

Enhancing combustion-driven boiler efficiency and competitiveness

through advanced two-dimensional temperature measurement with optical pyrometers

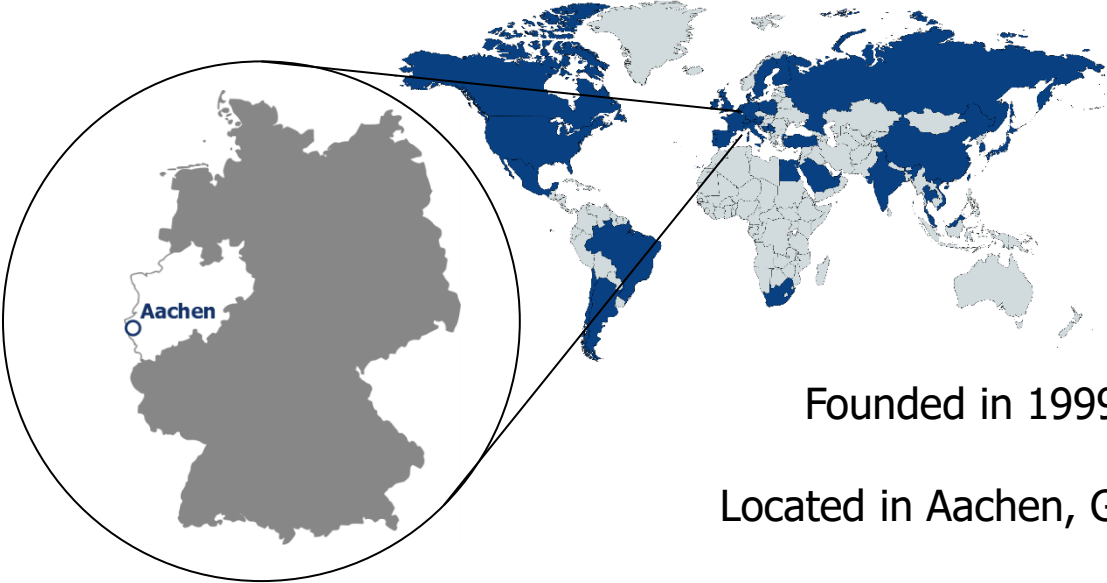
- Dr. Stefan Heidinger



Content

- EUTech Scientific Engineering
- Volatilization of power generation in India
- Combustion challenges
- Key process parameter: Furnace exit gas temperature (FEGT)
- Best practices & application results
- Summary and outlook

Company Profile



Founded in 1999 (1995)

Located in Aachen, Germany

1000+ executed engineering projects

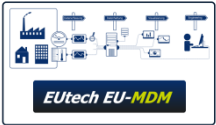
International teams of highly qualified engineers

Global customer base from various industries

Regional engineering partners in Australia, USA, China, India, Taiwan, Europe, Brazil, Korea and Japan



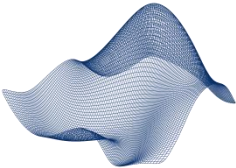
-  Digital Solutions
-  Energy Solutions
-  Testing Solutions



