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FINAL REPORT

CATERPILLAR 789B (DT 420)
FUEL EFFICIENCY EVALUATION
ROCHE CONTRACTORS
KCGM OPERATIONS

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C O N T E N T S

Appendix

EXECUTIVE SUMMARY

This final report details the results of both phases of the fuel efficiency study which covers the operations of DT 420 hauling from the "Office" pit.

The evaluation has been designed to monitor changes in fuel consumption hauling up the two ramps, "A" and "P", plus extensions of hauls to waste.

Baseline tests were completed during the week commencing 28th July, 1997 and treated tests during week commencing 11th August, 1997. Return to baseline tests were conducted week commencing 8th September, 1997.

The trial procedure enables fuel consumption measurements to be made with the truck operating under normal mine working conditions, monitoring haul times, net fuel consumed, fuel temperature, payload carried and distance travelled.

The results achieved in the two phases of this evaluation are detailed in this report and confirm that:-

1. The trial data has uniformity and reproducibility which provides confidence in the measuring technique and test protocol.

2. Measuring the change in mean fuel efficiency, baseline 1 to FTC-3 treated fuel test resulted in a **3.9%** improvement. Return to baseline test following cessation of FTC-3 addition to the fuel measured a **4.0%** deterioration in fuel efficiency. A comparison of baseline 1 and return to baseline indicate the fuel efficiency returned to its original level following withdrawal of FTC-3 from the fuel.

3. The average gross efficiency gain based on the ore to waste haulage ratio is **4.4%**.

INTRODUCTION

Roche Contractors agreed to evaluate the FTC-3 Combustion Catalyst at the KCGM Fimiston open pit mining operations employing a Caterpillar 789B dump truck in an effort to quantify the economic benefit of reduced fuel consumption under actual mine haulage operations.

The trial was structured to measure the baseline (untreated) fuel consumptions then treating the truck's fuel with FTC-3 catalyst for a 200 hour conditioning period and measuring the treated fuel consumption as the first phase of the trial. Fuel treatment was then to cease and the truck continued to operate on untreated fuel and then re-measure fuel consumption to establish a return to baseline, the second phase of the test.

Truck number DT 420 was selected by Roche Contractors for the test being one of the newest and potentially most fuel efficient units in the fleet.

The evaluation was designed to measure fuel consumption over the most rigorous and high fuel consuming section of the open pit operation, namely the climb out of the pit to the adjacent ROM pads, which accounts for approximately 15% of the material hauled.

As approximately 85% is hauled to waste this section was also evaluated which includes the pit haul and continuation on to the waste areas.

TEST PROCEDURE

The Specific Fuel Consumption (SFC) test procedure requires measurement of the mass of fuel consumed related to the work performed in hauling a measured load of ore over a defined distance.

A start point was selected at a given distance from the current excavator operations at base of the "A" and "P" ramps and marked with a bollard. Points at the top of each ramp were also marked with bollards. A further set of bollards were placed on the haul roads to waste. The distance between the bollards is measured by survey data provided by Roche Contractors (*Refer Appendix*).

MacNaught Model M5 flow transducers, complete with thermocouple probes, are connected to the truck's fuel tank outlet and return fuel pipelines (*Photograph No. 1*). These transducers, which have been calibrated to $\pm$ 0.25% by a NATA Certified Laboratory, are then connected to a KEP Minitrol totaliser mounted in the truck cab. The thermocouple probes are connected to a dual reading digital thermometer also mounted in the cab work-station (*Photograph No. 2*).

As the temperature of the fuel can vary relative to ambient temperature changes as well as increase significantly during a working shift, constant temperature monitoring is required to enable calculation of the mass of fuel consumed for each haul.

Prior to the test commencing a fuel sample is drawn and the density measured at observed temperature and then corrected to the industry standard of 15°C by use of the Institute of Petroleum Density Correction Table, Volume VIII, Table 53B.

Following loading of the truck at each cycle, allowing the load monitor to register, the load in kilograms is recorded and the truck driven to the bottom pit marker and stopped. The Minitrol totaliser and stopwatch are zeroed. At the signal "*GO*" the driver accelerates and the test engineer activates the totaliser and stopwatch.

To avoid driver variables the truck is driven at full throttle over the haul test circuit. Fuel temperatures are recorded at the mid haul point and upon arrival at the pit haul top marker, the stopwatch and Minitrol totaliser readings are also recorded. Approximately twenty test runs were recorded for each test section.

TEST RESULTS

The individual results achieved for each of the four test sectors for each phase of the evaluation are shown in Table 1 below.

The results are reported as fuel consumed in kilograms/tonne (kg/t) which relates to a more accurate mass measurement compared to the volumetric measurement which is subject to the variable of fuel temperature changes.

We have also calculated the results on the basis of fuel consumed for a given amount of work done and reported as tonne kilometres/kilogram (tkm/kg) (References Koehler D E and Doglio JA, SAE Technical Paper 872146).

TABLE 1

CATERPILLAR 789 B (TRUCK DT420)

	Phase 1		**Phase 2**	
Test Sector	**Base 1/Treated**		**Treated/Base 2**	
	kg/t	tkm/kg	kg/t	tkm/kg
A Ramp Haul	- 3.1	+ 3.1	+ 3.5	- 3.4
A Ramp Waste	- 4.7	+ 4.9	+ 5.2	- 5.0
P Ramp Haul	- 3.4	+ 3.5	+ 3.8	- 3.8
P Ramp Waste	- 4.1	+ 4.2	+ 4.0	- 3.9

Details of all data extracted during both phases of the trial program for each of the four test sectors are shown in the following computer printouts. Graphical presentation of the data is also presented on the following pages.

SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

Customer:	Roche KCGM	Engine Hrs	4663
Date:	29/07/97	Amb; Temp; Start deg; C	14.9
Truck No;	420	Amb; Temp; Finish deg; C	18.6
Make/Model	Cat 789B	Circuit Distance Metres	1100m
		A Ramp 1st marker	

Fuel Sample	Density	Temp Deg C
	0.832	35.4
Corrected	0.846	15

UNTREATED

Run No	Time	Load kg	Haul Time Mins	Haul Time Secs	Haul Time Mins	Fuel (Lt) In	Fuel (Lt) Out	Fuel (Lt) Consumed	Fuel Temp In	Fuel Temp Out	Density In	Density Out	Fuel (kg) In	Fuel (kg) Out	Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
1	10.15	188000	6	22	6.37	92.78	60.20	32.58	35.7	51.9	0.832	0.820	77.17	49.38	27.79	0.1037	10.6072
2	10.45	203100	6	27	6.45	93.64	60.31	33.33	36.7	51.6	0.831	0.821	77.82	49.48	28.34	0.1001	10.9884
3	11.10	183300	6	25	6.42	92.85	60.29	32.56	37.6	55.3	0.831	0.818	77.11	49.31	27.80	0.1056	10.4181
4	12.00	195400	6	34	6.57	94.00	60.02	33.98	39.3	51.9	0.829	0.820	77.95	49.23	28.72	0.1043	10.5481
5	12.30	174900	6	02	6.03	92.45	59.73	32.72	39.9	54.7	0.829	0.818	76.62	48.88	27.74	0.1088	10.1080
6	12.50	190100	6	23	6.38	93.38	60.02	33.36	40.2	57.3	0.829	0.817	77.37	49.01	28.37	0.1050	10.4733
7	1.15	184600	6	26	6.43	92.81	60.05	32.76	41.2	56.8	0.828	0.817	76.84	49.05	27.78	0.1050	10.4764
8	2.45	193500	6	27	6.45	93.12	59.91	33.21	43.8	57.2	0.826	0.817	76.93	48.92	28.00	0.1024	10.7431
9	3.10	183600	6	25	6.42	93.25	59.78	33.47	44.6	58.7	0.826	0.816	76.98	48.75	28.23	0.1071	10.2723
10	4.10	194600	6	24	6.40	93.71	60.10	33.61	45.7	57.7	0.825	0.816	77.28	49.05	28.23	0.1028	10.7003
11	6.35	208300	6	47	6.78	93.40	59.83	33.57	34.1	48.9	0.833	0.823	77.79	49.21	28.58	0.0991	11.0952
12	7.00	159800	6	27	6.45	90.32	59.45	30.87	35.1	50.9	0.832	0.821	75.16	48.81	26.36	0.1099	10.0084
13	7.25	157700	6	18	6.30	90.86	59.32	31.54	35.7	48.9	0.832	0.823	75.58	48.79	26.79	0.1127	9.7612
14	7.45	179400	6	18	6.30	91.65	59.42	32.23	35.9	50.9	0.832	0.821	76.23	48.78	27.44	0.1058	10.3981
15	8.15	159000	6	04	6.07	89.35	58.01	31.34	36.1	49.7	0.832	0.822	74.29	47.68	26.62	0.1114	9.8775
16	9.25	191900	6	30	6.50	92.89	59.55	33.34	37.3	52.6	0.831	0.820	77.16	48.82	28.34	0.1042	10.5519
17	9.45	164000	6	11	6.18	90.89	59.52	31.37	38.0	52.7	0.830	0.820	75.46	48.79	26.66	0.1093	10.0666
18	10.40	192700	6	26	6.43	92.39	58.85	33.54	40.0	54.3	0.829	0.819	76.57	48.17	28.40	0.1041	10.5630
19	11.30	200100	6	31	6.52	92.68	59.21	33.47	42.0	57.7	0.827	0.816	76.67	48.33	28.35	0.1012	10.8692
20	12.55	174200	6	16	6.27	91.05	59.01	32.04	44.0	58.8	0.826	0.816	75.20	48.12	27.08	0.1065	10.3274
21	2.05	200600	6	30	6.50	92.28	59.06	33.22	45.4	59.0	0.825	0.815	76.12	48.15	27.97	0.0997	11.0353
22	2.30	189200	6	37	6.62	93.38	59.24	34.14	46.0	59.5	0.825	0.815	76.99	48.28	28.71	0.1067	10.3137
23	2.55	172100	6	15	6.25	90.56	58.74	31.82	46.5	58.6	0.824	0.816	74.64	47.91	26.73	0.1060	10.3740
Mean		184352			6.39			32.79							27.784	0.1053	10.4599
Std Dev		14590			0.1678			0.9188							0.7353	0.0036	0.3545
C.V		7.9%			2.6%			2.8%							2.6%	3.4%	3.4%

SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

Truck No:	420	Engine Hrs	4947
Date:	12/13 Aug 97	Amb; Temp; Start deg; C	7
		Amb; Temp; Finish deg; C	20

Fuel Sample	Density	Temp Deg C
	0.84	22.2
Corrected	0.845	15

TREATED

Run No	Time	Load kg	Haul Time Mins	Haul Time Secs	Haul Time Mins	Fuel (Lt) In	Fuel (Lt) Out	Fuel (Lt) Consumed	Fuel Temp In	Fuel Temp Out	Density In	Density Out	Fuel (kg) In	Fuel (kg) Out	Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
1	1.15	201600	6	34	6.57	93.56	59.80	33.76	30.5	47.4	0.834	0.822	78.05	49.17	28.88	0.1026	10.7257
2	1.45	201200	6	30	6.50	93.35	60.04	33.31	31.4	48.2	0.834	0.822	77.81	49.33	28.48	0.1013	10.8616
3	2.1	209100	6	31	6.52	93.22	59.76	33.46	32.4	50.5	0.833	0.820	77.63	49.00	28.63	0.0990	11.1074
4	3.05	205300	6	33	6.55	93.10	59.45	33.65	33.8	51.1	0.832	0.820	77.44	48.73	28.72	0.1006	10.9290
5	**7.45**	200900	6	29	6.48	93.22	59.54	33.68	22.9	39.3	0.840	0.828	78.27	49.29	28.97	0.1031	10.6643
6	**8.55**	207700	6	38	6.63	94.14	60.05	34.09	27.5	45.3	0.836	0.824	78.73	49.46	29.27	0.1017	10.8135
7	**9.20**	186200	6	27	6.45	92.05	59.64	32.41	28.4	45.2	0.836	0.824	76.93	49.13	27.79	0.1044	10.5351
8	**9.45**	191200	6	24	6.40	92.48	59.45	33.03	29.6	47.0	0.835	0.823	77.20	48.90	28.30	0.1044	10.5396
9	**10.40**	195900	6	25	6.42	92.52	59.48	33.04	30.6	47.7	0.834	0.822	77.17	48.89	28.28	0.1025	10.7322
10	**11.00**	192300	6	24	6.40	92.48	59.40	33.08	32.2	49.4	0.833	0.821	77.04	48.76	28.28	0.1039	10.5915
11	**12.55**	189400	6	20	6.33	89.69	57.97	31.72	33.0	49.8	0.832	0.821	74.66	47.56	27.09	0.1006	10.9377
12	**1.30**	181900	6	17	6.28	91.40	58.79	32.61	35.3	51.2	0.831	0.820	75.94	48.18	27.76	0.1060	10.3791
13	**1.55**	200900	6	30	6.50	92.82	59.31	33.51	36.2	49.9	0.830	0.820	77.05	48.66	28.39	0.1011	10.8830
14	**2.20**	205000	6	34	6.57	93.37	59.47	33.90	37.0	51.5	0.830	0.819	77.46	48.72	28.74	0.1008	10.9097
15	**2.45**	188000	6	21	6.35	91.90	58.94	32.96	37.9	52.5	0.829	0.819	76.18	48.25	27.93	0.1042	10.5559
16	**3.10**	216600	6	37	6.62	93.61	59.65	33.96	38.8	53.7	0.828	0.818	77.54	48.78	28.76	0.0970	11.3460
17	**3.30**	188600	6	21	6.35	91.70	58.89	32.81	39.5	54.7	0.828	0.817	75.91	48.11	27.80	0.1035	10.6295
18	**3.55**	188600	6	22	6.37	92.33	59.25	33.08	40.6	55.7	0.827	0.816	76.36	48.37	27.99	0.1042	10.5555
19	**4.15**	204600	6	39	6.65	93.43	59.14	34.29	41.2	55.3	0.827	0.817	77.23	48.29	28.94	0.1017	10.8192
20	7.10	206700	6	38	6.63	93.98	59.77	34.21	42.1	56.0	0.826	0.816	77.63	48.78	28.85	0.1006	10.9317
21	7.35	194700	6	17	6.28	91.45	58.85	32.60	25.6	43.5	0.838	0.825	76.60	48.55	28.05	0.1021	10.7736
22	8.50	210300	6	40	6.67	94.32	59.79	34.53	26.4	44.6	0.837	0.824	78.96	49.28	29.68	0.1022	10.7604
23	9.20	202500	6	29	6.48	92.22	58.42	33.80	29.6	47.5	0.835	0.822	76.99	48.03	28.96	0.1025	10.7310
24	11.15	194000	6	19	6.32	89.42	57.28	32.14	30.6	48.6	0.834	0.821	74.59	47.05	27.54	0.1005	10.9459
25	11.40	211600	6	39	6.65	94.25	60.07	34.18	35.0	52.4	0.831	0.819	78.32	49.18	29.14	0.0999	11.0066
Mean		198992			6.48			33.35							28.448	0.102	10.787
Std Dev		9164.875			0.1242			0.7199							0.6050	0.0020	0.2112
C.V		4.6%			1.9%			2.2%							2.1%	1.9%	2.0%

%CHANGE: Treated-Baseline	Load kg			Haul Time Mins		Fuel (Lt) Consumed		Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
Baseline	7.94%			1.31%		1.73%		2.39%	**-3.1%**	**3.1%**

SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

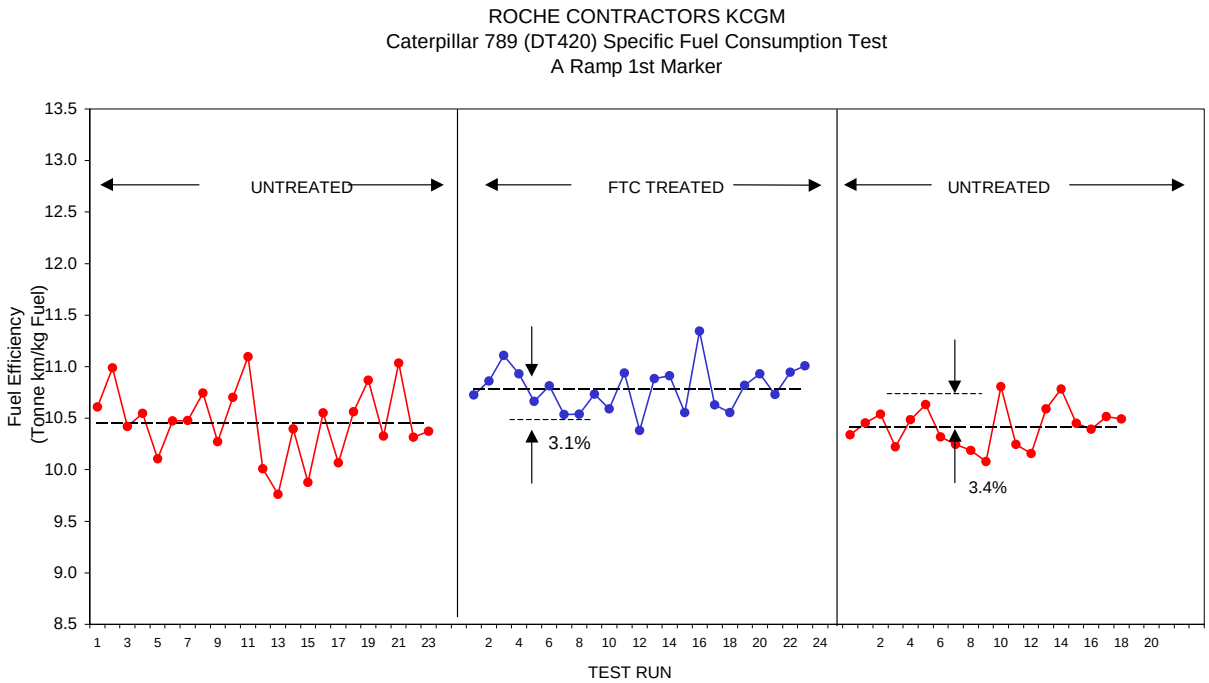
Truck No:	420	Engine Hrs	5569
Date:	8/09/97	Amb; Temp; Start deg; C	12.5
		Amb; Temp; Finish deg; C	19

Fuel Sample	Density	Temp Deg C
	0.839	29.1
Corrected	0.849	15

RETURN TO UNTREATED

Run No	Time	Load kg	Haul Time Mins	Haul Time Secs	Haul Time Mins	Fuel (Lt) In	Fuel (Lt) Out	Fuel (Lt) Consumed	Fuel Temp In	Fuel Temp Out	Density In	Density Out	Fuel (kg) In	Fuel (kg) Out	Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
1	10.40	200300	6	35	6.58	93.67	58.86	34.81	34.8	53.3	0.835	0.822	78.21	48.38	29.83	0.1064	10.3369
2	11.10	188600	6	25	6.42	91.43	58.36	33.07	35.6	51.7	0.834	0.823	76.29	48.03	28.26	0.1052	10.4555
3	12.20	184200	6	25	6.42	92.12	59.87	32.25	38.7	56.0	0.832	0.820	76.66	49.09	27.57	0.1044	10.5393
4	1.35	177900	6	25	6.42	92.36	59.74	32.62	41.0	56.5	0.831	0.820	76.71	48.96	27.75	0.1076	10.2226
5	2.30	182800	6	23	6.38	90.54	58.03	32.51	42.2	56.8	0.830	0.819	75.12	47.55	27.57	0.1049	10.4848
6	4.05	197900	6	30	6.50	92.25	58.24	34.01	44.4	58.4	0.828	0.818	76.40	47.65	28.75	0.1035	10.6329
7	6.00	187300	6	26	6.43	92.67	59.44	33.23	32.4	48.9	0.837	0.825	77.53	49.04	28.49	0.1066	10.3206
8	7.05	187600	6	28	6.47	92.56	59.04	33.52	34.0	51.2	0.836	0.823	77.33	48.61	28.73	0.1073	10.2471
9	7.50	184500	6	25	6.42	92.40	59.30	33.10	35.1	57.3	0.835	0.819	77.13	48.57	28.56	0.1080	10.1875
10	8.05	185100	6	31	6.52	93.46	59.58	33.88	35.6	51.4	0.834	0.823	77.98	49.05	28.94	0.1092	10.0775
11	9.30	209100	6	45	6.75	94.71	60.24	34.47	38.2	55.5	0.833	0.820	78.85	49.41	29.43	0.1018	10.8052
12	1.50	185000	6	33	6.55	92.96	59.24	33.72	44.8	57.5	0.828	0.819	76.96	48.51	28.45	0.1074	10.2461
13	2.10	177000	6	24	6.40	91.55	58.62	32.93	45.4	59.6	0.827	0.817	75.75	47.92	27.83	0.1083	10.1572
14	2.30	194000	6	34	6.57	92.87	59.16	33.71	45.6	59.3	0.827	0.818	76.83	48.37	28.46	0.1039	10.5895
15	3.20	197400	6	29	6.48	91.57	58.05	33.52	46.2	60.3	0.827	0.817	75.72	47.42	28.30	0.1020	10.7830
16	8.40	194900	6	31	6.52	92.51	58.69	33.82	35.2	52.1	0.835	0.823	77.22	48.28	28.93	0.1053	10.4511
17	9.40	200300	6	37	6.62	93.55	58.76	34.79	36.9	53.1	0.834	0.822	77.97	48.30	29.67	0.1059	10.3909
18	11.45	189500	6	24	6.40	92.94	59.76	33.18	40.4	55.0	0.831	0.821	77.23	49.05	28.19	0.1046	10.5168
19	12.10	210000	6	40	6.67	94.10	58.26	35.84	40.9	56.2	0.831	0.820	78.16	47.76	30.40	0.1048	10.4941
20	12.35	193300	6	35	6.58	93.21	59.39	33.82	41.5	56.0	0.830	0.820	77.38	48.69	28.69	0.1050	10.4789
Mean		191335			6.50			33.64							28.640	0.106	10.421
Std Dev		9190.457			0.1006			0.8666							0.7495	0.0020	0.1987
C.V		4.8%			1.5%			2.6%							2.6%	1.9%	1.9%

% CHANGE: Untreated-Treated	Load kg			Haul Time Mins		Fuel (Lt) Consumed		Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
Treated	-3.8%			0.4%		0.9%		0.7%	**3.5%**	**-3.4%**



SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

Customer:	Roche KCGM	Engine Hrs	4663
Date:	29/07/97	Amb; Temp; Start deg; C	14.9
Truck No;	420	Amb; Temp; Finish deg; C	18.6
Make/Model	Cat 789B	Circuit Distance Metres	2295m
		A Ramp W2	

Fuel Sample	Density	Temp Deg C
	0.832	35.4
Corrected	0.846	15

UNTREATED

Run No	Time	Load kg	Haul Time		Haul Time	Fuel (Lt)		Fuel (Lt)	Fuel Temp		Density		Fuel (kg)		Fuel (kg)	Fuel (kg)	Tonne/km
			Mins	Secs	Mins	In	Out	Consumed	In	Out	In	Out	In	Out	Consumed	Per Tonne	Per kg Fuel
1	10.15	188000	8	46	8.77	126.50	81.62	44.88	35.7	51.9	0.832	0.820	105.22	66.95	38.27	0.1428	16.0717
2	10.45	203100	8	59	8.98	128.43	82.39	46.04	36.7	51.6	0.831	0.821	106.74	67.60	39.14	0.1382	16.6010
3	12.00	195400	9	02	9.03	128.70	82.38	46.32	39.3	51.9	0.829	0.820	106.73	67.58	39.15	0.1422	16.1422
4	12.30	174900	8	43	8.72	125.66	81.05	44.61	39.9	54.7	0.829	0.818	104.15	66.33	37.82	0.1484	15.4697
5	12.50	190100	8	55	8.92	127.27	82.00	45.27	40.2	57.3	0.829	0.817	105.46	66.95	38.50	0.1426	16.0995
6	1.15	184600	8	50	8.83	126.55	81.52	45.03	41.2	56.8	0.828	0.817	104.77	66.59	38.18	0.1443	15.9063
7	2.45	193500	8	55	8.92	127.67	82.40	45.27	43.8	57.2	0.826	0.817	105.47	67.29	38.18	0.1396	16.4399
8	3.10	183600	8	49	8.82	125.76	80.71	45.05	44.6	58.7	0.826	0.816	103.81	65.82	38.00	0.1441	15.9218
9	6.35	208300	8	59	8.98	129.52	82.61	46.91	34.1	48.9	0.833	0.823	107.88	67.95	39.93	0.1385	16.5700
10	7.25	157700	8	27	8.45	123.10	80.03	43.07	35.7	48.9	0.832	0.823	102.39	65.82	36.57	0.1538	14.9172
11	7.45	179400	8	40	8.67	124.88	80.50	44.38	35.9	50.9	0.832	0.821	103.86	66.09	37.77	0.1456	15.7609
12	8.15	159000	8	22	8.37	121.27	78.34	42.93	36.1	49.7	0.832	0.822	100.84	64.39	36.45	0.1525	15.0488
13	8.40	184400	8	39	8.65	125.11	80.87	44.24	36.5	51.3	0.831	0.821	103.99	66.38	37.61	0.1423	16.1325
14	9.45	164000	8	31	8.52	123.40	80.11	43.29	38.0	52.7	0.830	0.820	102.45	65.67	36.77	0.1507	15.2282
15	11.30	200100	8	58	8.97	127.07	81.39	45.68	42.0	57.7	0.827	0.816	105.13	66.43	38.69	0.1381	16.6129
16	12.55	174200	8	38	8.63	124.20	80.04	44.16	44.0	58.8	0.826	0.816	102.58	65.27	37.30	0.1468	15.6387
17	1.20	207800	9	06	9.10	128.26	81.89	46.37	44.3	57.7	0.826	0.816	105.90	66.84	39.07	0.1357	16.9075
18	1.40	193700	8	58	8.97	126.78	81.18	45.60	44.9	59.3	0.825	0.815	104.63	66.17	38.46	0.1405	16.3316
19	2.05	200600	8	56	8.93	126.24	80.77	45.47	45.4	59.0	0.825	0.815	104.14	65.85	38.28	0.1364	16.8212
20	2.55	172100	8	83	9.38	122.75	79.25	43.50	46.5	58.6	0.824	0.816	101.17	64.64	36.53	0.1449	15.8364
21	10.00	185300	8	48	8.80	125.71	80.54	45.17	39.7	54.2	0.829	0.819	104.21	65.94	38.28	0.1443	15.9074
Mean		185705			8.83			44.92							38.046	0.143	16.017
Std Dev		14872.24			0.2349			1.1055							0.9358	0.0050	0.5523
C.V		8.0%			2.7%			2.5%							2.5%	3.5%	3.4%

SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

Truck No:	420	Engine Hrs	4947
Date:	14/08/97	Amb; Temp; Start deg; C	14.5
		Amb; Temp; Finish deg; C	6

Fuel Sample	Density	Temp Deg C
	0.838	26.4
Corrected	0.846	15

TREATED

Run No	Time	Load kg	Haul Time		Haul Time	Fuel (Lt)		Fuel (Lt)	Fuel Temp		Density		Fuel (kg)		Fuel (kg)	Fuel (kg)	Tonne/km
			Mins	Secs	Mins	In	Out	Consumed	In	Out	In	Out	In	Out	Consumed	Per Tonne	Per kg Fuel
1	4.15	200500	9	07	9.12	128.10	82.49	45.61	42.6	52.6	0.827	0.819	105.87	67.59	38.28	0.1365	16.8158
2	8.05	191800	8	52	8.87	126.38	82.32	44.06	27.6	45.5	0.837	0.825	105.79	67.87	37.92	0.1395	16.4500
3	7.25	195100	8	44	8.73	124.67	81.37	43.30	36.4	53.2	0.831	0.819	103.59	66.64	36.95	0.1343	17.0884
4	7.50	191400	8	36	8.60	122.68	79.80	42.88	37.0	52.9	0.831	0.819	101.89	65.37	36.51	0.1345	17.0584
5	8.15	203000	8	53	8.88	126.03	81.79	44.24	37.5	52.5	0.830	0.820	104.62	67.03	37.59	0.1328	17.2779
6	8.45	192400	8	52	8.87	125.74	81.83	43.91	38.1	53.9	0.830	0.819	104.33	66.98	37.35	0.1371	16.7384
7	9.10	187200	8	45	8.75	124.73	80.98	43.75	38.4	53.6	0.830	0.819	103.46	66.30	37.17	0.1391	16.4999
8	9.35	184000	8	47	8.78	125.00	81.41	43.59	38.9	52.8	0.829	0.819	103.64	66.70	36.94	0.1399	16.4025
9	10.00	204900	9	04	9.07	127.74	82.63	45.11	39.1	53.5	0.829	0.819	105.90	67.66	38.24	0.1342	17.0989
10	10.25	187600	8	37	8.62	123.15	80.56	42.59	39.4	54.2	0.829	0.818	102.07	65.92	36.14	0.1351	16.9913
11	10.55	190800	8	53	8.88	125.86	81.60	44.26	39.6	53.1	0.829	0.819	104.29	66.84	37.45	0.1383	16.5955
12	11.20	188200	8	39	8.65	123.79	80.64	43.15	39.7	53.4	0.829	0.819	102.57	66.04	36.54	0.1362	16.8468
13	11.45	187800	8	39	8.65	124.34	80.92	43.42	39.9	54.3	0.828	0.818	103.00	66.21	36.79	0.1374	16.7036
14	12.40	217100	9	20	9.33	130.87	83.32	47.55	40.1	52.3	0.828	0.820	108.40	68.30	40.10	0.1350	17.0027
15	1.10	184900	8	53	8.88	125.81	81.90	43.91	40.2	52.3	0.828	0.820	104.20	67.13	37.06	0.1399	16.4033
Mean		193780			8.85			44.09							37.402	0.1367	16.7982
Std Dev		9034.236			0.2036			1.2385							0.9695	0.0023	0.2842
C.V		4.7%			2.3%			2.8%							2.6%	1.7%	1.7%

% CHANGE: Treated-Baseline	Load kg			Haul Time Mins		Fuel (Lt) Consumed		Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
Baseline	4.35%			0.19%		-1.84%		-1.69%	**-4.7%**	**4.9%**

SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

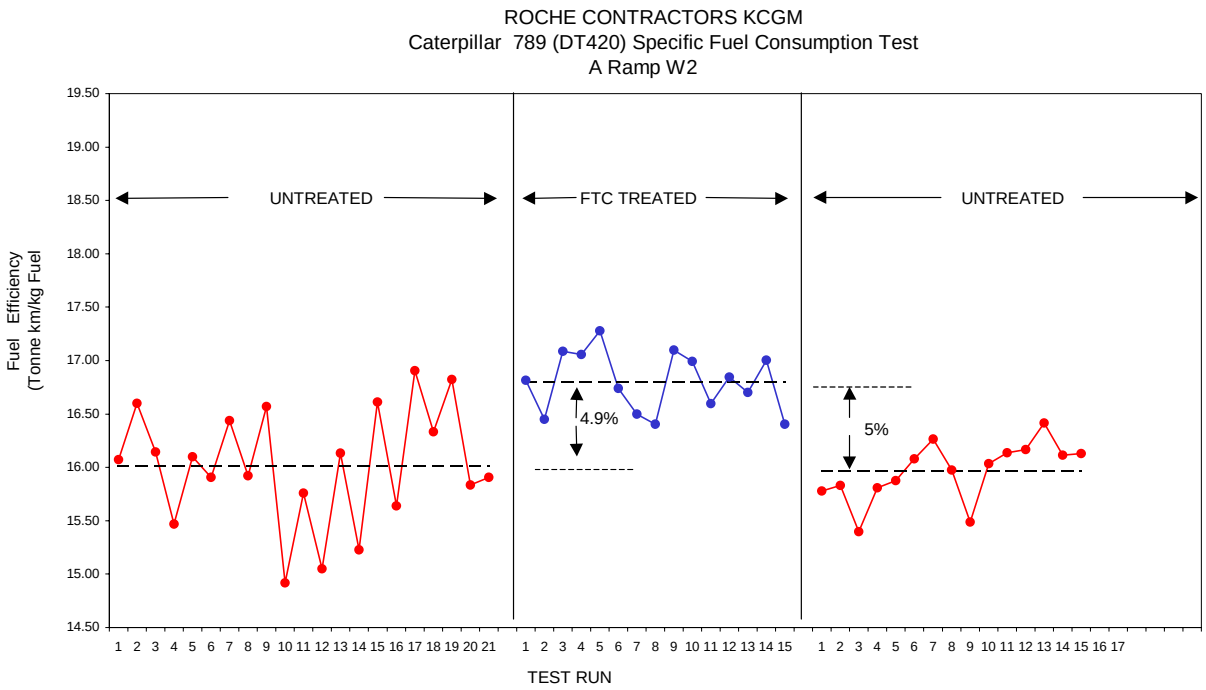
Truck No:	420	Engine Hrs	5569
Date:	10/09/97	Amb; Temp; Start deg; C	14
		Amb; Temp; Finish deg; C	21

