



CHORNCO TRIAL RESULTS

REPORT FOR AND ON BEHALF OF

WORKS INFRASTRUCTURE LTD

**CENTRAL OPERATIONS, PALMERSTON NORTH,
NEW ZEALAND**

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OBJECTIVES

The purpose of these trials was to explore the claims made by Chornco Limited, that their 2082 Diesel Fuel Treatment would provide meaningful fuel cost and maintenance savings, in addition to reducing harmful emissions from the company's machinery.

Chornco's 2082 Diesel Fuel Treatment is presented as a 100% petroleum hydrocarbon based product that contains no aromatic solvents, metals, ashes or wear precursor additives and is therefore safe for use in diesel engines. 2082 reduces the surface tension of the diesel fuel resulting in improved fuel flow and smaller droplets of fuel entering the combustion chamber through the injectors. The smaller droplet size ensure a more complete burn of the fuel on compression ignition thereby improving the combustion efficiency and resulting in both fuel economy and an improvement in power. Due to the more complete burn of the fuel droplets there is a resulting lower exhaust temperature and a reduction in exhaust emissions such as particulates, total hydrocarbons, carbon monoxide, oxides of nitrogen, sulphur and sulphur dioxide. Additional benefits include the following:

1. 2082 fully disperses and re-absorbs foreign particles thus cleaning bulk storage tanks, fuel tanks, lines and injector bodies.
2. 2082 inhibits the formation of sulphuric, nitric, hydrochloric and hydrobromic acids thus extending the life of metal components by resulting rust formation.
3. 2082 provides a bacteriostatic and emulsification action that controls the growth of bacteria (diesel bug) and absorbs a percentage of suspended water in the fuel carrying it harmlessly through the combustion chamber to be burned off harmlessly.
4. 2082 retards oxidation thus slowing down the fuel aging process in storage while preventing the formation of gums and varnishes.
5. 2082 is an effective lubricity enhancer. This aspect will become increasingly important as NZ (and the rest of the world) moves continually to lower the Sulphur content of automotive diesel fuel.

TRIAL OBJECTIVES

The primary objectives of this testing and evaluation is therefore to identify the effectiveness of this product with particular reference to the following:

1. Lower exhaust emissions.
2. Improve the maintainability of the equipment.
3. Reduce fuel consumption

All testing was carried out on company equipment operating under normal operational conditions in order to ensure that any results would be capable of being replicated elsewhere within the fleet.

All testing would be independently verified and recorded with Chornco representative providing support on protocols and other technical issues.

CONCLUSIONS

Having completed the trials, and in light of the attached appendices the results are conclusive in that each of the objectives have been met in varying significant degrees. Lower emissions have been measured. Maintenance tests and references have identified the effects to be positive.

Fuel savings have been identified that provide net savings to the company after the purchase of the product making and before considering the effects on health, safety and maintenance, the application of Chornco 2082 Diesel Fuel Treatment provides solutions to real problems faced in fuel management and operation. The objectives set out at the commencement of this trial have been achieved.

Chornco Limited
Appendix 1.
Vehicle Emissions

Tests were carried out on a before treatment and after treatment basis on selected equipment in order to identify the effects of #2082 on the exhaust emissions.

All test machines were operational at the time of the testing.

All tests carried out independently.

Test 1.

Test Instrument – Testo 325-1 gas analyser

Dynapac Vibrating Roller
Machine ref: CC142 measuring Carbon Monoxide (CO)

	Before Treatment	After Treatment	Reduction
At Idle	384ppm	11ppm	-97%
At normal operational revs.	1283ppm	208ppm	-84%

(Measurements by GM Consult.)

Test 2.

Test Instrument – Motor X 790 Opacity Meter.

Isusu Truck model 380CX2
Machine ref: 875842 measuring Opacity

K=02.7 L/m K=01.8 L/m = **-50%**

This has the effect of reducing overall exhaust gas emissions from 41% to 28% by conversion.

(Measurements by EDE Limited.)

Appendix 2
Maintenance related tests.

Ultrasonic tests:

A series of Ultrasonic tests were undertaken in order to establish the vibration effects on upper engine components. This was in order to examine the claim that Chornco 2082 improved fuel lubricity, which could produce valuable savings in maintenance and down time.

Ultrasonic readings would indicate the levels of any increased lubricity of the moving parts in the upper cylinder, injectors and fuel pump, all of which are high cost maintenance items.

Tests were carried out before and after treatment with Chornco 2082 Diesel Fuel treatment and after with the results being compared.

In general, comparisons between the readings taken from the injectors and the fuel pump indicated a reduction in sound levels of up to 14Db, which is significant and would result in a reduction in the wear of engine and fuel system components.