Data Management and
Field Test Support



Diagnostics



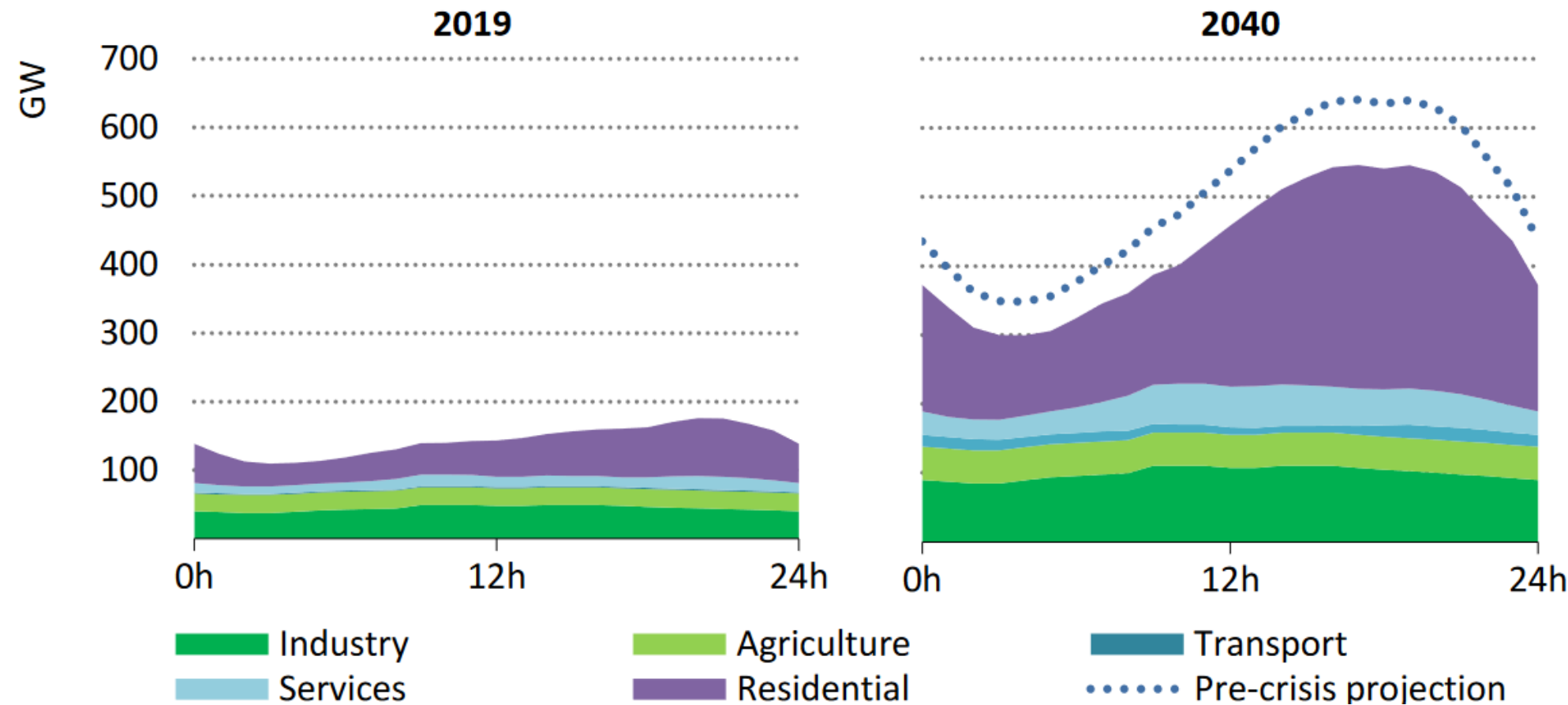
Simulation & Control



Services

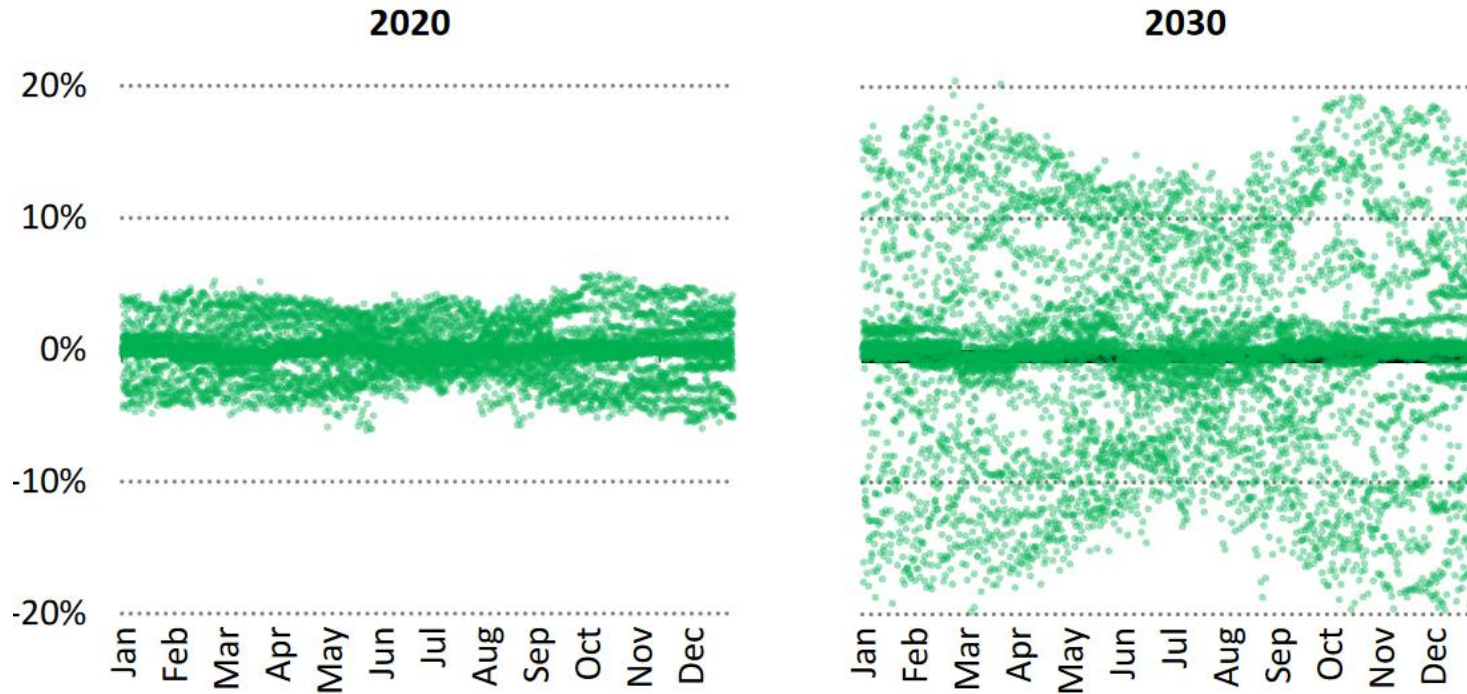
Volatilization of power generation in India

Daily electricity demand in India in 2019 and 2040



India Energy Outlook 2021 - World Energy Outlook Special Report - International Energy Agency

Hourly change in generation



“In the wake of Covid-19, coal has been acting as the main source of flexibility in India’s power system.”