Fuel Sample	Density	Temp Deg C
	0.84	31.2
Corrected	0.851	15

RETURN TO UNTREATED

Run No	Time	Load kg	Haul Time Mins	Haul Time Secs	Haul Time Mins	Fuel (Lt) In	Fuel (Lt) Out	Fuel (Lt) Consumed	Fuel Temp In	Fuel Temp Out	Density In	Density Out	Fuel (kg) In	Fuel (kg) Out	Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
1	11.10	188600	8	54	8.90	126.08	80.49	45.59	35.6	51.7	0.837	0.826	105.52	66.44	39.07	0.1455	15.7770
2	12.20	184200	8	51	8.85	125.96	81.26	44.70	38.7	56.0	0.835	0.823	105.14	66.84	38.30	0.1450	15.8303
3	1.35	177900	8	54	8.90	126.38	81.31	45.07	41.0	56.5	0.833	0.822	105.29	66.84	38.44	0.1491	15.3966
4	2.30	182800	8	48	8.80	124.21	79.35	44.86	42.2	56.8	0.832	0.822	103.37	65.22	38.15	0.1452	15.8094
5	8.40	194900	9	11	9.18	129.53	83.26	46.27	35.2	52.1	0.837	0.825	108.44	68.71	39.74	0.1445	15.8770
6	11.45	189500	8	52	8.87	126.07	80.92	45.15	40.4	55.0	0.834	0.823	105.08	66.61	38.47	0.1427	16.0792
7	12.10	210000	9	16	9.27	128.97	80.90	48.07	40.9	56.2	0.833	0.822	107.44	66.52	40.92	0.1411	16.2643
8	12.35	193300	9	06	9.10	127.88	81.73	46.15	41.5	56.0	0.833	0.823	106.49	67.22	39.26	0.1437	15.9750
9	1.05	184200	8	51	8.85	126.71	80.66	46.05	42.3	56.6	0.832	0.822	105.45	66.30	39.15	0.1482	15.4893
10	1.25	195600	8	59	8.98	127.72	81.38	46.34	42.8	58.5	0.832	0.821	106.24	66.79	39.45	0.1431	16.0334
11	1.50	192500	8	50	8.83	126.37	80.75	45.62	43.2	57.6	0.832	0.821	105.08	66.32	38.76	0.1422	16.1363
12	2.15	188000	8	49	8.82	125.16	80.26	44.90	43.8	56.7	0.831	0.822	104.02	65.97	38.05	0.1420	16.1659
13	2.45	206900	9	12	9.20	128.53	81.10	47.43	44.3	56.8	0.831	0.822	106.77	66.66	40.11	0.1398	16.4142
14	3.10	207400	9	12	9.20	128.42	80.22	48.20	44.6	60.5	0.831	0.819	106.65	65.72	40.93	0.1424	16.1155
15	3.35	200100	9	08	9.13	127.95	80.98	46.97	45.4	60.4	0.830	0.819	106.20	66.35	39.85	0.1423	16.1306
Mean		193060			8.99			46.09							39.243	0.1438	15.9663
Std Dev		9614.632			0.1682			1.1433							0.9297	0.0025	0.2756
C.V		5.0%			1.9%			2.5%							2.4%	1.7%	1.7%

% CHANGE: Untreated-Treated	Load kg			Haul Time Mins		Fuel (Lt) Consumed		Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
Treated	-0.37%			1.66%		4.54%		4.92%	**5.2%**	**-5.0%**



SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

Customer:	Roche KCGM	Engine Hrs	4663
Date:	29/07/97	Amb; Temp; Start deg; C	14.9
Truck No;	420	Amb; Temp; Finish deg; C	18.6
Make/Model	Cat 789B	Circuit Distance Metres	1950m
		P Ramp 1st marker	

Fuel Sample	Density	Temp Deg C
	0.842	21.1
Corrected	0.846	15

UNTREATED

Run No	Time	Load kg	Haul Time Mins	Haul Time Secs	Haul Time Mins	Fuel (Lt) In	Fuel (Lt) Out	Fuel (Lt) Consumed	Fuel Temp In	Fuel Temp Out	Density In	Density Out	Fuel (kg) In	Fuel (kg) Out	Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
1	7.55	184500	7	28	7.47	107.70	69.52	38.18	31.8	50.9	0.835	0.821	89.88	57.07	32.81	0.1240	15.7216
2	9.30	167500	7	12	7.20	105.39	68.40	36.99	34.1	53.0	0.833	0.820	87.77	56.05	31.71	0.1281	15.2176
3	9.5	201200	7	44	7.73	109.95	70.52	39.43	34.9	53.8	0.832	0.819	91.51	57.75	33.76	0.1201	16.2411
4	2.20	165500	7	11	7.18	104.62	67.80	36.82	42.6	54.1	0.827	0.819	86.50	55.51	30.99	0.1262	15.4468
5	7.25	201400	7	40	7.67	108.80	69.03	39.77	36.6	56.0	0.831	0.817	90.42	56.42	34.01	0.1208	16.1365
6	7.50	181200	7	27	7.45	106.59	68.13	38.46	36.9	55.0	0.831	0.818	88.55	55.73	32.82	0.1257	15.5170
7	8.10	184600	7	26	7.43	106.69	68.21	38.48	37.6	56.9	0.830	0.817	88.60	55.71	32.89	0.1243	15.6886
8	8.30	196800	7	35	7.58	107.75	69.10	38.65	37.6	57.0	0.830	0.817	89.48	56.43	33.05	0.1194	16.3323
9	8.50	199200	7	46	7.77	110.38	69.93	40.45	38.1	55.2	0.830	0.818	91.62	57.20	34.42	0.1233	15.8177
10	9.15	188900	7	32	7.53	107.39	68.73	38.66	38.8	56.8	0.830	0.817	89.08	56.14	32.94	0.1225	15.9178
11	9.35	200900	7	44	7.73	109.22	69.33	39.89	39.4	58.6	0.829	0.816	90.55	56.54	34.02	0.1211	16.1030
12	11.40	189800	7	26	7.43	106.02	67.95	38.07	42.0	58.9	0.827	0.815	87.70	55.40	32.30	0.1197	16.2882
13	12.00	197500	7	33	7.55	107.26	68.50	38.76	42.6	60.9	0.827	0.814	88.68	55.75	32.93	0.1187	16.4324
14	12.40	203100	7	44	7.73	108.99	69.41	39.58	44.5	51.3	0.826	0.821	89.97	56.96	33.01	0.1166	16.7254
15	1.00	177700	7	20	7.33	105.19	67.35	37.84	45.1	53.6	0.825	0.819	86.78	55.16	31.62	0.1227	15.8913
16	1.25	190500	7	27	7.45	106.22	67.70	38.52	45.8	54.4	0.825	0.819	87.59	55.41	32.18	0.1190	16.3931
17	2.05	185400	7	25	7.42	105.72	67.55	38.17	47.1	55.9	0.824	0.817	87.07	55.22	31.86	0.1200	16.2461
18	2.30	189600	7	27	7.45	106.07	67.65	38.42	47.6	57.3	0.823	0.816	87.33	55.23	32.10	0.1191	16.3786
19	2.50	175400	7	18	7.30	104.57	66.80	37.77	48.1	58.3	0.823	0.816	86.05	54.49	31.56	0.1236	15.7795
20	3.15	195800	7	25	7.42	105.74	67.31	38.43	48.6	58.7	0.823	0.815	86.98	54.88	32.10	0.1164	16.7557
21	3.25	185400	7	25	7.42	105.48	67.21	38.27	48.9	58.7	0.822	0.815	86.75	54.80	31.94	0.1204	16.2013
22	4.00	203600	7	50	7.83	110.15	69.93	40.22	49.3	58.7	0.822	0.815	90.55	57.02	33.53	0.1182	16.4916
23	4.20	210500	7	48	7.80	110.19	69.12	41.07	49.7	58.7	0.822	0.815	90.55	56.36	34.19	0.1177	16.5667
Mean		190261			7.52			38.73							32.728	0.1212	16.0996
Std Dev		11720.25			0.1863			1.0515							0.9441	0.0031	0.4115
C.V		6.2%			2.5%			2.7%							2.9%	2.6%	2.6%

SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

Truck No:	420	Engine Hrs	4947
Date:	13/14 Aug 97	Amb; Temp; Start deg; C	7.9
		Amb; Temp; Finish deg; C	18