(Data supplied by GM Consult)

Water control:

The bulk fuel storage tanks at the Manor Park Site have been treated since 13th May 2003 with Chornco 2082. The facility has been experiencing problems with water in the fuel tanks. The purpose was to identify improvements in the tank management and fleet operations given Chornco 2082's proven abilities in dealing with the problems created by water in diesel fuel*.

“Indications from the facility show an extended filter life on the tanks filter system with the fuel pump running longer between filter changes. A noticeable improvement in the pumping co-efficient of performance has been identified.

A general observation of the fleet operating from this facility shows a marked reduction in the black smoke emissions from the vehicles/machines and enhanced fuel economy.”

* *(Refer to Army report 19100-01/SQ & EA – Lubricity and Solid Energy report on bacteria control)*

Note. In using Chornco 2082 as a water control measure and in particular the effects on bacteria (“Diesel Bug”) it should be noted that the product is completely ashless in that following combustion in an engine there is no residue or harmful emission. It is a 100% hydrocarbon based product, which works by developing an interface between the water and the fuel, and so eliminating the environment for bacteria to grow. Existing bacteria dies, and continued use of 2082 will ensure that it will not return under normal circumstances.

It is also important to note that it is not a chemical biocide. Chemicals are commonly used to kill bacterial growth however, in many instances, they can have long term adverse effects on equipment performance and emissions.

Appendix 3 **Fuel Savings.**

Two Isuzu trucks were selected out of Wanganui for fuel economy testing. A series of runs were carried out where kilometres and fuel consumption in litres were recorded to establish the average baseline Km/L factor. The equipment was subjected to three series of tests were conducted in the following order:

1. Pure diesel fuel only – Baseline data,
2. Chornco/diesel at a treatment ratio of 1:640 – the “clean up phase” and
3. Chornco/diesel at a treatment ratio of 1:1280.

The trials simply monitored the general everyday performance of the vehicle under test. Additional loads only were recorded which involved the towing of trailers and their approximate weights, which would have a significant impact on fuel consumption. All other readings were those taken during an average working day for the vehicles.

Test No. 1 - Isuzu Truck No. 785842 **Baseline data:**

This represented a series of daily operations carried out from 26th March to 15th April 2003.

Odometer reading – start – 115134 Km's
Odometer reading – finish – 119237 Km's
Diesel fuel consumed – 2729 litres

Average performance = 1.503 Km/L

Trial data – “Cleanup phase”:

This represented a series of daily operations carried out from 15th April to 17th May 2003.

Treatment of the diesel fuel is increased to 1:640 in order to clean the system and components. It should be noted here that, during this period fuel performance does initially deteriorates

Odometer reading – start – 119237 Km's
Odometer reading – finish – 125082 Km's
Diesel fuel consumed – 3815 Litres

Average performance = 1.532 Km/L **

Trial data – Operational:

This represented a series of daily operations carried out from 17th May to 10th June 2003.

Odometer reading – start – 125082
Odometer reading – finish – 128965
Diesel fuel consumed – 2148 Litres

Average performance = 1.807 Km/L

Overall trial result shows an improved fuel consumption performance of 20.22%

**** Throughout the “clean up phase” the truck hauled a trailer with a variable additional load of 22 to 44 tonnes.**

Test No. 2 - Isuzu Truck No. 785907 **Baseline data:**

This represented a series of daily operations carried out from 27th March to 10th May 2003.

Odometer reading – start – 55119 Km's
Odometer reading – finish – 60552 Km's
Diesel fuel consumed – 2375 litres

Average performance = 2.287 Km/L

Appendix 3 cont.....

Recorded data did not differential the effects of the “clean-up” phase and so reading indicate all treated runs.

Trial data – Operational:

This represented a series of daily operations carried out from 10th May to 6th June 2003.

Odometer reading – start – 60552
Odometer reading – finish – 65209
Diesel fuel consumed – 2015 Litres

Average performance = 2.311 Km/L*

Overall trial result shows an improved fuel consumption performance of 1.05%

***** Throughout the operational period the truck hauled a trailer with an additional load of 43/44 tonnes.**

In analysing the results, truck #785842 demonstrated an excellent improvement in performance. The additional loads hauled during the “clean-up” phase were consistent and did not impact on the final results. Readings taken from this period show a modest improvement in any event.

Truck #785907 demonstrated a modest improvement and this should be taken in the context that throughout the trial period this vehicle was hauling an additional 43/44 tonnes that was not the case during the baseline data recording. It also travelled 1000Km without treatment, which would also have an impact when reviewing the total Kilometres run. The impact of these heavy loads can be considered using accepted industry norms. For example Caterpillar consider fuel consumption for their Articulated Trucks**** to operate within the following fuel/load consumption levels:

Low Load 16.5 – 23 litres
Medium Load 23 - 32.5 litres
High Load 32.5 - 47.5 litres

Given that Truck #785842 operated generally throughout the trial data collection period on **Medium Load** factors the fuel performance can be considered to stand at an average of 20.22%.

