

PENTOMAG[®] 4450



Combustion Additive for Gas Turbines

Eliminate Corrosion



Reduce Fuel Consumption

THINK DIFFERENTLY



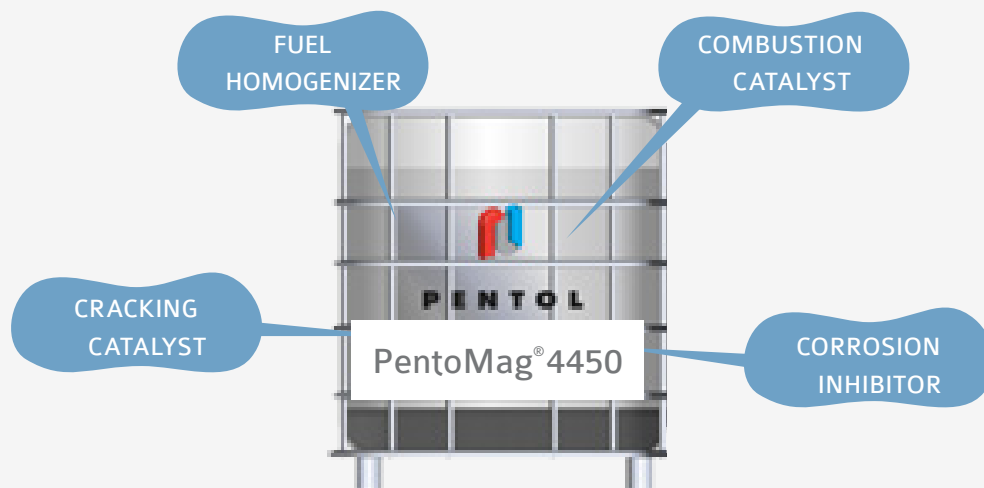
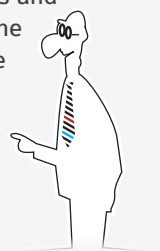
Eric Blauenstein (President/Founder)

Olivier Blauenstein (CEO)

Pentol offers a unique way to improve the **eco-efficiency** of power plants

Pentol more than 50 years of experience in improving combustion for the power industry. Our mission is to combine environmental benefits with an increase of efficiency.

An increased eco-efficiency of boilers, gas turbines and diesel engines allows our clients to participate in the reduction of greenhouse gases while saving on the operating cost: a true win-win solution!



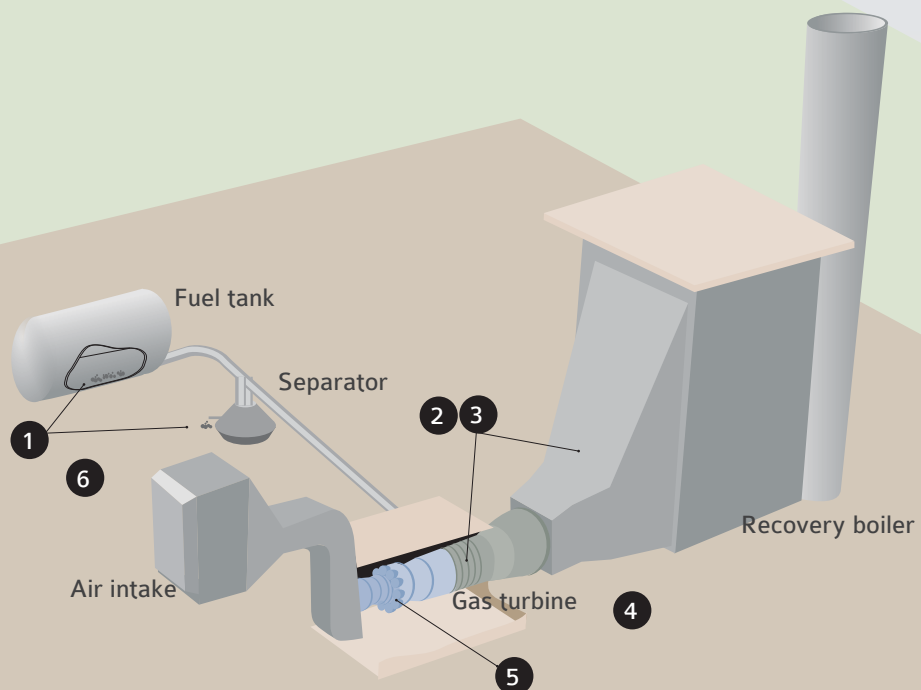
DESIGN PARAMETERS

To get the best results with combustion optimizers,
Pentol looks at the **full picture**

Beginning at fuel delivery to the plant and ending with the gases emitted and waste materials treated after combustion.

