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# FLUEGAS CONDITIONING



**REDUCE SOLID EMISSION**



**PENTOL**

**REDUCE SOLID EMISSION**



To comply with regulations restricting sulfur dioxide emission, the power industry has begun the switch to sulfur coals. However low sulfur coal, tends to generate more fly ash and flue gas per megawatt. Because of the higher resistivity of this ash, it is difficult to collect in existing precipitators. Pentol offers Flue Gas Conditioning Systems which increase the efficiency of the existing precipitators, in order to comply with solid emission regulations.

#### **REDUCE FLY ASH RESISTANCE**

Reducing the fly ash resistivity, the ESP can work at or even above its design efficiency and collect more fly ash.

#### **INCREASE ESP PERFORMANCE**

With the precipitator performing at its design efficiency, sparking and back corona is eliminated, extending the life-time of the precipitator and allowing the operator to run the precipitator on rated current.

#### **REDUCE EMISSION**

Solid emission is widely reduced. With the automatic control system, the Flue Gas Conditioning System of Pentol follows the boiler load and ensures optimal treatment of the fly ash and guarantees best ESP performance.



**WHAT IS FLUE GAS  
CONDITIONING?**

Flue gas conditioning is the controlled injection of small quantities of sulfur trioxide into the flue gas stream, reducing the resistivity of the fly ash and permitting its collection in the existing precipitator. When flue gas conditioning is installed on units that have switched to lower sulfur coal, sulfur oxide emissions are significantly reduced, complying with environmental regulations and utility standards.



**IF IS INJECTED SULFURTRIOXIDE  
INTO THE FLUE GAS, WON'T IT  
INCREASE THE SO<sub>2</sub>/SO<sub>3</sub> EMISSION?**

It is a common question. The answer lies in the difference between sulfur dioxide and sulfur trioxide. When high sulfur coals are burned, they yield large quantities of SO<sub>2</sub>, but very small amounts of SO<sub>3</sub>.

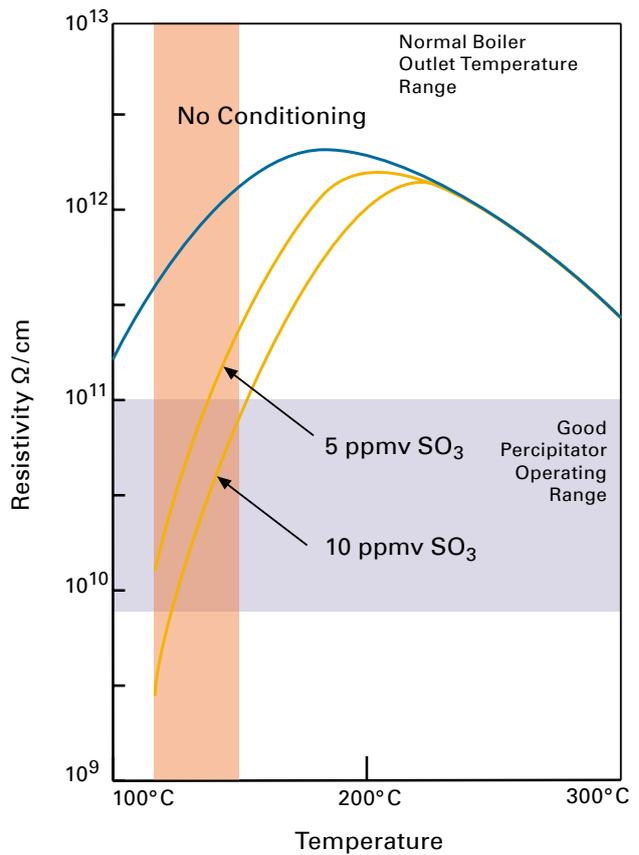
This SO<sub>3</sub>, however, is very important, because it naturally combines with the moisture in the flue gas to create sulfuric acid. Sulfuric acid immediately reacts with the fly ash particles to form a thin conductive film, which eventually lowers the fly ash resistivity.

Burning low sulfur coal, natural SO<sub>3</sub> levels are reduced to the point that they no longer can create enough sulfuric acid to properly condition the fly ash. Without flue gas conditioning, high resistivity ash would go through the precipitators, creating unacceptable emissions.

