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INNOVATIONS IN FLUID HANDLING



TECHNO-KLEAN

ULTIMATE FUEL TREATMENT

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Techno-Klean or “take a risk”?

Understanding Diesel Fuel Contamination

Water Contamination of Diesel Fuel

The most common form of diesel fuel contamination is water. Water in stored diesel fuel is normally formed from condensation over time. The introduction of Bio-Diesel which is hydroscopic, also results in water being drawn into tanks. Water contamination in the fuel storage system can lead to corrosion of the storage tank (depending on the materials used). This corrosion can lead to further contamination of the fuel.

Diesel fuel tainted by water can reduce the performance and fuel efficiency of diesel powered vehicles, generators and equipment. Water pollution can cause filter blockages and serious damage to parts of your generator or engine such as the injectors, pipelines, seals or gaskets. For standby generators water in fuel can reduce the effective life of its engine, increase the risk of internal corrosion and worst of all, result in equipment failure due to the fuel being too hydrolysed (tainted by water).

Petroleum diesels typically hold 60ppm of suspended water. At this level, the water is almost insignificant as long as it is regularly used and replenished (and microbial contamination does not occur). Bio-diesels typically hold up to 25 times more suspended water than petroleum diesel. In recent years the worldwide introduction of bio-diesel has brought what was mainly a mariner's fuel problem to every diesel fuel user. Bio-diesel is a perfect habitat for vigorous microbial growth.

Consequently the amount of exposure to natural condensation over time in an undisturbed storage tank before micro Bacteria proliferation begins is dramatically reduced. Deterioration in modern biofuel is much faster than for petroleum based fuels.

Bacteria Contamination of Diesel Fuel

Growth of microorganisms in petroleum products has been recorded since 1895. Water contamination of diesel fuel leads to the build up of microbes, bacteria and sometimes fungi. These Colony Forming Units (CFUs) of microorganisms feed on the fuel at water-fuel interface (where the water meets the fuel) until becoming too heavy and floating to the bottom of the tank, quickly forming bio-films and sludge. Both aerobic and anaerobic bacteria can produce corrosive acids and sticky residues. These undesired chemicals (broken down carbon chains) can further affect engine performance by reducing the combustible properties of the fuel and shortening the life of both engines and storage tanks. The resulting sludge and sticky residue within the diesel fuel can cause blocked filters, fuel lines and damage the precision fuel injectors that are vital to the efficient running of a diesel engine.

Other fuels

With the introduction of biofuels into petrol in the form of bio-ethanol, petrol, a once unaffected fuel, has now also become subject to the consequences of microbial contamination.

Evidence of degraded fuel is

- the presence of black smoke from the exhaust,
- unacceptable engine performance and reduced power output
- poor starting (or failure to start at all)
- shorted fuel filter life,
- incorrect fuel gauge readings (caused by sludge and residue contamination).



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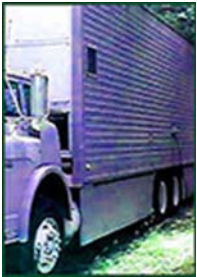
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TECHNO-KLEAN CONCENTRATE

TECHNO-KLEAN provides total fuel system maintenance to give improved engine performance and economy.

TECHNO-KLEAN is suitable for use in leaded, unleaded & high octane petrol, diesel, heating kerosene and bunker fuels.



TECHNO-KLEAN is used at only 1 litre per 4000 litres of fuel and is extremely cost effective.

TECHNO-KLEAN removes water from fuel and fuel lines and retards fungal growth.

The presence of water from condensation, seal leakage, etc can accelerate the degradation of the fuel, especially if high sulfur levels are present. In diesel, water allows microbial growth (eg: *Hormoconis resinae*) to proliferate. This 'diesel bug' feeds on the fuel, but propagates in the water and causes fuel degradation and filter and injector blockages.



TECHNO-KLEAN is also more effective than other products at neutralising the harmful effects of acids formed in aged, water-contaminated or high sulfur fuels, and in reducing the formation of gum and varnish deposits that can result from this. Not only are these acids corrosive, but they can also catalyse oxidation and premature fuel aging.



TECHNO-KLEAN allows fuel to burn cleanly and efficiently, and helps keep injectors and combustion chambers clean. Fuel injectors build up deposits from a variety of causes (poor quality fuel, waxes or biofouling, improper engine tuning, etc). Such deposits affect the spray pattern of fuel into the combustion chamber so that there are areas of lean burn and rich burn. The results of this include higher exhaust emission of unburnt hydrocarbons and carbon monoxide, rough engine running, excessive fuel consumption and loss of engine power.



TECHNO-KLEAN contains dispersants to reduce the aggregation of wax particles, as well as high detergency to keep injectors clean and promote improved fuel combustion. This leads to reduced levels of unburnt hydrocarbons and carbon monoxide in the exhaust gases.



