	
0.03705419		0.05758511		0.0725023	
-0.08916220		-0.23075112		-0.2428154	
0.12784421		0.04802713		0.0270425	
0.05488422		0.01238314		0.2173466	
-0.08218823		0.01876015		-0.1813237	
-0.03119924		0.07600316		0.1141678	

Above serial correlations significant if their absolute values are greater than 0.377964

2.0695 Durbin-Watson Value

Multicollinearity Section

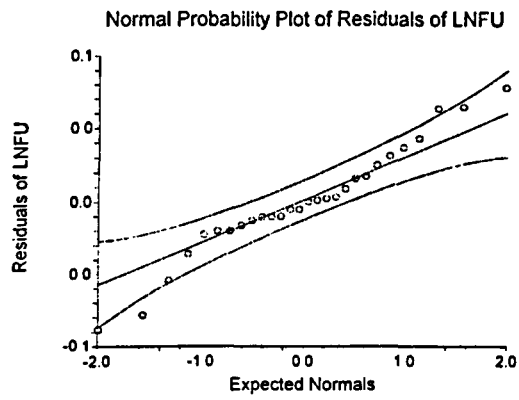
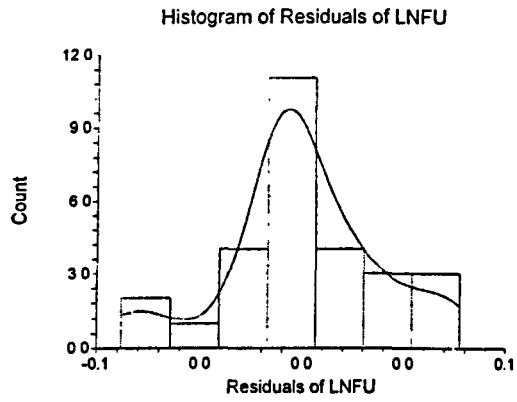
Diagonal of X'X Inverse	Tolerance	R-Squared Vs Other X's	Variance Inflation	Independent Variable
0.3047543	0.753889	0.246111	1.326456	LNPR
8.883058E-02	0.580510	0.419490	1.722625	LNNO
6.259817	0.333227	0.666773	3.000956	LNAV
1.533142	0.257622	0.742378	3.881661	LNHR

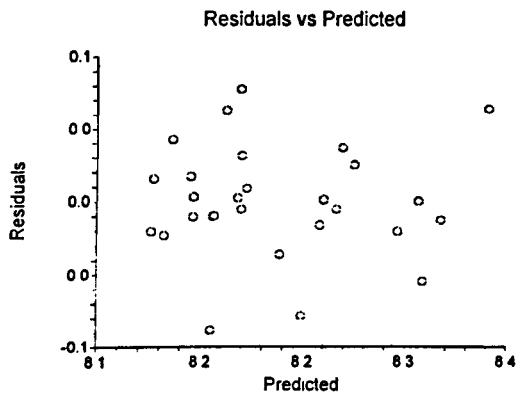
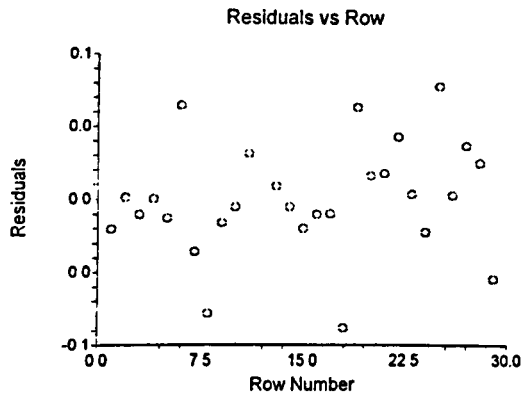
Eigenvalues of Centered Correlations

