

EUtech Scientific Engineering

Power Generation Solutions

- Advanced measurement diagnostics
- Intelligent control strategies
- Combustion optimization



EUvis insitu™

On-load monitoring
inside furnaces

EUflame™

Multi-dimensional
flame temperature

EUvis™

Furnace monitoring and
flame analysis

EUcontrol™

Real-time combustion
optimization

EUsoft air™

Flow measurement with
virtual sensors

EUcoalflow™

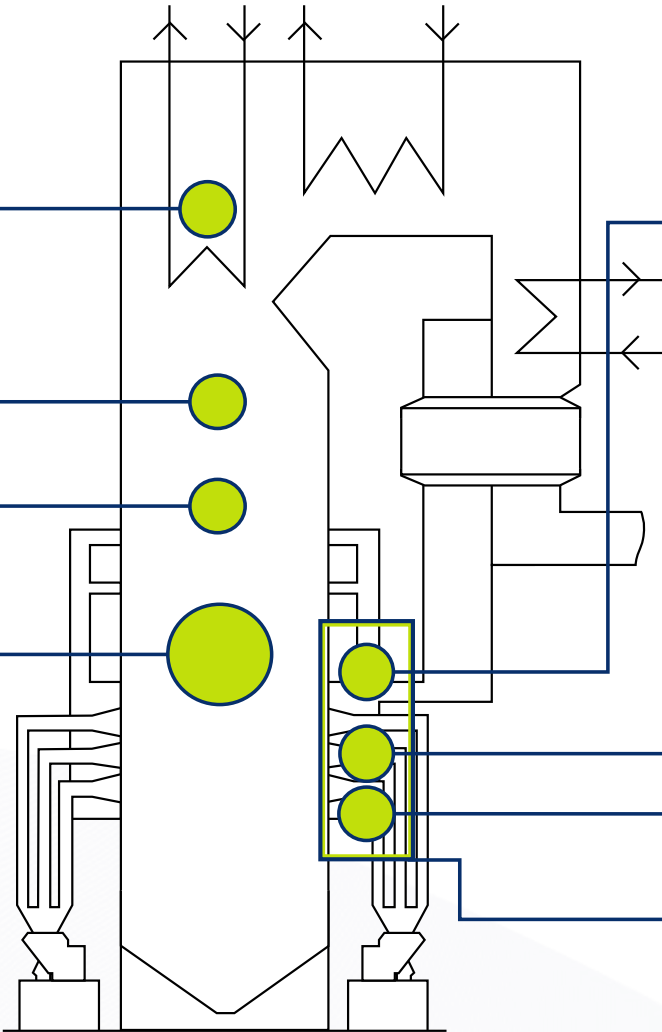
Coal mass flow control

EUcoalsizer™

Coal flow analysis

**Total AFR™
Management**

Air Fuel Ratio



EUcoalsizer™

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EUcoalsizer™

Laser-based online analysis of coal particles

The coal particle size spectrum has a strong impact on the combustion process. It influences ignition delay, combustion efficiency and Lol (loss on ignition), the emission levels as well as slagging and fouling. Despite the significance of this property, there has not yet been a robust and easy to handle system for the online measurement of coal fineness inside the pipe.

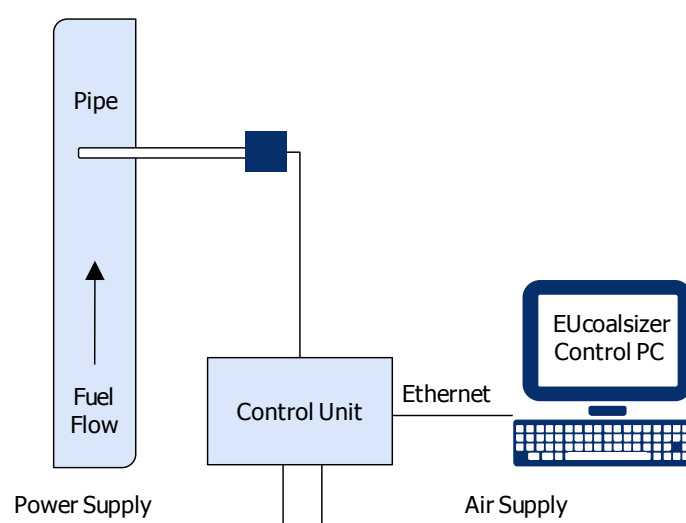
EUcoalsizer solves this problem. The system measures the particle size distribution and the coal and air flow inside a measurement volume that is placed at the tip of an insertable lance. The results are available in real-time and open up possibilities for optimization.