Fuel Sample	Density	Temp Deg C
	0.835	30.8
Corrected	0.846	15

TREATED

Run No	Time	Load kg	Haul Time Mins	Haul Time Secs	Haul Time Mins	Fuel (Lt) In	Fuel (Lt) Out	Fuel (Lt) Consumed	Fuel Temp In	Fuel Temp Out	Density In	Density Out	Fuel (kg) In	Fuel (kg) Out	Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
1	2.40	198700	7	34	7.57	106.62	69.26	37.36	33.5	50.9	0.833	0.821	88.83	56.84	31.98	0.1148	16.9921
2	**8.05**	191700	7	32	7.53	106.51	69.48	37.03	25.1	42.3	0.839	0.827	89.36	57.45	31.92	0.1175	16.6004
3	**8.35**	181000	7	20	7.33	105.50	68.52	36.98	26.7	44.3	0.838	0.825	88.40	56.56	31.84	0.1220	15.9836
4	8.00	179500	7	19	7.32	105.20	68.71	36.49	27.0	45.2	0.838	0.825	88.13	56.67	31.45	0.1212	16.0878
5	8.25	184100	7	22	7.37	105.35	69.51	35.84	28.1	46.5	0.837	0.824	88.17	57.27	30.90	0.1170	16.6675
6	9.45	180900	7	20	7.33	105.07	68.95	36.12	31.5	50.5	0.835	0.821	87.68	56.61	31.07	0.1191	16.3729
7	10.10	187700	7	26	7.43	105.57	68.93	36.64	32.0	50.5	0.834	0.821	88.06	56.59	31.46	0.1175	16.5907
8	10.35	217400	7	50	7.83	109.48	71.84	37.64	32.5	51.6	0.834	0.820	91.28	58.92	32.36	0.1088	17.9205
9	10.55	203700	7	38	7.63	107.12	69.80	37.32	29.7	46.9	0.836	0.824	89.52	57.49	32.03	0.1129	17.2702
10	12.05	192000	7	29	7.48	105.80	68.65	37.15	36.6	54.0	0.831	0.819	87.91	56.19	31.72	0.1166	16.7217
11	1.55	192800	7	30	7.50	105.88	68.67	37.21	39.5	55.1	0.829	0.818	87.75	56.16	31.60	0.1158	16.8368
12	8.35	178600	7	25	7.42	105.01	68.71	36.30	28.7	47.4	0.837	0.823	87.84	56.56	31.28	0.1210	16.1218
13	9.00	207500	7	45	7.75	108.38	71.03	37.35	29.8	49.2	0.836	0.822	90.57	58.38	32.19	0.1120	17.4142
14	9.25	177200	7	16	7.27	104.16	68.39	35.77	30.8	50.5	0.835	0.821	86.97	56.15	30.83	0.1198	16.2703
15	9.50	191700	7	31	7.52	106.12	68.47	37.65	31.6	51.4	0.834	0.820	88.55	56.17	32.37	0.1192	16.3656
16	11.10	182100	7	21	7.35	104.97	69.47	35.50	35.4	54.8	0.832	0.818	87.30	56.83	30.48	0.1163	16.7698
17	11.35	183700	7	28	7.47	106.89	69.47	37.42	36.0	55.2	0.831	0.818	88.86	56.81	32.05	0.1215	16.0431
18	11.55	186000	7	21	7.35	105.18	68.53	36.65	37.0	56.7	0.831	0.817	87.36	55.96	31.40	0.1180	16.5186
19	12.15	188300	7	29	7.48	106.22	68.87	37.35	37.8	57.9	0.830	0.816	88.16	56.18	31.98	0.1192	16.3605
20	12.45	203900	7	46	7.77	108.08	70.70	37.38	38.9	57.6	0.829	0.816	89.62	57.69	31.93	0.1125	17.3388
Mean		190425			7.49			36.86							31.642	0.1171	16.6623
Std Dev		10897.99			0.1595			0.6560							0.5267	0.0035	0.5152
C.V		5.7%			2.1%			1.8%							1.7%	3.0%	3.1%

%CHANGE: Treated-Baseline	Load kg			Haul Time Mins		Fuel (Lt) Consumed		Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
Baseline	0.09%			-0.42%		-4.85%		-3.32%	**-3.4%**	**3.5%**

SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

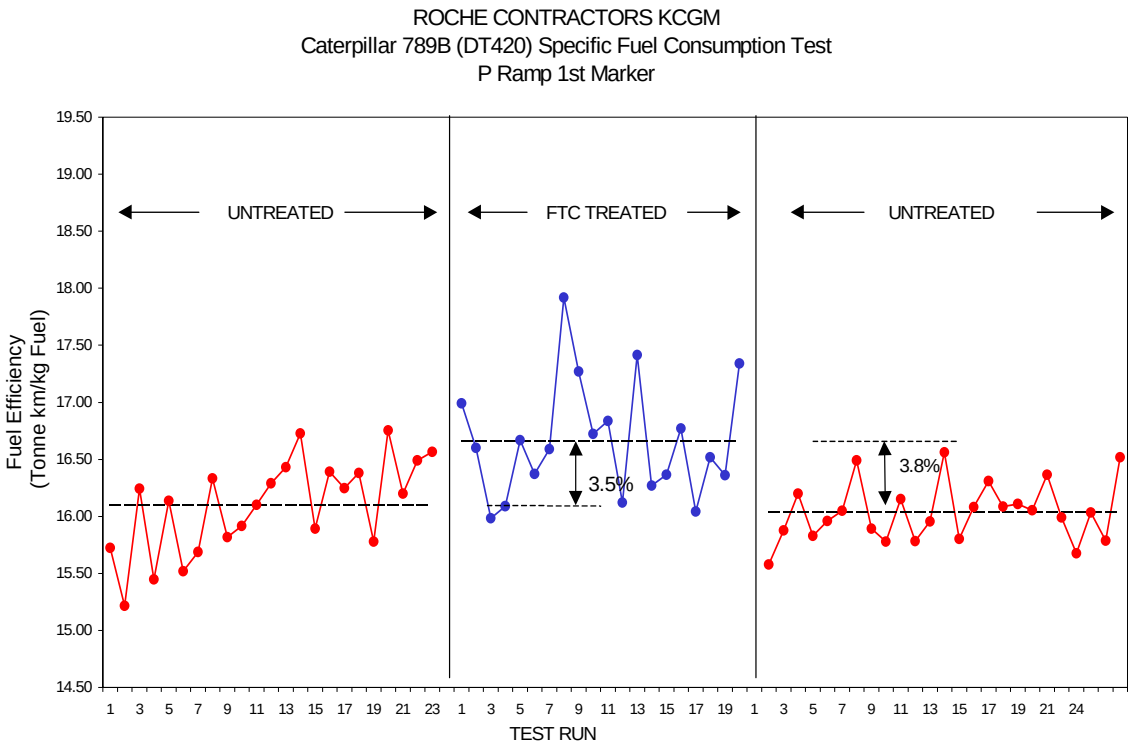
Truck No:	420	Engine Hrs	5569	
Date:	8/09/97	Amb; Temp; Start deg; C	12.5	
		Amb; Temp; Finish deg; C	19	

