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OPERATING EXPERIENCES FROM COMBUSTION OF BIOMASS AT ELEVATED STEAM TEMPERATURES WITH THE FOCUS ON CHALLENGING BIOMASS FUELS

Expert meeting on Combustion of Challenging Biomass Fuels

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OVERVIEW

THE EcoFluid® COMBUSTION TECHNOLOGY

BIOMASS FIRED POWER PLANT UMEÅ/ SWEDEN

OPERATING EXPERIENCES

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OVERVIEW

THE ECOFLUID® COMBUSTION TECHNOLOGY

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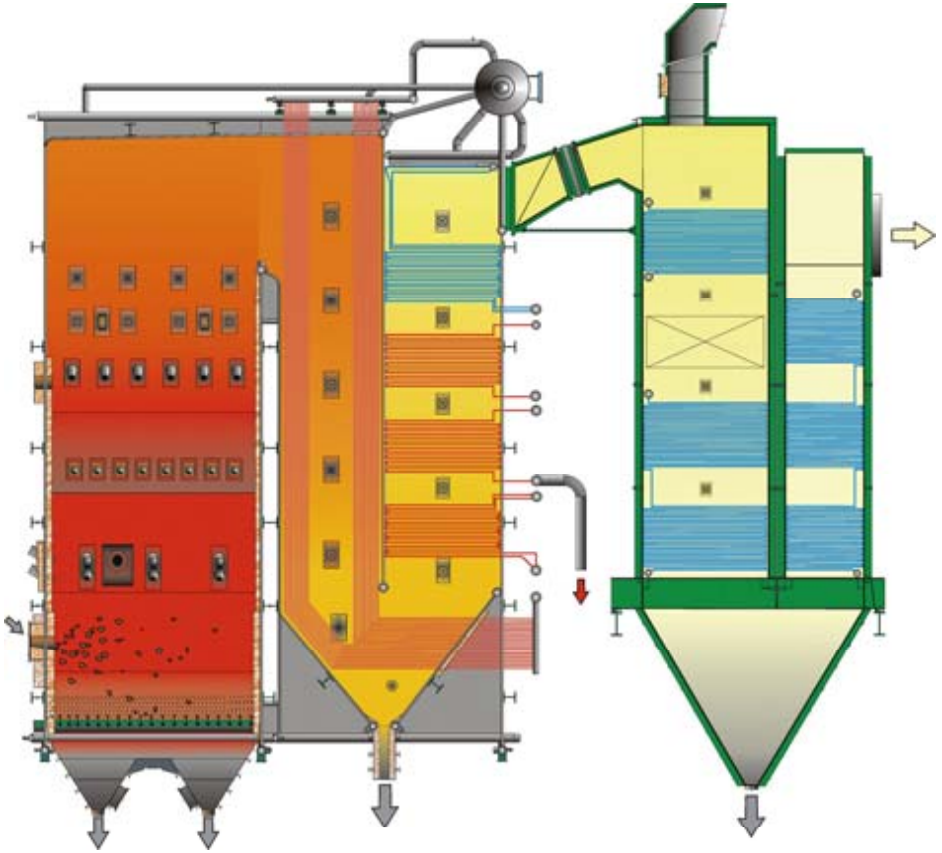
Bubbling Fluidised Bed Boiler - ECOFLUID®

Main Features

- High fuel flexibility
- Fulfilment of EC/2001/76 (850 °C for 2 sec)
- Minimisation of emissions (NOx, CO)
- Substoichiometric combustion
- Integrated boiler design with open nozzle grid



Capacity

Steam capacity	5 - 250 t/h
Fuels	Biomass, sludge, rejects, poultry litter and manure, residues from bio ethanol- and biodiesel-production

