PENTOMAG®

Additive for Combustion Optimisation

Eliminate Corrosion

Reduce Fuel Consumption
Pentol offers a unique way to improve the eco-efficiency of power plants

Instead of upgrading with expensive cleaning equipment, Pentol chemicals solve emission problems at the source. Power plant operators receive technological turnkey solutions to improve performance significantly. Beside an attractive return of investment, this is an active contribution to the long-term preservation of our environment.

The PentoMag® product line of Pentol is one of the few technologies on the market that truly approach the eco-efficiency of a power plant.

PentoMag® reduces emission of SO₂ and its blueish plume. At the same time it allows an efficiency increase of the boiler by reducing the exit gas temperature. Let us show you how we do this.
PentoMag® keeps heat transfer components clean and protected.

PentoMag® allows reduction of exit gas temperature by neutralizing SO3.

PentoMag® is adapted for the specific requirements of our clients.

It is injected directly into the fuel oil and is activated in the flame.

Clean surfaces allow a better heat transfer, more efficiency, and fewer stops for cleaning.

Pento offers a package of technical service and additives to optimize boiler treatment.

It saves fuel oil and removes the plume of your chimney.
TYPICAL PROBLEMS IN FURNACE AND HIGH TEMPERATURE SECTION

High-temperature corrodes on heat transfer surfaces

Ash sticks to the surface of boiler walls, super heaters, reheaters, and economizers.

Deposits grow more rapidly. Δp increase. The deposits are corrosive, therefore, hard to remove and catalyze $\text{SO}_2$ to $\text{SO}_3$.

Growing deposits set a long sequence of compensation actions into gear.

Until a service shutdown for cleaning breaks this cycle.
At metal temperatures below 600°C, the fly-ash components with a low melting point (vanadium, nickel, sodium, lead, potassium) condense and form a highly corrosive liquid, then solidifying into a hard, tenacious deposit.

Vanadium pentoxide forms a molten slag, adhering to the tube surfaces and its sticky nature resists soot blowing. The vanadium slag reduces heat flux, affecting the efficiency of the boiler and leading to increased fuel demand.

And on top of this, the vanadium slag is a powerful catalyst for the formation of sulfur trioxide, leading to emission problems, corrosion, and load restrictions.

Corrosive chemical reactions are set into gear, after compounds are formed, resulting from individual melting points of heavy fuel oil components.
**PENTOMAG® IN HOT END SECTION**

The oil-soluble liquid is injected directly into the fuel oil line.

PentoMag® breaks the circle of slag formation. Magnesium oxide (MgO) reacts with vanadium pentoxide to produce magnesium orthovanadate.

When sulfur dioxide oxidates to sulfur trioxide, vanadium pentoxide is needed as a catalyst.

PentoMag® reacts with vanadium in the combustion chamber. Vanadium loses its catalytic power, becoming inert.

Magnesium sulfate is formed on the tubes, making it easy to water wash during the outages because of its water soluble properties.

This is a high melting point ash product, which is much easier to remove from the furnace tubes by the soot blowers.

The thin, powdery, corrosion protecting layer can be easily removed by soot blowing, hand brushing or water washing.

Soot blowing will be most effective. Hard vanadium deposits are converted to powdery magnesium orthovanadate, stopping the corrosion of the pipes and the catalysis of SO₂ to SO₃.

The heat transfer is restored to the design parameters, increasing the power output of the plant.

PenTOmaG® reacts with vanadium in the combustion chamber. Vanadium loses its catalytic power, becoming inert.
if you need reliable SO₃ monitoring, you will find our PDF on www.pentol.com
TYPICAL PROBLEMS IN COLD END

Fouling in air preheater from acidic corrosion

1. Condensation
   - Flue gas 380°C
   - 80°C heated combustion air
   - pH < 2

2. H₂SO₄ formation
   - SO₂ in flue gas
   - H₂O condensation
   - H₂SO₄ acid
At temperatures below 180°C, SO₃ reacts with water vapor and forms sulfuric acid. Most of the sulfuric acid is trapped in the air preheater, leading to serious corrosion issues and finally plugging the air preheater, as soot blowing is mostly inefficient. To prevent condensation of SO₃, operators increase exit gas temperature, trying to find a balance between air preheater lifetime and economic requirements.

With an exit gas temperature of 160°C, the average metal temperature in the lower end of the air preheater is still around 120°C, well below the acid dew point (ADP). Fouling and corrosion, therefore, mostly occur in the lower end of the air preheater.

Sulfuric acid forms a sticky layer of ash deposits, slowly closing the narrow gaps between the air heater elements and increasing the delta p.

Due to the increased exit gas temperature (EGT), the economic balance of the plant gets worse. An increase of 20°C in EGT reflects a 1% increase in fuel oil consumption.
Pentomag® helps to neutralize sulfuric acid to avoid corrosion and fouling at the cold end.

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.

The reduction of catalytic activity on the super heater leads to a reduction of SO₃ arriving at the air heater, resulting in a
- lower acid dew point,
- lower free acidity.

The presence of magnesium oxide in the air heater reduces the corrosion risk by increasing the alkalinity of the ash.

Without sulfuric acid in the air preheater, dust is not collected in the baskets.

The exit gas temperature can safely be reduced by observing the free acidity, leading to an increase of boiler efficiency.
We recommend to use PentoMag® with PentoMuls®. You will find our PDF on www.pentol.com
TAILORED BLENDS
from the range of specialty chemicals

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

After decades of experience, we offer the most advanced solutions, including the best of two chemical worlds.

Let’s find your perfectly balanced formula to meet all your tasks.

Together, we will localize the type and source of the main problem.

We will envisage the boiler type and its individual parameters.

Pentol produces specialty chemicals, tailored for each boiler and customer’s needs.

1. Inorganic Mg
   magnesium oxide, magnesium hydroxide

2. Organic Mg
   high purity magnesium-carboxylate, Magnesium-sulfonate

3. Low heat transfer rate
   Corrosion & Fouling
   SO₂ formation

4. Corrosion & plugging
   Low heat transfer rate
   Frequent cleaning
   High exit gas temperature

5. Emission
   SO₂
   Particulate solid matter
   CO
   NOx

6. Tailored Blends from the range of specialty chemicals

7. Pentol produces a multi-purpose, wide range of specialty chemicals for fuel oil treatment to gain optimum results and maximize savings for each boiler.

8. After decades of experience, we offer the most advanced solutions, including the best of two chemical worlds.

9. Let’s find your perfectly balanced formula to meet all your tasks.
TYPICAL RESULTS WITH PENTOMAG

Clean plant – high availability – extended lifetimes.

Thermal exchange rate on average, without PentoMag

Thermal exchange rate on average, with PentoMag

Reduce fouling, corrosion, and deposits.

Less soot blowing, lower O2 and atomizing steam consumption.

Reduce maintenance works and down time – extended boiler availability and life.
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. Discuss fuel characteristics, define additive
2. Identify dosing point
3. Clean boiler
4. Start treatment
5. Measure results
6. Supervise treatment and adjust combustion

Customer relations is important to us. We keep in touch and assist our clients continuously for best results.

Get 1-2 % more net efficiency
PENTOMAG®

For Fuel Oil Fired Plants

- Increase efficiency
- Prevent fouling and deposits
- Save approx. 2% of fuel oil!
- Reduce emission

PENTOL dosing equipment (rentable)

Water-in-Oil PENTOMULS (recommended)

PENTOL SO₂ monitor (on demand)

www.pentol.com

Get your answers in our chat

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