



# Fluidized Bed Combustion of Demanding Fuels

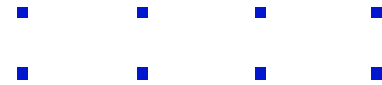
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# Contents



- Introduction
- Problems with demanding fuels
- Solutions to demands
- Summary



- Driving forces towards demanding fuel resources:
  1. The Kyoto Protocol
    - Industrial countries have committed to reduce greenhouse gas emissions 5.2% from the 1990 level by 2008-2012
  2. Environmental Legislation
    - Landfilling of combustible fractions will not be allowed in the future (2005 ->)
  3. Draining Energy Resources
    - The selection of “good” fuels moving towards more demanding and more difficult fuels

## The Kyoto Protocol:

- Increasing the efficiency of steam boilers
- Use of natural gas
- Use of CO<sub>2</sub>-neutral fuels

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## Environmental Legislation:

- Increased use of different wastes
- Combustion of various sludges
- Ash quality/properties

## Draining Energy Resources:

- Low heating value fuels
- High ash fuels
- High amounts of demanding components

# Introduction – demanding fuels

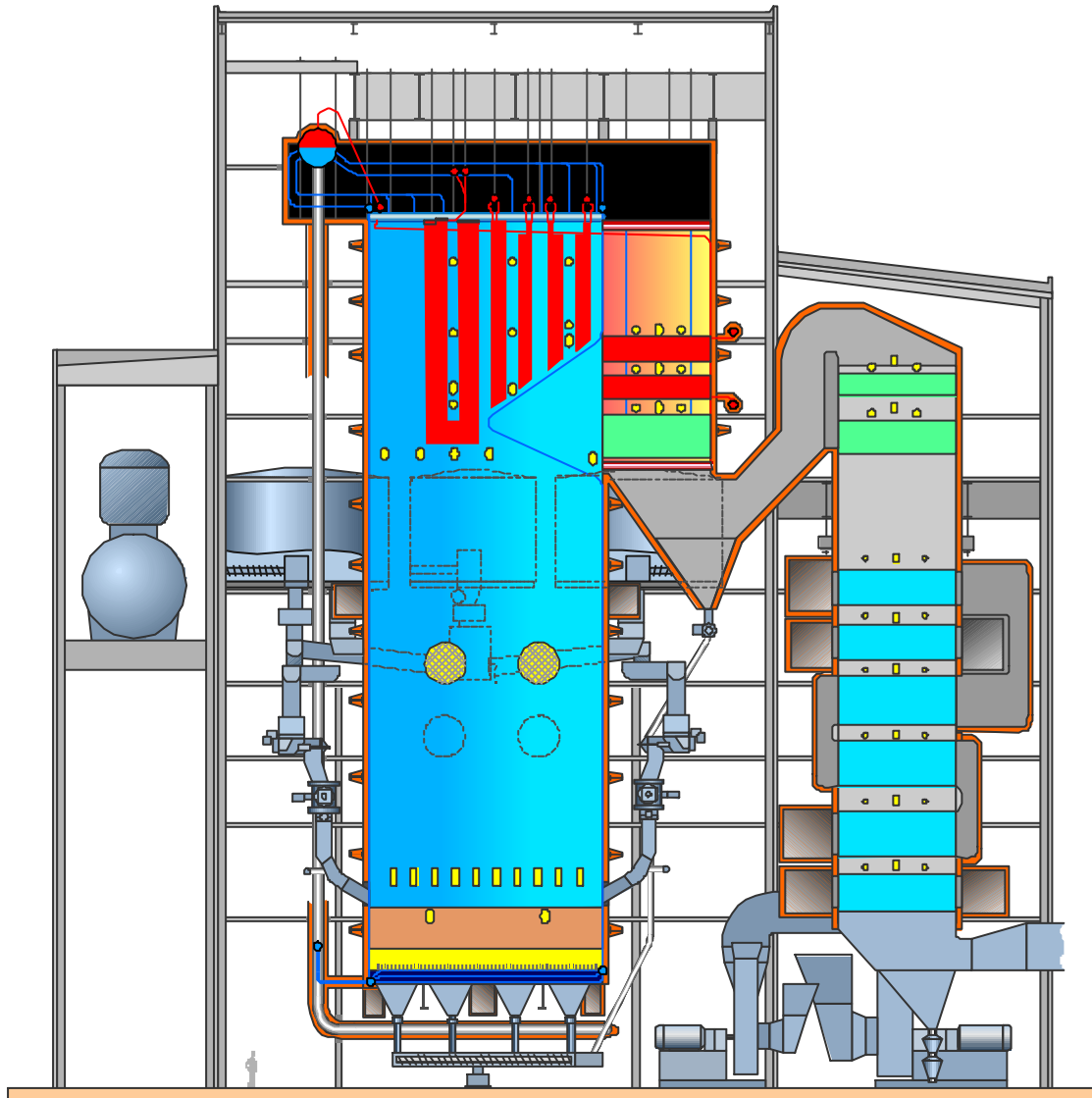


# Introduction – waste-derived fuels



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# Introduction – latest references



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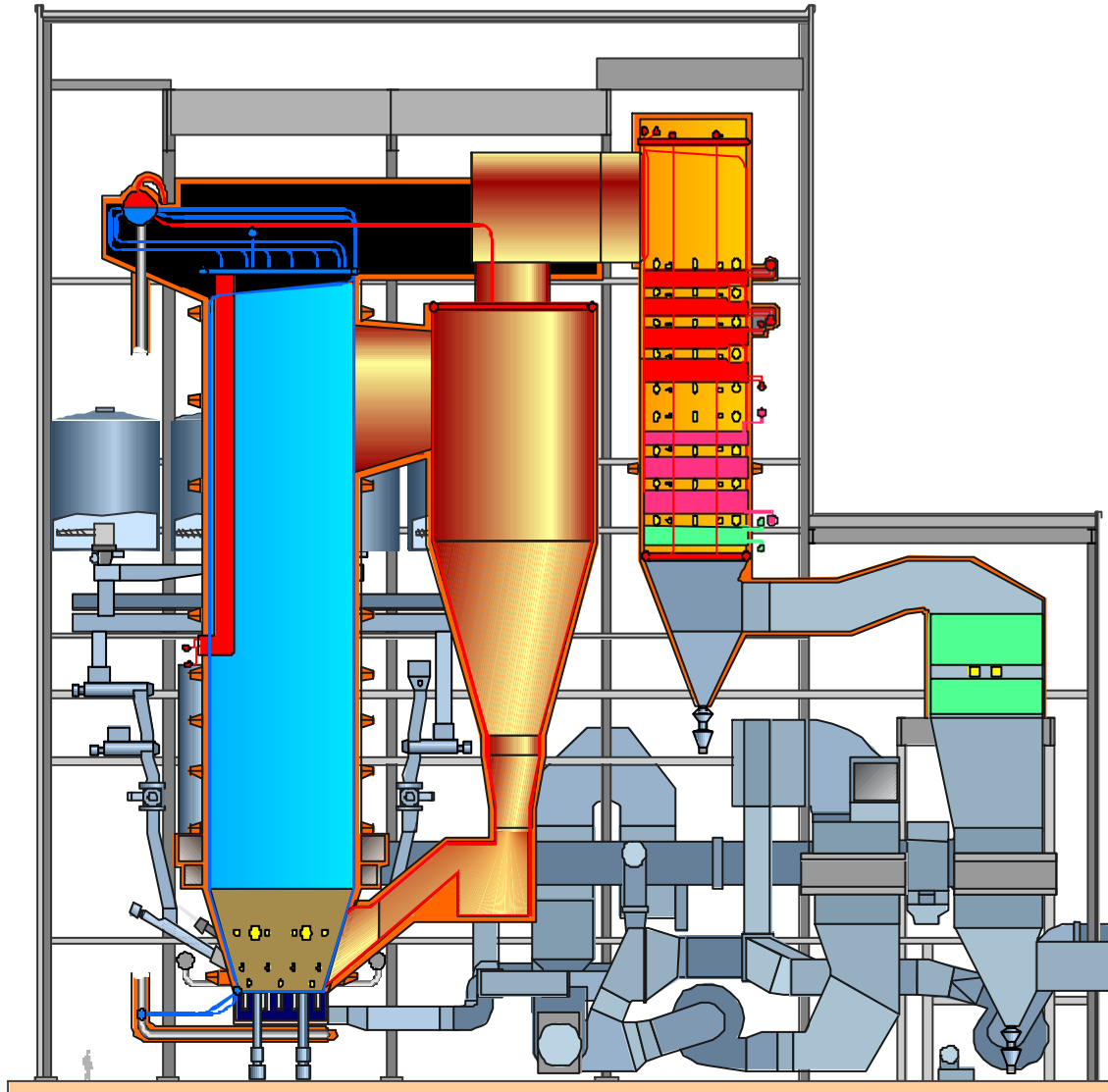
Kymin Voima,  
Kuusankoski, Finland