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DESCRIPTION

This advanced technology product provides the following benefits:

- Suitable for petrol & diesel,
- Absorbs and removes water from fuel and lines
- Helps neutralise acids in aged or high sulfur fuels
- Dissolves and prevents wax, gum and varnish deposits in the fuel tank, lines & injectors
- Helps decarbonise combustion chambers
- Prevents fungal and microbial growth
- Reduces harmful exhaust emissions
- Burns off completely and harmlessly
- Contains no corrosive ingredients
- Super concentrated - super economical
- Contains premium top end lubricant

USE

Mix 50 ml or more of **TECHNO-KLEAN** per 200 litres of fuel in fuel tank.

For fleet use, bulk holding tanks should be dosed (preferably at time of filling, to ensure adequate mixing).

Where more viscous fuels are used, such as bunker fuels in power stations, **TECHNO-KLEAN** may be metered into the fuel tank outlet line at 1 part **TECHNO-KLEAN** to 1000-4000 parts fuel.

SAFETY

Read Material Safety Data Sheet before use. Keep out of reach of children.

TECHNO-KLEAN CONCENTRATE

PROPERTIES

- Appearance : coloured mobile liquid
- pH : neutral
- Specific Gravity : approx 1.0
- Boiling Point : > 120o C
- Flash Point : >65oC
- Flammability : non-flammable
- Corrosivity : non-corrosive
- Toxicity : non-toxic. Skin and eye irritant.
- Use Rate : 1:1000 to 1:4000
- Fuel Types : all hydrocarbons fuels
- Phosphate Content : nil
- Metal Content : nil
- Alcohol Content : nil
- Aromatic Solvent Content : nil



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Case Studies

TECHNO-KLEAN contains dispersants to reduce the aggregation of wax particles as well as high detergency to keep injectors clean and promote improved fuel combustion. This leads to reduced levels of unburnt hydrocarbons and carbon monoxide in the exhaust gases, as illustrated below:



EXHAUST EMISSIONS

Renault 25 (United Kingdom)

- exhaust emissions measured before use of **TECHNO-KLEAN** and after 1700 miles (2720 km) with **TECHNO-KLEAN**

- Fuel saving		+15.9 %
- Emission improvement	Carbon Monoxide	-51.6 %
	Carbon Dioxide	+12.0 %
	Hydrocarbons	-21.0 %



Caterpillar Diesel (Underground mine, Western Australia)

- emissions measured after 16 hours continuous underground use

- Emission change	Carbon Monoxide	-46.2 % (low idle)
	Carbon Monoxide	-14.3 % (high idle)
	Hydrocarbons	Reduced

Italy

- Testing for smoke reduction gave positive results of 4-10%

Indonesia

- Testing under the authority of the Badepal and East Java Pollution Control Authority showed significant reduction in both carbon monoxide and unburnt hydrocarbon levels.

China

- Testing by the Beijing Automotive Research Institute on diesel bus after top-end purging and flushing and use of **TECHNO-KLEAN**

- Emission improvement (hydrocarbons)	
after purging/flushing	-55.6%
after TECHNO-KLEAN	-18.7%

Fishing Boats

we have received a number of reports relating to the much greater use life of marine exhaust systems of vessels using **TECHNO-KLEAN**, presumably due to the reduction of acidic exhaust gases.



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FUEL CONSUMPTION

Fleet trials undertaken by end-users over the years have given strongly positive results:

City Council 1 (Victoria, Australia)

- 7 diesel trucks, various makes; one month fuel consumption baseline plus one month evaluation of **TECHNO-KLEAN** used at 1:4000
- Fuel Savings (weighted average) +7.0%

City Council 2 (Western Australia)

- 7 petrol cars and 3 diesel trucks, various makes; 3 weeks baseline measurement followed by 4 weeks using **TECHNO-KLEAN**
- Fuel Savings

Cars	+1.4%
Trucks	+13.6%

Food Distribution Company (Western Australia)

- 5 Diesel trucks, various makes; total fuel used 156,000L; initial system clean-up dose of **TECHNO-KLEAN** 1:2000, thereafter 1:4000.
- Fuel Savings

Truck 1	no change
Trucks 2-5	+3.5%

Fishing Vessel

- 20m with Fiat V8 Twin Turbo
- Fuel Savings after 2 refuellings +10%

Transport Company (rural Western Australia)

- 8 Volvo diesel trucks, covering 360,000 km
- Fuel Savings +6.3%

Bus Company (China)

- Diesel bus tested by Beijing Automotive Research Institute Vehicle purged, flushed and then **TECHNO-KLEAN** added.
- Fuel Savings +5.2%

Railways (China, Malaysia)

- diesel locos trailing **TECHNO-KLEAN** in China and Malaysia gave excellent fuel savings.



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OTHER BENEFITS

TECHNO-KLEAN is suitable for all liquid petroleum hydrocarbon fuels: leaded, unleaded & high octane petrols, summer or winter grade diesels, heating kerosene and bunker fuels. It has not been formally assessed for use in avgas and is not approved for use in aircraft.