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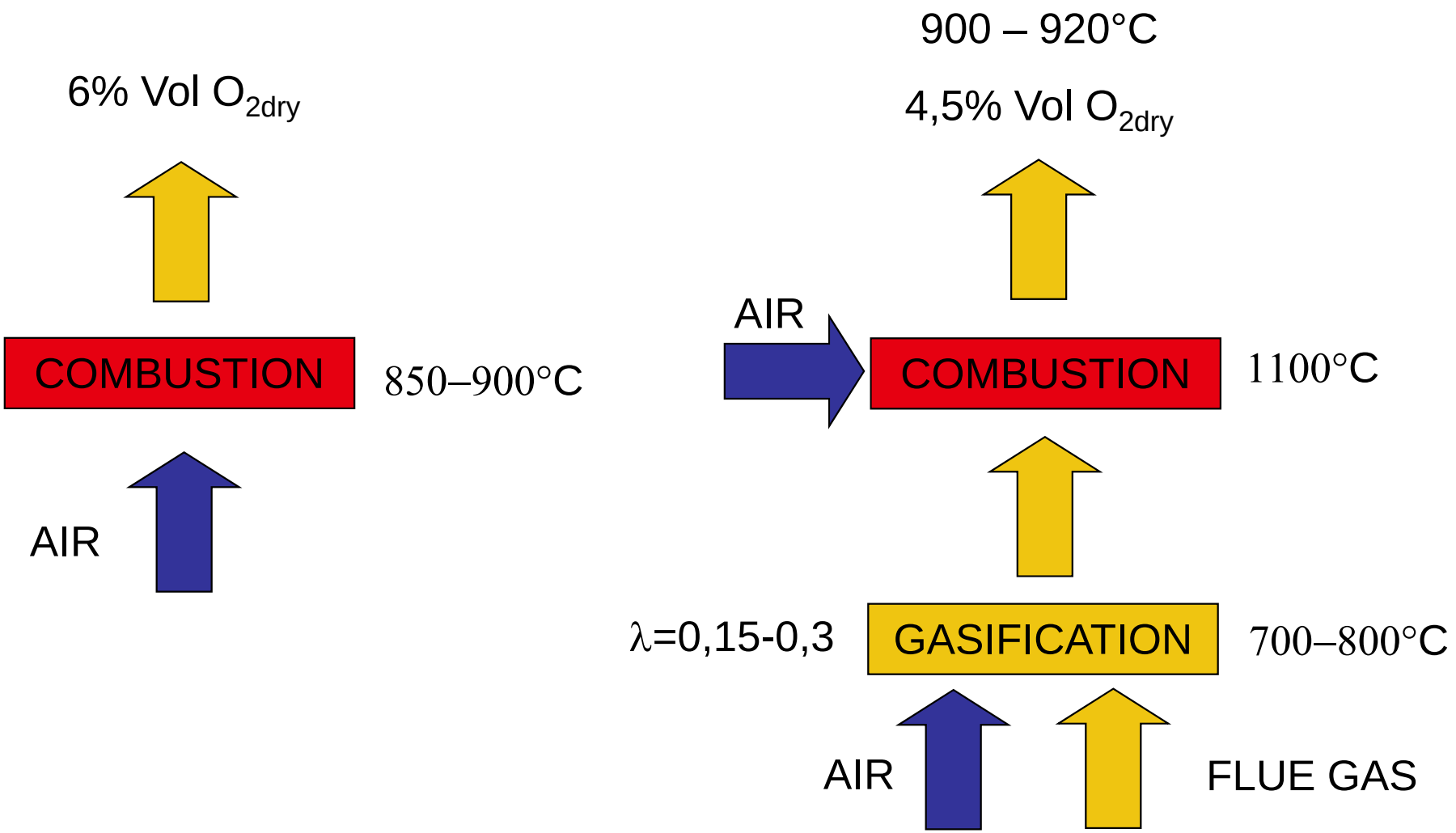
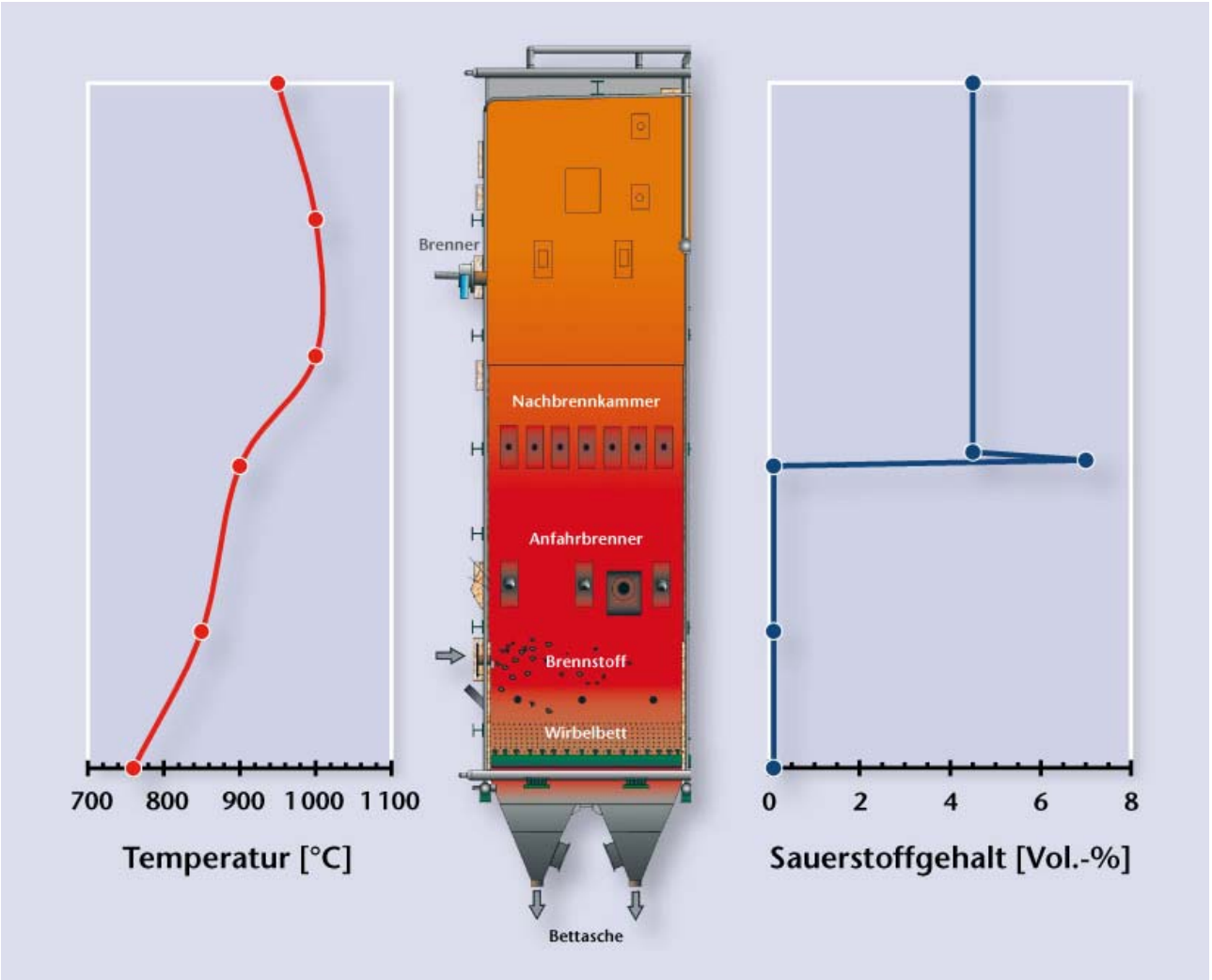
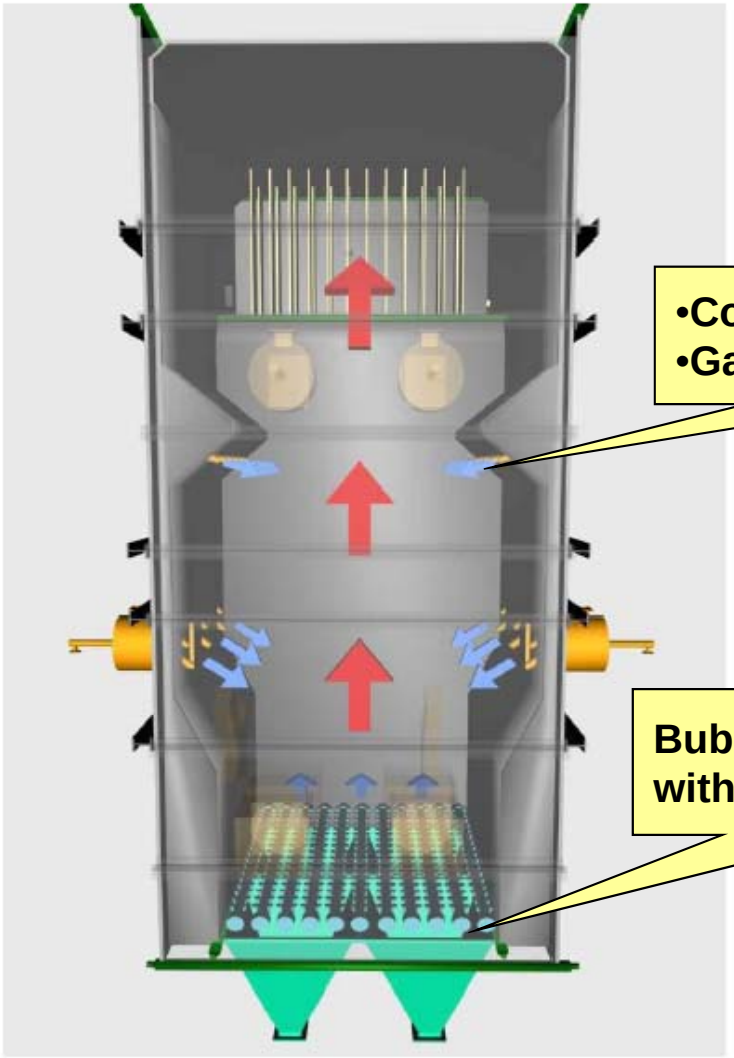
ECOFLUID® combustion technology