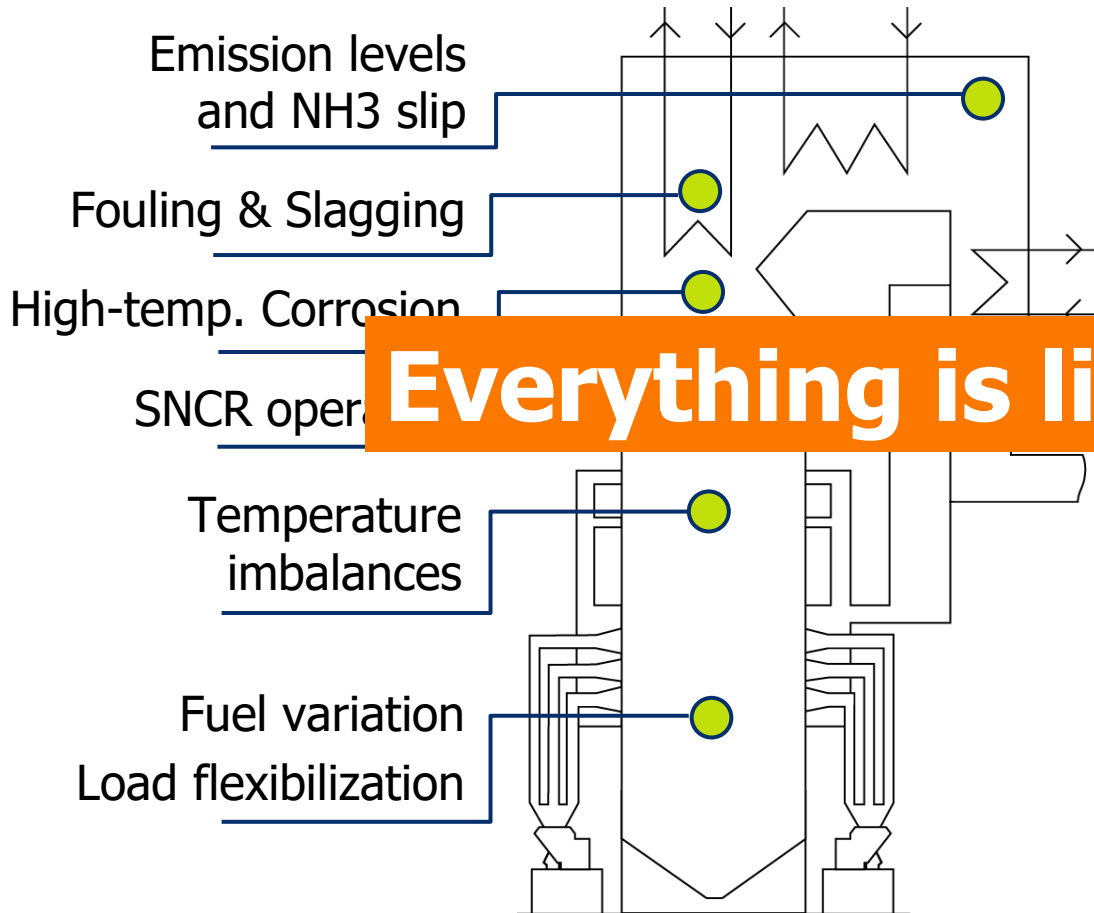
“...lower output and more frequent and faster ramping may lead to increased variable costs, and potentially to some need for investment in technical upgrades, as well as increased wear and tear of equipment.”

India Energy Outlook 2021 - World Energy Outlook Special Report - International Energy Agency

Combustion challenges



Temperature is a key parameter



Demand

- Cost-effective determination of important process variables (online root cause analysis)