Fuel Flow Analysis

- Direct reading of particle size distribution, velocity and temperature
- Continuous measurement capability
- Real performance monitoring
- Coal flow and air/fuel distribution tuning
- Spatially resolved readings (2D-distribution)
- Fast tuning of modern burners and feeders e.g. low NOx burners, dynamic feeders
- Applicable to various solid fuels e.g. hard coal, biomass, lignite

Benefits

- Real-time mill adjustment and fuel line balancing
- Condition-based pulverizer maintenance
- Improvement of fuel consumption efficiency
- Reduction of emissions and Lol
- Combustion quality enhancement
- Advantages over isokinetic sampling method, e.g. results available online in real-time



EUcoalsizer system set-up



EUcoalflow™

Online coal flow measurement

The air-fuel-ratio (AFR) has a strong impact on the combustion process. It influences ignition delay, combustion efficiency and Lol (loss on ignition), the emission levels as well as slagging and fouling. In order to improve combustion quality and boiler performance online reading of the coal flow in each coal pipe is required.

EUcoalflow is an online system for dynamic coal flow monitoring and balancing. It is based on non-intrusive micro-wave sensors which continuously measure the mass flow and coal velocity inside coal pipes and quantify the imbalance of coal flow from pipe to pipe.

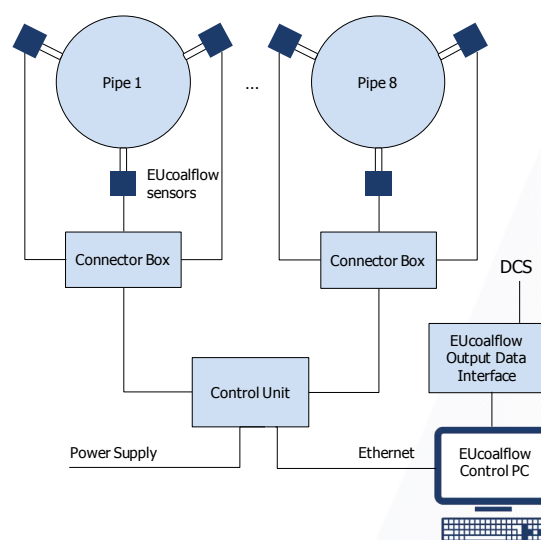
In combination with **Total AFR™ Management** EUcoalflow enables to adjust the air-fuel-ratio at burner level.

Real-time Flow Measurement

- Reading of current mass flow situation
- High sensitivity and dynamics
- Independent of fuel type/quality
- Easily retrofitted to existing plants/ports
- Essential for combustion optimization
- Seamless integration into DCS
- EPRI tested, patented system
- Available as stationary and mobile system
- More than 1,200 installations worldwide

Benefits

- Fuel flow balancing
- Reduction of fuel consumption
- Reduction of Lol, emissions and slagging
- Increasing efficiency
- Non-intrusive measurement
- Applicable to various solid fuels
e.g. hard coal, biomass, lignite



EUcoalflow system set-up



EUsoft air™

Taking control of air flow

Efficient and optimal process control requires precise and reliable process information. This is particularly true for the air flow distribution in a thermal steam generating unit: The challenge is to achieve perfect mixing of the air and the fuel at the individual burners, as this has strong repercussions on efficiency, emissions and combustion quality. Conventional air flow measurement technology reaches its natural limits when equipping an entire boiler: Not only is it too costly to install, the maintenance burden is very high, and, above all, the readings are not as accurate and robust as required over the entire operating range.