Temperature and oxygen profile



Boiler System

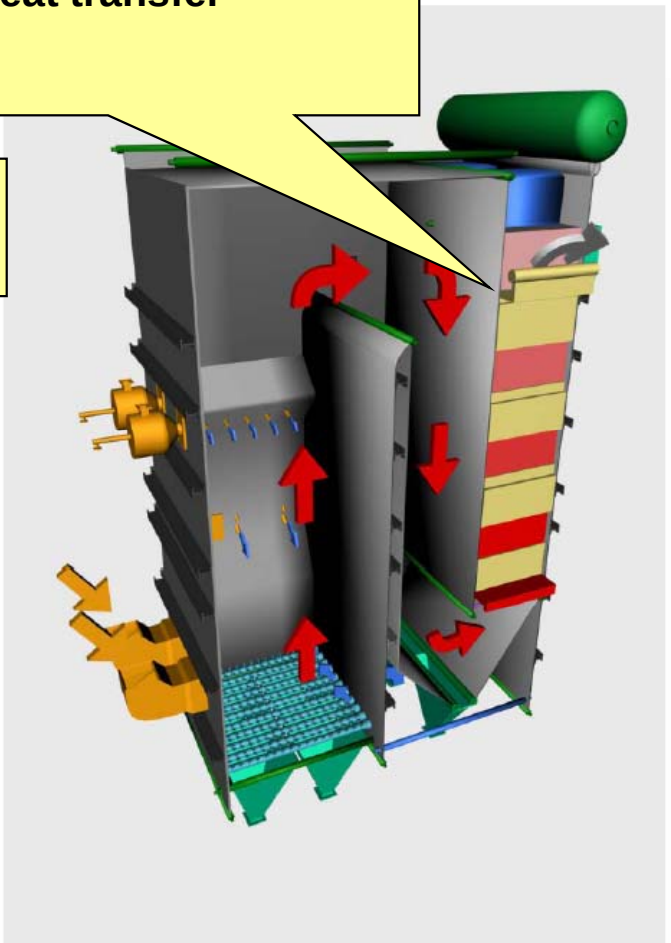


•Integrated boiler system
•Flexibility for heat transfer sections

•Combustion air injection
•Gas-oil for start-up

Bubbling fluidised bed with open nozzle grid

GASIFICATION



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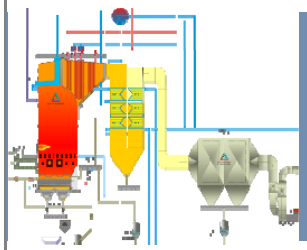
COMBUSTION OF CLEAN BIOMASS AT HIGH STEAM PARAMETERS OF 540°C

BIOMASS FIRED POWER PLANT UMEÅ/ SWEDEN



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UMEA DAVA 2 110 MW_{th} fluidised bed boiler

- Fluidised bed boiler plant, system ECOFLUID®, for the biomass-fired power plant UMEA DAVA 2 of Umea Energi AB
- Combustion of bark, forestry wood, wood chips and peat
- Production of electric power and steam for the local district heating network

KEY DATA

CUSTOMER:

Umea Energi AB

Umea / Sweden StartUp 2009

TECHNOLOGY:

Bubbling fluidised bed system

Steam output:	147 t/h
Steam pressure:	143 bar
Steam temperature:	543 °C
Fuel:	bark, forestry wood, wood chips, peat
Calorific value:	6 – 12 MJ/kg