- Online measurement and diagnostic

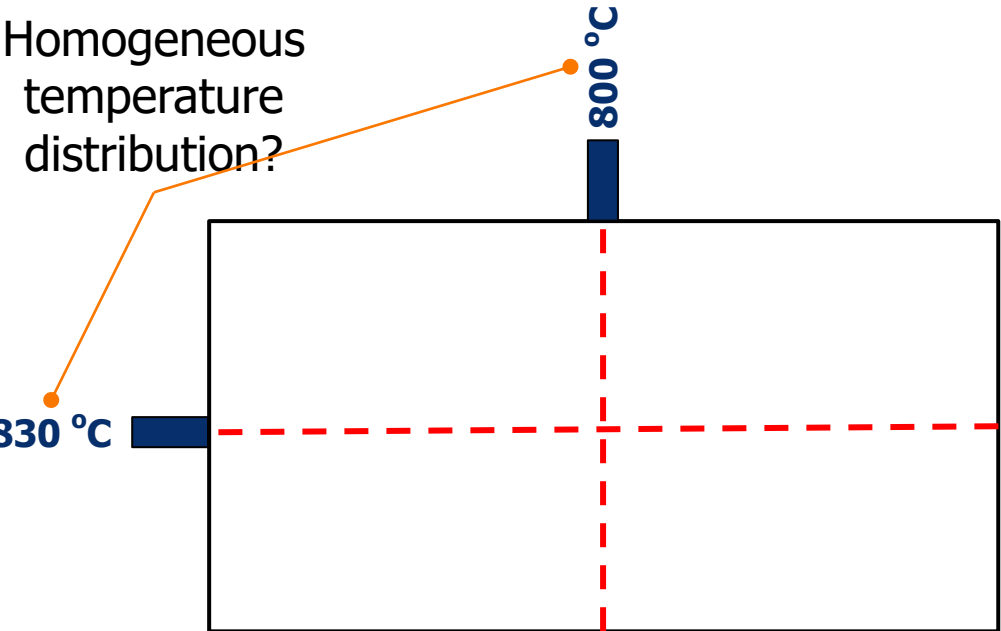
Measures

- Effective primary measures
- Enabling secondary measures

Furnace exit gas temperature (FEGT)

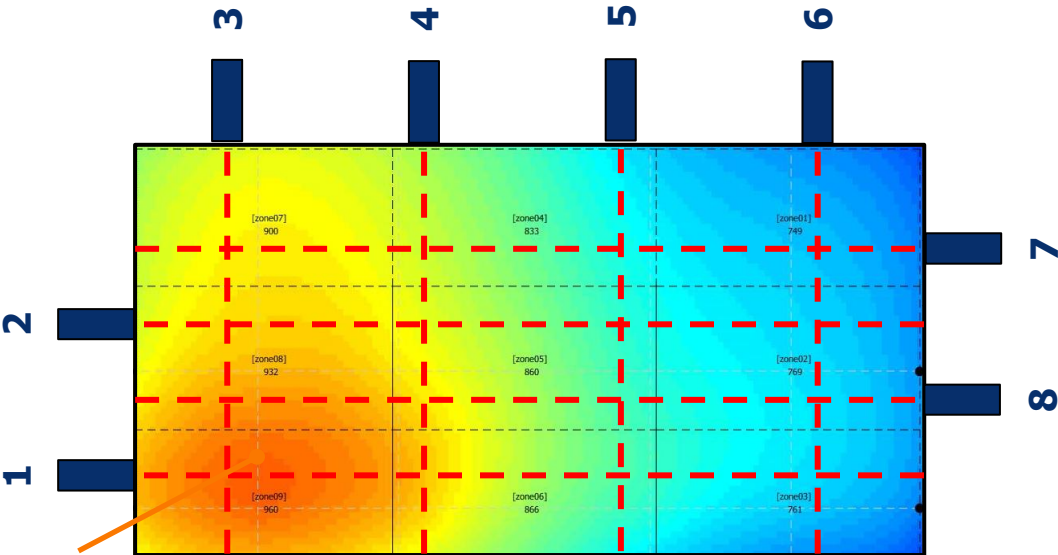
EUflame

Line measurement vs. 2D temperature mapping



Limited, misleading temperature information!

VS.



True temp. maximum >1.000 °C

2D Temperature information
No blind spot!

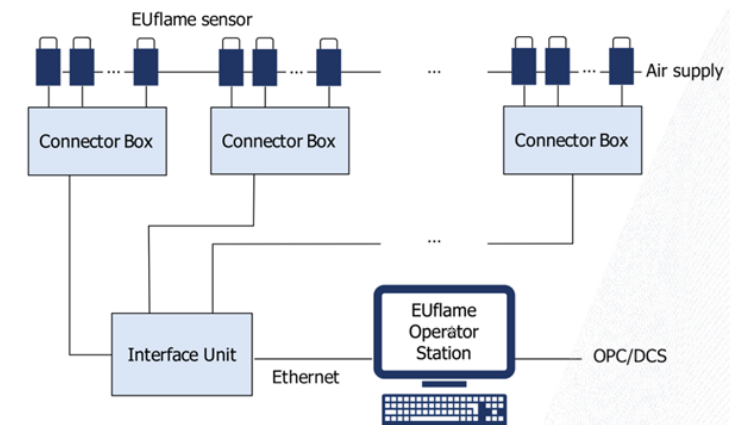
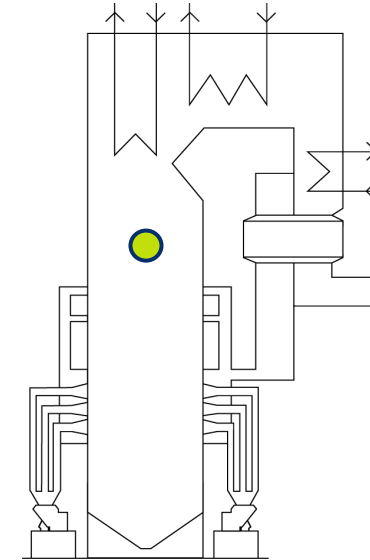
 Furnace cross section