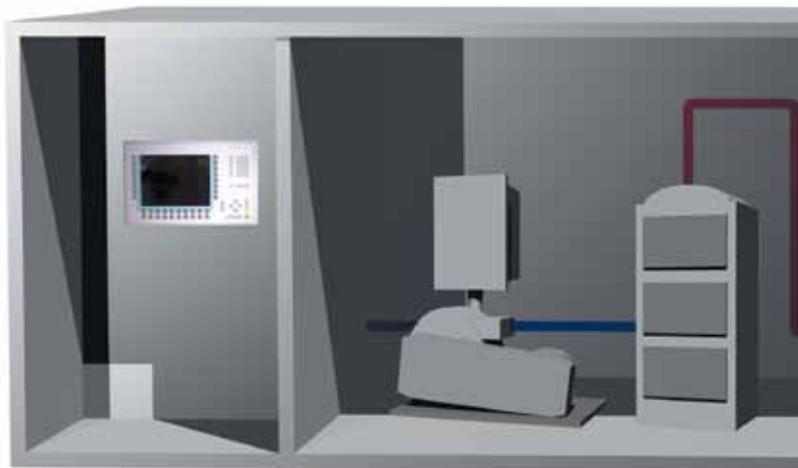
## WHY IS IT IMPORTANT TO KEEP FLUE GAS RESISTIVITY AT A CONSTANT LEVEL?

Fly ash resistivity is an important parameter to design electrostatic precipitators and determine their size. For economic reasons, expensive filters should be designed as small as possible, which limits the coal types that can be used.

The flue gas conditioning system of Pentol keeps the fly ash resistivity in a good precipitator operating range, allowing constantly low emissions with a broad range of coal types.



**Typical fly ash resistivity. If natural  $\text{SO}_3$  is missing in the fly ash, it has to be added with flue gas conditioning to bring down the resistance to levels between  $10^{10}$  and  $10^{11}$  Ohm/cm.**



**Converter Unit**

Blower

Air Heater

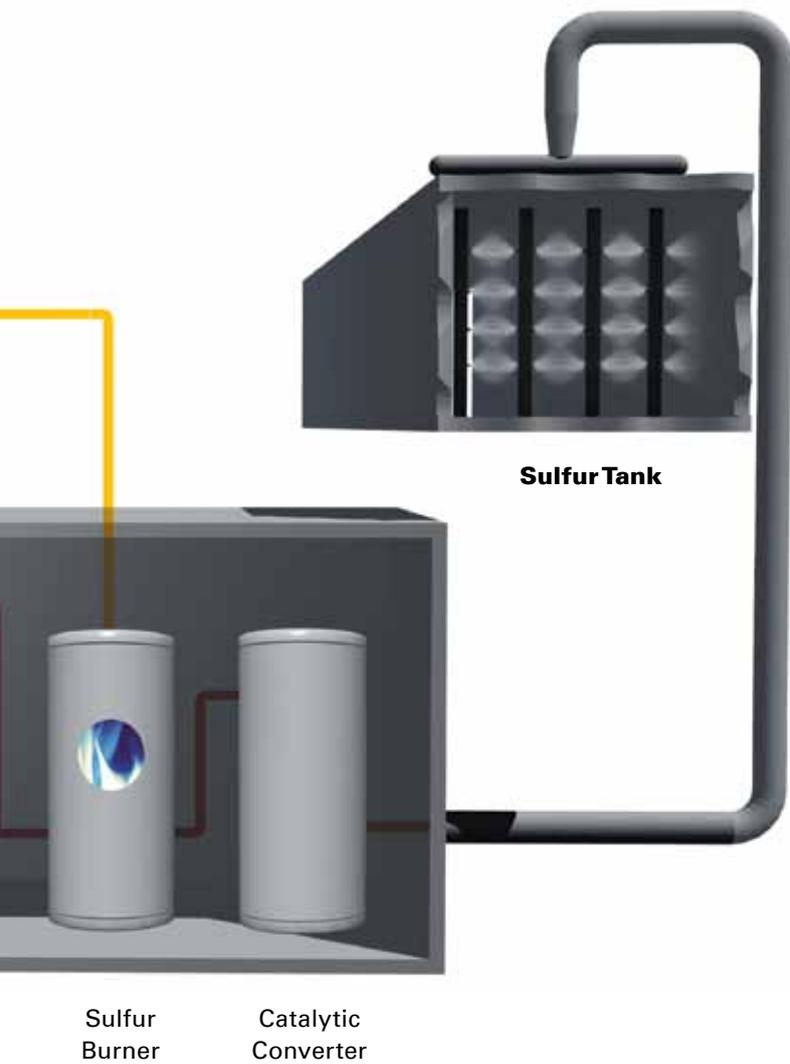
## THE PENTOL CONCEPT

Pentol Flue Gas Conditioning units are basically consisting of a converter unit, which is delivered on site completely assembled and tested, and a liquid sulfur storage tank.

The converter unit consists of the electrical and the mechanical instrumentation and machinery, which is needed to convert liquid sulfur into an SO<sub>3</sub>/air mixture.

Filtered ambient air is heated up well above the selfignition temperature of sulfur by means of electrical heaters. In the sulfur burner, the sulfur ignites, burns down and is converted to SO<sub>3</sub> with the Pentol TwinCat catalyser.