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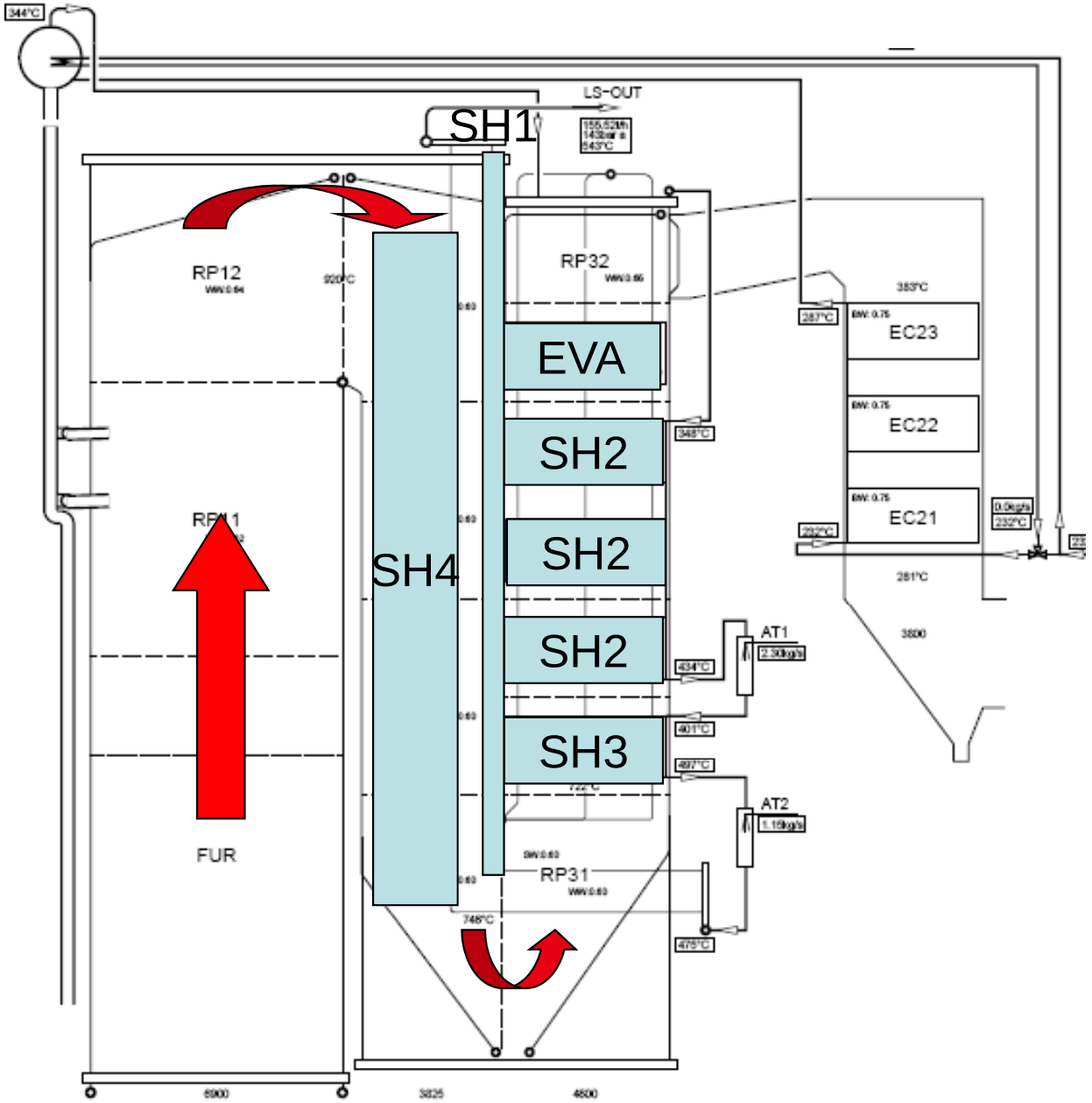
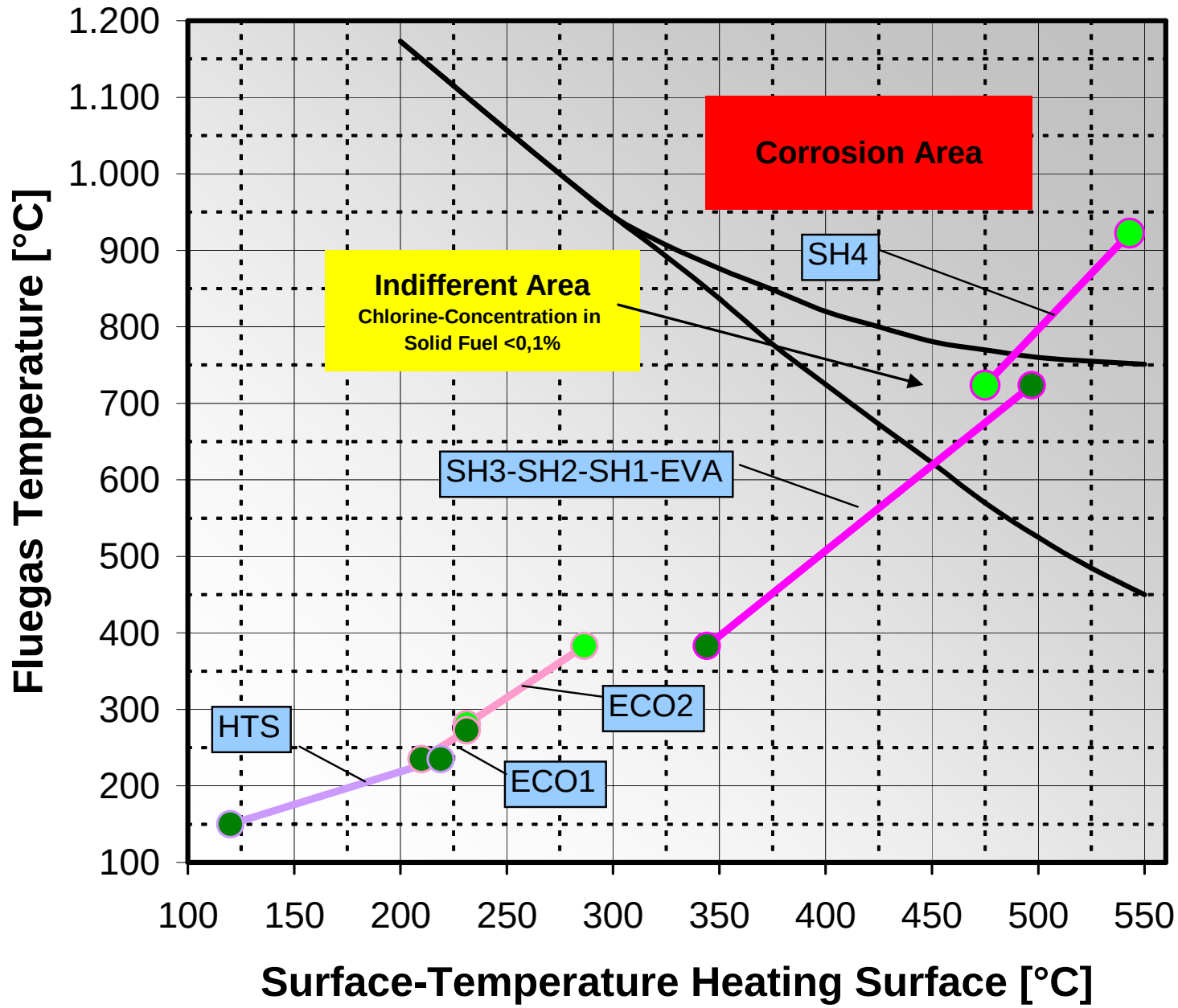
Arrangement of heating surfaces

Chloride
max. 0.02 %w dry
in the fuel mixture



Arrangement of heating surfaces



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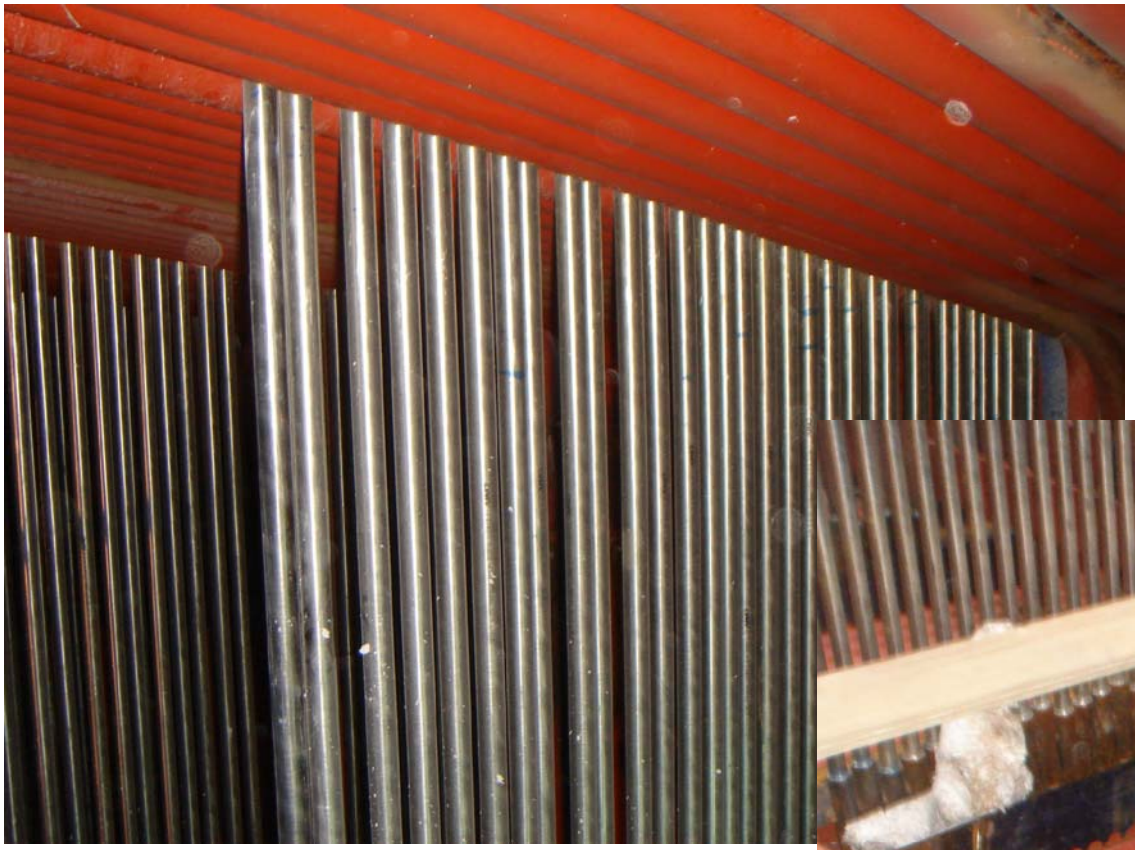
Superheater 4 made of AC66