 EUflame Sensor

 Direction of view – measuring path

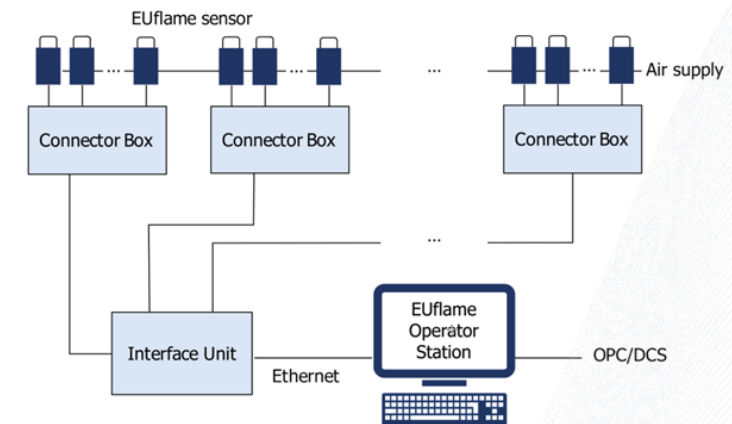
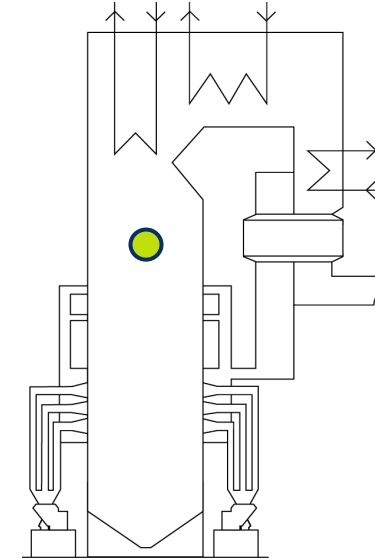
Flame temperature and burnout

- Online flame temperature and burnout measurement (2D/3D)
- Sensor based on optical measuring technique
- Single-point and 2D/3D-measurements
- Stationary or mobile system available
- Essential for effective combustion optimization and DeNO_x (e.g. SNCR) operation



Advantages of optical pyrometers

- Burnout measurement possible
- Small and simple openings → no bypass necessary
- Not influenced by noise, vibrations, etc. (e.g. soot blowers)
- Cost-effective