PentoMag 4450® is designed to fulfill the following goals:

- ❶ Eliminate disintegration of organic **sludge** in the fuel tanks of the refinery, the fuel trucks and the tanks in the plants
- ❷ Reduce **fouling** in gas turbine and recovery boiler
- ❸ Neutralize vanadium deposits and corresponding corrosion effects
- ❹ Reduction of maintenance time
- ❺ Improve combustion of the fuel with catalytic action
- ❻ Reduce wastewater generation



ACTION PRINCIPLE

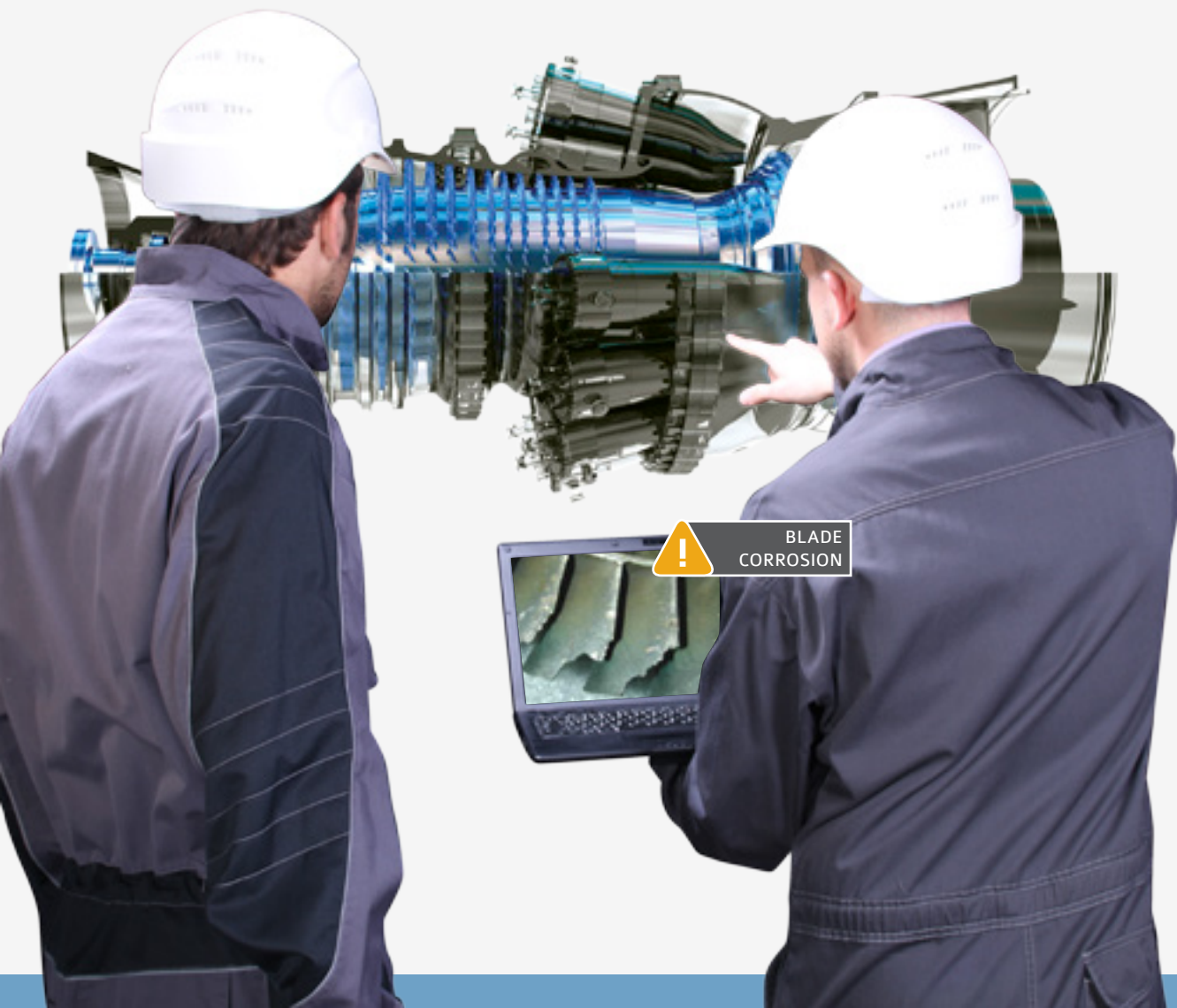
In a gas turbine that burns fuel-oil or residual fuel, ashes of the metallic salts are formed that come out with the gases of the combustion.