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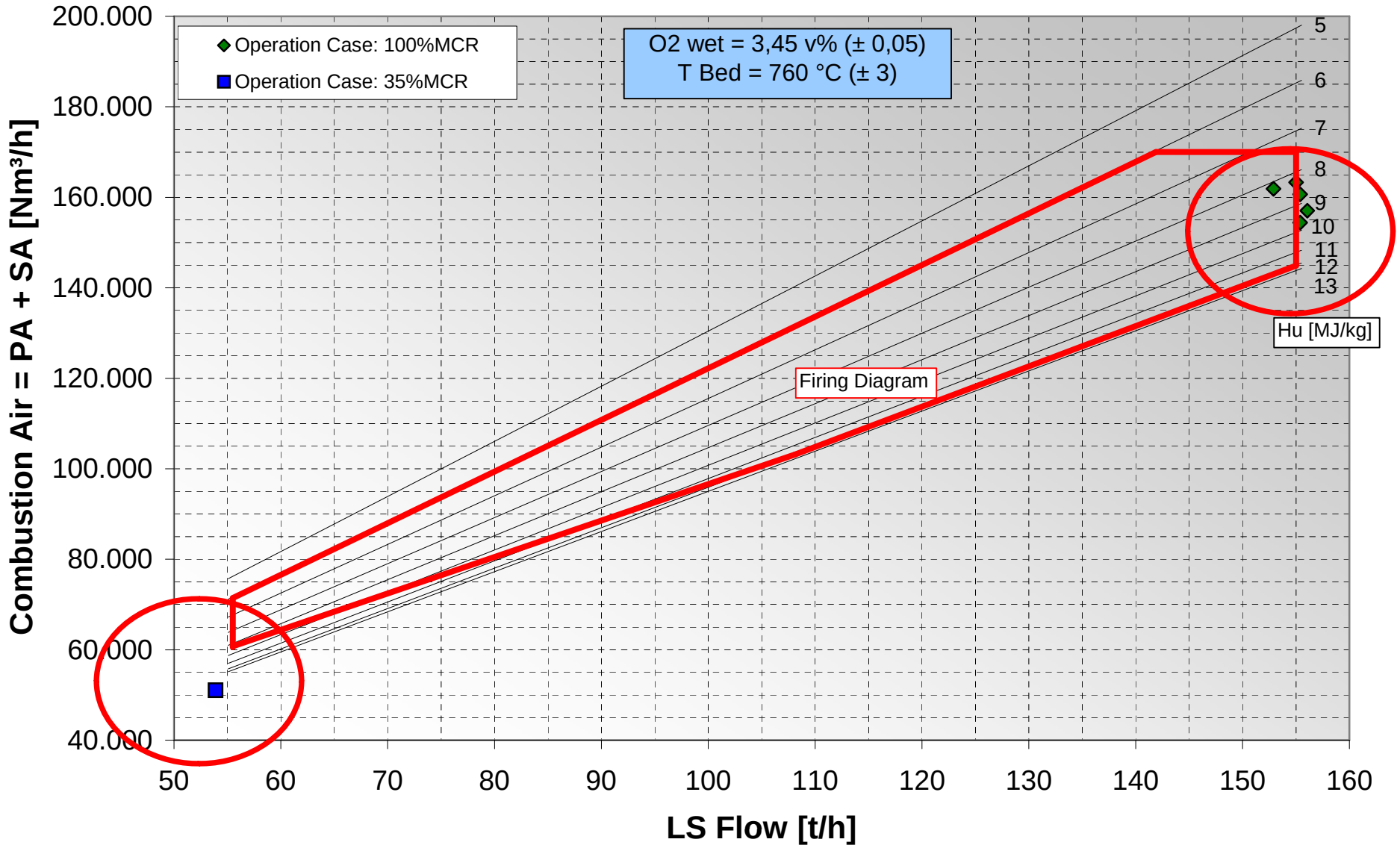
OVERVIEW

OPERATING EXPERIENCES

Arrangement of heating surfaces



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Arrangement of heating surfaces