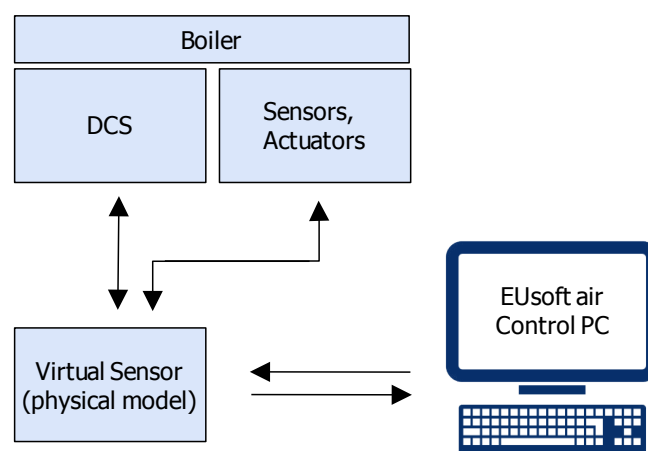
This is where EUsoft air steps in, a next generation virtual sensor. Essentially, it is a clever piece of software that continuously determines the complete air flows from readily available DCS data.

Virtualization

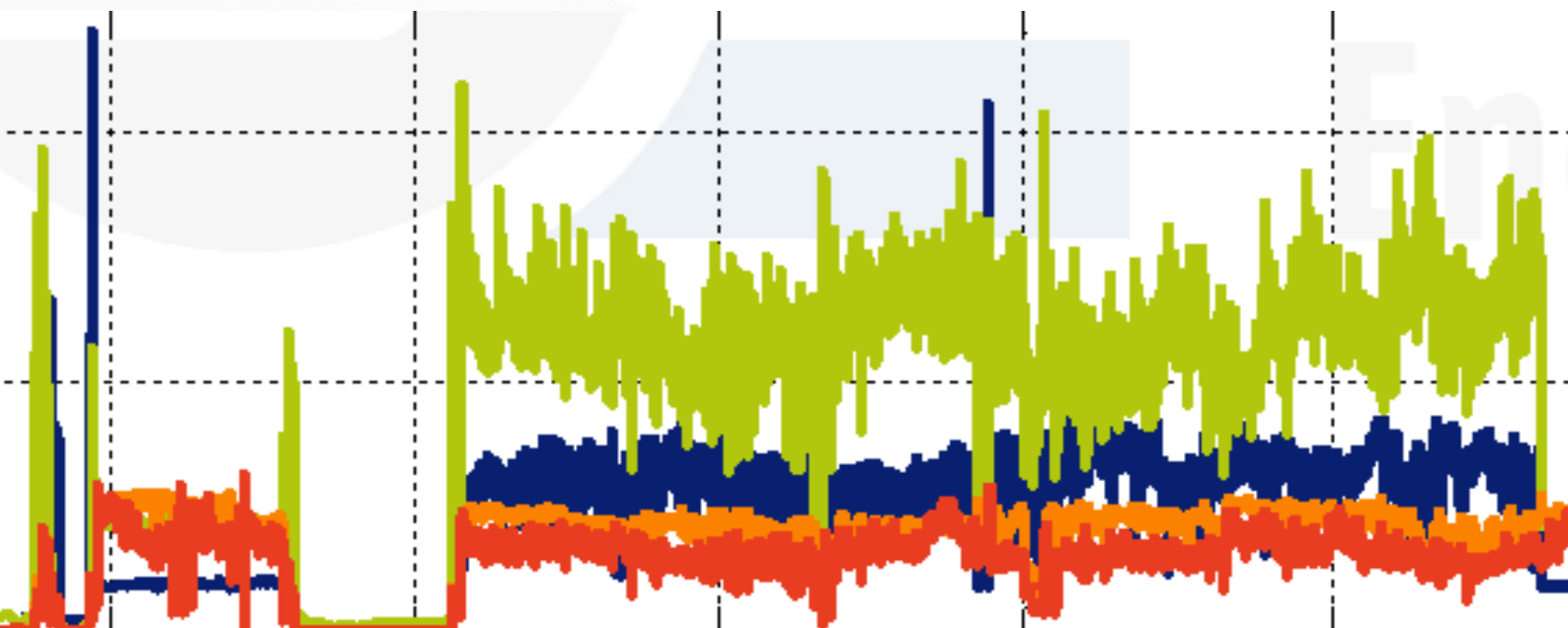
- Robust air flow measurement
- Based on physical system model
- High sensitivity and dynamics
- Leverages redundant process data
- Extends traditional measurement concepts
- Platform independent
- Seamless integration into DCS