Steam 269 MW<sub>th</sub>  
107 kg/s  
114 bar  
541 °C

Fuels Bark, forest residue,  
sludge, peat, gas, oil

Start-up 2002

# Introduction – latest references



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Alholmens Kraft,  
Pietarsaari, Finland

Steam 550 MW<sub>th</sub>, 240 MW<sub>e</sub>  
194/179 kg/s  
165/40 bar  
545/545°C

Fuels Wood, peat, coal  
Start-up 2001

# Problems with demanding fuels

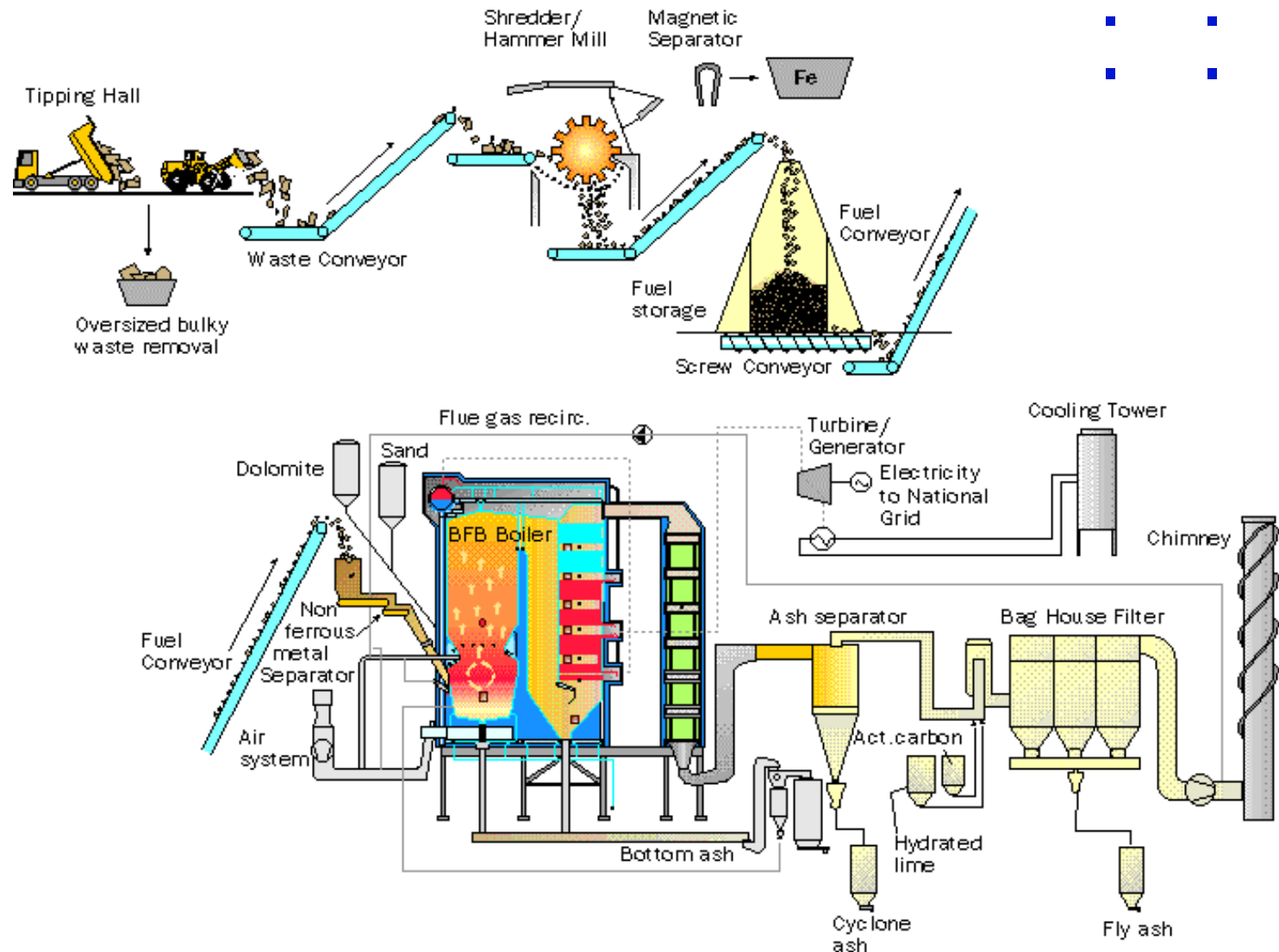


- Fuel feeding
- Fluidization
  - Bed agglomeration
- Fouling
  - Plugging
- Corrosion
- Coarse removal