This formation of ashes is **INEVITABLE** as the oil contains sulphur, vanadium, sodium, potassium and other metals. These residuals adhere to the surfaces forming deposits and causing corrosion, reducing the useful life of gas turbines.

These deposits depend fundamentally on the humidity and the temperature of the gas and are corrosive in nature. The volume of the deposits formed are directly related to the content of sludge in the fuel and their physical-chemical nature of these deposits.

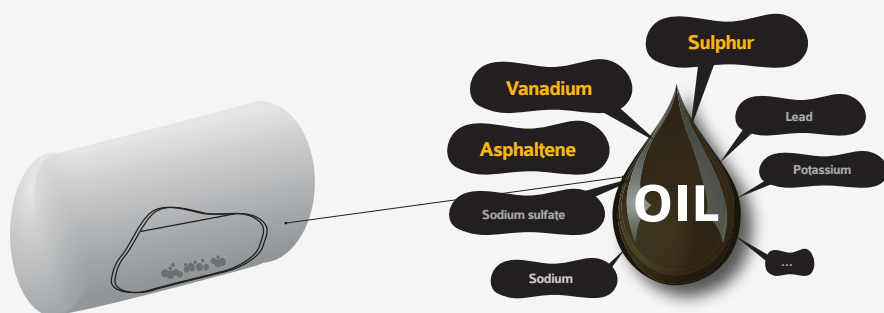
The corrosion in the gas turbines is mainly located in the combustion chamber and is provoked by two principal causes:

- Formation of sodium vanadates of low fusion point that are corrosive. These compounds are formed as the fuel contains Vanadium (V) and Sodium (Na).
- Formation of sodium sulphate (a compound corrosive at high temperatures) will be formed independently of the fuel oil sulphur content. Despite the low sodium content of the fuel-oil a sulphur content below 0,1% is enough to form corrosive compounds.



NEUTRALIZATION OF VANADIUM

PentoMag 4450® is designed for fuel oil with 70 ppm of vanadium



The additive works by **modifying the fusion point** of these combustion residuals. Thus 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 turbine and extend the useful life of the turbine as well as the recovery boiler.