Benefits

- Reliable *and* accurate
- Limited hardware requirements
- No maintenance necessary
- Improved combustion control
- Improvement of availability and flexibility
- Identification of faults in a very early state



EUsoft air system set-up



EUflame™

Flame temperature monitoring system

The flame temperature and its distribution are fundamental properties of the combustion process influencing coal devolatilization, pollutant formation, heat transfer, unburned carbon (LoI) as well as slagging and fouling. Moreover, an unrecognized imbalance of the flame ball position may impose excessive stress on boiler parts leading to premature system failure. Reliable information on the temperature and its distribution are therefore paramount for an optimal boiler operation.

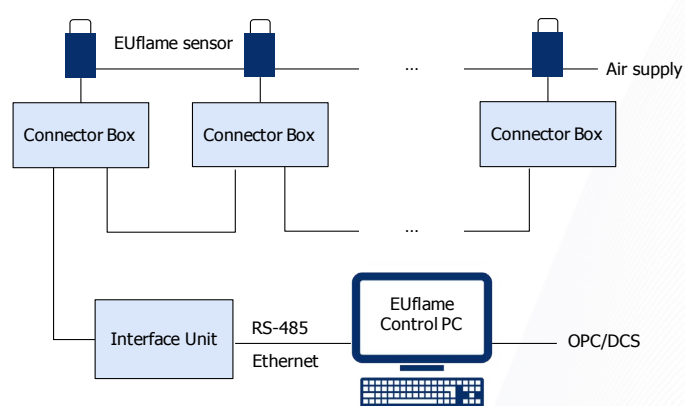
EUflame is an optical sensor based system specially designed for the application in fossil-fired steam generators to measure the furnace exit gas temperature (FEGT).

Multi-dimensional Temperature Profiling

- Precise measurement of FEGT distributions
- Essential pre-requisite for robust and optimal SNCR operation
- Combustion and flame monitoring
- Flame ball centering
- Applicable to hard coal, lignite, biomass, gas etc.
- Two-dimensional temperature profile mapping
- Available as stationary and mobile system
- Monitoring of oil-fired start-up

Benefits

- Online combustion optimization
- Improving handling of differing coal qualities
- Efficiency and availability improvement
- Reduction of thermal material stress
- Optimizing effectiveness of on-load cleaning
- Emission reduction
- Shortening of start-up time



EUflame system set-up



EUvis™

Furnace monitoring and flame analysis

An unbalanced combustion process caused by flame displacements, low burn-out rates and deposits has a significant influence on boiler efficiency. High temperature corrosion and thermal stresses can lead to boiler tube ruptures. In addition, slagging and fouling reduce the heat exchanger efficiency, disturb the local heat balance and require expensive on-load cleaning.