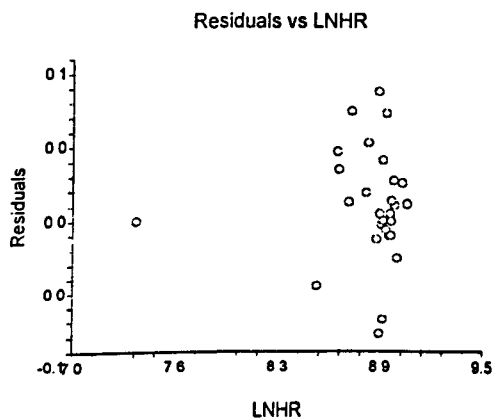
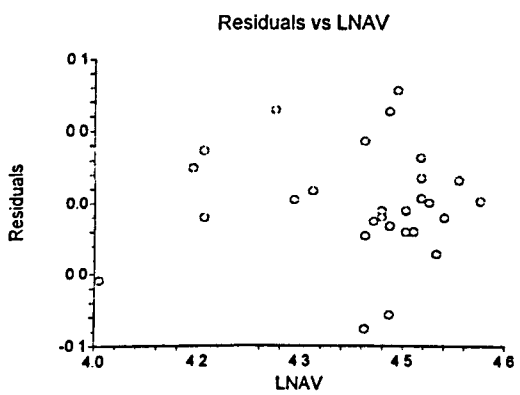
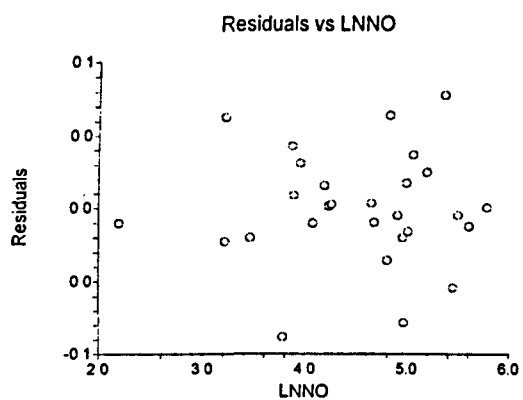
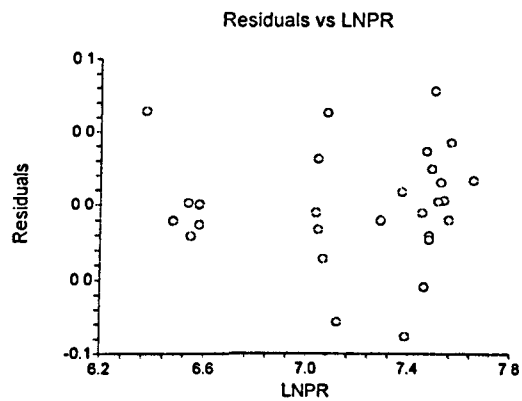
Condition Number	Cumulative Percent	Incremental Percent	Eigenvalue	No.
0	45.58	45.58	1.823212	1
5	71.61	26.03	1.041317	2
2	96.63	25.02	1.000767	3
3.53	100.00	3.37	0.134704	4

All Condition Numbers less than 100. Multicollinearity is NOT a problem.

Plots Section







Appendix 20 : Analysis of Nonlinear Regression

It was observed in the text that applying linear multiple regression models were not satisfactory for some cases. The reason may differ from a kiln to another or from EL model to a FUEL model. These reasons were due to the non validity of some of the underlying assumptions of the model. The violations of the assumptions include existence of outliers, non-normality of the dependent variable, non-normality of residuals, non-randomness of errors, non-constant variance of errors. To solve such problems, one may try to use transformations of variables and then apply a nonlinear multiple regression models. This section provides this type of analysis. The complete computer output of this analysis is given in Appendices (15-18).

Transformations of Dependent Variables

- 1) We tested the normality of each of the dependent variables EL and FUEL together with their logarithms, square roots, and reciprocals. Table (1) reports the results of these tests. It seems reasonable from this table that
 - a) The dependent variable EL for Kilns 1, 2, 5, and 6 are not normally distributed.
 - b) The dependent variable FUEL for kilns 2, 4, 5, and 6 are not normally distributed.
 - c) The three suggested transformations (logarithm, square root and reciprocal) of EL for kilns 1, 5, and 6 failed to have a normal distribution. However, for kiln 2, the reciprocal of EL has a normal distribution.
 - d) The three suggested transformations (logarithm, square root and reciprocal) of FUEL for kilns 2, 4 and 6 failed to have a normal distribution. However, for kiln 5, the reciprocal of FUEL has a normal distribution.

Table (1) Normality Test of Transformed Dependent Variables

Normality Tests Section for Kiln 1

Variable	----- Skewness Test -----			----- Kurtosis Test -----			Omnibus Test -		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	2.03	4.48	0.0000	8.25	3.63	0.0003	33.21	0.0000	No
FUEL	0.27	0.82	0.4147	2.17	-1.44	0.1487	2.75	0.2528	Yes
LNEL	1.69	3.98	0.0001	6.80	3.18	0.0015	25.93	0.0000	No
LNFU	0.23	0.70	0.4869	2.14	-1.56	0.1182	2.92	0.2317	Yes
SQEL	1.86	4.24	0.0000	7.49	3.41	0.0007	29.55	0.0000	No
SQFU	0.25	0.76	0.4500	2.15	-1.50	0.1325	2.83	0.2425	Yes
IEL	-1.37	-3.43	0.0006	5.63	2.69	0.0072	18.99	0.0001	No
IFU	-0.19	-0.57	0.5653	2.11	-1.67	0.0945	3.13	0.2094	Yes

Normality Tests Section for Kiln 2

Variable	----- Skewness Test -----			----- Kurtosis Test -----			Omnibus Test -		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	0.95	2.64	0.0083	4.62	2.12	0.0343	11.45	0.0033	No
FUEL	2.46	5.10	0.0000	10.40	4.14	0.0000	43.17	0.0000	No
LNEL	0.67	1.95	0.0510	3.89	1.52	0.1279	6.13	0.0467	No
LNFU	2.24	4.83	0.0000	9.39	3.93	0.0001	38.83	0.0000	No
SQEL	0.81	2.30	0.0214	4.22	1.82	0.0689	8.60	0.0136	No
SQFU	2.35	4.97	0.0000	9.89	4.04	0.0001	41.02	0.0000	No

IEL	-0.41	-1.24	0.2157	3.38	0.97	0.3327	2.47	0.2907	Yes
IFU	-2.02	-4.54	0.0000	8.44	3.71	0.0002	34.35	0.0000	No