TECHNO-KLEAN exhibits good biocidal activity, as shown by independent testing on diesel fuel with a gross infestation of *Cladosporium resinae*:

Time	Dilution Rate	DynaFuel	Competitor
2 Days	1 : 2000	No growth	Bacterial colony present
	1 : 4000	No growth	Bacterial colony present
	1 : 6000	No growth	Bacterial colony present

TECHNO-KLEAN does not contain phosphates, boron or corrosive ingredients. It has a high flashpoint (> 70 °C) and low toxicity and is free from many transportation restrictions.

TECHNO-KLEAN variants have been formulated to, for example:

- remain liquid to -30 °C for use in sub-arctic conditions
- contain a premium synthetic top-end lubricant blend
- be much more strongly biocidal for severe bug infestations
- blend with cheap solvents to give 'economy' products for retail sale (use rate 1:200 to 1:1000)
- give optimal performance in low grade bunker fuels
-

TECHNO-KLEAN is a total fuel system treatment. It preserves the fuel and keeps the entire fuel / combustion / exhaust system clean, from the tank, through the fuel lines, injectors, combustion chambers and exhaust. The result is greater engine efficiency, improved fuel economy, reduced exhaust emissions and less maintenance downtime. **TECHNO-KLEAN** will pay for itself.



Exhaust Emission Test Summary

Assessment of **TECHNO-KLEAN** fuel additive was carried out in an underground mine to determine its benefits in reducing harmful exhaust emissions as follows :

Site : **Western Mining, Kambalda, Western Australia**

Vehicle/Engine type : Caterpillar 12G Diesel

DynaFuel Use Rate : 1 to 4000 v/v in diesel

Testing Authority : BGC Consultants for the Department of Minerals and Energy, WA

Test Results (February, 1996) :

	<u>Low Idle</u>	<u>Fast Idle</u>
<u>Carbon Monoxide (CO)</u>		
No Additive	465 ppm	287 ppm
15 mins after addition	378 ppm	262 ppm
16 hrs after addition	250 ppm	246 ppm
Reduction (%)	46.2 %	14.3 %
<u>Nitrogen Dioxide (NO₂)</u>		
No Additive	102 ppm	72 ppm
15 mins after addition	88 ppm	71 ppm
16 hrs after addition	80 ppm	71 ppm
Reduction (%)	21.6 %	1.4 %



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DEMONSTRATIONS

These tests are designed only to illustrate the principles involved. Although the proportions of each liquid used here are obviously not the same as found in practice, these demonstrations nevertheless do indicate the types of benefits obtained by using **TECHNO-KLEAN** and its advantages over many older technology competitor products (eg Promar, Wynns, Fortron, etc) and newer 'me-too' copycat products (eg Liquid Engineering).

1 . WATER UPTAKE

The presence of water in fuel (from, e.g. condensation in the tank, leaks, etc.) allows the fouling of fuel tanks, lines and filters through the propagation of biological organisms such as *Cladisporum resinae*, facilitates the formation of sulphur acids and accelerates corrosion. This demonstration shows the superior water uptake capacity of **TECHNO-KLEAN** over traditional fuel additives.

- i) Add 10 ml of DIESEL and 3ml of competitor fuel additive to a glass test tube (approx 25 ml capacity). Add 1 ml of water, shake the test tube and observe that either the water settles to the bottom of the tube, or sends the diesel milky.
- ii) Repeat in another test tube using 10 ml Diesel and 3ml **TECHNO-KLEAN**. The mixture should be clear with no signs of separation. The water has 'dissolved' into the fuel. It will not settle out.
- iii) Mix the contents of both tubes together and see what happens. **TECHNO-KLEAN** is so powerful it can often overcome the shortcomings of the competitor product.



2 . GUM & VARNISH REMOVAL

TECHNO-KLEAN is also more effective than other products at neutralising the harmful effects of acids in aged or high sulphur fuels, and in reducing the formation of, and removing existing, gum and varnish deposits.

- i) To each of 2 glass test tubes, add about 10 ml DIESEL and 10 drops of concentrated sulfuric acid (98%). Brown tarry deposits form.
- ii) To one of the test tubes, add 3 ml of **TECHNO-KLEAN** and shake thoroughly. The deposits are completely dissolved.
- iii) To the other test tube, add 3 ml of competitor product and shake. The deposits will not dissolve completely, and become increasingly evident on standing for a few minutes.
- iv) Now fold a paper tissue over several times to form a flat wad. Hold it over the open end of the test tube containing the competitor product with a finger, and invert the tube to wet the tissue.
Repeat with the tube containing **TECHNO-KLEAN**.
Note the appearance of the area in contact with the acid/fuel/additive mixtures. The **TECHNO-KLEAN** one is much cleaner.