Austrian Energy & Environment AG & Co KG

Combustion of DDGS in Fluidiszed beds

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Fluidized Bed Conversion IA
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The clean energy specialist

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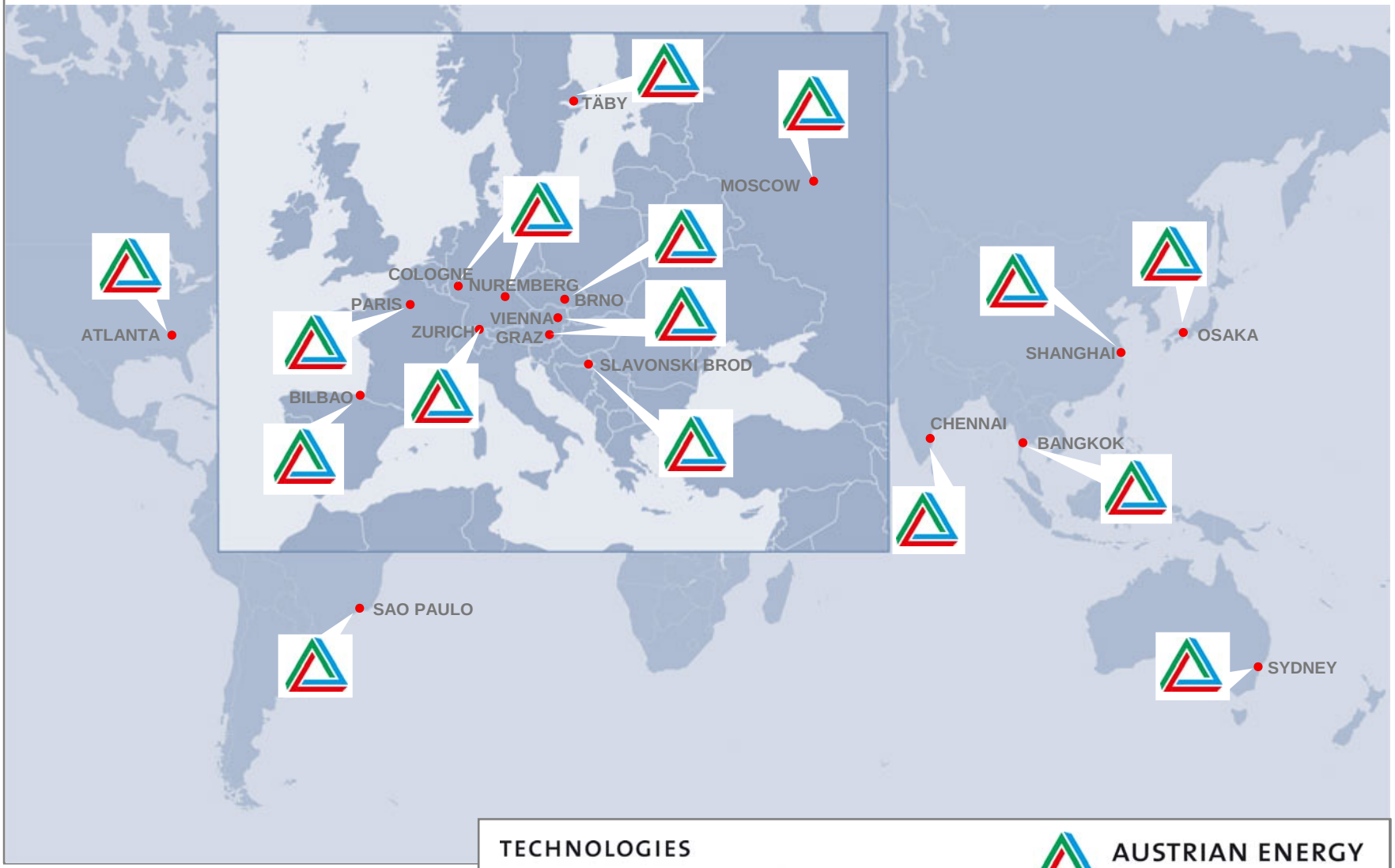
PRODUCT PORTFOLIO
& REFERENCES

