



# CASE STUDY

## Boiler Diagnosis and Detection of Deposits With SMART Furnace and SMART Convection at the Lignite-Fired Power Plant in Lippendorf, Germany

### Situation

The Lippendorf power plant, consisting of the two units "R" and "S", ranks among the most modern lignite-fired power plants globally with a net efficiency of 42 %. In the past, the steam generator was operated with fixed and pre-set cleaning routines. Clyde Bergemann's task was to optimise the cleaning of the boiler unit "R" of 920 MW through the targeted deployment of intelligent on-load cleaning technology and thereby increase heat transfer and steam generator efficiency. Concurrently, the existing rigid boiler diagnosis system was to be replaced.

### Our Solution

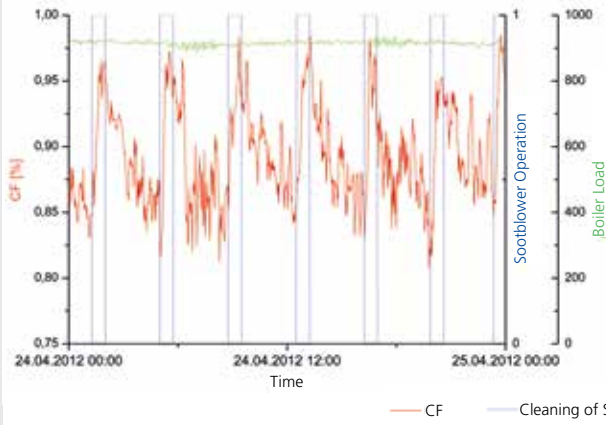
SMART Clean, the comprehensive system for intelligent boiler cleaning, combines online diagnosis and simultaneous analysis of deposits on heating and reaction surfaces and facilitates target-oriented control of the boiler cleaning.

#### 1. Furnace

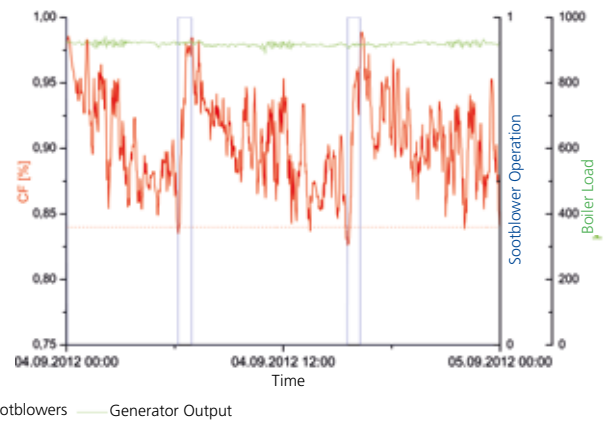
For diagnosis in the furnace, the infrared camera system SMART InfraScan is used and installed above the burner in the area with the most slagging. SMART InfraScan measures the surface temperature of the furnace walls with infrared sensors and shows the surface temperature distribution. The surface temperature rises with increased layer thickness, thus indicating zones with deposits. Based on the collected camera data, flexible cleaning

Lippendorf Power Plant data, Germany, Unit "R"	
Boiler design	Tower boiler, Babcock AG
Performance	920 MWel, 2.420 t <sup>steam</sup> /h at 267,5 bar and 554° C
Fuel	Lignite - throughput 18.000 t/day at full load





Initial status



Status after optimisation by  
Clyde Bergemann

# Targeted Cleaning of Deposits in the Entire Boiler

patterns are calculated for targeted and demand-oriented control of the water cannons with the help of the intelligent software module, SMART Furnace.

## 2. Convective Area

In the convective area, a software package is used for thermodynamic modeling (TDM) of the process. For this purpose, the whole power plant process is represented through a model, which is furnished and trained with historical process and measurement data. During operation, current measurement data from the water/steam cycle and the flue gas is then used as input for the model. By taking the boiler load and limiting conditions into account, TDM calculates heat and mass flow as well as the effectiveness of the individual heating surfaces. If a heat exchanger is identified as not efficient, this information is forwarded to "SMART Convection". SMART Convection is the software for the analysis of fouling in the convective area, which activates the related cleaning devices with optimum cleaning parameters after successful detection of the main fouling areas.

## Results

- determined over a defined reference period -

- Avoid cleaning too often or too seldom in the entire boiler.
- Reduction of superheater spray rates by 7.8 kg/s.
- Reduction of sootblowing steam by 1.2 kg/s in the convective area through the application of thermodynamic balancing.
- Reduction of flue gas temperature after the economiser by 3.1 °C.
- Increase of boiler effectiveness by 0.26 %.



User interface of SMART Clean – TDM system



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