Fuel Sample	Density	Temp Deg C
	0.839	29.1
Corrected	0.849	15

RETURN TO UNTREATED

Run No	Time	Load kg	Haul Time Mins	Haul Time Secs	Haul Time Mins	Fuel (Lt) In	Fuel (Lt) Out	Fuel (Lt) Consumed	Fuel Temp In	Fuel Temp Out	Density In	Density Out	Fuel (kg) In	Fuel (kg) Out	Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
1	10.10	180800	7	33	7.55	107.47	69.41	38.06	34.0	51.3	0.836	0.823	89.79	57.15	32.65	0.1252	15.5781
2	11.35	192500	7	41	7.68	108.63	69.59	39.04	36.9	55.6	0.834	0.820	90.54	57.08	33.47	0.1228	15.8783
3	12.00	193800	7	36	7.60	107.66	69.14	38.52	37.9	55.8	0.833	0.820	89.66	56.70	32.96	0.1204	16.1999
4	12.45	181700	7	26	7.43	106.05	68.33	37.72	39.6	57.5	0.832	0.819	88.19	55.96	32.24	0.1232	15.8307
5	1.10	200100	7	43	7.72	109.82	69.63	40.19	40.5	57.4	0.831	0.819	91.25	57.03	34.22	0.1222	15.9601
6	2.55	198700	7	50	7.83	109.69	69.75	39.94	43.0	58.2	0.829	0.818	90.94	57.08	33.86	0.1215	16.0501
7	3.15	206600	7	44	7.73	108.43	68.47	39.96	43.6	59.6	0.829	0.817	89.86	55.97	33.89	0.1182	16.4914
8	3.40	183200	7	31	7.52	106.59	68.49	38.10	44.2	59.3	0.828	0.818	88.29	56.00	32.29	0.1227	15.8942
9	5.35	189300	7	35	7.58	107.99	69.15	38.84	31.7	47.5	0.837	0.826	90.40	57.12	33.28	0.1236	15.7790
10	6.20	194600	7	33	7.55	107.65	68.99	38.66	33.5	50.6	0.836	0.824	89.98	56.83	33.15	0.1207	16.1526
11	6.45	198000	7	40	7.67	108.95	68.86	40.09	33.6	50.9	0.836	0.824	91.06	56.71	34.35	0.1236	15.7829
12	8.30	192200	7	34	7.57	107.51	68.62	38.89	36.3	53.5	0.834	0.822	89.65	56.39	33.27	0.1222	15.9552
13	9.50	206500	7	59	7.98	111.88	72.42	39.46	39.4	57.2	0.832	0.819	93.05	59.32	33.73	0.1177	16.5625
14	10.15	182500	7	32	7.53	106.76	68.78	37.98	39.6	56.0	0.832	0.820	88.78	56.39	32.39	0.1234	15.8040
15	10.35	182500	7	29	7.48	104.76	67.38	37.38	40.5	56.7	0.831	0.820	87.05	55.22	31.83	0.1212	16.0830
16	11.00	198400	7	38	7.63	107.72	68.65	39.07	41.0	58.1	0.831	0.819	89.47	56.19	33.28	0.1195	16.3114
17	11.30	194100	7	38	7.63	108.06	68.91	39.15	42.0	57.1	0.830	0.819	89.68	56.45	33.23	0.1212	16.0857
18	11.50	201600	7	39	7.65	108.85	68.69	40.16	42.7	58.6	0.829	0.818	90.28	56.20	34.08	0.1210	16.1104
19	12.35	187100	7	31	7.52	106.27	68.06	38.21	43.6	59.8	0.829	0.817	88.07	55.63	32.44	0.1215	16.0554
20	12.55	191700	7	32	7.53	105.93	67.77	38.16	44.3	60.4	0.828	0.817	87.73	55.35	32.38	0.1192	16.3641
21	9.15	193600	7	39	7.65	108.19	69.09	39.10	36.4	51.9	0.834	0.823	90.21	56.85	33.36	0.1219	15.9921
22	10.00	190700	7	37	7.62	107.69	68.17	39.52	37.7	53.4	0.833	0.822	89.70	56.02	33.67	0.1244	15.6763
23	10.25	199700	7	46	7.77	108.96	69.01	39.95	38.6	54.3	0.832	0.821	90.69	56.67	34.02	0.1216	16.0339
24	10.50	184100	7	33	7.55	106.70	68.46	38.24	39.0	55.7	0.832	0.820	88.77	56.15	32.62	0.1235	15.7860
25	11.15	205000	7	39	7.65	107.72	68.25	39.47	39.7	56.8	0.832	0.819	89.57	55.92	33.65	0.1181	16.5180
Mean		193160			8			39							33.212	0.1216	16.0374
Std Dev		7905.431			0.1188			0.8325							0.7009	0.0020	0.2613
C.V		4.1%			1.6%			2.1%							2.1%	1.6%	1.6%

% CHANGE: Untreated-Treated	Load kg			Haul Time Mins		Fuel (Lt) Consumed		Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
Treated	1.44%			1.87%		5.69%		4.96%	**3.8%**	**-3.8%**



SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

Customer:	Roche KCGM	Engine Hrs	4663
Date:	29/07/97	Amb; Temp; Start deg; C	14.9
Truck No;	420	Amb; Temp; Finish deg; C	18.6
		Circuit Distance Metres	2710m
		P Ramp TW1	

Fuel Sample	Density	Temp Deg C
	0.839	23.1
Corrected	0.845	15

UNTREATED

Run No	Time	Load kg	Haul Time		Haul Time	Fuel (Lt)		Fuel (Lt)	Fuel Temp		Density		Fuel (kg)		Fuel (kg)	Fuel (kg)	Tonne/km
			Mins	Secs	Mins	In	Out	Consumed	In	Out	In	Out	In	Out	Consumed	Per Tonne	Per kg Fuel
1	7.55	184500	8	11	8.18	120.88	77.50	43.38	31.8	47.3	0.833	0.822	100.68	63.70	36.98	0.1398	19.3814
2	9.30	167500	8	06	8.10	118.16	76.68	41.48	34.1	50.2	0.831	0.820	98.21	62.86	35.35	0.1428	18.9726
3	9.50	201200	8	41	8.68	123.54	78.90	44.64	34.9	52.6	0.831	0.818	102.62	64.55	38.08	0.1354	20.0137
4	2.20	165500	8	05	8.08	117.63	76.12	41.51	42.6	57.1	0.825	0.815	97.07	62.04	35.03	0.1427	18.9922
5	7.25	201400	8	37	8.62	122.36	77.67	44.69	36.6	50.3	0.830	0.820	101.50	63.67	37.82	0.1344	20.1618
6	7.50	181200	8	22	8.37	119.94	76.55	43.39	36.9	50.7	0.829	0.820	99.45	62.73	36.72	0.1406	19.2762
7	8.10	184600	8	21	8.35	119.82	76.60	43.22	37.6	51.2	0.829	0.819	99.29	62.74	36.55	0.1381	19.6178
8	8.30	196800	8	32	8.53	121.25	77.47	43.78	37.6	54.8	0.829	0.817	100.48	63.26	37.22	0.1345	20.1550
9	8.50	199200	8	45	8.75	124.22	79.43	44.79	38.1	55.3	0.828	0.816	102.90	64.83	38.07	0.1364	19.8731
10	9.15	188900	8	28	8.47	120.70	77.23	43.47	38.8	55.4	0.828	0.816	99.93	63.04	36.89	0.1372	19.7525
Mean		187080			8.41			43.44							36.872	0.1382	19.6196
Std Dev		13104.6			0.2383			1.1814							1.0412	0.0032	0.4478
C.V		7.0%			2.8%			2.7%							2.8%	2.3%	2.3%

SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

Truck No:	420	Engine Hrs	4947
Date:	13/14 Aug 97	Amb; Temp; Start deg; C	7.9
		Amb; Temp; Finish deg; C	18

Fuel Sample	Density	Temp Deg C
	0.838	26.4
Corrected	0.846	15

TREATED

Run No	Time	Load kg	Haul Time		Haul Time	Fuel (Lt)		Fuel (Lt)	Fuel Temp		Density		Fuel (kg)		Fuel (kg)	Fuel (kg)	Tonne/km
			Mins	Secs	Mins	In	Out	Consumed	In	Out	In	Out	In	Out	Consumed	Per Tonne	Per kg Fuel
1	2.40	198700	8	32	8.53	121.45	78.92	42.53	33.5	50.9	0.833	0.821	101.17	64.76	36.41	0.1306	20.7459
2	**8.05**	191700	8	31	8.52	121.01	79.27	41.74	25.1	42.3	0.839	0.827	101.52	65.53	35.98	0.1324	20.4628
3	**8.35**	181000	8	16	8.27	119.01	78.16	40.85	26.7	44.3	0.838	0.825	99.71	64.51	35.20	0.1349	20.0934
4	8.00	179500	8	16	8.27	119.24	78.87	40.37	27.0	45.2	0.838	0.825	99.88	65.04	34.83	0.1342	20.1900
5	8.25	184100	8	20	8.33	119.78	78.44	41.34	28.5	46.0	0.837	0.824	100.20	64.64	35.55	0.1346	20.1305
6	10.55	203700	8	33	8.55	121.94	79.33	42.61	29.7	46.9	0.836	0.824	101.89	65.33	36.56	0.1289	21.0264
7	12.05	192000	8	24	8.40	120.15	78.89	41.26	36.6	54.0	0.831	0.818	99.82	64.56	35.26	0.1296	20.9070
8	1.55	192800	8	26	8.43	120.24	78.90	41.34	39.5	55.1	0.829	0.818	99.64	64.52	35.13	0.1288	21.0465
9	8.35	178600	8	21	8.35	119.85	77.95	41.90	28.7	47.4	0.836	0.823	100.24	64.16	36.08	0.1395	19.4226
10	9.00	207500	8	43	8.72	123.44	79.87	43.57	29.8	49.2	0.836	0.822	103.15	65.64	37.51	0.1305	20.7715
11	11.10	182100	8	12	8.20	118.25	77.56	40.69	35.4	54.8	0.832	0.818	98.34	63.44	34.90	0.1332	20.3520
12	11.35	183700	8	27	8.45	120.61	78.61	42.00	36.0	55.2	0.831	0.818	100.25	64.27	35.98	0.1364	19.8621
13	11.55	186000	8	16	8.27	118.65	77.73	40.92	37.0	56.7	0.831	0.817	98.54	63.47	35.07	0.1319	20.5536
14	12.15	188300	8	24	8.40	119.81	78.07	41.74	37.8	57.9	0.830	0.816	99.43	63.68	35.75	0.1332	20.3391
15	12.45	203900	8	42	8.70	122.63	79.40	43.23	38.9	57.6	0.829	0.816	101.67	64.78	36.89	0.1299	20.8557
Mean		190240			8.43			41.74							35.807	0.1326	20.4506
Std Dev		9463.147			0.1554			0.9273							0.7862	0.0030	0.4616
C.V		5.0%			1.8%			2.2%							2.2%	2.3%	2.3%