Global operations with local solutions



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Full line supplier with proven technologies

BOILERS & PLANTS

- Fluidised bed boilers
- Industrial boilers
- Conventional boilers
- Liquor recovery boilers
- Heat recovery steam generators
- Grate boilers for waste, biomass, coal
- Turnkey biomass and industrial power plants

FLUE GAS CLEANING

- Wet and dry flue gas desulphurisation
- Wet and dry flue gas cleaning
- SCR technology

WASTE-TO-ENERGY

- Grate technology
- Rotary kiln technology
- Fluidised bed technology
- Flue gas cleaning
- Residue treatment
- Turnkey plants

SERVICES

- Engineering
- Maintenance and servicing contracts
- Modernisation and revamping
- Plant audits and optimisation
- Plant operation (O&M Contracts)

IND. EQUIPMENT

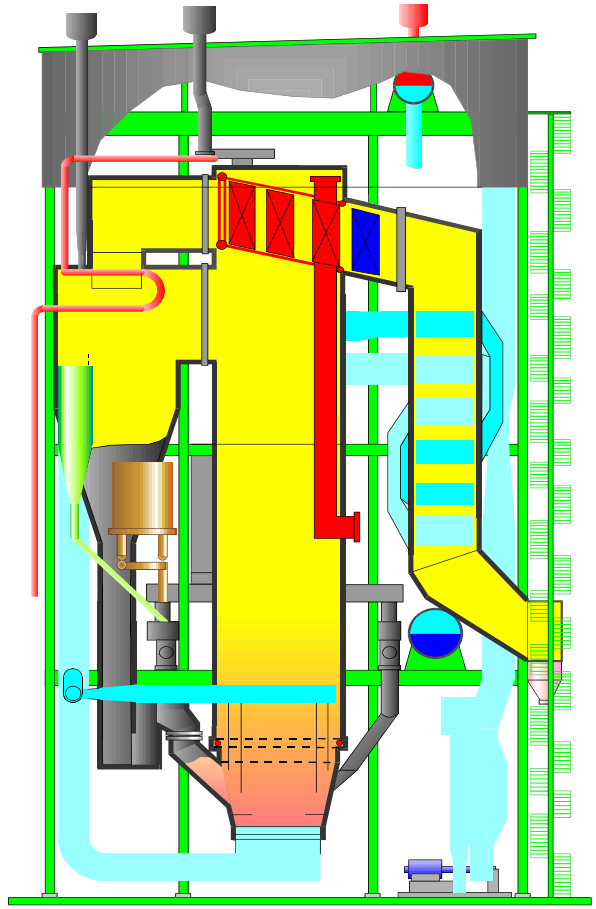
- Boiler manufacture
- Coal gasification
- Valves

The Group today focuses on five major product lines, offering the customer solutions with a high energy efficiency and innovative environmental protection technologies.

Circulating Fluidised Bed Boiler - POWERFLUID®

Main Features

- extremely wide fuel flexibility
- excellent part load behaviour
- high combustion efficiency
- efficient cyclone separation
- low SO_2 emissions
- low NO_X emission



Capacity

Steam capacities	50 - 500 tphr
Fuels	Coal, biomass, sludge, RDF, pet coke, etc. in the range of 5 - 40 MJ/kg