Truck #785907 operated from baseline factors in the **Medium Load** category to trial load factors in the **High Load** category consideration should be given to the above data in which the effect on fuel consumption, by way of an average, would indicate a potential negative effect in fuel consumption of up to 32% deterioration. These factors together would have an appreciable effect when added to the performance data showing a positive effect of 1.05% improvement. It could therefore reflect that the performance data for #785907 in reality would mirror more closely that of #785842.

Having completed the trials the consensus of driver opinion was as follows:

“The engine model in question has always been known to emit excessive black smoke from the exhaust and during the trials there was a noticeable reduction.”

“The engine held in gear longer during up hill sections.”

“During normal working conditions and when carrying variable loads the motor fet as though it had more pulling power.”*

**** (Caterpillar 735 Articulated Truck – 365HP)

Appendix 3 cont.....

Data

Isusu Truck No. 785842

	Date	Odometer Readings (Kilometres)	Fuel used in Fill-ups (Litres)	Abnormal Loads (Tonnes)
BASELINE DATA				
	26-Mar	115134	380	Normal operating Loads
	26-Mar	115423	100	Normal operating Loads
	27-Mar	115673	214	Normal operating Loads
	29-Mar	116136	283	Normal operating Loads
	01-Apr	116550	250	Normal operating Loads
	07-Apr	116962	100	Normal operating Loads
	08-Apr	117122	94	Normal operating Loads
	08-Apr	117444	200	Normal operating Loads
	10-Apr	117644	116	Normal operating Loads
	10-Apr	117962	193	Normal operating Loads
	12-Apr	118218	160	Normal operating Loads
	12-Apr	118477	170	Normal operating Loads
	15-Apr	118906	272	Normal operating Loads
	15-Apr	119237	197	Normal operating Loads
		4103	2729	
				c/f
CLEAN-UP PHASE				
Treatment ratio 1:640	15-Apr	119237	<i>End of Baseline</i>	
	17-Apr	119783	325	44/Trailer
	17-Apr	120096	189	44/Trailer
	23-Apr	120385	186	22/Trailer
	23-Apr	120648	160	22/Trailer
	25-Apr	121059	250	43/Trailer
	28-Apr	121277	100	20/Trailer
	29-Apr	121522	135	44/Trailer
	01-May	121982	234	44/Trailer
	01-May	122268	203	44/Trailer
	05-May	122506	154	44/Trailer
	05-May	122763	176	44/Trailer
	06-May	123051	194	44/Trailer
	07-May	123314	126	44/Trailer
	08-May	123612	187	44/Trailer
	12-May	123991	321	44/Trailer
	13-May	124246	209	44/Trailer
	14-May	124526	232	44/Trailer
	15-May	124796	236	44/Trailer
	17-May	125082	198	44/Trailer
		5845	3815	
				c/f
OPERATIONAL PHASE				
Treatment Ratio 1:1280	17-May	125082	<i>End of Clean-up phase</i>	
	21-May	125746	204	44/Trailer
	22-May	125981	128	44/Trailer
	23-May	126156	125	normal operating loads
	26-May	126490	245	normal operating loads
	27-May	126817	220	normal operating loads
	28-May	127063	160	normal operating loads
	29-May	127344	198	normal operating loads
	29-May	127624	190	normal operating loads
	03-Jun	127809	125	normal operating loads
	04-Jun	128209	255	normal operating loads
	05-Jun	128519	122	normal operating loads
	05-Jun	128759	86	normal operating loads
	10-Jun	128965	100	normal operating loads
		3883	2158	
				c/f

Notes:

Heavy loads hauled during the clean-up phase did not affect the overall balance of the data. An overall improvement did occur during this period in spite of increased loads (see above) and the initial negative effect of the product during this period, demonstrates the effect that the product was having.

Appendix 3 cont.....

Data

Isuzu Truck No. 785907

	Date	Odometer Readings (Kilometres)	Fuel used in Fill-ups (Litres)	Abnormal Loads (Tonnes)	
BASELINE DATA	27-Mar	55119	Full		
	01-Apr	56669	240	Normal operating Loads	
	08-Apr	57340	286	Normal operating Loads	
	15-Apr	57748	245	Normal operating Loads	
	16-Apr	57899	no fill	Normal operating Loads	
	23-Apr	58266	196	Normal operating Loads	
	30-Apr	58702	269	Normal operating Loads	
	05-May	59240	264	Normal operating Loads	
	05-May	59396	95	Normal operating Loads	
	06-May	59692	182	Normal operating Loads	
	07-May	59955	201	Normal operating Loads	
	08-May	60231	200	Normal operating Loads	
	10-May	60552	197	Normal operating Loads	
		5433	2375		c/t
CLEAN-UP OPERATIONAL DATA					
	10-May	60552	<i>End of Baseline readings</i>		
	12-May	61102	191	Normal operating Loads	
	13-May	61352	195	Normal operating Loads	
	19-May	62361		44/Trailer	
	22-May	62715	170	43/Trailer	
	26-May	63136	237	43/Trailer	
	28-May	63431	193	43/Trailer	
	29-May	63716	181	43/Trailer	
	30-May	63985	170	43/Trailer	
	03-Jun	64281	193	43/Trailer	
	05-Jun	64732	246	43/Trailer	
	06-Jun	65209	239	43/Trailer	
		4657	2015		c/t