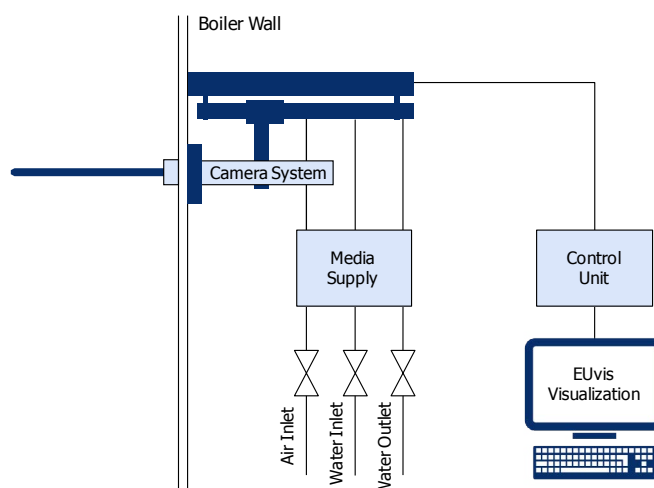
EUvis is a specially designed monitoring system for on-line analysis of combustion processes inside furnaces. It helps to keep close track of the process and operating conditions, and identifies problem areas early in advance. The powerful software tool helps to automatically analyze and evaluate process information - such as flame position and deposit thickness - using edge detection algorithms.

Video-based Monitoring

- Flame analysis and burn-out grate monitoring
- Continuous supervision of critical areas e.g. boiler walls, ash hopper and heat exchangers
- Water-cooled camera housing with pneumatic retraction unit
- Various front optics with purging air adapter
- Digital image acquisition and processing
- Applicable to all types of fuel

Benefits

- Real-time supervision of combustion quality
- Adjustment of burner operation and flame appearance
- Direct identification of deposits and/or damages
- Flame positioning and stabilization
- Immediate reaction to critical situations for increased plant safety
- Evaluation and controlling of the soot blowing effectiveness
- Avoiding of tube damages



EUvis system set-up



EUvis insitu™

Intelligent boiler condition monitoring

The condition of the boiler tubes has a significant influence on boiler operation and efficiency. Slagging and fouling reduce the heat exchanger efficiency, disturb the local heat balance and require expensive on-load cleaning. Worse, slagging and fouling may prove irreversible if corrective action is not initiated in a timely manner. Excessive cleaning, however, leads to tube ruptures – the root cause of many forced outages.

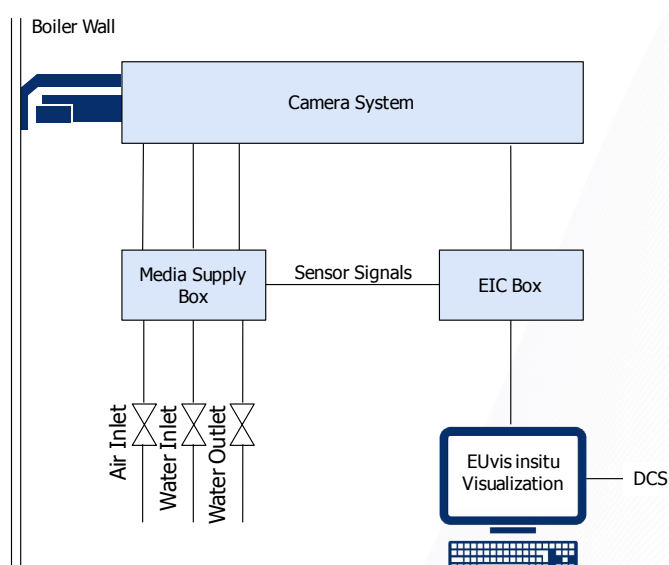
EUvis insitu is a one-of-a-kind fully insertable camera system. It traverses the boiler under full load operation to constantly monitor the condition of the boiler tubes.