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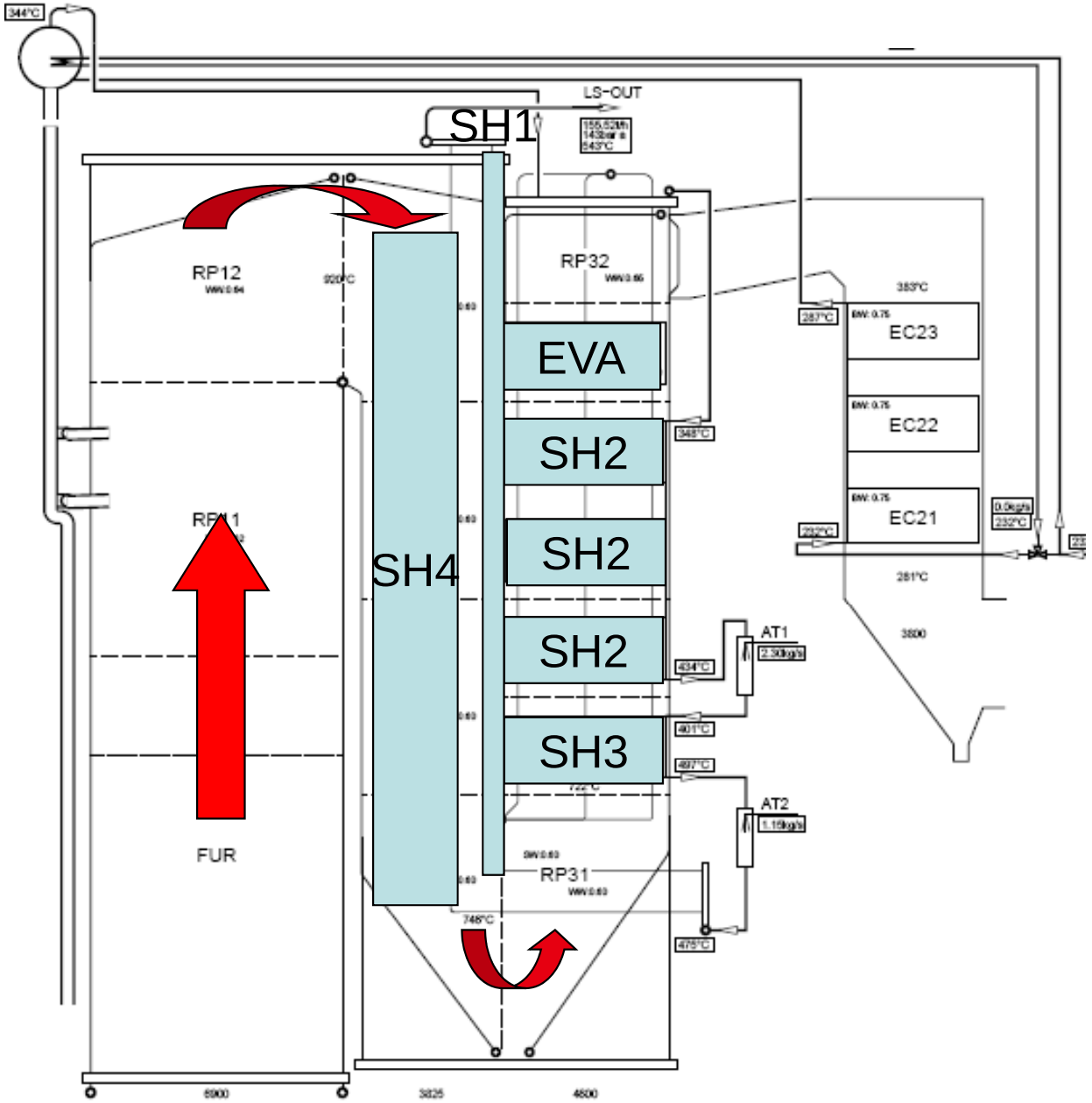
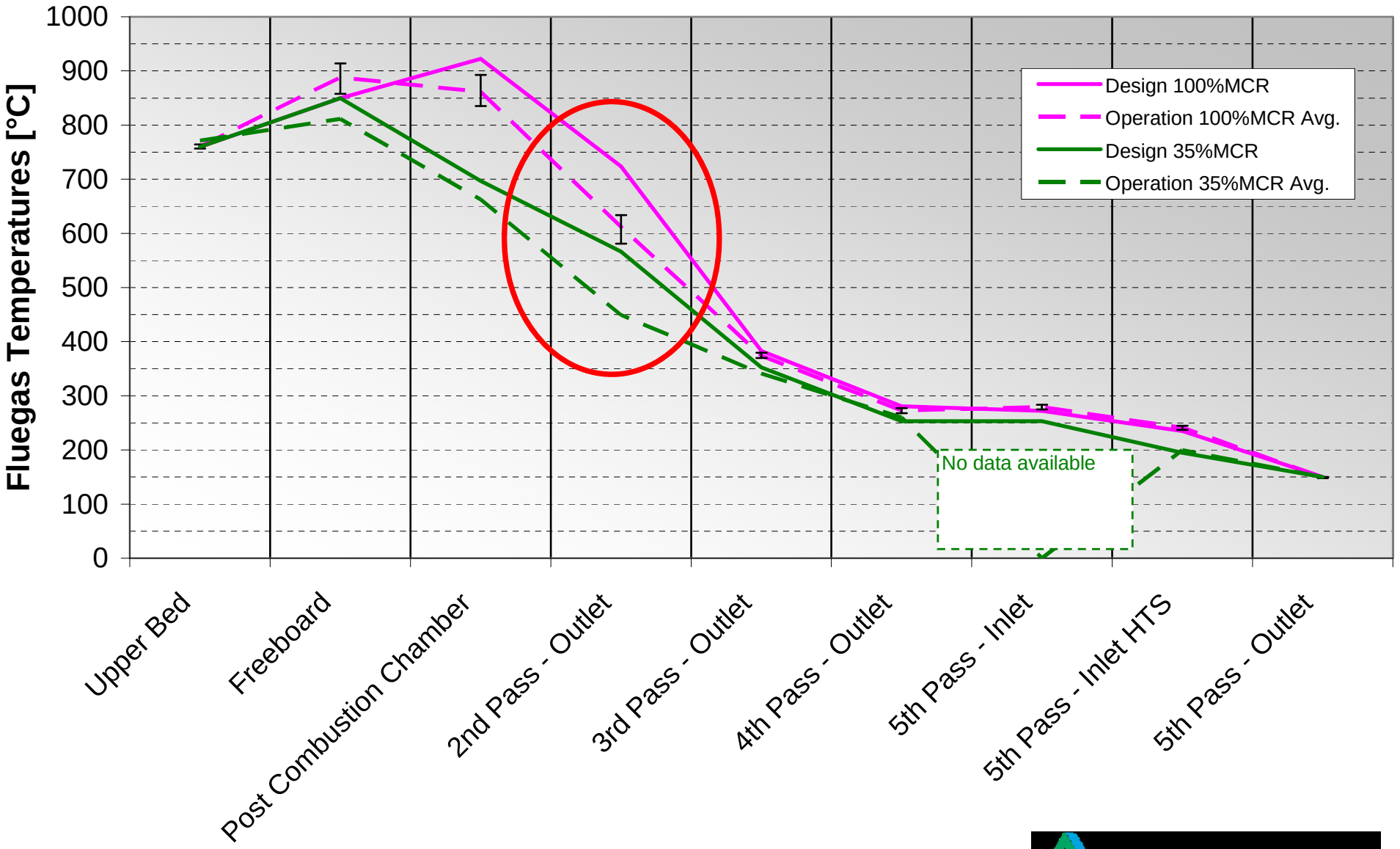
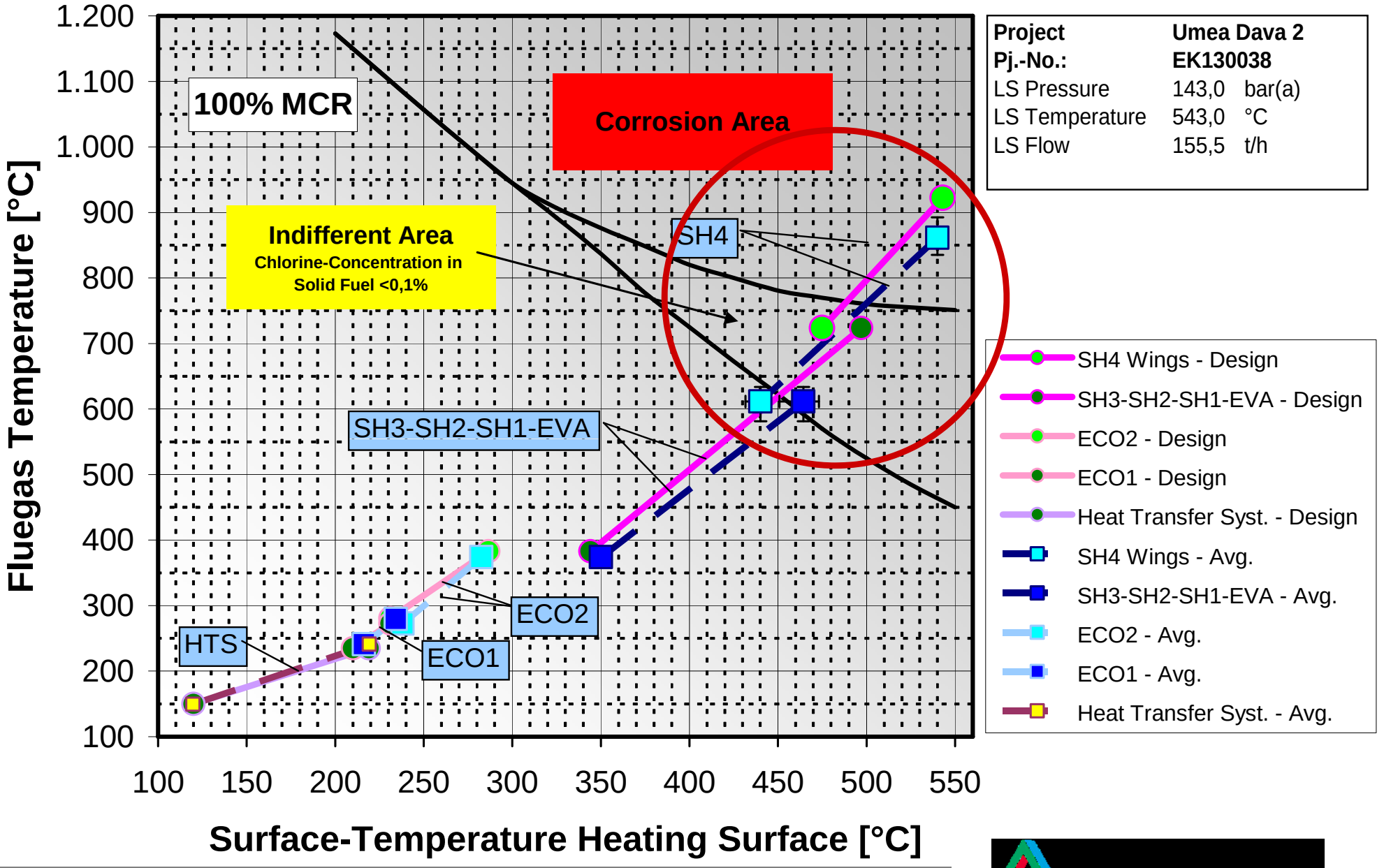