Normality Tests Section for Kiln 4

Variable	----- Skewness Test -----			----- Kurtosis Test -----			----- Omnibus Test -----		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	0.64	1.85	0.0640	3.81	1.44	0.1489	5.51	0.0635	Yes
FUEL	0.67	1.92	0.0553	2.12	-1.62	0.1054	6.30	0.0430	No
LNEL	0.20	0.60	0.5471	3.92	1.55	0.1215	2.76	0.2515	Yes
LNFU	0.62	1.78	0.0749	2.04	-1.93	0.0534	6.90	0.0317	No
SQEL	0.43	1.28	0.2017	3.81	1.44	0.1505	3.70	0.1575	Yes
SQFU	0.64	1.85	0.0644	2.08	-1.78	0.0757	6.57	0.0374	No
IEL	0.32	0.97	0.3300	4.64	2.11	0.0346	5.41	0.0667	No
IFU	-0.56	-1.64	0.1000	1.97	-2.24	0.0253	7.71	0.0212	No

Normality Tests Section for Kiln 5

Variable	----- Skewness Test -----			----- Kurtosis Test -----			----- Omnibus Test -----		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	6.34	7.87	0.0000	41.47	6.13	0.0000	99.55	0.0000	No
FUEL	1.31	3.32	0.0009	6.44	3.04	0.0024	20.28	0.0000	No
LNEL	5.68	7.53	0.0000	36.02	5.97	0.0000	92.43	0.0000	No
LNFU	0.89	2.46	0.0137	4.75	2.19	0.0285	10.87	0.0044	No
SQEL	6.16	7.78	0.0000	39.98	6.09	0.0000	97.68	0.0000	No
SQFU	1.09	2.89	0.0038	5.52	2.63	0.0085	15.29	0.0005	No
IEL	-3.56	-6.12	0.0000	19.88	5.20	0.0000	64.44	0.0000	No
IFU	-0.56	-1.62	0.1042	3.62	1.25	0.2114	4.20	0.1224	Yes

Normality Tests Section for Kiln 6

Variable	----- Skewness Test -----			----- Kurtosis Test -----			----- Omnibus Test -----		Variable Normal?
	Value	Z	Prob	Value	Z	Prob	K2	Prob	
EL	2.11	4.62	0.0000	9.85	4.01	0.0001	37.46	0.0000	No
FUEL	1.21	3.16	0.0016	3.61	1.24	0.2150	11.54	0.0031	No
LNEL	1.33	3.39	0.0007	6.48	3.07	0.0021	20.89	0.0000	No
LNFU	1.10	2.94	0.0033	3.34	0.92	0.3581	9.47	0.0088	No
SQEL	1.70	4.04	0.0001	7.93	3.55	0.0004	28.93	0.0000	No
SQFU	1.15	3.05	0.0023	3.47	1.08	0.2793	10.48	0.0053	No
IEL	-0.63	-1.82	0.0684	4.89	2.29	0.0222	8.55	0.0139	No
IFU	-0.99	-2.70	0.0069	3.09	0.58	0.5621	7.65	0.0219	No

2) Therefore, normality of the dependent variables is still a problem. This is why we have applied the robust regression analysis in a previous section. However, for the sake of comparison, we will run multiple regression only on the transformed variables, which are normally distributed. Table (2) gives a summary of the R-squared values of the fitted models. It seems reasonable from this table that the values of R-squared had not been affected much by the used transformations. And the values of R-squared for these nonlinear models are still smaller than those of the robust regression. So, we can say that

these transformations had not helped in increasing the R-squared values. Hence we still recommend using robust regression models.

Table (2): R-squared Values for Full Models with Transformed Variables

	K1	K2	K4	K5	K6
EL			0.676991		
Ln(EL)			0.635236		
Sqrt(EL)			0.657320		
1/EL		0.657457			
FUEL	0.405061				
Ln(FUEL)	0.405381				
Sqrt(FUEL)	0.4052				
1/FUEL	0.4055			0.318068	

Quadratic Regression

As another type of nonlinear regression we had fitted quadratic regression models to model of EL and FUEL for all kilns with only four independent variables (AvNO, AvHOURS, PRORATE, and AVL). Moreover, for the sake of comparison we have fitted linear models with the same four independent variables. The full computer output is given in Appendix (13). Table (3) provides the R-squared values of the fitted models. The last column in this table gives the percentage of the value of R-squared of the linear models to that of the quadratic model. It seems reasonable from this table that these percentages vary between 70% and 99%. This means that it may be enough to use only linear models because linear models are simpler than the quadratic models and the above percentages are very high. One may think of quadratic models only for FUEL of kilns 2 and 5 and for EL of kiln 6. Otherwise there is no need to use quadratic models.