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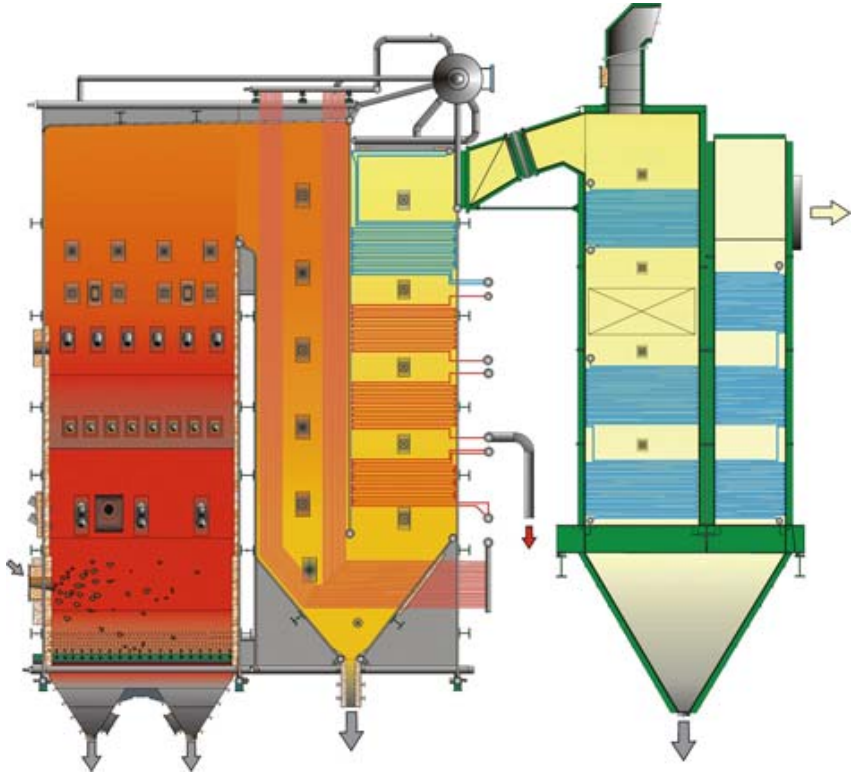
Bubbling Fluidised Bed Boiler - ECOFLUID®

Main Features

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



Capacity

Steam capacity	5 - 250 tphr
Fuels	Biomass, sludge, rejects, poultry litter and manure, residues from bio ethanol- and biodiesel-production, etc. in the range of 3 - 20 MJ/kg

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Approach to novel fuels

3 Steps to test and evaluate the usability of a novel fuel

a) Literature study and fuel/ash analysis in the Chemical Laboratory of AE&E

b) Laboratory tests with different inert materials and additives in co-operation with Technical University Vienna or Graz

c) Combustion trials in Klus (CFB) or optional in a commercial operated reference plant

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Approach to novel fuels

a) Literature study and fuel/ash analysis

The R&D project shall start with a literature study and necessary fuel and ash analysis done by the AE&E (Chemical Laboratory)

- **Fuel Analysis**
  - Elementary analyses
  - Chemical composition of fuel and ash
  - Heating value
  - Ash melting point
  - Combustion tests with special fuels and biomass

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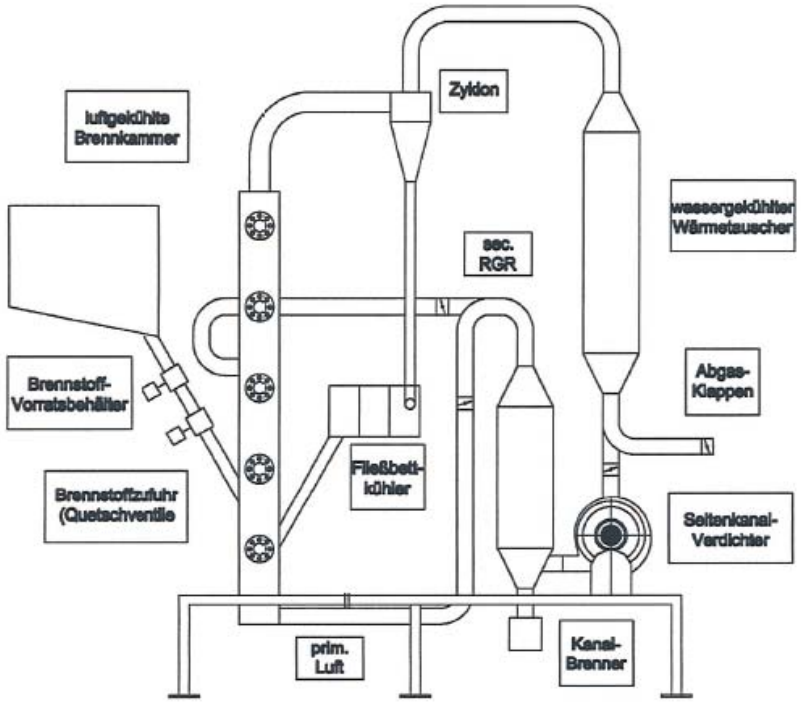
Approach to novel fuels

b) Laboratory tests with different inert materials and additives



Previously to the planned fuel tests at the 2 MW Pilot Plant in Klus tests regarding agglomeration effects in bubbling beds shall be carried out at Technical University Vienna or Graz.

