PENTOMAG®

For diesel engines

# FUEL SAVING
# CLEAN ENGINE

# Corrosion  # Turbo  # Injectors  # Fouling
Pentol offers a unique way to improve the **eco-efficiency** of diesel engines

Experience

Pentol has 50 years of experience in power industry. In our first years we worked on singular solutions for ordinary problems: corrosion, slagging, sludge, emission.

We started to combine this tasks as the benefits started to add up inside a big picture of power plant optimization.

Evolution

As we have been focused on improving combustion with additives, combustion engineers started to work at Pentol, hand in hand with our clients.

An increased **eco-efficiency** of diesel engines (or boilers and gas turbines) allows our clients to participate in the reduction of greenhouse gases while saving on the operating cost: a true win-win solution!
To get the best results, we have to see the big picture.

Before starting a treatment, Pentol analyses the situation beginning at fuel delivery and ending with the flue gas emitted and waste materials treated.

The compounds formed during combustion cause problems such as corrosion and fouling on:
- Exhaust valve seats, liners, piston rings
- In the nozzle ring
- On the blades of the turbo charger.

Besides a longer life time of engine components, this treatment reduces down time for cleaning and repairing and the fuel oil consumption.

The all-in-one diesel additive is designed to fulfill the following goals:

1. Reduce sludge in storage tanks with
   » CRACKING CATALYST
2. Reduce waste separation and disposition with
   » FUEL HOMOGENIZER
3. Improve combustion of the fuel with
   » COMBUSTION CATALYST
4. Neutralize corrosion effects and eliminate deposits with
   » CORROSION INHIBITOR

PentoMag® is designed for low quality heavy fuel oils.
PentoMag® is dosed on the filling line of the day tank or storage tank by means of a simple dosing pump. It includes sludge dispersing solvents to stabilize the fuel.

This keep tanks and tank trucks free from sludge deposits. It prevents the formation of sludge on the injection pumps and nozzles.

Sedimentation and sludge formation can occur in oil storage tanks, oil preheaters, strainers and fuel lines.

The main cause of sediment and sludge in oil tanks and fuel oil lines is due to separation of the water content from the fuel oil and when asphaltenes, waxes and other materials flocculate and settle.

PentoMag® cracks the long chains of asphaltene and rearranges them in a stable oil emulsion.

The cracking process needs time and happens in the storage tanks.
Every fuel contains asphaltene that is separated by a centrifuge. PentoMag reduces approx. 50% of the asphaltene separation.

Instead of separating and disposing of heavy fractions, they are dispersed in the fuel and burnt.

10% asphaltene

As a result, the total sludge absorbed in the fuel separators is minimized and they will be unloaded significantly, reducing the purge cycles and the water consumption.

Increasing the net calorific value of the fuel used and reducing the amount of waste disposed of.
The catalyst in the PentoMag® produces a more complete burn out of the fuel by reducing the activation energy of the fuel. Solid emission, CO and unburned carbon is reduced to the minimum. Consequently, the lack of deposits in the turbo and the recovery boiler lead to improved efficiency.

The activation energy is the minimum amount of energy that must be provided by a molecular collision for the reaction to occur. Excess air required for complete combustion is reduced.

**Without catalyst:**
- more unburned carbon
- corrosive combustion residuals
- higher emission

**With catalyst:**
- reduced activation energy
- combustion period starts sooner /takes longer
- carbon burnout is more complete

This leads to a reduction of fuel consumption, improving the combustion and producing less smoke.
The additive works by modifying the fusion point of the combustion residuals.

Sodium, Vanadium and Sulfur compounds can form molten deposits in exhaust valve seats, nozzle rings and on the turbo charger blades.

At low temperatures, sulfuric acid is formed.

Ash particles stick to cool surfaces and build up deposits.

PentoMag prevents formation of these deposits, extending lifetime of the engine.

The additive works by modifying the fusion point of the combustion residuals.

The corrosion inhibitor is a magnesium compound, increasing the pH of the fly ash above 6.

The salts formed now have reduced corrosion and adherence properties. That’s why they are easily removed from the gas flow as they don’t stick in the elements of the diesel engine and extend the useful life as well as the recovery boiler.

Because of the elimination of vanadium deposits, $\text{SO}_2$ generated in the combustion will not be converted to $\text{SO}_3$, and therefore the condensation of $\text{SO}_3$ in the recovery boiler is prevented, leading to a reduction of cleaning cycles and corrosion issues.
«After an extensive trial period in 2010, Pentomag® is continuously used and deployed to all our diesel power plants. In addition to the reduction of maintenance works, we save approx. 3.5 g/kw of fuel oil using PentoMag®.»

«We faced serious problems in our Diesel Engines, leading to shutdowns every 3.5 days to clean the injection nozzles, valves and the turbo charger.»

Cleaning intervals increased to 2,000 h

Sludge is transformed into fuel. Instead of wasting it, it can be used to produce electricity.

Pentol expects a fuel oil saving in the order of 2-5%, depending on the fuel characteristics, combustion parameters and the general condition of the diesel engine.

Manuel Gonzales, Service Engineer
The fuel saving correlates directly to a reduction of CO₂ emission per MW. In addition, solid emission (black smoke, particulate emission) is eliminated completely as well as emission of SO₃.

PentoMag® is a powerful combination of different technologies developed by Pentol over many years. It solves a chain of problems starting at the refinery and ending after combustion of the fuel.

Pentol manufactures a multi-purpose, wide range of specialty chemicals for fuel oil treatment to gain optimum results and maximize savings for boiler, diesel engines and gas turbines.

After decades of experience, we offer the most advanced solutions, for heavy fuel oil fired processes.

Let’s find your perfectly balanced formula to meet all your requirements.
PentoMag® is a liquid solution and is injected by means of a dosing pump into the transfer line from the unloading pump to the storage tank. PentoMag® is delivered in IBC containers of 1000 l each.

For precise dosing, we offer a range of individual equipment from our production in Germany.

Our long-term experience leads us to a rugged design, easy to use, with minimal maintenance.
SUPPORT IN ALL STAGES

From diagnosis to service

1. Contact Pentol to arrange the first visit in your plant
2. Pentol analyzes fuel characteristics and engine to select the best additive
3. On site, the dosing point is defined and the skid prepared
4. Pentol produces the startup documentation to record long term and short-term savings
5. Continuously, Pentol measures results from treatment and assist the client during operation
6. The treatment is supervised continuously

Victor Gomez, Sales Manager

«Please contact me – we keep in touch and assist our clients continuously for best results.»

Get 2-5% more net efficiency
PENTOMAG®

For Diesel Engines

- Reduce emission
- Protect recovery boiler
- Clean injectors
- Clean turbo
- Clean valves
- Prevent sludge
- Reduce water consumption
- INCREASE EFFICIENCY

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