**Table (3): R-squared values of Quadratic and Linear Models
With Four Independent Variables**

Kiln	Model of	Quadratic Model	Linear Model	% of linear over Quadratic
1	EL	0.660807	0.644260	97%
	FUEL	0.433526	0.405061	93%
2	EL	0.771008	0.694476	90%
	FUEL	0.487751	0.354068	73%
4	EL	0.700341	0.672695	96%
	FUEL	0.440981	0.367416	83%
5	EL	0.707052	0.700189	99%
	FUEL	0.720554	0.503132	70%
6	EL	0.826737	0.617841	75%
	FUEL	0.690800	0.633985	92%

Polynomial Regression with Interaction Terms

As another type of nonlinear regression we have run a procedure that fits a polynomial of order three with interaction terms, i.e. all possible products of the independent variables. Appendix (12) reports the output of this procedure. Table (4) provides the significant R-

squared values of the obtained models at level of significance 0.05. It seems reasonable from this table that

- 1) The models for both EL and FUEL of Kiln 5 are not significant.
- 2) Quadratic terms are significant only for EL model of Kiln 2 and EL model of Kiln 6.
- 3) Linear by linear interaction terms are significant only for EL model of Kiln4, and FUEL model for kiln 6.
- 4) The last column gives the percentage of R-squared due to linear terms, which is the value of R-squared of linear divided by the over all R-squared value of the regression model. It seems reasonable from this column that the linear terms have a very high contribution to the variability of the dependent variables in all models except possibly for FUEL models of kilns 2 and 4. Hence dealing with linear models seems to be satisfactory for the available data.

Table (4) : R-squared values of significant terms
(A blank means the term is not significant at 0.05 level of significance)

Kiln	Dependent	Regression	Linear	Quadratic	Linear*Linear	% of R-squared due to linear terms
1	EL	0.687485	0.644260			94%
	FUEL	0.497122	0.405061			81%
2	EL	0.855257	0.713316	0.075043		83%
	FUEL	0.548357	0.355643			65%
4	EL	0.930340	0.676520		0.242663	73%
	FUEL	0.849552	0.536714			63%
5	EL					
	FUEL					
6	EL	0.936707	0.680299	0.182319		73%
	FUEL	0.921844	0.668719		0.206645	73%

To sum up, we observe from the above additive nonlinear regression models that

- 1) Transformations are not helpful because almost all do not resolve the normality problem. Moreover the obtained R-squared values of these transformed models are smaller than those of the raw data.
- 2) The percentage of the contributions of the linear terms in the quadratic models range between 70% to 99% of the overall R-squared values, which means that still linear regression is a valid one.
- 3) The polynomial regression with interactions complicates the model and still the contributions of the linear terms in the polynomial models with interactions range between 63% to 94% of the overall R-squared values, which means that linear regression is still a valid one.

Multiplicative Regression Models

Multiplicative regression models had been fitted to all kilns.

It seems reasonable from Appendix (11) that

- 1) For EL of Kiln1
- i) The estimated multiplicative model is $EL = AvNO^{(6.765318E-02)} * AvHOURS^{(0.0447921)} * PRORATE^{(0.1273357)} * AVL^{(0.5375845)}$
- ii) The variable PRORATE is not significant

- iii) The R-squared value is 0.317219 which is too low.
- 2) For FUEL of Kiln1
- i) The estimated multiplicative model is $FUEL = AvNO^{(4.247055E-02)} * AvHOURS^{(1.456098E-02)} * PRORATE^{(0.5448774)} * AVL^{(0.4160854)}$
- ii) This model is not useful since the R-squared value is zero.
- 3) For EL of Kiln 2
- i) The estimated model is $EL = AvNO^{(7.917824E-02)} * AvHOURS^{(8.701563E-02)} * PRORATE^{(0.6552985)} * AVL^{(-0.0437992)}$
- ii) The variable AVL is not significant.
- iii) The R-squared value is 0.555313, which seems to be a useful coefficient of determination.
- 4) For FUEL of Kiln 2
- i) The fitted model is $FUEL = AvNO^{(4.033374E-02)} * AvHOURS^{(4.577021E-02)} * PRORATE^{(0.7551863)} * AVL^{(0.1868567)}$
- ii) This model is not useful since the R-squared value is zero.
- 5) For EL of Kiln 4
- i) The estimated model is $EL = AvNO^{(1.412698E-02)} * AvHOURS^{(0.082738)} * PRORATE^{(-0.7015304)} * AVL^{(0.190868)} * Aratio^{(3.424781E-02)} * Sratio^{(1.198057)} * LimeSF^{(1.267604)}$
- ii) The variables AvNO, AVL, Aratio, and Sratio are not significant.
- iii) The R-squared value is 0.619473, which seems to be an useful coefficient of determination.
- 6) For FUEL of Kiln 4
- a) The estimated model is $FUEL = AvNO^{(4.421016E-02)} * AvHOURS^{(-1.230873E-02)} * PRORATE^{(-0.3485591)} * AVL^{(0.2189038)} * Aratio^{(-5.789635E-02)} * Sratio^{(0.2196004)} * LimeSF^{(1.005484)}$
- b) The variables AvHOURS, AVL, and Sratio are not significant.
- iv) The R-squared value is 0.534143 which seems to be a useful coefficient of determination.
- 7) For EL of Kiln 5
- a) The estimated model is $EL = AvNO^{(1.554337E-02)} * AvHOURS^{(4.705557E-02)} * PRORATE^{(-0.4052387)} * AVL^{(-0.3485646)} * Aratio^{(-0.4467981)} * Sratio^{(-2.372304)} * LimeSF^{(1.984661)}$
- b) The variable AvNO is not significant.
- iii) The R-squared value is 0.806814 which is a very strong coefficient of determination.
- 8) For FUEL of Kiln 5
- a) The estimated model is $FUEL = AvNO^{(5.511214E-02)} * AvHOURS^{(8.93405E-03)} * PRORATE^{(-0.5123753)} * AVL^{(-6.641965E-02)} * Aratio^{(-0.1550902)} * Sratio^{(-1.163263)} * LimeSF^{(1.785298)}$
- b) The variables AvHOURS, AVL, Aratio, and Sratio are not significant.
- iii) The R-squared value is 0.577327 which seems to be a useful coefficient of determination.
- 9) For EL of Kiln 6
- a) The estimated model is $EL = AvNO^{(-0.1193172)} * AvHOURS^{(4.851277E-02)} * PRORATE^{(-0.8777823)} * AVL^{(-0.6237986)} * Aratio^{(-0.4507635)} * Sratio^{(0.3744851)} * LimeSF^{(2.210583)}$

- b) The variables Aratio, and Sratio are not significant.
- c) The R-squared value is 0.639052 which seems to be a useful coefficient of determination.