The temperature of the bubbling bed is kept at a certain level and after the test the material from the bubbling bed is visually described especially regarding agglomeration effects.

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Approach to novel fuels

c) Combustion trials in Klus (CFB)

- **CFB/BFB test rig in KLUS/Switzerland**
  - Pilot plant in semi-industrial dimension (riser diameter 0.8m and riser height 12m)
  - Combustion experiments with novel fuels
  - Bed material experiments
  - Experiments with additives
  - Thermal power 1 – 2.5 MWth
  - Flue gas volume flow 3,200 Nm^3/h
  - Temperature range in riser 650 – 1000°C

Used fuels

Corn fuel

Wheat Pellets

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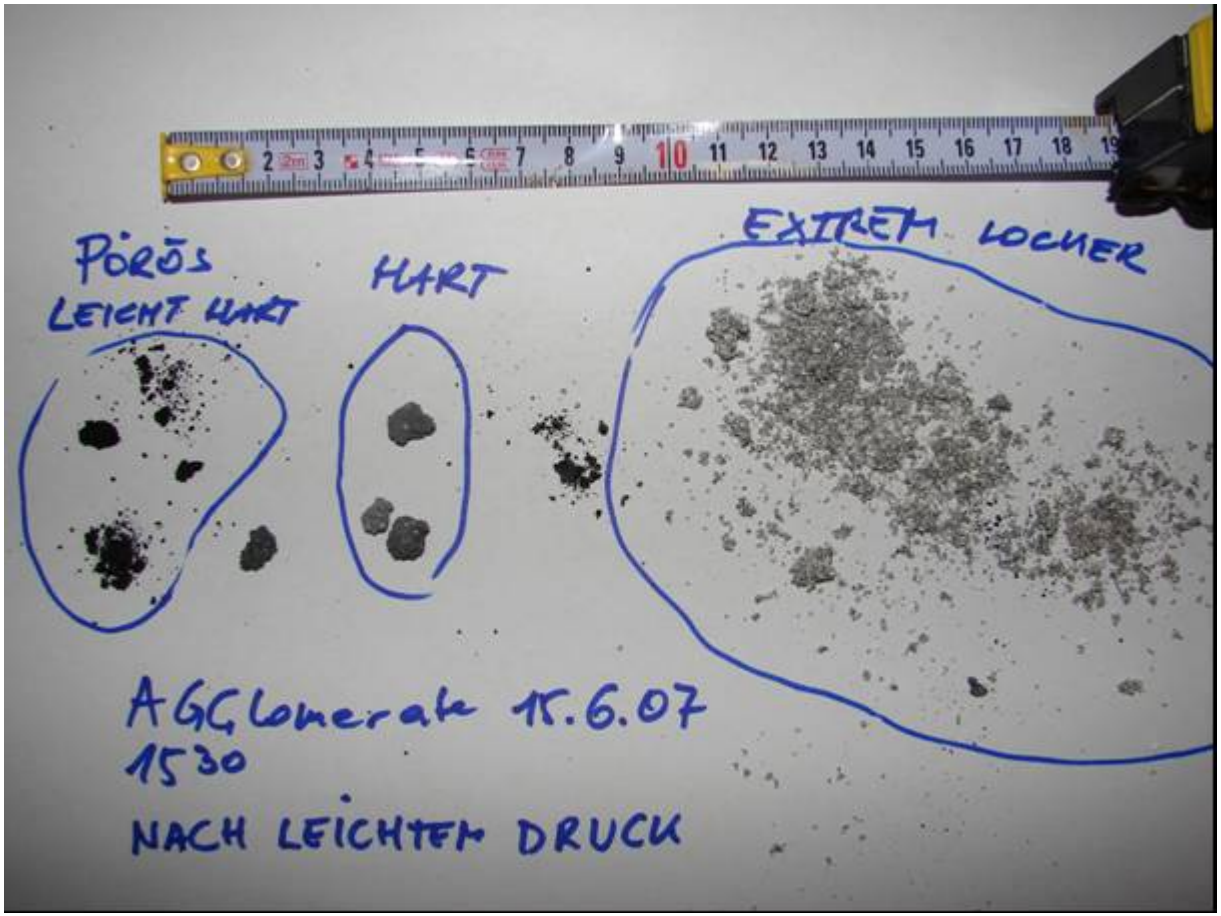
Bed ash