Optical Inspection System

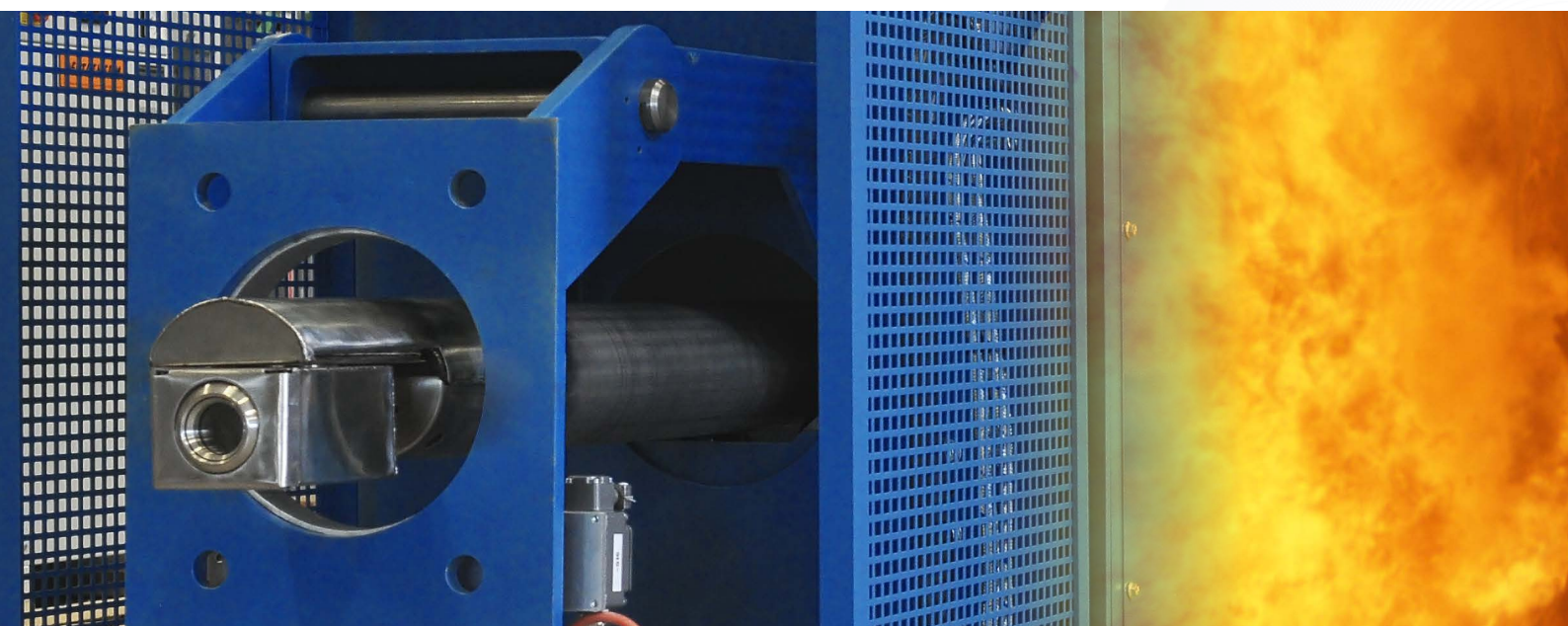
- Continuous monitoring to improve cleaning strategies
- Visualization and analysis of erosion
- Early identification of problematic operating conditions
- Condition-dependent boiler maintenance
- Applicable to fossil fuels and biomass
- Rotational camera head +/- 120°
- Traversing range up to 5.5 m
- Operating temperature up to 1,250 °C

Benefits

- Localization and quantitative measurement of deposits
- Evaluation and controlling of soot blowing effectiveness
- Prevention of tube damages caused by overcleaning
- Immediate reaction to critical situations
- Improve handling of differing fuel qualities



EUvis insitu system set-up



Total AFR™ Management

Total control of all essential combustion parameters

An air-fuel-ratio control strategy plays a fundamental role in the safe and profitable operation of firing systems in heaters, boilers and furnaces. Especially in modern low-NOx burners the air-fuel-ratio has serious impact on the combustion quality. Inefficient conditions caused by an inadequate air-fuel-ratio result in high loss on ignition, emission problems, reduced boiler efficiency and material stress.