10) For FUEL of Kiln 6

a) The estimated model is $FUEL = AvNO^{(-3.932112E-03)} * AvHOURS^{(-3.311373E-03)} * PRORATE^{(-0.6115279)} * AVL^{(-0.4379416)} * Aratio^{(-0.1310681)} * Sratio^{(0.3071666)} * LimeSF^{(2.013965)}$

- b) The variables AvNO, AvHOURS, Aratio, and Sratio are not significant.
- c) The R-squared value is 0.626226 which seems to be a useful coefficient of determination.

Since there are some nonsignificant variables in the above models. We have re-run multiplicative models again after deleting the non-significant variables. The final fitted models are:

a) EL model for Kiln 1;

$$EL = AvNO^{(6.982025E-02)} * AvHOURS^{(4.398347E-02)} * AVL^{(0.6735674)}$$

b) EL model for Kiln 2;

$$EL = AvNO^{(0.07906)} * AvHOURS^{(8.611979E-02)} * PRORATE^{(0.614341)}$$

c) EL model for Kiln 4;

$$EL = AvHOURS^{(8.102614E-02)} * PRORATE^{(-0.597735)} * LimeSF^{(1.144716)}$$

d) FUEL model for Kiln 4;

$$FUEL = AvNO^{(2.441024E-02)} * PRORATE^{(-0.3465203)} * Aratio^{(-4.770764E-02)} * LimeSF^{(1.254849)}$$

e) EL model for Kiln 5;

$$EL = AvHOURS^{(4.663016E-02)} * PRORATE^{(-0.4084042)} * AVL^{(-0.432225)} * Aratio^{(-0.4455258)} * Sratio^{(-2.1859)} * LimeSF^{(2.030025)}$$

f) FUEL model for Kiln 5;

$$FUEL = AvNO^{(6.208962E-02)} * PRORATE^{(-0.5214719)} * LimeSF^{(1.484882)}$$

g) EL model for Kiln 6;

$$EL = AvNO^{(-0.1184801)} * AvHOURS^{(4.532456E-02)} * PRORATE^{(-1.100501)} * AVL^{(-0.6302096)} * LimeSF^{(2.467599)}$$

h) FUEL model for Kiln 6;

$$FUEL = PRORATE^{(-0.6590492)} * AVL^{(-0.4208373)} * LimeSF^{(2.089969)}$$

Table (5) reports the R-squared values of these models. It seems reasonable that these values are smaller than those of the robust models. So, we can say that nonlinear models are not recommended for the data under consideration. Hence, we still prefer using robust regression model.

Table (5): R-squared Values for Final Multiplicative Models

	K1	K2	K4	K5	K6
EL	0.304715	0.553153	0.583113	0.800617	0.616105
FUEL	-----	-----	0.471138	0.540164	0.603876

Based on all the results in this section we still recommend using Andrew's sine robust regression for the available data.

Appendix 21: Regression on unrounded data of Kiln 6

Initial Multiple EL Regression Report

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 Dependent REL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-12.45221	57.29444	-0.2173	0.829173	Accept Ho	0.055145
AvNO	-10.79814	3.667536	-2.9442	0.005640	Reject Ho	0.817248
AvHOURS	0.3236844	0.1013299	3.1944	0.002911	Reject Ho	0.874538
Aratio	-2.971239	5.373745	-0.5529	0.583737	Accept Ho	0.083803
Sratio	4.194863	7.0224	0.5974	0.554010	Accept Ho	0.089558
LimeSF	0.9289225	0.5039356	1.8433	0.073525	Accept Ho	0.434229
RPR	-0.2394105	7.391647E-02	-3.2389	0.002581	Reject Ho	0.883260
RAV	-0.2339809	8.158863E-02	-2.8678	0.006869	Reject Ho	0.796901
R-Squared	0.659463					

Model

-12.45221-10.79814*AvNO+ .3236844*AvHOURS-2.971239*Aratio+ 4.194863*Sratio+ .9289225*LimeSF-.2394105*RPR-.2339809*RAV

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	37419.07	37419.07			
Model	7	502.4189	71.77413	9.9593	0.000001	0.999994
Error	36	259.4421	7.206726			
Total(Adjusted)	43	761.8611	17.7177			

Root Mean Square Error	2.684535	R-Squared	0.6595
Mean of Dependent	29.16219	Adj R-Squared	0.5932
Coefficient of Variation	9.205531E-02	Press Value	453.0535
Sum Press Residuals	89.96038	Press R-Squared	0.4053