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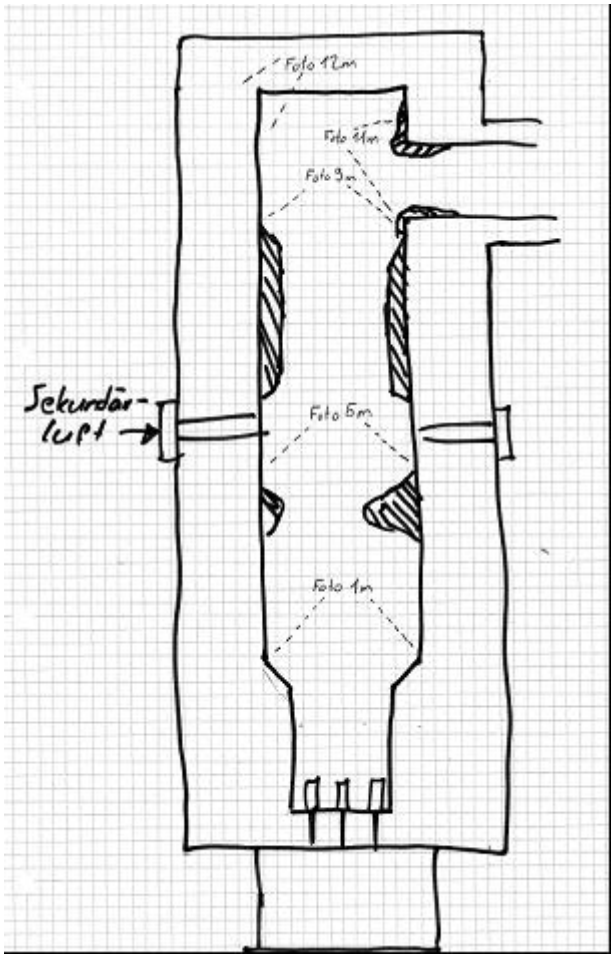
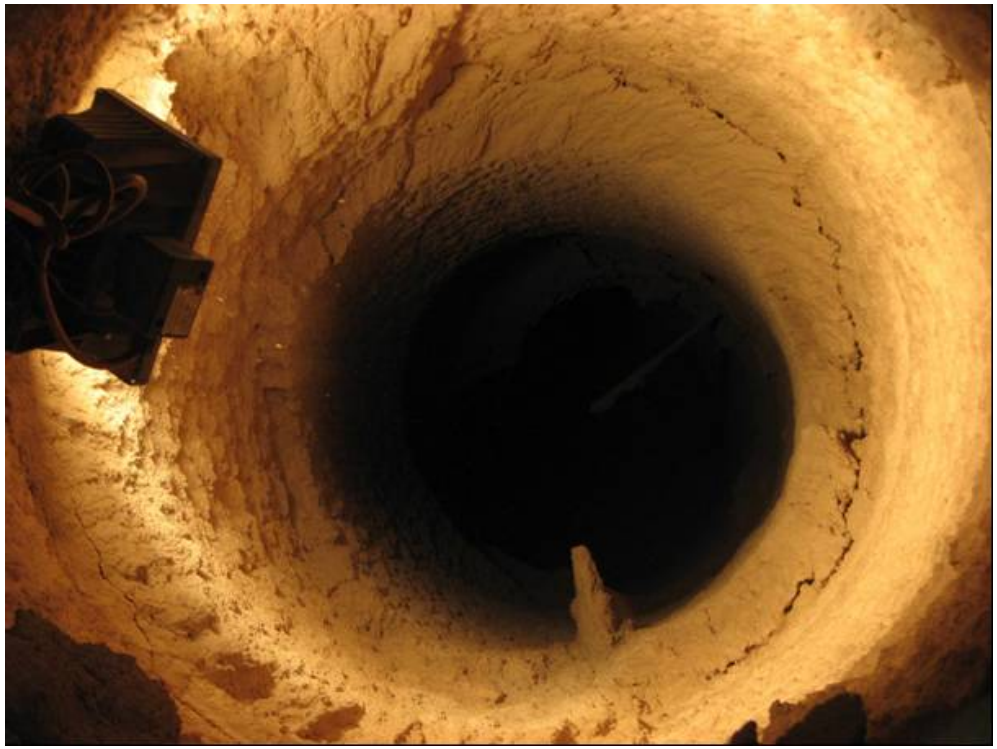
Slagging