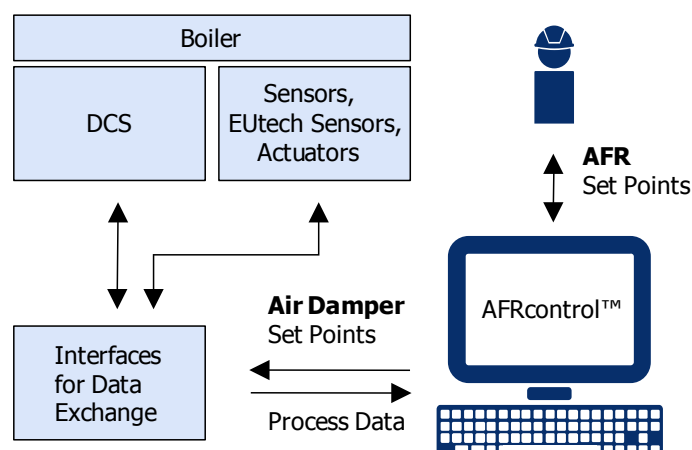
Total AFR™ Management is a real-time air-fuel control system that considers all relevant parameters to exploit the full potential of power plants. It enables the direct adjustment of the air-fuel ratio, which is the key-driver of combustion. Using physical and model-based measurement data of e.g. coal flow, air flow, coal fineness etc. based on DCS data and EUtech sensors, the secondary air dampers are adjusted to the desired air-fuel-level. Securing correct air-fuel-ratio values, the combustion process can be optimized reaching higher efficiency, lower emissions and reduced slagging.

Air-fuel-ratio Control

- Continuous and optimal air-fuel-ratio control
- Simple integration into existing DCS
- Real-time and online parameter changes
- Air and coal flow measurement using EUtech sensors
- Integration of EUcontrol, overall combustion optimizer (optional)

Benefits

- Direct profit through proper air-fuel-ratio settings
- Relief of control room personnel
- Clean and reliable combustion process
- Positive effects on availability and maintenance
- Applicable to all boiler designs



Total AFR Management system set-up



EUcontrol™

Intelligent optimization of fossil fired steam generators

The overall performance and availability of a fossil-fired thermal power plant is predominantly affected by the steam generating unit. Even though conventional plant DCS/PLC control ensures sufficiently safe and reliable operation, it neither rigorously optimizes the boiler control settings nor does it take care of special combustion problems. Not to mention that much of the information gathered by modern IT systems and advanced monitoring equipment remains untapped. Facing growing technical, environmental and commercial challenges, plant operators can avoid substantial investments by unearthing these “hidden reserves”.

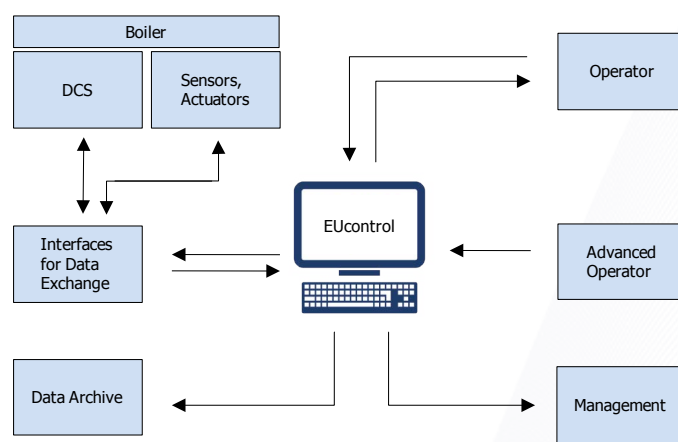
EUcontrol extracts available system information and uses it for intelligent control and optimization objectives: Increasing combustion efficiency, lowering emissions and reducing slagging/fouling tendencies in fossil-fired steam generators.