Arrangement of heating surfaces

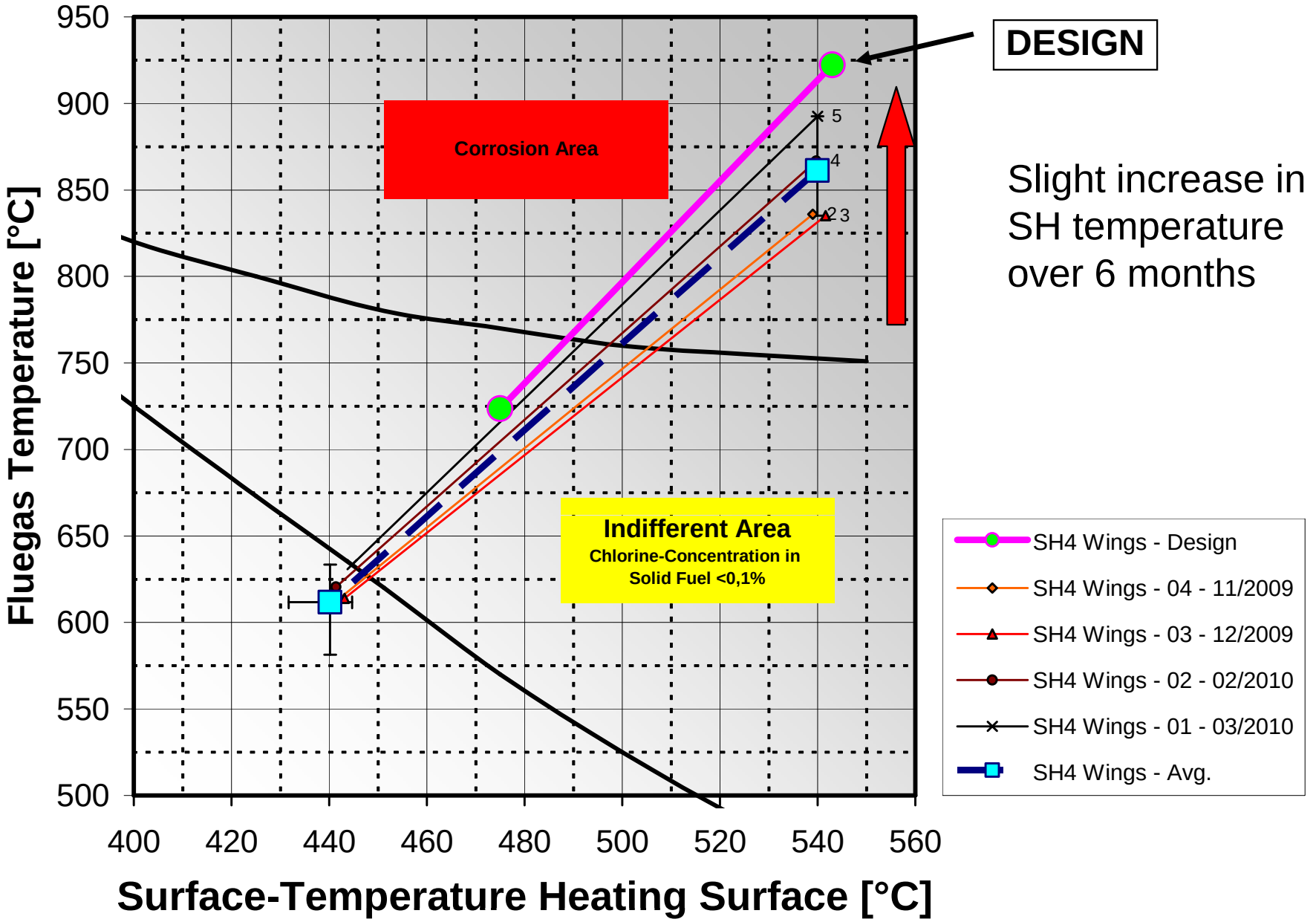
Superheater 4 takes more heat out of the flue gas as in design