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Conclusion

- Combustion test were concluded successfully
- No major bed ash sintering encountered due to additive adding
- Bed ash agglomeration controllable in industrial boilers
- High NOx emission
- High absorption of SO2 in the fluidized bed
- High slagging behavior of the ash

- => Next step: Combustion test in a large scale biomass boiler

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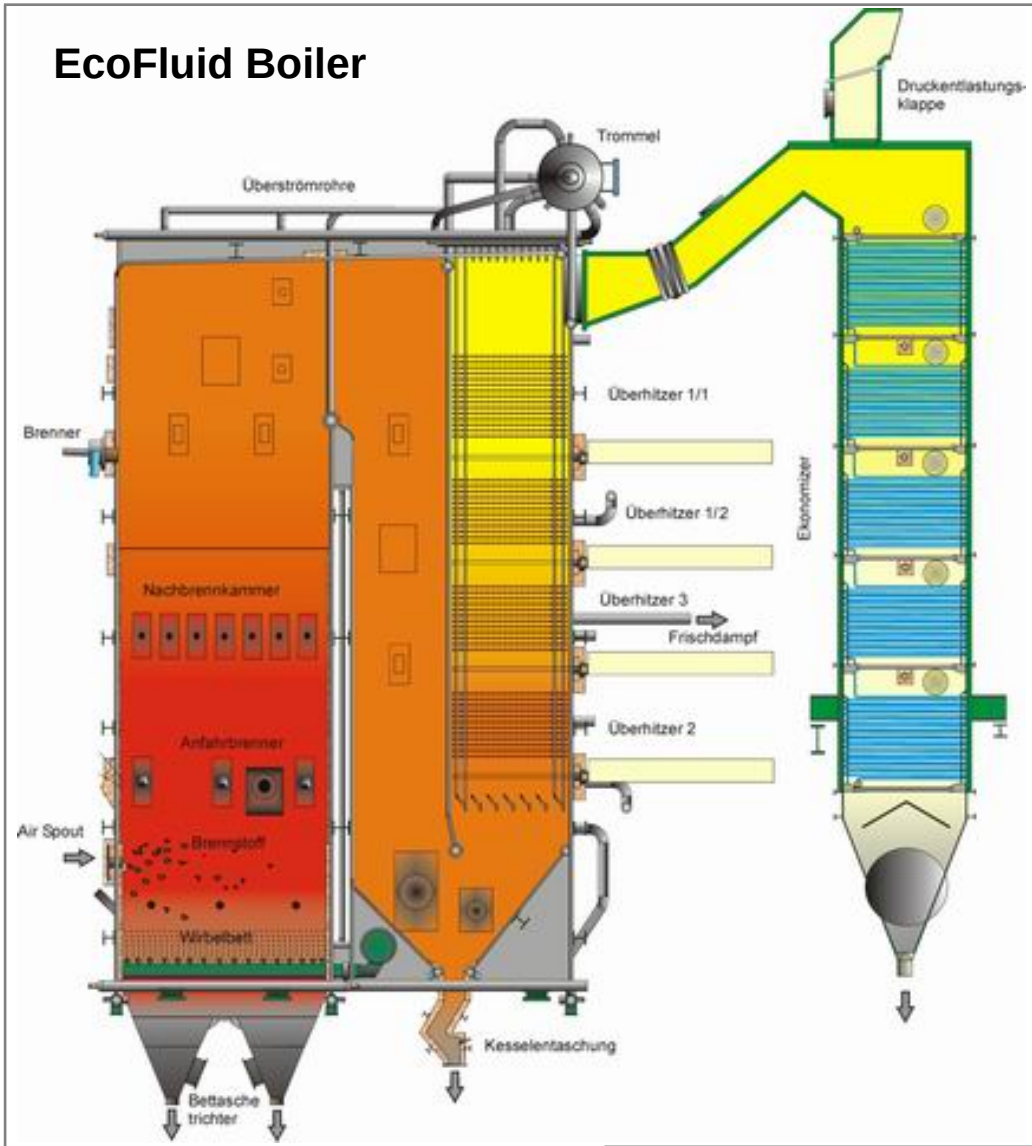
Biomass Plant for combustion tests