% CHANGE: Treated-Baseline	Load kg			Haul Time Mins		Fuel (Lt) Consumed		Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
Baseline	1.69%			0.15%		-3.90%		-2.89%	**-4.1%**	**4.2%**

SPECIFIC FUEL CONSUMPTION TRUCK TRIAL

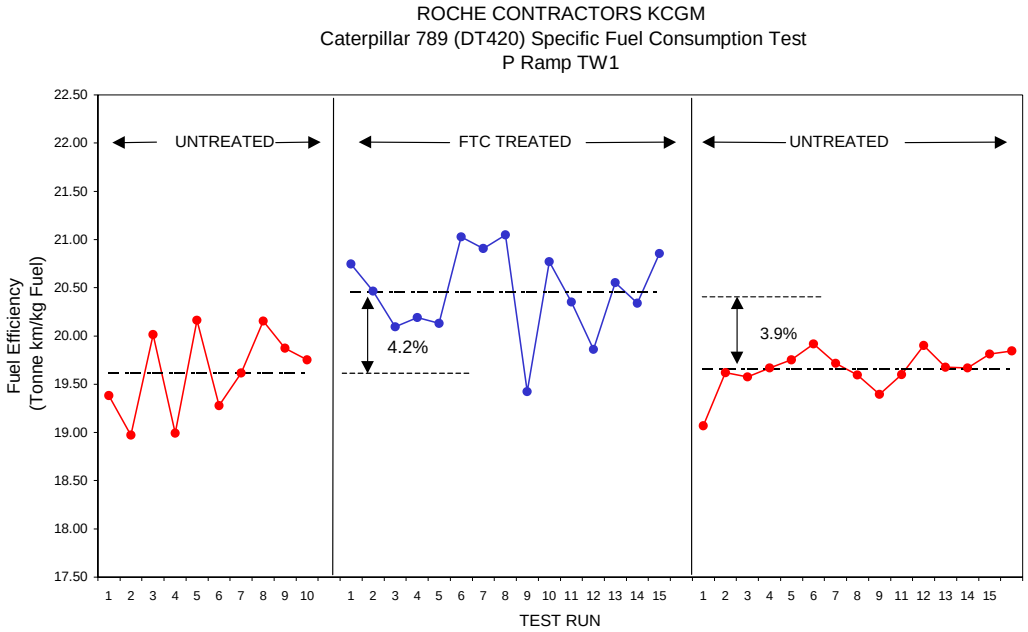
Truck No:	420	Engine Hrs	5569	
Date:	8/09/97	Amb; Temp; Start deg; C	12.5	
		Amb; Temp; Finish deg; C	19	

Fuel Sample	Density	Temp Deg C
	0.839	29.1
Corrected	0.849	15

RETURN TO UNTREATED

Run No	Time	Load kg	Haul Time		Haul Time	Fuel (Lt)		Fuel (Lt)	Fuel Temp		Density		Fuel (kg)		Fuel (kg)	Fuel (kg)	Tonne/km
			Mins	Secs	Mins	In	Out	Consumed	In	Out	In	Out	In	Out	Consumed	Per Tonne	Per kg Fuel
1	10.10	180800	8	30	8.50	120.91	77.68	43.23	34.0	51.3	0.836	0.823	101.02	63.95	37.07	0.1421	19.0676
2	11.35	192500	8	38	8.63	121.85	77.94	43.91	36.9	55.6	0.834	0.820	101.56	63.93	37.64	0.1381	19.6217
3	12.00	193800	8	31	8.52	121.88	77.55	44.33	37.9	55.8	0.833	0.820	101.50	63.60	37.90	0.1384	19.5763
4	12.45	181700	8	19	8.32	119.11	76.92	42.19	39.6	57.5	0.832	0.819	99.05	62.99	36.06	0.1378	19.6663
5	1.10	200100	8	40	8.67	123.22	78.09	45.13	40.5	57.4	0.831	0.819	102.38	63.96	38.43	0.1372	19.7532
6	2.55	198700	8	45	8.75	123.15	78.43	44.72	43.0	58.2	0.829	0.818	102.10	64.19	37.92	0.1360	19.9195
7	3.15	206600	8	46	8.77	122.65	76.15	46.50	43.6	59.6	0.829	0.817	101.64	62.25	39.40	0.1375	19.7153
8	3.40	183200	8	26	8.43	119.71	76.76	42.95	44.2	59.3	0.828	0.818	99.16	62.76	36.40	0.1383	19.5971
9	5.35	189300	8	33	8.55	121.65	77.73	43.92	31.7	47.5	0.837	0.826	101.83	64.20	37.63	0.1397	19.3951
10	6.20	194600	8	32	8.53	121.95	77.65	44.30	33.5	50.6	0.836	0.824	101.94	63.97	37.97	0.1383	19.5988
11	6.45	198000	8	38	8.63	122.27	78.12	44.15	33.6	50.9	0.836	0.824	102.19	64.34	37.85	0.1362	19.9024
12	1.20	204500	8	41	8.68	123.94	77.63	46.31	43.9	58.7	0.829	0.818	102.68	63.50	39.18	0.1377	19.6768
13	2.55	198100	8	38	8.63	121.67	76.17	45.50	46.2	59.0	0.827	0.818	100.61	62.29	38.32	0.1378	19.6688
14	9.15	193600	8	37	8.62	121.77	77.92	43.85	36.4	51.9	0.834	0.823	101.53	64.11	37.42	0.1368	19.8148
15	10.00	190700	8	35	8.58	121.04	77.69	43.35	37.7	53.4	0.833	0.822	100.81	63.85	36.97	0.1366	19.8438
Mean		193747			8.59			44.29							37.743	0.1379	19.6545
Std Dev		7737.281			0.1181			1.1961							0.9081	0.0015	0.2126
C.V		4.0%			1.4%			2.7%							2.4%	1.1%	1.1%

% CHANGE: Untreated-Treated	Load kg			Haul Time Mins		Fuel (Lt) Consumed		Fuel (kg) Consumed	Fuel (kg) Per Tonne	Tonne/km Per kg Fuel
Treated	1.84%			1.93%		6.11%		5.41%	**4.0%**	**-3.9%**



To prove the statistical significance of the difference in the means between baseline (1) and treated, also between treated and baseline (2), a Student t-Test was performed. All four test sectors for both phases of the evaluation show that the difference between FTC treated and each sector of untreated tests the means are significant at a 99% level of confidence.

To confirm the reproducibility of the test method a comparison of baseline 1 and baseline 2 shows the difference in means not to be significant at a 99% confidence level. This also indicates fuel efficiency returned to its original level following cessation of FTC-3 treatment of the fuel.

CONCLUSION

The results of this extensive and rigorous test program evaluating the performance of FTC-3 at the KCGM Fimiston open pit operations provides accurate and conclusive evidence of economic fuel consumption reductions.

Based on the ratio of waste to ore the results calculate to an average gross efficiency gain of **4.4%**.

Additional to the net economic benefit of reduced fuel consumption, longer-term use of the catalyst will also provide meaningful maintenance benefits as a result of more complete and cleaner combustion.

Appendix "A"

Student t-Test

Raw Data

Phase 1 - Baseline 1 - Treated Tests

Phase 2 - Baseline 2 Tests

Phase 2