FUEL OIL TREATMENT

Maximize Eco Efficiency

Treat Deposit and Corrosion

PentoMuls® and PentoMag®
THE IDEA BEHIND

The Pentol-way is driven by results.

Increased eco-efficiency for your power station.

In our solutions we always try to include the full picture: from fuel delivery to emission – as well as from energy-production to operating-costs.

You will be supported by chemicians, service-technicians and operation-specialists. They mainly focus on combustion, emission, corrosion and heat transfer.

In several decades of experiences our company has grown continuously. Today we develop and produce combustion-additives and technical-equipment in our own independent production-sites to achieve maximum usability and reliability.
Due to increased usage of low quality fuel oil with high sulphur, asphaltene and vanadium content, power stations all over the world face both environmental and technical problems.

The full picture

PentoMuls®
- Optimize combustion

PentoMag®
- Eliminate fouling and corrosion

Treat the incomplete combustion of the fuel oil as well as the vanadium and sulphur content.

Solve deposits and corosions in all parts of the boiler and excessive emissions of solids and sulphur trioxide.

MAXIMIZE ECO EFFICIENCY
Pento’s unique dual treatment uses two additives.
STEP 01 Optimize combustion

Conventional combustion with a standard heavy fuel oil

Without water-in-oil emulsion, atomisation is insufficient.

The combustion time is too short to burn the oil completely, resulting in unburned carbon leaving the combustion chamber.

Unburned carbon can be reduced by about 80-90 % and ash load reduced by about 50 %

PentoMuls® allows the on-line production of a stable water-in-oil emulsion.
Firing an emulsion has a great impact on the boiler

Due to the secondary atomisation, the fuel oil burns much more completely. The result is a compact, short flame with a good temperature distribution, therefore much less nitrogen oxide (NOx) and sulphur trioxide (SO₃) is generated.

Positive effects:
- Dust load reduced
- Combustion efficiency increased
- NOx and SO₃ formation reduced

The secondary atomisation cracks down fuel oil particles and allows a complete carbon burn-out within shorter time.
PentoMuls® is a well balanced blend of surfactants, dispersants and catalysts.

The surfactants allow the creation of a stable, high-quality water-in-oil emulsion with water particle sizes in the range of 4 to 6 µm.

Deagglomerating asphaltenes in the emulsion reduces the demand for excess air during combustion and, therefore, results in a corresponding reduction of NOx and SO3 emissions.

To achieve the best possible combustion with heavy fuel oil, water droplets with a size of 4 to 6 µm have to be thoroughly mixed with the oil. If the size of the water droplets is too small, the energy set free during combustion is too small to atomise the fuel oil. On the other hand, water droplets with particle size of more than 10 µm will atomise too slowly which will result in an unbalanced flame.

Emulsification equipment

The emulsification unit is the key item to create the water-in-oil emulsion. It remains property of Pentol and is rented to the power plant.

The emulsification equipment is fitted with a fully automatic control and grants that a constant quality of the water-in-oil emulsion is maintained. Options to operate it remotely from the control room are included in the basic design.

The emulsification unit is installed on the main fuel oil line. Water, PentoMuls® and PentoMag® are emulsified online. The water monitor constantly monitors and regulates the water content in the emulsion.
Pentol offers a range of fireside additives which are compatible with PentoMuls®. For this reason, the emulsification unit is equipped with dosing equipment for PentoMag®. This dosing equipment is controlled by a common CPU and allows the operator to take full control via a common user interface.

PentoMag products are magnesium oxide based fuel oil additives, designed to reduce the exit gas temperature below the acid dew point (ADP).

It prevents corrosion and deposits in the back end and at the same time eliminates SO$_3$ emission and acid smut fallout.

A reduction of the exit gas temperature by 20 °C corresponds to fuel oil saving of 1%. The average achievable exit gas temperature ranges between 110 and 120 °C. Just imagine your savings.

PentoMag®s main property is to reduce high and low temperature corrosion.

Reduced corrosion means extended life time of high and low temperature sections in the flue gas duct.

Reduced fouling increases heat transfer in superheater and air heater sections and reduces down-time for cleaning.

SO$_3$ emission and the visible white chimney plume are reduced.

Cleaning intervals for air heater and superheater are reduced. Dosing equipment designed by Pentol is of rugged design and requires minimum maintenance. Reduced corrosion and deposits mean extended lifetime of high and low temperature sections, allows longer cleaning intervals and less unexpected down-time.

Improved heat transfer, lower O$_2$ and atomising steam consumption, less soot blowing and particularly the possibility to reduce final gas temperature to a minimum, resulting in a substantial increase in boiler efficiency.
At metal temperatures above 600 °C, the fly-ash components with a low melting point (vanadium, sodium, lead, potassium) form hard tenacious and corrosive deposits. Cleaning is difficult, but these deposits cause high draft losses, decreased heat transfer and lower combustion efficiency.

The metallic oxides in the PentoMag® increase the melting point of the above mentioned fuel oil components by approx. 300°C to temperatures which are well above the boiler temperatures. As a result, the high temperature section remains clean and free of corrosive deposits. The deposits are dried out, fried and of neutral to alkaline pH. Excess powder is taken away in the gas stream or can easily be blown away by soot blowers.
Fuel oil contains sulphur. In the past, this led to uneconomical boiler operation with high exit gas temperatures between 140 °C and 180 °C. While fuel oil was cheap, this method was the easiest and least expensive way to avoid cold end problems.

PentoMag® allows surprisingly high reductions in exit gas temperatures and still protects the back end against corrosion and plugging. In most cases, the fuel oil saving resulting from the reduced exit gas temperature pays for the PentoMag treatment, let alone the cost reduction due to shorter down-time and improved availability of the rated capacity of the plant.

Further to providing protection against fouling and corrosion, PentoMag helps to maintain the heat transfer at the most economical level.
Example of economic balance

A prediction of results can be calculated for different types of boilers and fuel oils.

- Improved thermal exchange rate
- Reduction of cleaning cost
- Reduction of unburned carbon
- Reduction of soot blowing
- Reduction of flue gas temperature → fuel oil saving
- Reduction of excess air
- Reduction of atomising steam

If you take the increased efficiency and the extended boiler availability into consideration, you will state that the treatment pays for itself.

Victor Gomez
(Sales Manager)

Environmental benefits

Reduced emission
- SO₂ approx 90%
- Solids by up to 90%
- NOx by up to 30%
- CO₂ and acid smut fallout
Pentol offers complete solutions for combustion optimization consisting of chemicals, dosing equipment and engineering.

Our main objective is to help power plants to reduce their emissions and to increase their efficiency.

Each boiler requires specific treatment to gain optimum results and to maximize savings. For this reason, Pentol offers a full scope of products and services.

Ask Pentol for a customised quotation to see a detailed calculation of your savings and find out that environmental protection actually pays off!
FUEL OIL TREATMENT

Additives for fuel fired plants

INCREASE EFFICIENCY

PENTOMAG®
PENTOMULS®
PENTOL emulsification and dosing unit
Burn low quality heavy fuel oils

Prevent fouling and ash deposits

Save approx. 2 % of fuel oil!

Optional PENTOL SOx Monitor

REDUCE EMISSION

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