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	1.3694	0.170886	Accepted
Kurtosis	2.8778	0.004005	Rejected
Omnibus	10.1566	0.006230	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.204520	9	0.006723	17	-0.015289
2	-0.151876	10	0.174414	18	-0.334131
3	0.002637	11	0.016195	19	-0.038373
4	-0.097768	12	0.080496	20	0.171296
5	-0.298633	13	0.134454	21	0.012115
6	-0.141014	14	0.034024	22	-0.071925
7	0.047253	15	-0.094980	23	-0.009187
8	-0.112345	16	-0.048844	24	0.025339

Above serial correlations significant if their absolute values are greater than 0.301511
 Durbin-Watson Value 1.5754

Final Multiple EL Regression Report

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Dependent REL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	74.42475	11.92991	6.2385	0.000000	Reject Ho	0.999981
AvNO	-10.25862	3.698891	-2.7734	0.008386	Reject Ho	0.772270
AvHOURS	0.4072188	9.587029E-02	4.2476	0.000125	Reject Ho	0.985505
RPR	-0.2511295	6.626207E-02	-3.7899	0.000498	Reject Ho	0.958852
RAV	-0.1695349	7.642849E-02	-2.2182	0.032281	Reject Ho	0.581153
R-Squared	0.612660					

Model

74.42475-10.25862*AvNO+ .4072188*AvHOURS-.2511295*RPR-.1695349*RAV

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	38555.83	38555.83			
Model	4	481.1457	120.2864	15.8171	0.000000	0.999999
Error	40	304.1934	7.604834			
Total(Adjusted)	44	785.3391	17.84862			

Root Mean Square Error	2.757686	R-Squared	0.6127
Mean of Dependent	29.27108	Adj R-Squared	0.5739
Coefficient of Variation	9.421197E-02	Press Value	425.7018
Sum Press Residuals	88.50939	Press R-Squared	0.4579

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	1.0641	0.287290	Accepted
Kurtosis	3.2109	0.001323	Rejected
Omnibus	11.4419	0.003277	Rejected

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.315762	9	-0.012318	17	-0.082368
2	-0.031017	10	0.052804	18	-0.226262
3	0.081035	11	-0.088327	19	-0.015452
4	-0.069217	12	0.040690	20	0.114030
5	-0.240019	13	0.110942	21	0.026536
6	-0.070841	14	0.097557	22	-0.118998
7	0.129931	15	-0.090681	23	-0.116379
8	-0.116174	16	-0.044502	24	-0.071630

Above serial correlations significant if their absolute values are greater than 0.298142

Durbin-Watson Value 1.3499

Initial Multiple FUEL Regression Report

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 Dependent RFU

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	180.923	80.08308	2.2592	0.030023	Reject Ho	0.594345
AvNO	-3.503338	5.126285	-0.6834	0.498725	Accept Ho	0.102052
AvHOURS	-3.568044E-02	0.1416334	-0.2519	0.802535	Accept Ho	0.056920
Aratio	-11.08196	7.511132	-1.4754	0.148797	Accept Ho	0.300543
Sratio	-0.818556	9.815533	-0.0834	0.934000	Accept Ho	0.050756
LimeSF	0.336202	0.7043741	0.4773	0.636029	Accept Ho	0.075084

RPR	-0.5544815	0.1033165	-5.3668	0.000005	Reject Ho	0.999441
RAV	-0.4206304	0.1140402	-3.6884	0.000740	Reject Ho	0.948281
R-Squared	0.678986					

Model

180.923-3.503338*AvNO-3.568044E-02*AvHOURS-11.08196*Aratio-.818556*Sratio+ .336202*LimeSF-.5544815*RPR-.4206304*RAV

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	339815	339815			
Model	7	1072.098	153.1569	10.8778	0.000000	0.999999
Error	36	506.8706	14.07974			
Total(Adjusted)	43	1578.969	36.7202			

Root Mean Square Error	3.752298	R-Squared	0.6790
Mean of Dependent	87.88099	Adj R-Squared	0.6166
Coefficient of Variation	4.269749E-02	Press Value	825.2443
Sum Press Residuals	147.1889	Press R-Squared	0.4774

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.1769	0.859567	Accepted
Kurtosis	0.2255	0.821617	Accepted
Omnibus	0.0821	0.959763	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.350732	9	0.050090	17	-0.143166
2	0.221789	10	0.046258	18	0.126856
3	0.057840	11	0.077403	19	-0.016490
4	-0.164287	12	0.108505	20	-0.042047
5	-0.136860	13	0.152532	21	-0.018906
6	-0.241093	14	0.069907	22	-0.103607
7	-0.359420	15	0.028628	23	0.044136
8	-0.146684	16	-0.098259	24	0.026196

Above serial correlations significant if their absolute values are greater than 0.301511
 Durbin-Watson Value 1.2608

Final Multiple FUEL Regression Report

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 Dependent RFU

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	185.2441	11.79003	15.7119	0.000000	Reject Ho	1.000000
RPR	-0.5959902	8.040573E-02	-7.4123	0.000000	Reject Ho	1.000000
RAV	-0.3200226	8.620965E-02	-3.7121	0.000599	Reject Ho	0.952147
R-Squared						

Model

185.2441-.5959902*RPR-.3200226*RAV

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	346873.2	346873.2			
Model	2	1005.823	502.9116	35.9741	0.000000	1.000000