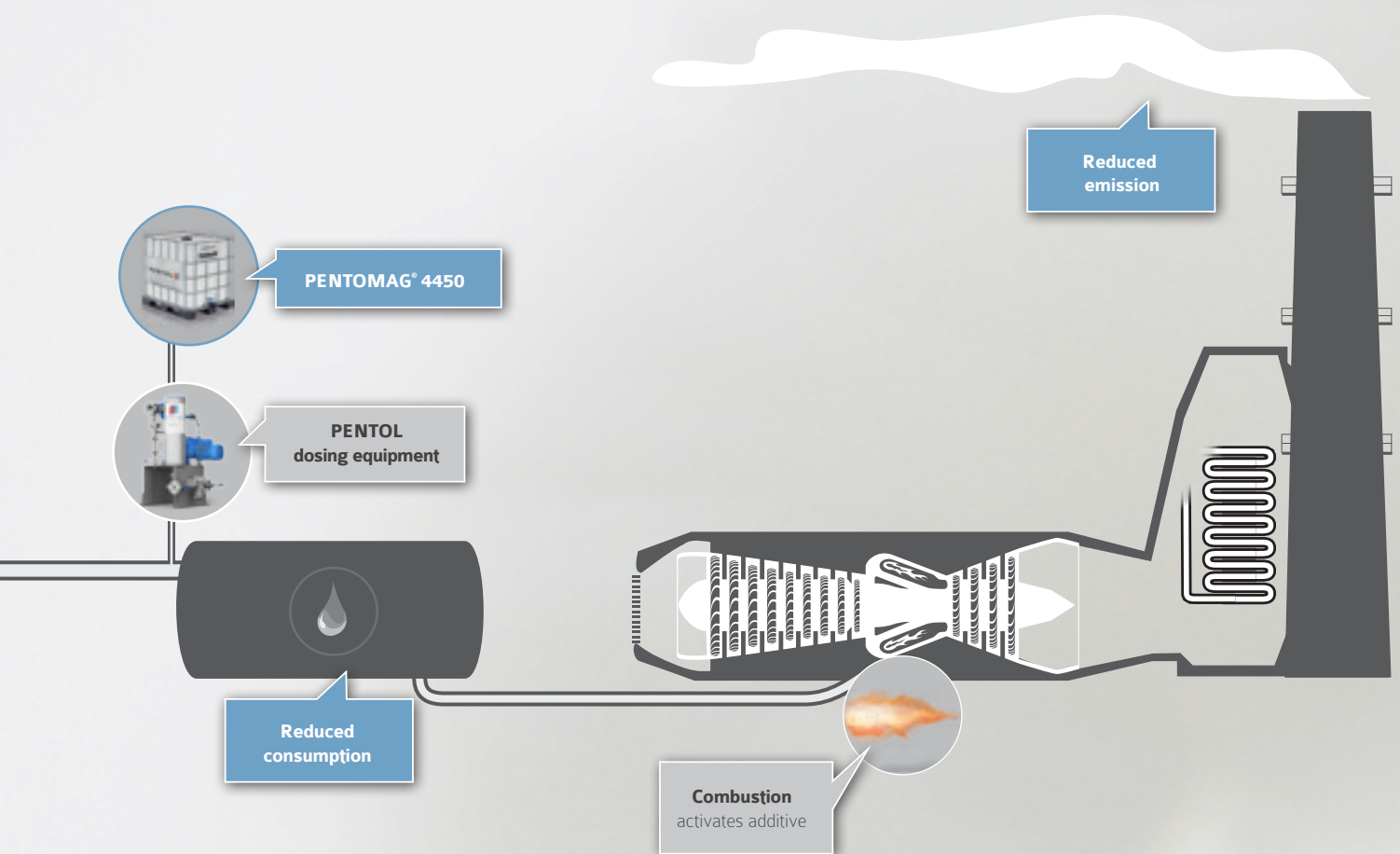
The organometallic compound of magnesium reduces the corrosive deposits due to the formation of complex salts of vanadium. The magnesium salts formed during the combustion are inert (not corrosive) and do not damage the turbine blades.

Because of the elimination of vanadium deposits, SO^2 generated in the combustion will not be converted to SO^3 and therefore the condensation of SO^3 in the recovery boiler is prevented, again leading to a reduction of cleaning cycles and corrosion issues.

CATALYTIC ACTION

The catalyst in the PentoMag® 4450 produces a more complete burn out of the fuel in any constant level of excess of air.

The combustion catalyst operates by reducing the activation energy of the fuel and reduces the excess air required for complete combustion.



