

FOR THE BEST WATER-RESISTANT

PENTOMULS®

WATER-IN-OIL EMULSION



PENTOL

PENTOMULS WATER-IN-OIL EMULSION

INTRODUCTION

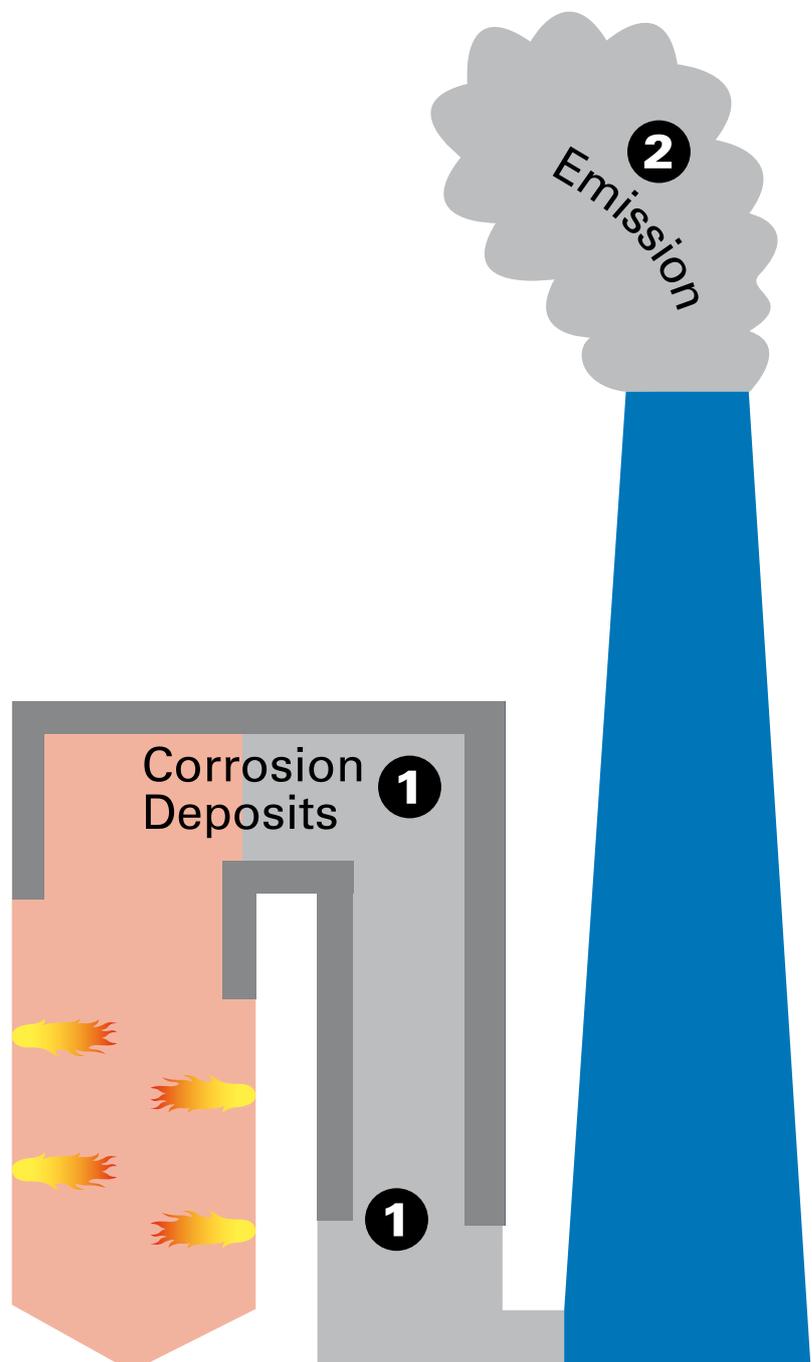
Due to increased usage of low quality fuel oil with high sulphur, asphaltene and vanadium content, power stations all over the world face both environmental and technical problems.