The SO<sub>3</sub>/air mixture is injected into the flue gas stream by means of injection probes with typical dosage rates of 10 to 15 ppm.



## **SULFUR STORAGE**

Depending on the availability of liquid or granulated sulfur, an appropriate tank has to be chosen.

Two metering pumps (one for backup) feed the liquid sulfur to the converter unit.

For small applications, Pentol can also supply flue gas conditioning systems with an SO<sub>2</sub> storage container.

## **ECOLOGICAL ASPECTS**

The complete installation is optimised to save energy. The energy required to keep the Catalytic converter at its operating temperature is taken from the combustion process of the sulfur. This allows to reduce the electrical load to a minimum. In addition, the air flow is reduced at low loads to enhance the net efficiency of the unit.

## RESULTS

In most countries, environmental regulations demand solid emission levels of  $50 \text{ mg/Nm}_3$  or less. Power Stations equipped with precipitators designed for high sulfur coal are not able to keep to this value all the time. **Load reductions** or **penalties** to be paid to the government are the result.

The flue gas conditioning system of Pentol is custom designed and therefore

- ▶ guarantees, that emission limits are not exceeded
- ▶ is an economical alternative to an additional ESP.

If FGD is present, the Pentol Flue Gas Conditioning system reduces the dust load on the FGD inlet resulting in a more stable operation of the FGD plant and a better quality gipsum.

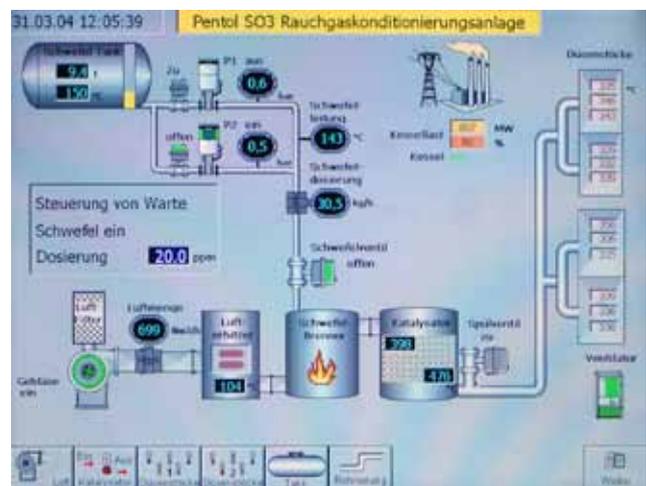


**FGC unit installed between the flue gas ducts on a 575 MW boiler. Typical dosage rate: 15 kg/h. The result: Solid emission <math>< 12 \text{ mg/Nm}\_3</math>**

## OPERATION

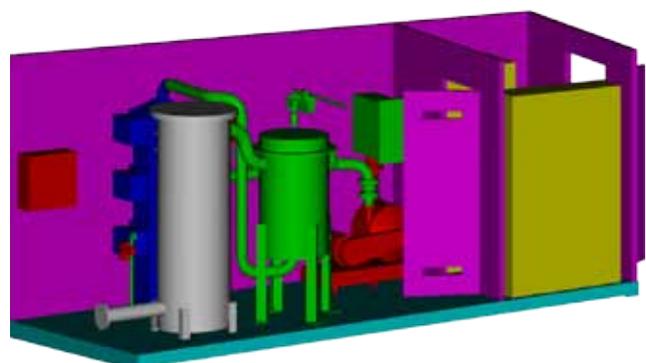
The controller of the Flue Gas Conditioning System is designed to request minimum attention from the operator Staff.

The system works automatically, following the boiler load. If available from the plant, ESP controller outputs are incorporated in the Flue Gas Conditioning System to allow fully automatic and most economical operation. A large Siemens display informs the operator about all vital information on just one screen.



**A large display informs the operator about all vital information on just one screen.**

**Arrangement inside the container. The electrical part is separated by a wall from the mechanical part.**



## RESULTS

**Pentol has more than 100 units operating in Europe.**



**Containerised FGC units and tanks are easily transported by truck or ship.**



**Rental equipment is installed in very short time. However, due to the results obtained most rental units are never returned.**



- ▶ FGC solves your EMISSION PROBLEMS.
- ▶ Affordable, FAST retrofit. If penalties have to be paid or the load has to be reduced, the investment is paid back within a few months.
- ▶ Easy to operate. No special personnel required to operate the system.

## **ABOUT US...**

Pentol develops products and services for the power industry. Our goal is to help our customers reduce emission and increase performance of coal and oil fired power stations.

Pentol looks back on more than 30 years of successful treatment of boilers and looks forward to a cleaner world.





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