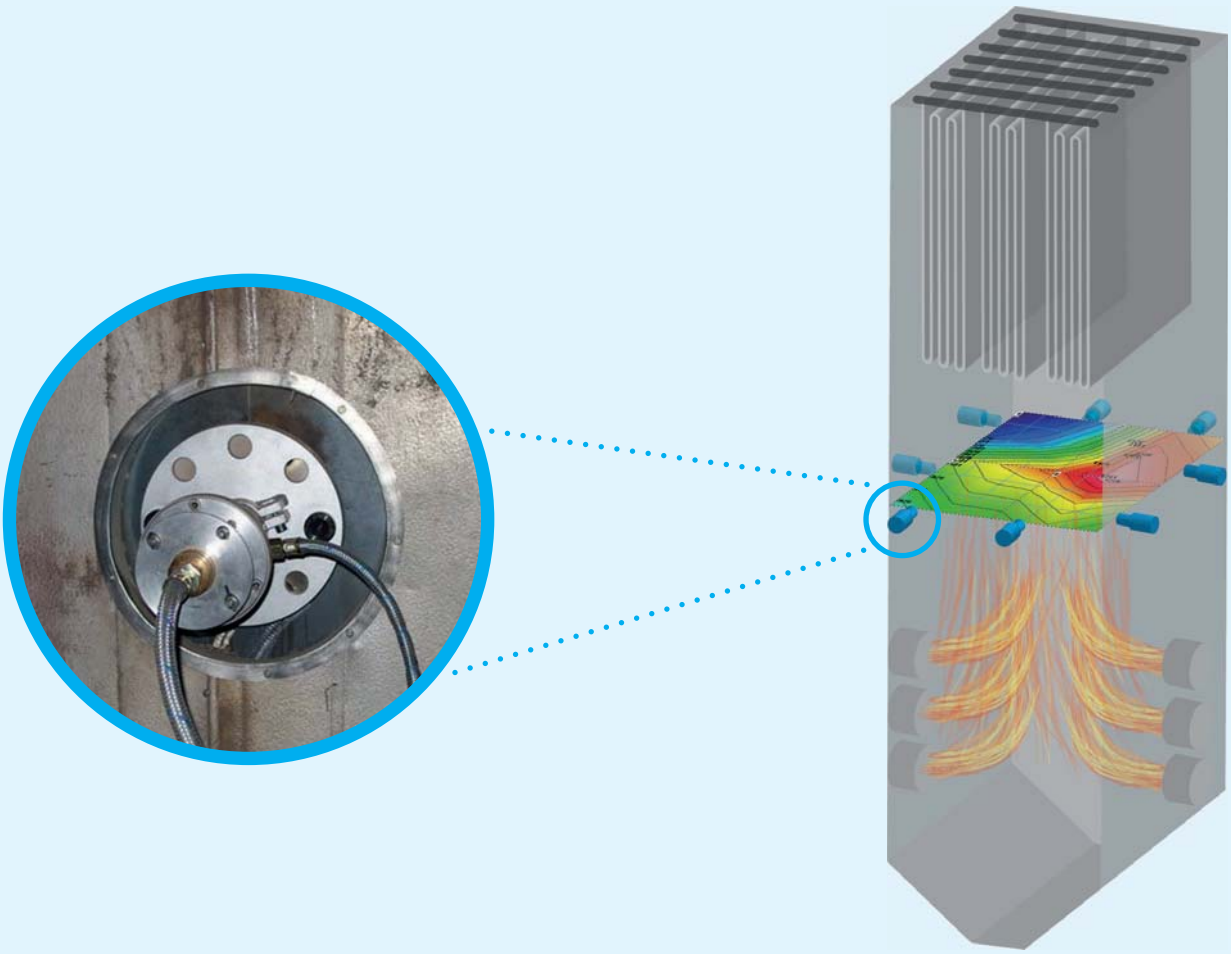
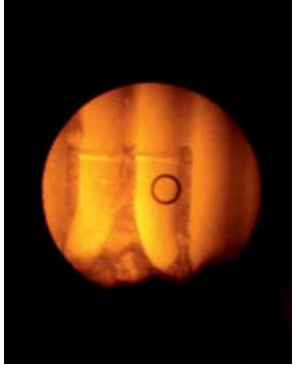