The incomplete combustion of the fuel oil as well as the vanadium and sulphur content cause deposits and corrosions **1** in all parts of the boiler and excessive emissions **2** of solids (particulates) and sulphur trioxide.

INCREASE NET EFFICIENCY

REDUCE SOLID EMISSION

REDUCE NO_x EMISSION

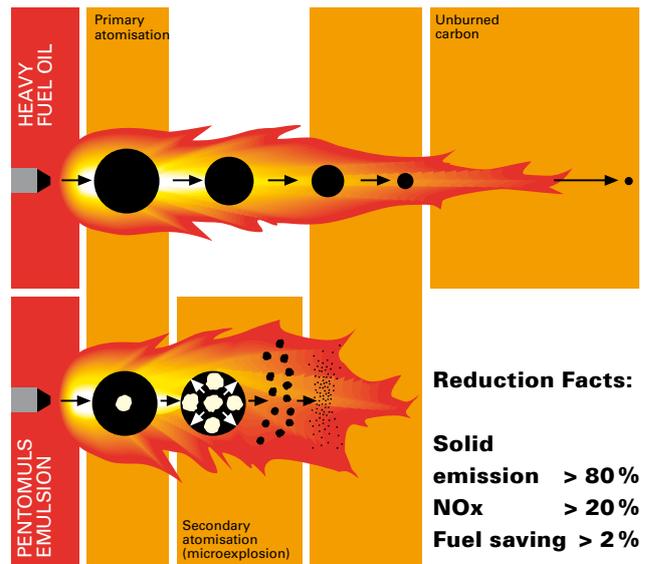


WHAT DOES PENTOMULS DO TO MY BOILER?



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 a great deal faster and much more completely. The result is a compact, short flame with a good temperature distribution, therefore much less nitrogen oxide (NO_x) and sulphur trioxide (SO_3) is generated.

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.



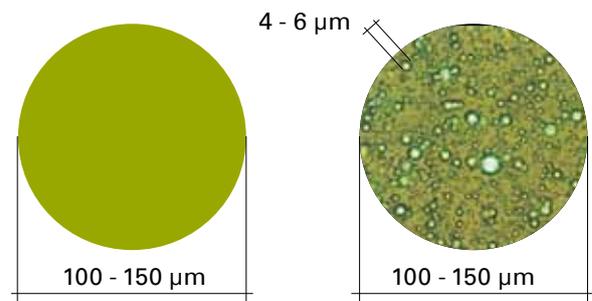
The secondary atomisation cracks down fuel oil particles and allows a complete carbon burn-out within shorter time.

THE TECHNOLOGY

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 NO_x and SO_3 emissions.



Typical fuel oil droplet size

Water droplets have a small size and are distributed well in the emulsion.

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.



Conventional Combustion.



Firing the Emulsion.

EMULSIFICATION EQUIPMENT

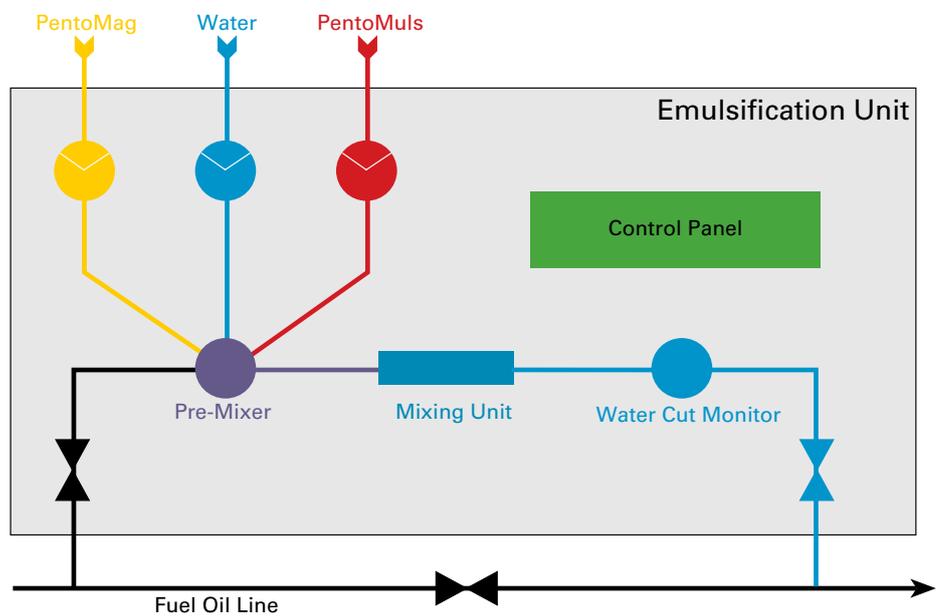
The emulsification unit is the key item to create the water-in-oil emulsion. It remains property of Pentol and is rented to the power plant.