Optimization Strategy

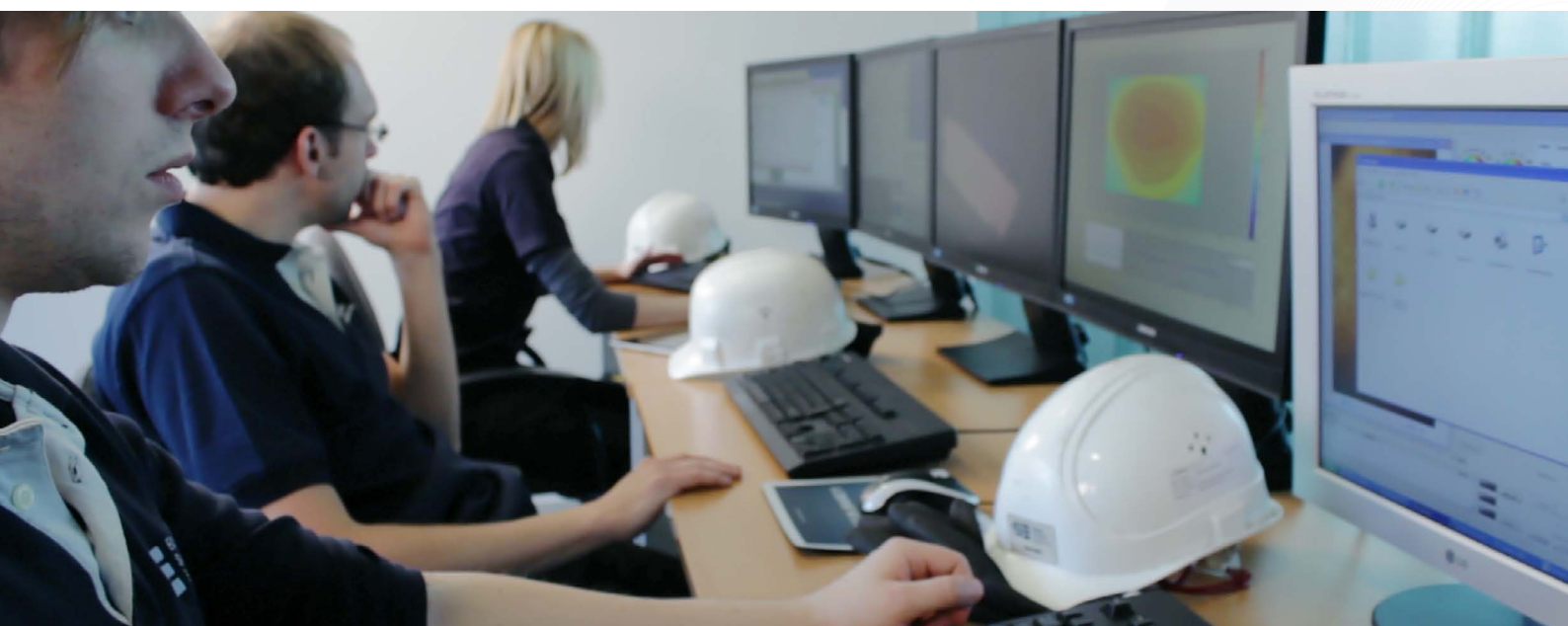
- Real-time optimization
- Physical model predictive control (PMPC)
- Adapting to changing plant conditions
- Multivariate target optimization
- Emissions control
- Mill operation control

Benefits

- Reducing and controlling emissions
- Improving boiler efficiency
- Reducing slagging and limiting loss on ignition
- Enhancing availability
- Reduction of fuel consumption



EUcontrol system set-up



EUtech Scientific Engineering GmbH

EUtech Scientific Engineering was founded in 1999. The company has established itself nationally and internationally as a successful engineering company in the areas of test stand engineering, simulation, automation and measuring technology. In addition to engineering services in all development phases, we offer turnkey test stands, software-based development tools and measurement systems for the power generation industry. With our innovative model based approach we optimize operations and increase the efficiency of power plants by stepping through the three phases: Measurement - Control - Optimization.

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