CASE STUDY

Process monitoring with SMART IsoTemp at coal-fired As Pontes power plant, Spain

CLYDE BERGEMANN



SMART IsoTemp
Thermal diagnostics for prompt optimisation

CLYDE BERGEMANN

Situation

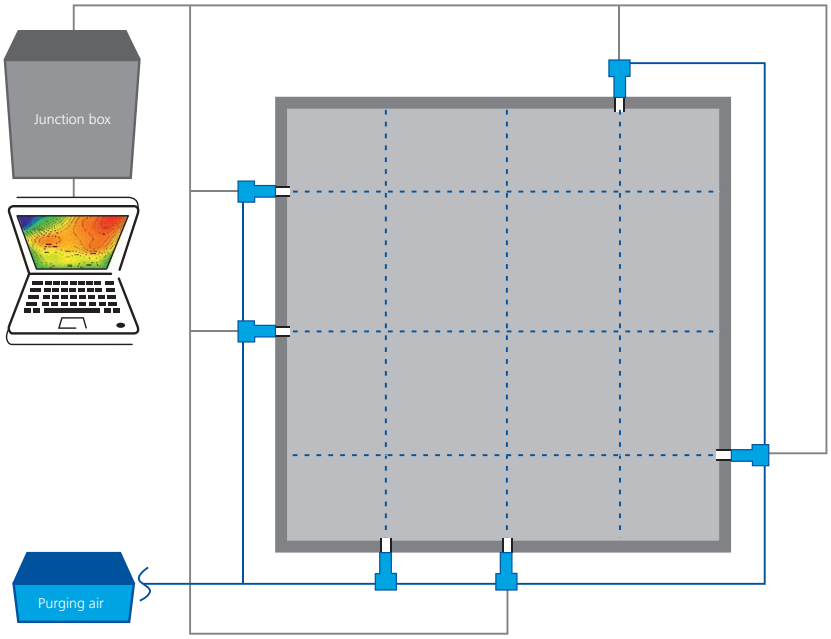
Variable boiler operation with changes in mill and burner combination leads to unpredictable imbalance in the flame position. This results in thermal overload at the membrane walls in the evaporator. Slagging hotspots will build on these areas of the furnace.

By altering the boiler design and changing from local lignite coal to imported sub-bituminous coal the problems cannot be completely avoided. In thermal overloaded areas, the evaporator tends to slag, in spite of using imported coal with a very low ash portion.

Objective target

The main objective target of using SMART IsoTemp was to gain a stable operating performance by retention of the variable boiler operation. Essential for this was to have a symmetrical and constant positioning of the flame in the middle, which would promote the cooling of the ash particles in the vicinity of the wall. This results furthermore in a reduction of deposit formation.
Thereby, the formation of local limited slagging in the furnace can be reduced.

Boiler data As Pontes, Spain	
Boiler design	Tower type boiler, Foster Wheeler
Performance	370 MWel 1090 t_{Steam}/h at 162 bar and 538 °C
Fuel	Sub-bituminous coal (import) – Mass flow of 3840 tonnes/day at full load
Firing	Tangential firing, 13 burner (Type "Jet") from EVT
Mills and coal/air supply	6 coal mills with 4 levels of secondary air each by EVT



SMART IsoTemp design at As Pontes power plant

Reliable centring of the flame

Solution

Important control parameters for qualitative evaluation of the combustion are the flame and flue gas temperatures.

SMART IsoTemp is an optical measurement device which records and evaluates these parameters continuously and contactless in real-time.

Based on the results, corrective actions in the firing operation can be carried out just in time to keep the temperature in optimised operation and to stabilize the operation performance.