Error	42	587.1524	13.97982
Total(Adjusted)	44	1592.976	36.20399
Root Mean Square Error	3.73896	R-Squared	0.6314
Mean of Dependent	87.79688	Adj R-Squared	0.6139
Coefficient of Variation	4.258648E-02	Press Value	689.5264
Sum Press Residuals	138.2888	Press R-Squared	0.5671

Normality Tests Section

Assumption	Value	Probability	Decision(5%)
Skewness	0.5284	0.597232	Accepted
Kurtosis	0.3125	0.754682	Accepted
Omnibus	0.3768	0.828271	Accepted

Serial-Correlation Section

Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.462319	9	-0.022639	17	-0.080506
2	0.295280	10	-0.044127	18	0.149346
3	0.125699	11	-0.007429	19	0.032416
4	-0.034645	12	-0.008917	20	-0.004540
5	-0.121462	13	0.021401	21	-0.008581
6	-0.235670	14	-0.009746	22	-0.062433
7	-0.347094	15	-0.017032	23	0.064195
8	-0.200388	16	-0.106867	24	0.052521

Above serial correlations significant if their absolute values are greater than 0.298142
Durbin-Watson Value 1.0308

Initial Robust EL Regression Report

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Dependent REL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-53.09008	19.4749	-2.7261	0.010309	Reject Ho	0.752866
AvNO	-5.874084	1.13215	-5.1884	0.000011	Reject Ho	0.998921
AvHOURS	0.3483818	3.261262E-02	10.6824	0.000000	Reject Ho	1.000000
Aratio	2.710959	1.801532	1.5048	0.142181	Accept Ho	0.308780
Sratio	7.002005	1.945214	3.5996	0.001063	Reject Ho	0.936950
LimeSF	1.033661	0.1853726	5.5761	0.000004	Reject Ho	0.999712
RPR	-0.1936136	2.164575E-02	-8.9446	0.000000	Reject Ho	1.000000
RAV	-0.1549481	0.0270717	-5.7236	0.000002	Reject Ho	0.999832
R-Squared	0.938975					

Model

-53.09008-5.874084*AvNO+ .3483818*AvHOURS+ 2.710959*Aratio+ 7.002005*Sratio+ 1.033661*LimeSF-.1936136*RPR-.1549481*RAV

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	22703.99	22703.99			
Model	7	196.0329	28.0047	70.3391	0.000000	1.000000
Error	32	12.74044	0.3981386			
Total(Adjusted)	39	208.7733	5.353163			

Root Mean Square Error	0.6309823	R-Squared	0.938975
Mean of Dependent Variable	28.87033	Adj R-Squared	0.925626
Coefficient of Variation	2.185573E-02		

Final Robust EL Regression Report

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 Dependent REL

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-47.17022	17.28964	-2.7282	0.010125	Reject Ho	0.754321
AvNO	-6.317195	1.061643	-5.9504	0.000001	Reject Ho	0.999931
AvHOURS	0.3671939	2.952882E-02	12.4351	0.000000	Reject Ho	1.000000
Sratio	8.389895	1.868522	4.4901	0.000082	Reject Ho	0.991714
LimeSF	0.9719376	0.1643575	5.9136	0.000001	Reject Ho	0.999920
RPR	-0.1828562	1.936441E-02	-9.4429	0.000000	Reject Ho	1.000000
RAV	-0.1529156	2.595787E-02	-5.8909	0.000001	Reject Ho	0.999913
R-Squared	0.944585					

Model

-47.17022-6.317195*AvNO+ .3671939*AvHOURS+ 8.389895*Sratio+ .9719376*LimeSF-.1828562*RPR-.1529156*RAV

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	23237.94	23237.94			
Model	6	214.152	35.69199	93.7507	0.000000	1.000000
Error	33	12.56348	0.3807116			
Total(Adjusted)	39	226.7154	5.813216			

Root Mean Square Error 0.6170183 R-Squared 0.944585
 Mean of Dependent Variable 28.97492 Adj R-Squared 0.934509
 Coefficient of Variation 2.129491E-02

Initial Robust FUEL Regression Report

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 Dependent RFU

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	187.0455	54.9705	3.4027	0.001650	Reject Ho	0.911589
AvNO	-3.569283	3.877238	-0.9206	0.363401	Accept Ho	0.145859
AvHOURS	-0.1936044	0.1113916	-1.7381	0.090750	Accept Ho	0.394376
Aratio	-5.033528	5.889046	-0.8547	0.398355	Accept Ho	0.132306
Sratio	-7.238518	6.687635	-1.0824	0.286284	Accept Ho	0.183679
LimeSF	0.39825	0.4874052	0.8171	0.419256	Accept Ho	0.125039
RPR	-0.5785337	7.649828E-02	-7.5627	0.000000	Reject Ho	1.000000
RAV	-0.4619228	8.210839E-02	-5.6258	0.000002	Reject Ho	0.999776
R-Squared	0.771165					

Model

187.0455-3.569283*AvNO-.1936044*AvHOURS-5.033528*Aratio-7.238518*Sratio+ .39825*LimeSF-.5785337*RPR-.4619228*RAV

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	242798.7	242798.7			
Model	7	638.7125	91.24464	17.3312	0.000000	1.000000
Error	36	189.5312	5.264755			