# Fuel feeding



# Fuel feeding

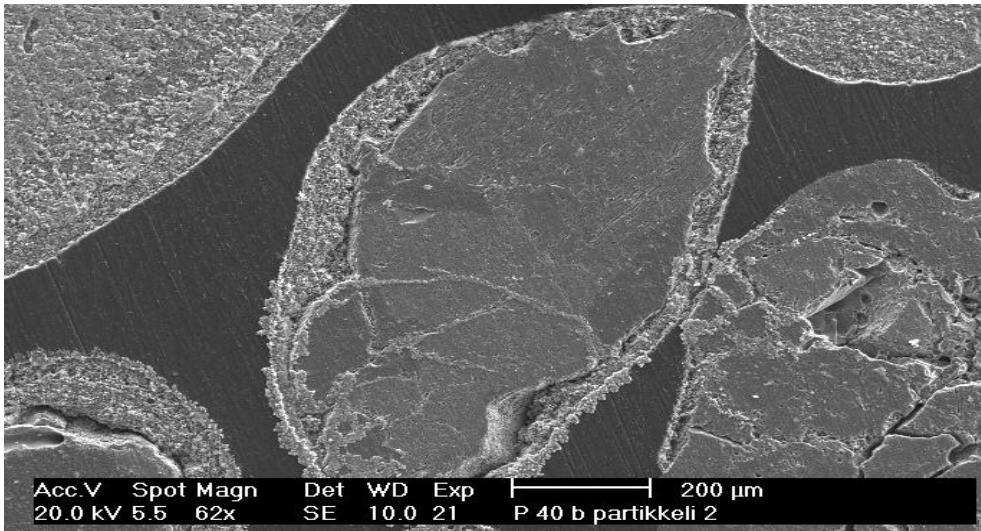


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# Fuel feeding



