



# Emission standards significantly beaten with efficient use of refinery gas

15 new DDG burners: Intelligent upgrade of the combustion plant at Lukoil in Burgas (Bulgaria)

The Russian oil group Lukoil operates the largest refinery in South-Eastern Europe on the Bulgarian Black Sea coast. Refinery gas occurs as a by-product when refining crude oil. This was previously not used efficiently. The steam produced in water-tube boilers is used to generate power according to the combined heat and power principle and as process steam. The boilers previously operated inefficiently and recorded emission values of about 350 mg/m<sup>3</sup> NO<sub>x</sub>.

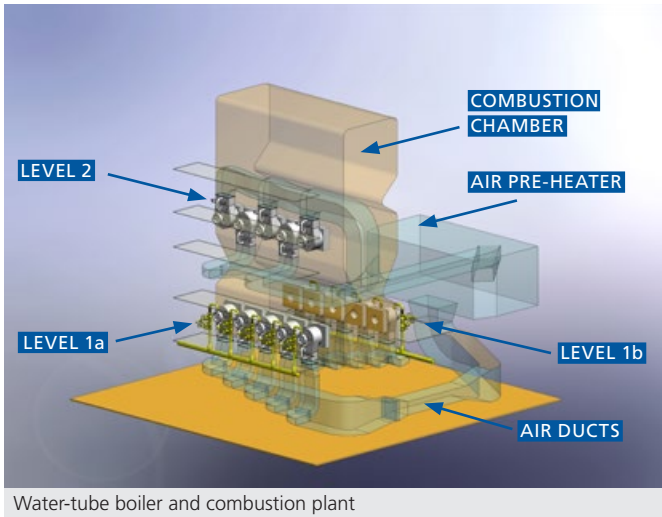
Special challenge: due to the burner arrangement, a simpler replacement with low-NO<sub>x</sub> burners would not have resulted in any great improvement in these values.

## Innovative combustion technology and process engineering

SAACKE developed an intelligent modernization concept for the combustion plant using cutting edge CFD (computational fluid dynamics) flow simulations. This concept permitted an optimal integration into the existing infrastructure and led to an extremely short renovation phase, as well as significantly reduced renovation costs.

## All the benefits at a glance

- Minimum down-time and renovation expense through optimal integration into the existing infrastructure
- Time and resource-efficient development using CFD simulations
- Increased efficiency and reduced NO<sub>x</sub> emissions
- Professional project management, quick delivery and smooth commissioning
- Robust, low-maintenance combustion systems with maximum availability that are easy to operate
- Modernized alignment for future investments and environmental regulations
- Reliable maintenance service even after commissioning



Water-tube boiler and combustion plant



Level 1a: 5 gas lance burners, air supply and flue

### A close look at the SAACKE solution

The 15 new DDG burners were arranged on two levels in order to permit a staged combustion in the combustion chamber and provide the lowest possible emission values, under the European  $\text{NO}_x$  limit values. The burners in the two lower levels are operated using sub-stoichiometric combustion while the upper level burners are operated using hyper-stoichiometric combustion. The refinery gas is now also converted to heat in the lower levels. The intelligent plant design ensures high availability and low maintenance expenses.

Thanks to the optimal combustion air supply, calculated based on CFD simulations and the significantly reduced pressure loss in the air duct, the customer was able to continue to use two existing blowers, saving about 10 % of the investment amount.

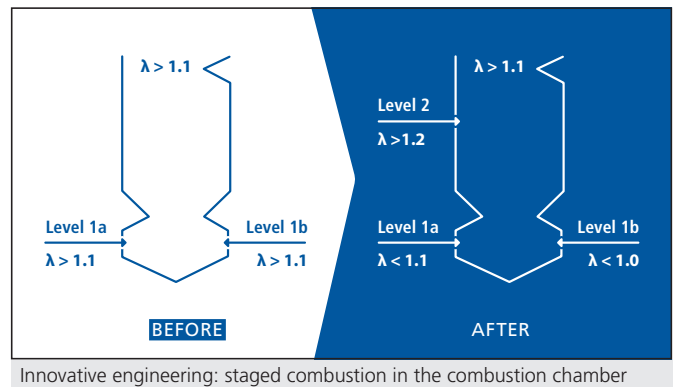
The SAACKE project management under one roof and products "Made in Bremen" guarantees an extremely short implementation phase and gives the customer planning certainty. The flexibility of the plant and the efficient combustion technology enables a rapid amortization period for the operator and also relieves the environmental burden.

### Conclusion

SAACKE solves complex challenges when upgrading water-tube boilers with high-end combustion technology and customised engineering. From planning through to smooth commissioning and maintenance, SAACKE is your partner for combustion plants and complete, optimally integrated plant systems.

*"All work was completed with great professionalism and quality and in the shortest possible time. The upgrade improved the boiler efficiency at all load points by more than 8%. At the same time,  $\text{NO}_x$  emissions have been halved."*

(A. A. Belov, Lukoil, Manager of the Burgas Plant)



Innovative engineering: staged combustion in the combustion chamber

### Key technical data: Water-tube boiler upgrade

<b>Burner type</b>	DDG
<b>Burner capacity</b>	15 x 17,2 MW
<b>Boiler capacity</b>	320 t/h superheated steam at 140 bar and 570 °C
<b>Fuel</b>	Natural gas, refinery gas
<b><math>\text{NO}_x</math> emissions</b>	Well under 200 mg/m <sup>3</sup> at a very high thermal load for the combustion chamber
<b>Design</b>	Staged combustion in the combustion chamber by arranging the burners in two levels, freely programmable SAACKE control system, new gas fitting lines, air preheating to 210 °C

For further information, please visit: [www.saacke.com](http://www.saacke.com)