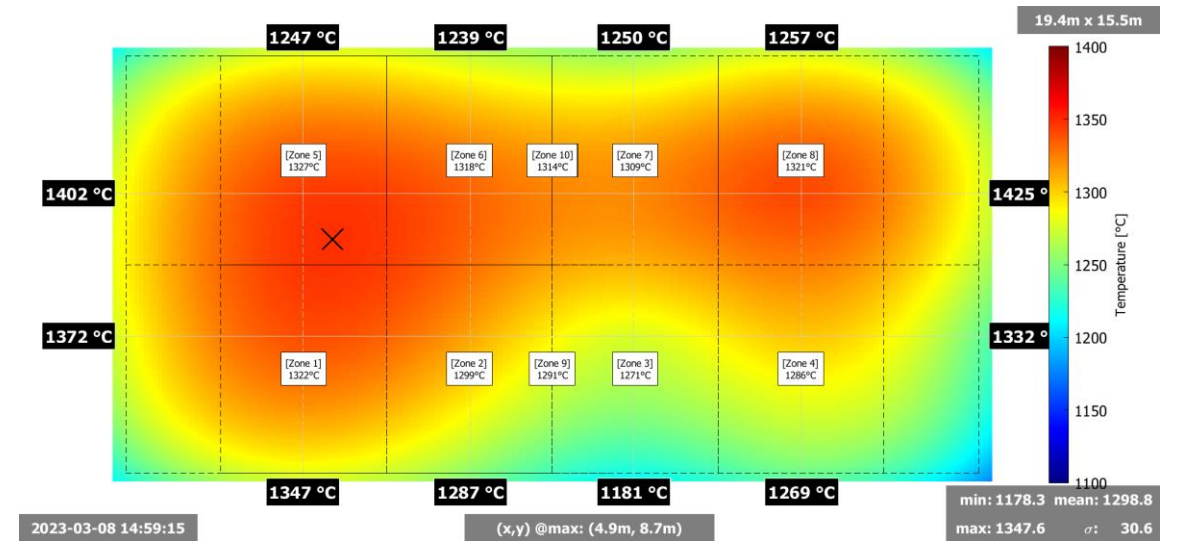


Best practices & application results

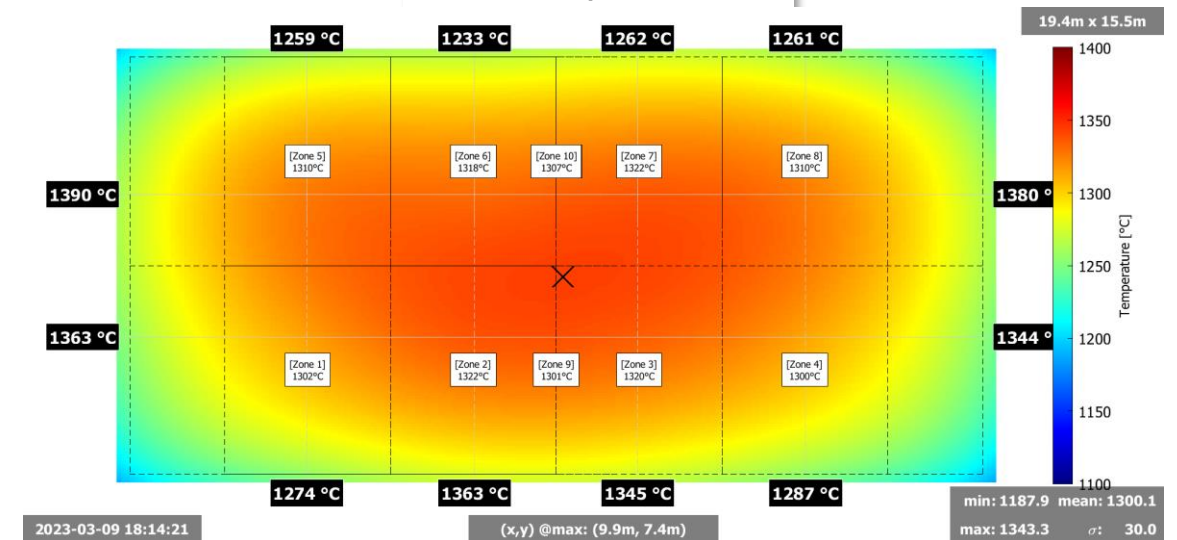


Combustion process improvement

- Challenge
 - Suboptimal CO levels
 - Reduced flexibility
- Solution
 - Measurement of FEGT distribution
 - Adaptation of air distribution not supported by air distribution measurements
- Results
 - Homogenization of FEGT distribution