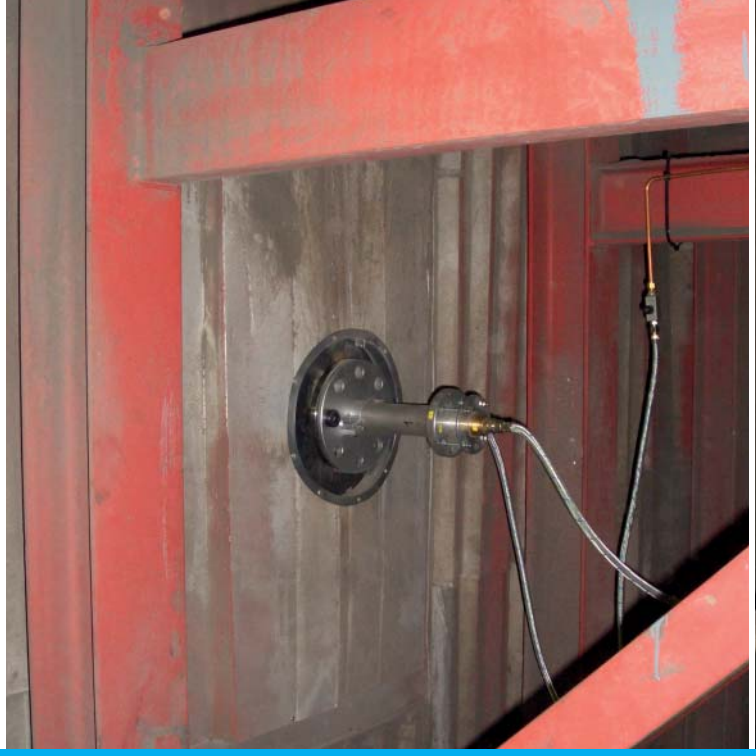
Realization

The furnace conditions call for six SMART IsoTemp pyrometers. To establish the desired optimisation all SMART IsoTemps have to be installed at the same level at the boiler wall at the end of the furnace. Due to the high ambient temperatures, a fibre optic detects the radiative temperature of the furnace and sends this to the pyrometer.

A PC based detection system transfers the radiation into temperature signals, from which the temperature profile of the complete furnace section will be generated. The visualisation is presented in a two dimensional image. Using an interface, the visualisation along with the measured temperature signals, the temperature distribution and the absorption coefficients will be transferred to the process control system.

The control centre receives easily interpretable information and is able to optimise the following parameters in real-time:

- Air feed and velocity
- Fuel mass flow
- Burner and mills combinations

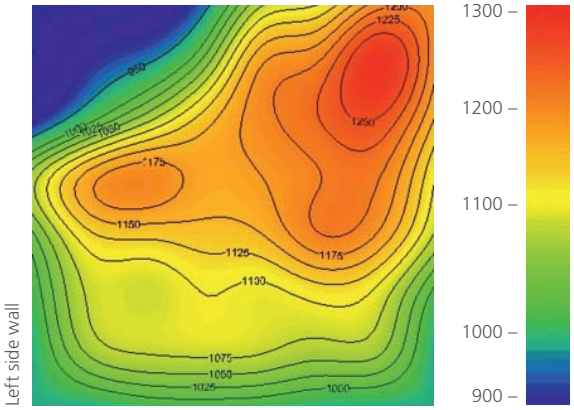


Flexible boiler operation by transparent combustion process

Results:

- Transparent process flow – The control centre easily recognizes the quality of the combustion process and can optimise it in real-time.
  This is especially helpful during the start-up process of the boiler after shut-downs, strong reductions in the boiler load and changes in mills.
- Results of the corrective actions for flame adjustment will be recognized.
- Changes in the fuel mix are procedural and at any time controllable. The important control parameters, flame temperature and location, are continuously monitored so that the temperature distribution can be presented as information that is easily understood.
- High fractions of unburned coal can be noticed.

Visualisation of the temperature distribution by thermal diagnosis with SMART IsoTemp



Results:

- Temperature distribution shows extreme flame imbalance

Consequences:

- Local slagging and corrosion
- Thermal overloading of the heat exchanger

Action needed:

- Correction of the furnace settings

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