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.





WHAT ABOUT FIRESIDE ADDITIVES? ARE THEY COMPATIBLE WITH PENTOMULS?

Pentol offers a wide 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 FIRESIDE ADDITIVES

Each boiler requires specific treatment to gain optimum results and to maximise savings. For this reason, Pentol offers a full scope of products to meet these needs. Please ask for the separate PentoMag leaflet if you do not have one yet.

PentoMag allows 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 SO₃ 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...



THE COMBINED TREATMENT WITH PENTOMULS AND PENTOMAG GRANTS BOTH BOILER PROTECTION AND REDUCTION OF OPERATING COSTS.



WHAT RESULTS CAN I EXPECT FROM FIRING A PENTOMULS EMULSION?

The major benefits of firing PentoMuls can be summarised as follows:

Environmental Benefits

- ▶ Reduce solid emission by up to 90%
- ▶ Reduce NO_x emission by up to 30%
- ▶ Reduce SO₃ emission by up to 90%
- ▶ Reduce CO emission
- ▶ Eliminate acid smut fallout

Economical Benefits

- ▶ Clean fuel system
- ▶ No high and low temperature corrosion
- ▶ No high and low temperature deposits
- ▶ Higher efficiency due to better heat transfer
- ▶ Higher boiler availability
- ▶ Efficiency improvement (reduce exit gas temperature)



WHAT ARE THE COSTS?

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

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

REFERENCES

Target: Reduce visible SO₃ plume.
Both boilers run at full power (400 MWe), one with and one without combined PentoMag and PentoMuls treatment.



Building contains 4 PentoMuls plants with storage tanks for PentoMag and PentoMuls nearby.



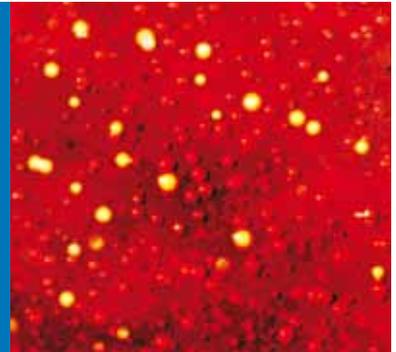
4 PentoMuls units emulsify 89 tons of fuel oil per hour each.

COMBUSTION OPTIMISATION

Pentol offers complete solutions for combustion optimisation consisting of chemicals, dosing equipment and engineering. Our main objective is to help power plants to reduce their emissions and to increase their efficiency.

1

PentoMuls



2

PentoMag



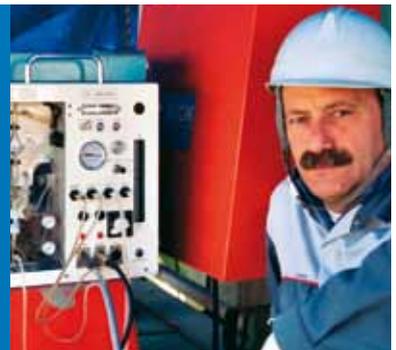
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**Emulsification
Systems**



4

Know-how





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