Total(Adjusted)	43	828.2437	19.26148		
Root Mean Square Error		2.294505	R-Squared	0.771165	
Mean of Dependent Variable		87.04906	Adj R-Squared	0.726669	
Coefficient of Variation		2.635876E-02			

Final Robust FUEL Regression Report

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 Dependent RFU

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	170.7949	8.947863	19.0878	0.000000	Reject Ho	1.000000
RPR	-0.4848496	0.0601854	-8.0559	0.000000	Reject Ho	1.000000
RAV	-0.3079155	6.181911E-02	-4.9809	0.000011	Reject Ho	0.998159
R-Squared	0.682308					

Model
 170.7949-.4848496*RPR-.3079155*RAV

Analysis of Variance Section

Source	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (5%)
Intercept	1	248028.7	248028.7			
Model	2	448.6944	224.3472	45.1017	0.000000	1.000000
Error	42	208.9187	4.974254			
Total(Adjusted)	44	657.613	14.94575			

Root Mean Square Error		2.230304	R-Squared	0.682308
Mean of Dependent Variable		86.57646	Adj R-Squared	0.667179
Coefficient of Variation		2.576108E-02		

Appendix 22 : List of contacted parties

1) Institute of chemical engineers UK

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Contacted mails :

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7) Prinston university USA

Address : www.princeton.edu

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8) UK department of trade and industry

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9) Innovative scientific technological engineering solution

Address : [www. Aeat.co.uk](http://www.Aeat.co.uk)

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10) Holderbank

11) Lafarge

12) Whitehopleman ICR

Address : www.whitehopleman.com

Appendix no. (23) : Job Description of Plant Energy Section Staff

This appendix presents the job descriptions of the energy section staff in the cement plants.

1. Energy Section Head:

- Objectives:

Control and conserve energy in the plant through the preparation of plans and programmes to ensure minimum energy consumption.

- Duties:

1. Prepare the plant annual energy saving plan in co-operation with the energy manager.
2. Prepare the monthly energy report.
3. Prepare the necessary technical studies to help ensure minimum energy consumption through proposing suitable solutions and remedies to problems and obstacles, which may have a negative effect on energy consumption.
4. Plant energy committee: Prepare the agenda, write the minutes of meeting, implement the recommendations.
5. Follow-up the activities of the energy quality circle.
6. Review daily production reports to ensure that the management of the process complies with the strategy of energy conservation.
7. Study and analyse daily energy consumption reports and data for all production units and identify deviations from expected values and determine the reasons for deviation.
8. Propose suggestions and recommendations to control and conserve energy.
9. Explain the importance of conservation of energy to all the plant employees through meetings, lectures, distribution of leaflets, brochures and making visits to concerned personnel.
10. Participate in maintenance work and emphasise the energy aspects.
11. Modernisation and development: Follow-up the recent developments in the field of cement industry especially those concerning the energy conservation and prepare feasibility studies.
12. Documentation: Ensure that all documents of reports, studies and research are proper and can be utilised efficiently in the future.

13. Projects: Participate in studies related to the projects to ensure that these projects are dealing with the target of reducing energy consumption.

2. Energy Engineer

- Objectives:

Control and conserve energy in the plant through participation in the preparation and implementation of plans and programmes leading to the minimisation of energy consumption.

- Duties:

1. Participate in the preparation of an energy annual plan and its implementation.
2. Prepare the weekly energy report.
3. Study daily energy consumption of all production units.
4. Analyse and enter data on computer concerning energy and production.
5. Participate in the preparation of a monthly energy report.
6. Hold the meetings of the energy quality circle; prepare the agenda; write the minutes of meeting; prepare the necessary reports, and follow-up on the activities of the circle.
7. Implement the recommendations of the meetings of the plant energy committee.
8. Prepare technical studies on energy aspects in co-ordination with the section head.
9. Participate in and follow-up on the activities of maintenance and emphasise efficiency in maintenance such as the prevention of air passage between cooler chambers, the replacement of grizzly bars and hammers for clinker and limestone crushers in order to achieve minimum feed size.
10. Check-up the operation conditions of all units and equipment by making rounds to make observations and notes, and to evaluate the commitment of relevant personnel to the recommendations of energy section and the results of studies and meetings.
11. Explain the importance of energy saving for all plant employees.
12. Document all necessary reports, data and studies on computer and in special files.

3. Energy Technician:

- Objectives:

Participation in control and saving energy by collecting necessary data, readings, measurements and implementation of the annual energy plan.

- Duties:

1. Daily rounds to all units and equipment to ensure the commitment to the target of saving energy. Notify the energy engineer of any observations.
2. Work order concerning department on energy related issue.
3. Daily production report used (includes: production figures, running hours, heat and electrical energy consumption) to prepare the energy reports.
4. Participate in the preparation of daily, weekly and monthly reports.
5. Participate in maintenance work concerning the energy issue.
6. Record measurements (flow, temperature, pressure, etc.) necessary for the preparation of studies and reports.
7. Collect data from control section and follow-up the production process in order to prepare reports and feasibility studies.
8. Participate in the weekly meeting of energy quality circle and follow-up the implementation of the circle's work and recommendations.
9. Aid in the documentation of all necessary studies, file reports, and computerisation.
10. Follow-up the implementation of the annual energy plan.

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