EcoFluid Boiler



Boiler Design Data

Live steam flow	57 t/h
Live steam pressure	41 barg
Live steam temperature	440°C
Guaranteed boiler efficiency	89%
Feedwater temperature	110 °C

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BMC Moerdijk BV / Netherlands 132 t/h BFB Boiler

- Supply of a BFB boiler plant, fuel handling, flue gas cleaning and ash handling in an open consortium with SIEMENS
- Combustion of poultry litter in an ECOFLUID boiler
- Generating of 36,5 MW of green electric power

KEY DATA

CUSTOMER:

BMC Moerdijk BV

Netherlands StartUp 2008

TECHNOLOGY:

Bubbling fluidised bed system

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

Fuel: poultry litter

Calorific value: 6 – 10 MJ/kg

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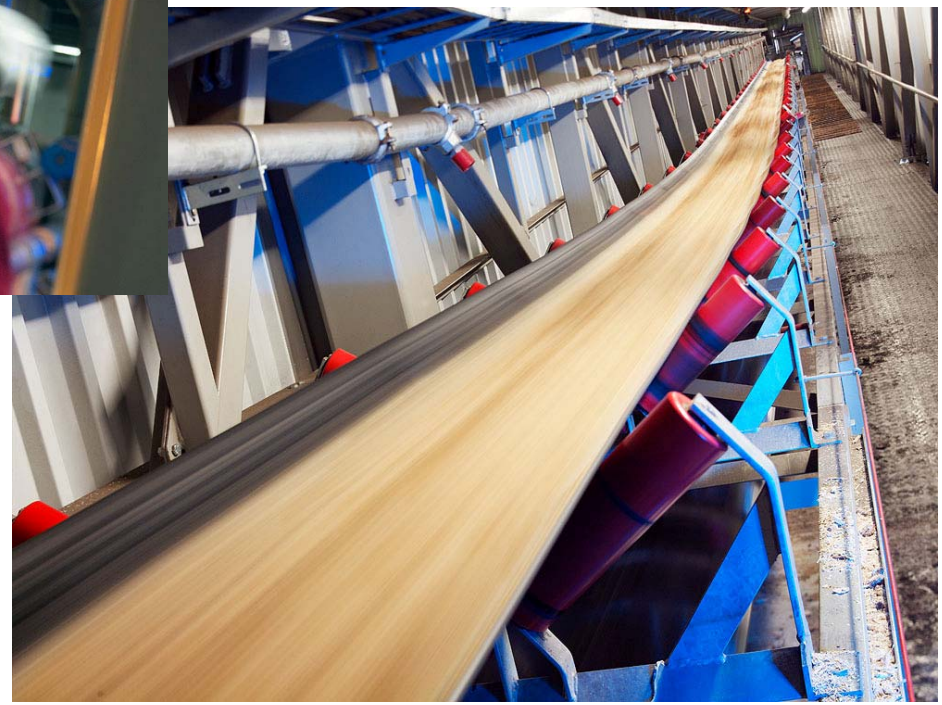

Thank you for your attention

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