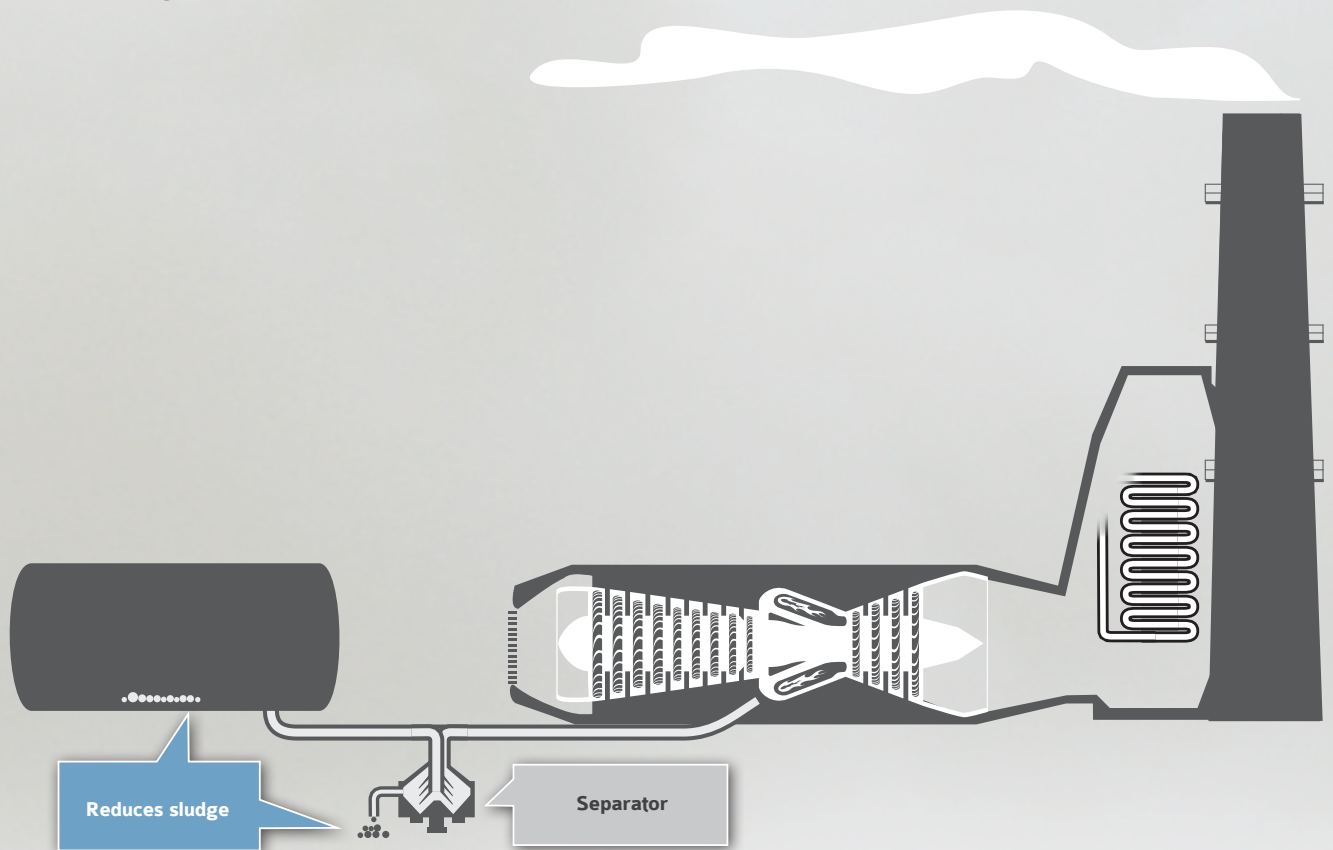
This leads to a reduction of fuel consumption, improving the combustion and producing less smoke.

SLUDGE DISPERSION

Waste reduction

PentoMag® 4550 includes sludge dispersing solvents and water emulsifiers to stabilize the fuel, keeps tanks and tank trucks free from sludge deposits and prevents the formation of sludge on the injection nozzles.

The fuel oil separators will be unloaded significantly, reducing the purge cycles and the water consumption.



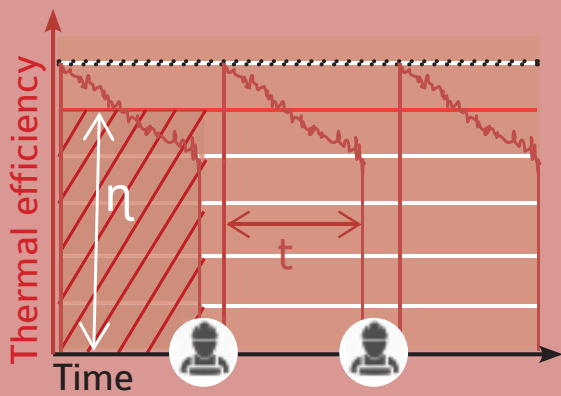
As a result, the total sludge absorbed in the fuel separators is minimized.

ECONOMY

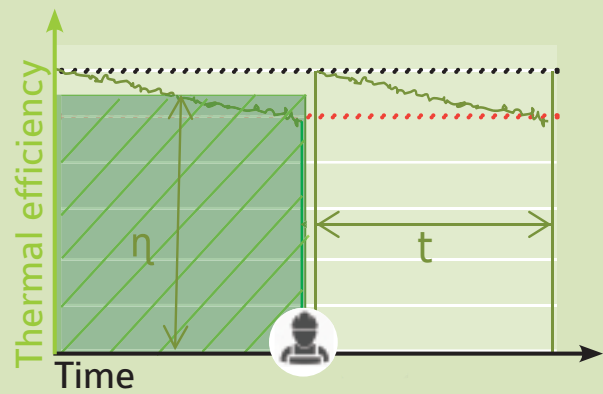
Sludge is transformed into fuel. Instead of wasting it, it can be used to produce electricity or desalinated water.

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 gas turbine.