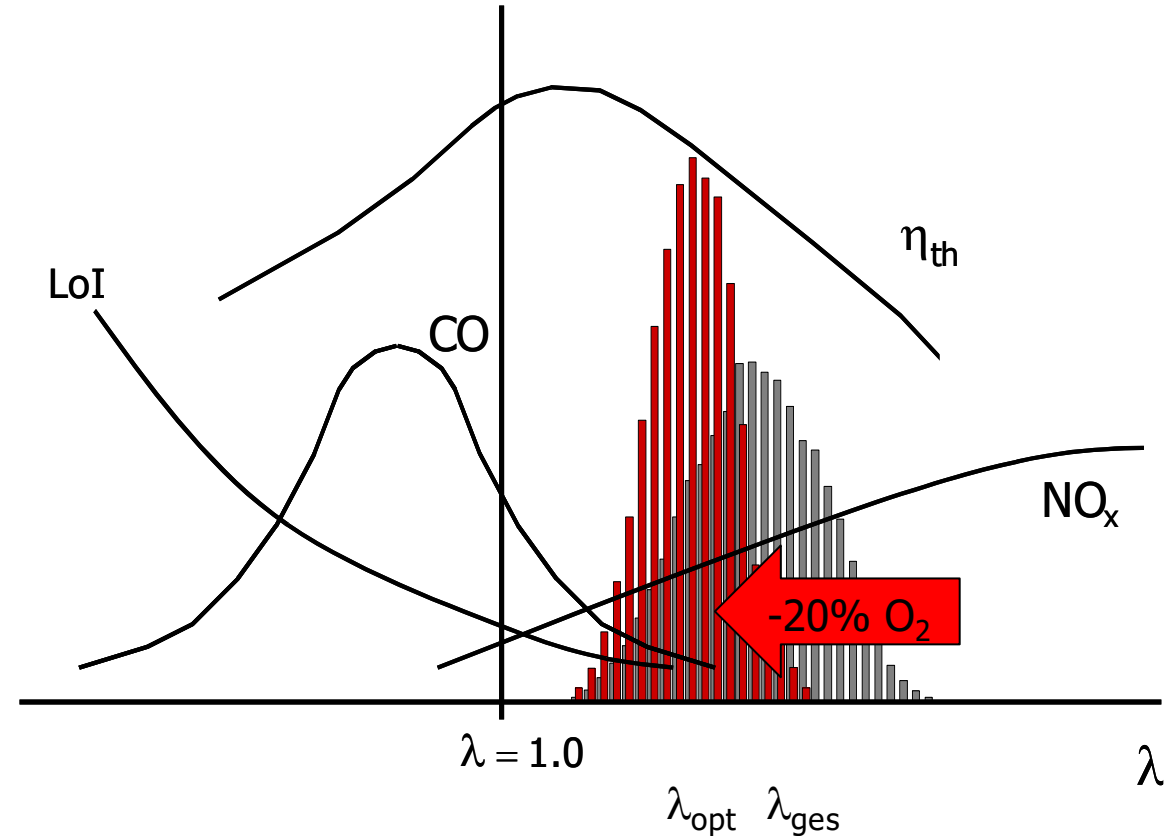
Before optimisation



After optimisation

Combustion process improvement

- Challenge
 - Suboptimal CO levels
 - Reduced flexibility
- Solution
 - Measurement of FEGT distribution
 - Adaptation of air distribution not supported by air distribution measurements
- Results
 - Homogenization of FEGT distribution
 - Reduction of emissions
 - Increased flexibility



Summary and outlook

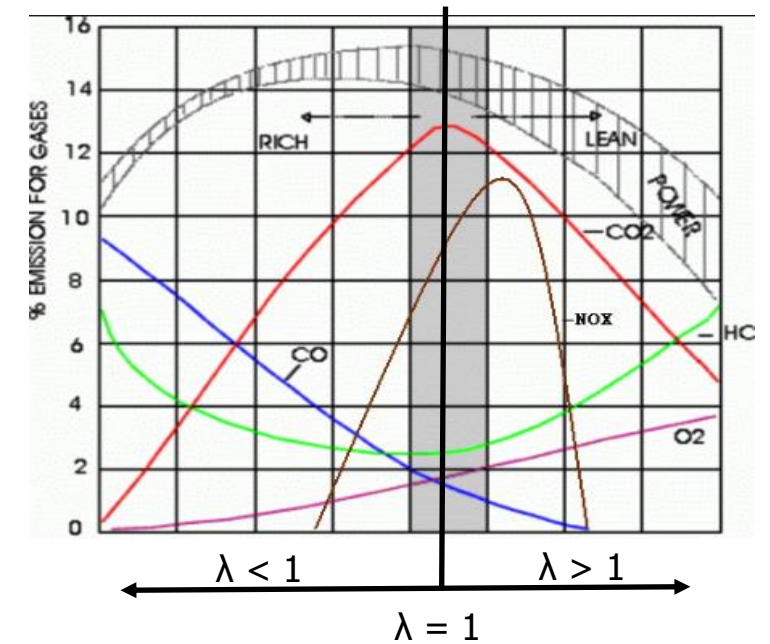
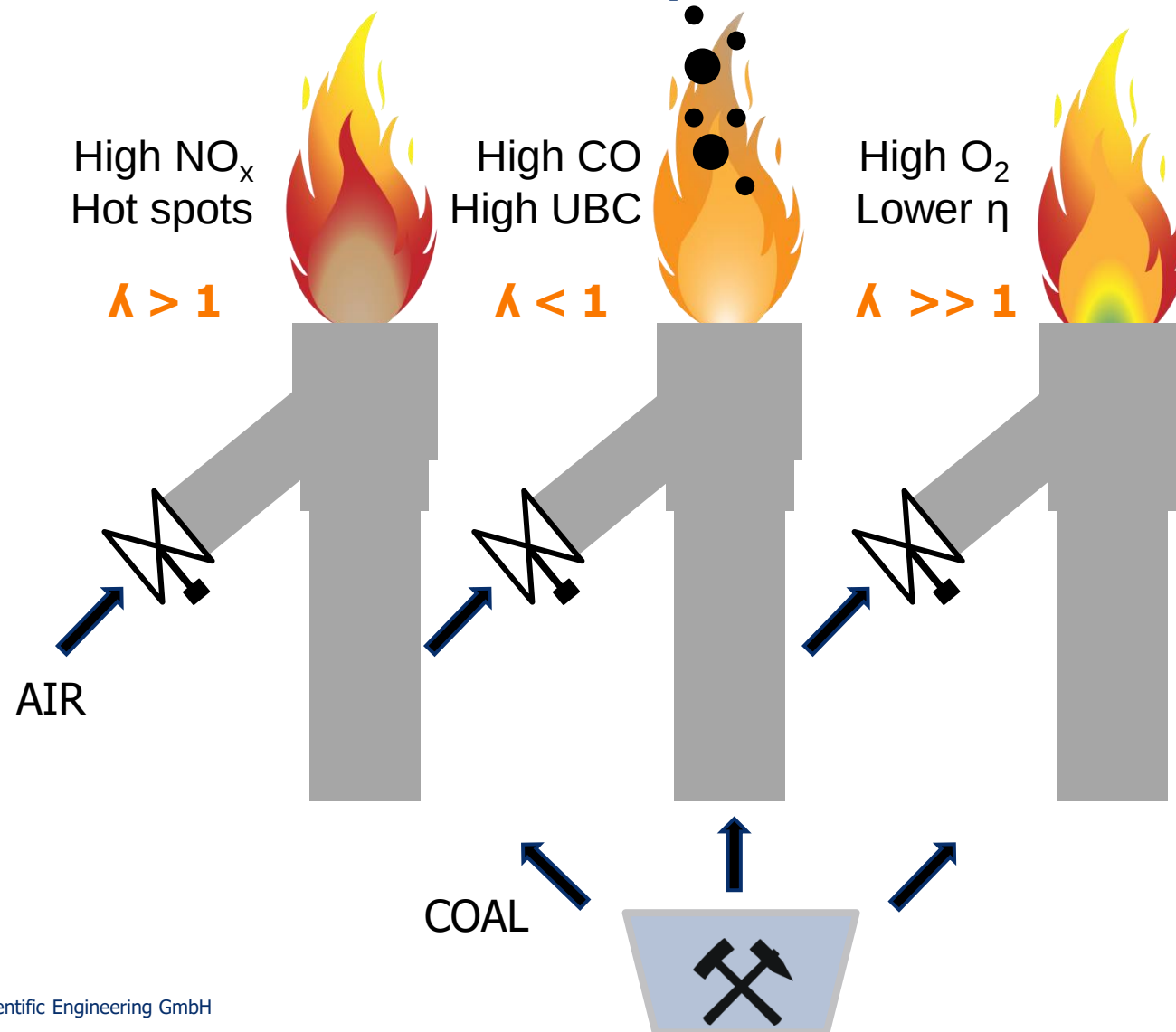
Summary and outlook