Notes:

Between 13th May and 19th May the truck did not return to base and was therefore not treated. There would be a residual effect of the treatment however this would result in some reduction in Km/L performance.

Heavy loads and trailers were hauled during the operational period, which would have a significant effect on the Km/L performance when compared to the baseline readings. (see above)

The good condition of this truck negated the requirement for an extensive "clean-up" phase and so the operational readings reflect the complete process.

Appendix 4
Costs

For the purpose of these calculations we will rely on a mean average 10% albeit the indications are that the real saving could be significantly higher.

- A. The following calculations represent the costs associated with the purchase of 25 x 208 litre drums of Chornco 2082 Diesel Fuel Treatment – (5200 litres)

General information:

a.	Estimated fuel costs to WI	-	NZ\$0.50 per litre.
b.	Chornco 2082 treatment ration	-	1 litre of #2082 treats 1280 litres of diesel fuel.
c.	25 Drums of #2082 will treat	-	6,656,000 litres of diesel fuel.
d.	25 Drums represents	-	5200 litres
e.	Total cost of fuel treated	-	NZ\$3,328,000
f.	Exchange rate NZ\$/US\$	-	0.5992 / 1.6689(8/7/03)
g.	Average Fuel economy	-	10%

The average fuel savings identified from the trial represent: = c x g
= 6,656,000 x 10%
= 665,600 litres

1. Fuel costs saving @ 0.50 cents/litre = NZ\$ 332,800.00

2. Fuel cost saving in US\$ x F = US\$199,414.00

3. Chornco 2082 Diesel Fuel Treatment @ US\$11.5/litrex 5200 litres = US\$ 59,800.00**

Net cost saving = US\$ 139,614.00 or NZ\$233,001.00

Alternatively

- B. Taking the overall estimated consumption identified as 16,800,000 the potential saving represents 1,680,000 reduction.

General information:

a.	Estimated fuel costs to WI	-	NZ\$0.50 per litre.
b.	Chornco 2082 treatment ration	-	1 litre of #2082 treats 1280 litres of diesel fuel.
c.	57 Drums of #2082 will treat	-	15,175,680 litres of diesel fuel.
d.	57 Drums represents	-	11,813 litres
e.	Total cost of fuel treated	-	NZ\$8,400,000
f.	Exchange rate NZ\$/US\$	-	0.5992 / 1.6689(8/7/03)
g.	Average Fuel economy	-	10%

The average fuel savings identified from the trial represent: = 1,680,000 litres

With a 10% fuel reduction the revised consumption would represent 15,120,000 litres.

Chornco 2082 required to treat the revised total = 11,813 litres (57x 208 drums)

1. Fuel costs saving @0.50 cents/litre = NZ\$ 840,000.00

2. Fuel Cost saving in US\$ x F = US\$ 503,328.00

3. Chornco 2082 Diesel Fuel treatment @ US\$ 10.00/litre x 11,813 litres= US\$ 118,130.00**

Net cost saving = US\$ 385,198.00 or NZ\$ 642,856.00

****All costs are FOB USA.**

E&OE

Appendix 5

Additional Information

Health & Safety

The Health and Safety of people who handle and use Chornco products is very important to us. The effects of Chornco products are environmentally positive and the products themselves are generally regarded as safe to handle and store. However, as with all petroleum products, excessive and prolonged skin contact may cause irritation. Therefore, good personal hygiene practices are recommended. Wash thoroughly with soap and water if contact with product occurs.

You are encouraged to obtain and read the "Material Safety data Sheet" for each Chornco product, to ensure employees/users fully understand how to safely use each product. For proper storage and handling of Chornco packaged products, you are encouraged to read the "Storage and Handling Handbook".

Customer Warranties.

The Chornco philosophy is to provide a performance at all stated levels in practical terms and a value for money financial proposal for ongoing use of all listed products. In conjunction with this Chornco provides a comprehensive insurance cover for its customers. The policy covers all customer, plant, equipment, vehicles, vessels and machines.

The normal procedure is to name the customer as an "additional insured" party on the policy which, in the event of an incident provides prompt and efficient access.

It should be noted that in the 30+ years of the development and usage of the Chornco products there have been no claims made, nor incidents of failure recorded against proper use.