Average maintenance rate, without PentoMag® 4450



Average maintenance rate, with PentoMag® 4450



Easy removal of deposits.
Minimized shutdown time.
Maximized productivity.
Longer lifetime of components.

ECOLOGY

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® 4450 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.



EQUIPMENT FOR DOSING

Minimal maintenance - maximal precision



PentoMag®4450 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®4450 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



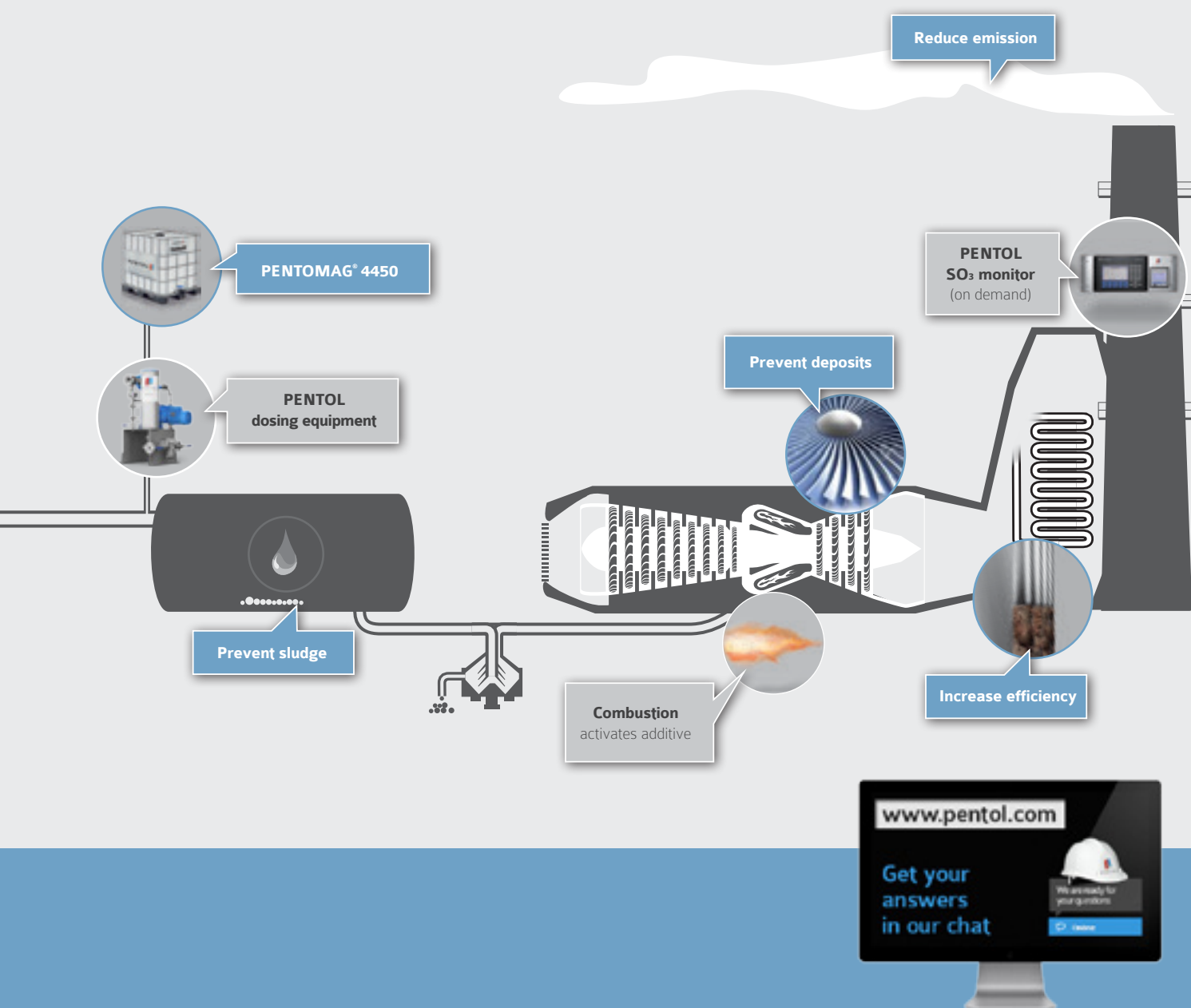
Customer relations are important to us. We keep in touch and assist our clients continuously for best results.

Victor Gomez, Sales Manager

**Get 2-5% more
net efficiency**

PENTOMAG® 4450

For Gas Turbines



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