- Increasing need of flexibility for Indian coal-fire power plants
→ Extra demand on combustion process control
- Temperature is linked to many typical issues in a combustion-driven boiler
→ The furnace exit gas temperature is a good indicator
- EUflame system with optical pyrometers provides online 2D temperature distribution
→ Over the cross-section of the boiler
- Successful optimization of large utility boiler (615 MW) via advanced two-dimensional temperature measurement with optical pyrometers
→ Improved emission behavior and flexibility of key process parameters

Accurate, online monitoring of key parameters is becoming necessary to address the fuel- and load-flexibility challenges that thermal assets will have to face in India.

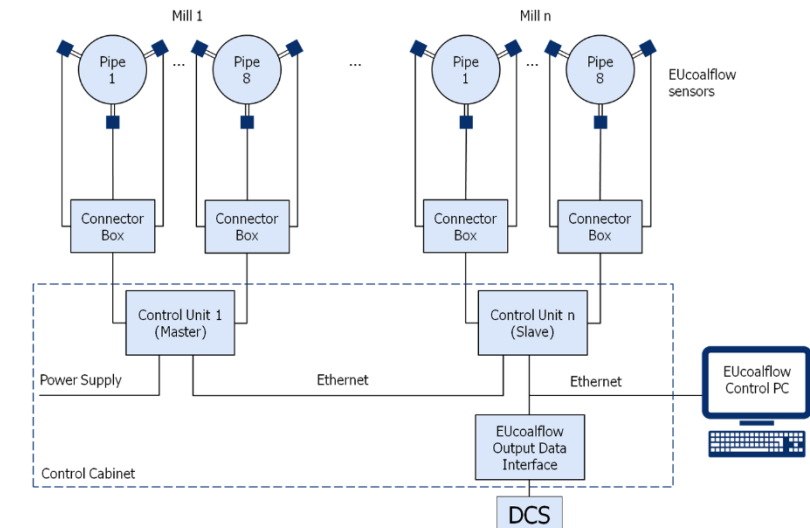
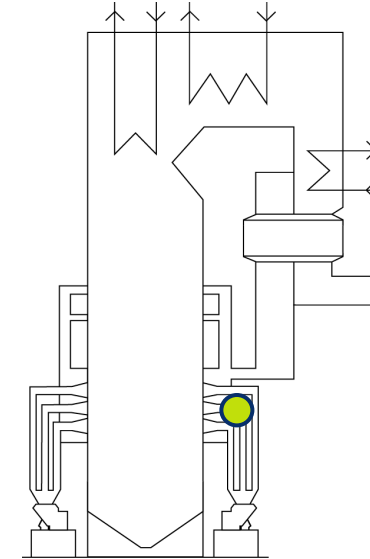
Thank you!
www.eutech-scientific.de

Impact of Air-Fuel Ratio on efficiency and emissions



Online fuel mass flow measurement

- Mass flow and velocity measurement
- Stationary and mobile EUcoalflow (ECF) System
- Plug and play solution
- Comfortable user interface (ECF Software)



Immediate fuel flow readings

- Online fuel flow analysis with direct results
 - Particle size distribution (PSD)
 - Air flow
 - Coal mass flow
 - Air-fuel ratio
- Immediate results & online reporting
- Built for everyday use