Design versus Operation



OPERATION BEHAVIOUR SH4 OVER TIME



Slight increase in SH temperature over 6 months

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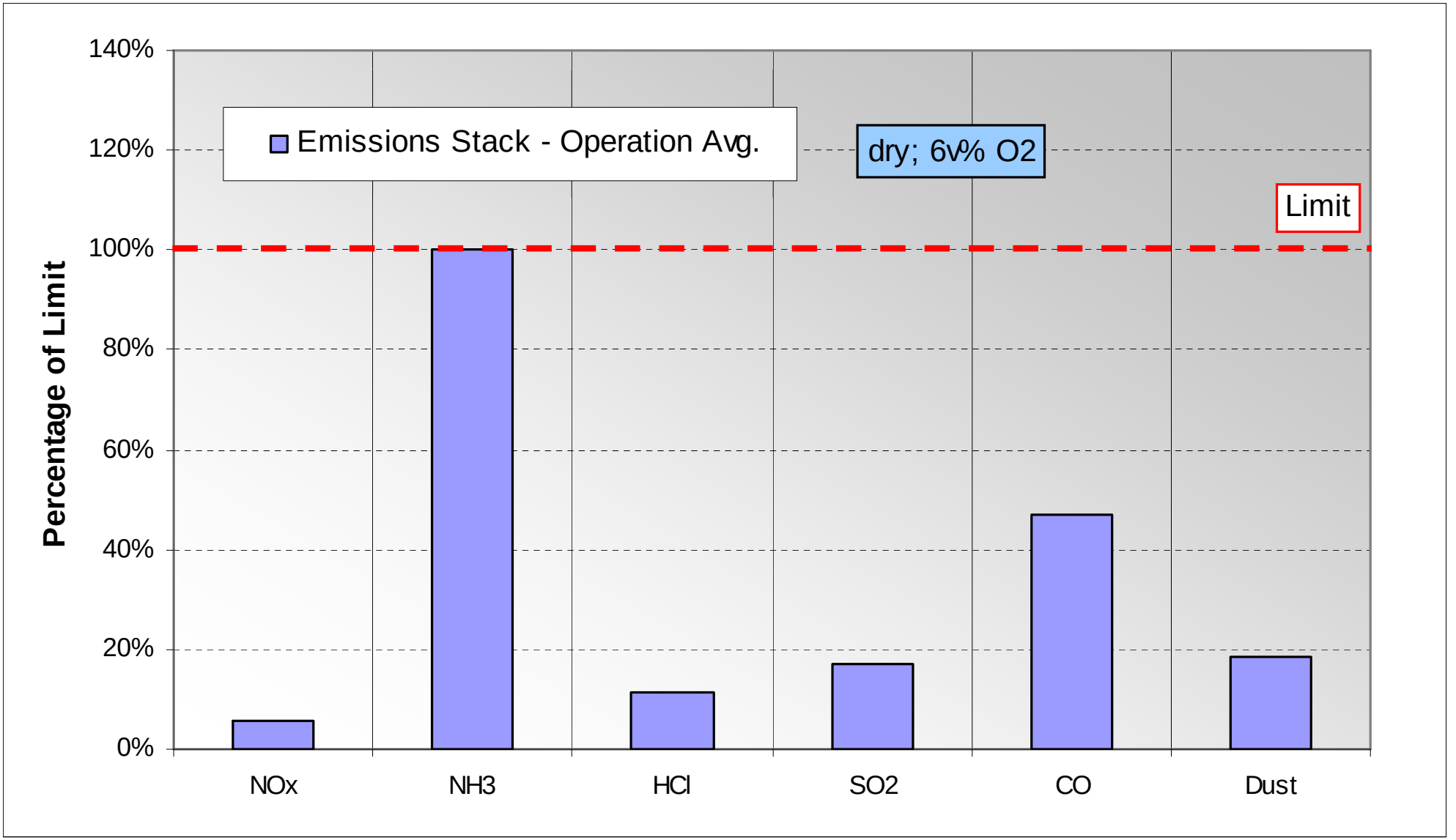
RELATIVE EMISSION VALUES



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OPERATING EXPERIENCE

- Commissioning started in October 2008
- PAC in January 2010 due to late turbine delivery and planned summer shut-down
- Turbine was stuck on the frozen river Elbe
- Minor modifications in the fuel bins
- Operation down to 35% without problems stable, safe and automatic controlled
- Successful 6 month operation without stop of the plant @ 540°C
- No major slagging tendency on the superheaters
- Emission levels could be kept easily

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Poultry Litter Fired Power Station MOERDIJK

Purpose of the project:

Disposal route for ~ 1/3 of The Netherlands poultry litter

Background:
European Nitrogen - directive heavily restricts application of litter on farming land
production of „green electricity“ by thermal utilisation

- **Location:** Moerdijk, NL
- **Plant Size:** 36 MW el gross
- **Fuel amount:** 400.000 t/a
- **Fuels:** Poultry Litter, Feathers

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MOERDIJK 36 MWel fluidised bed boiler

- Supply of a fluidised bed boiler plant system ECOFLUID® and flue gas cleaning for biomass-fired power plant Moerdijk
- Operations & Maintenance for 3 years
- Utilisation of „green electricity“ by thermal treatment of poultry litter

KEY DATA

CUSTOMER:

BMC Moerdijk

Moerdijk / Netherland StartUp 2008

TECHNOLOGY:

Bubbling fluidised bed system, flue gas cleaning

Steam output:	132 t/h
Steam pressure:	67 bar a
Steam temperature:	478 °C

Fuel: Poultry litter, feathers

Calorific value: 6 – 10 MJ/kg

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BFB Moerdijk – Operating Experience

- BFB design:
  - Design of boiler and combustion system was confirmed
  - Bed operation with high ash loads and low melting ash possible
  - Secondary air system was adapted to extend operation window for fuel with low NCV

- Emissions:
  - Waste Incineration Directive - generally achieved
  - Occasionally high CO-peaks due improper fuel quality
  - Occasionally high NH_3 due to high ammonia content of fuel
  - NO_x very low, sometimes no need to operate SCR

- Operating Experience Year 2009:
  - Continuous operation even with low quality fuel possible

www.aee-austria.at

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