# Fluidization/agglomeration



# Fouling and plugging



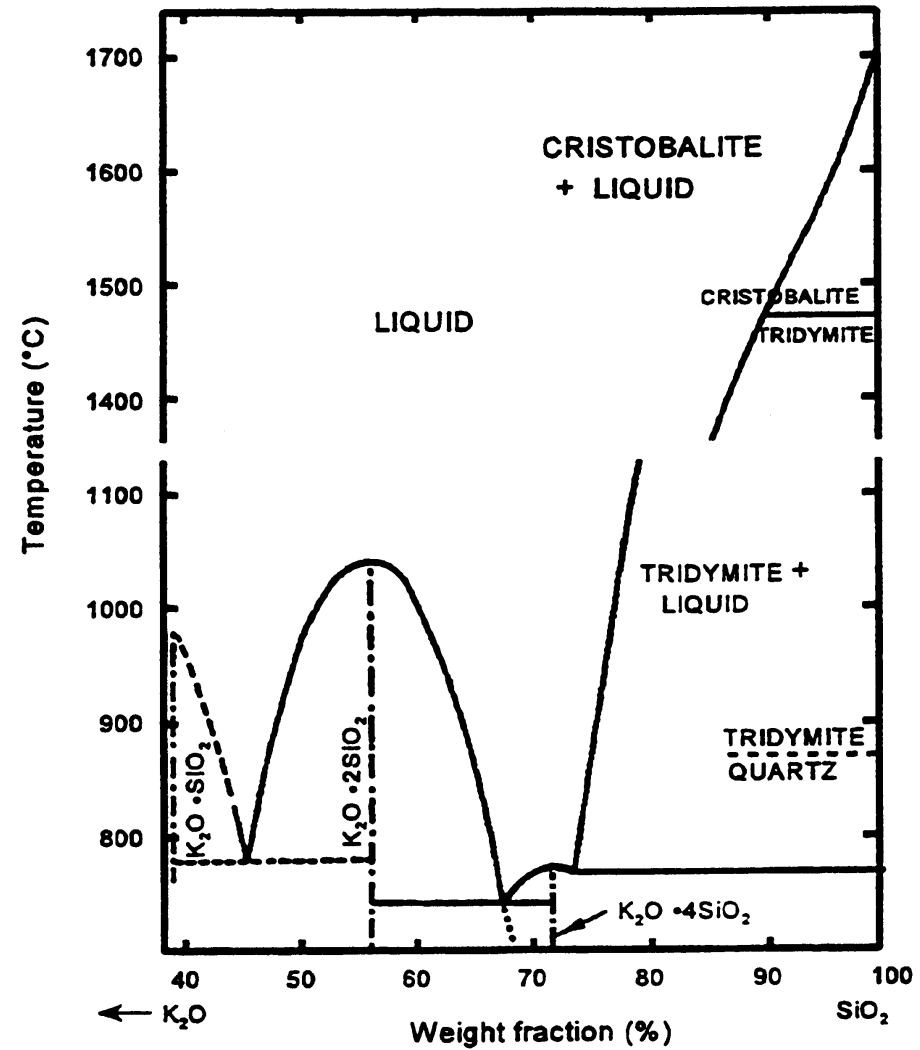
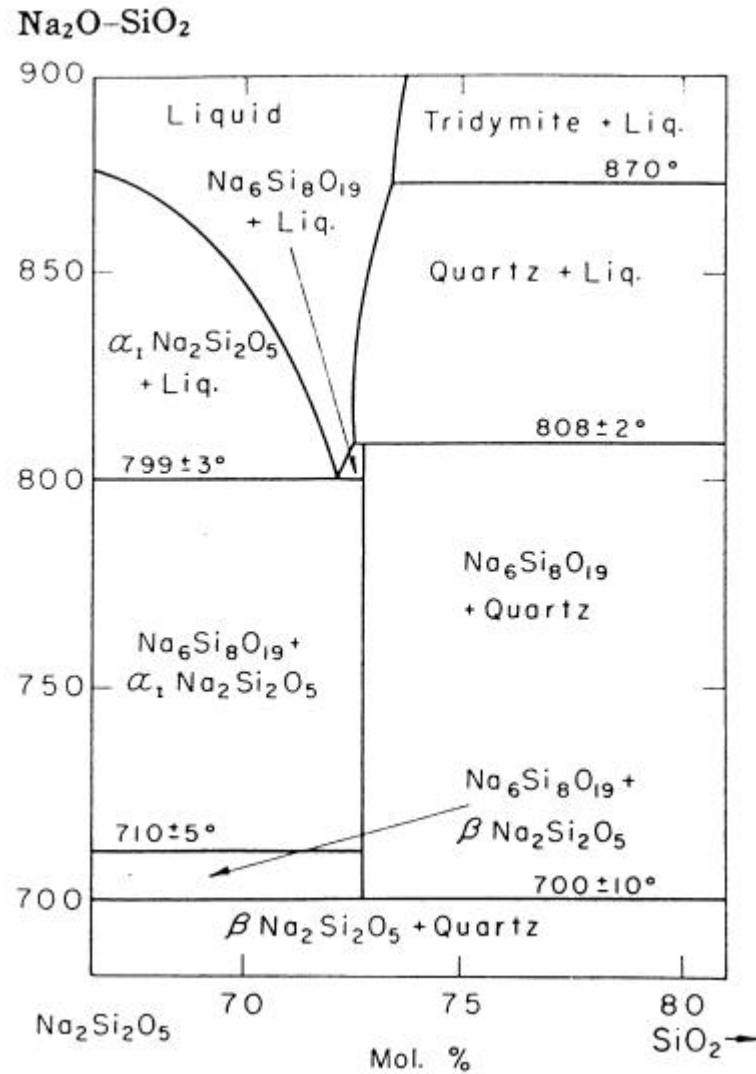
# Coarse removal



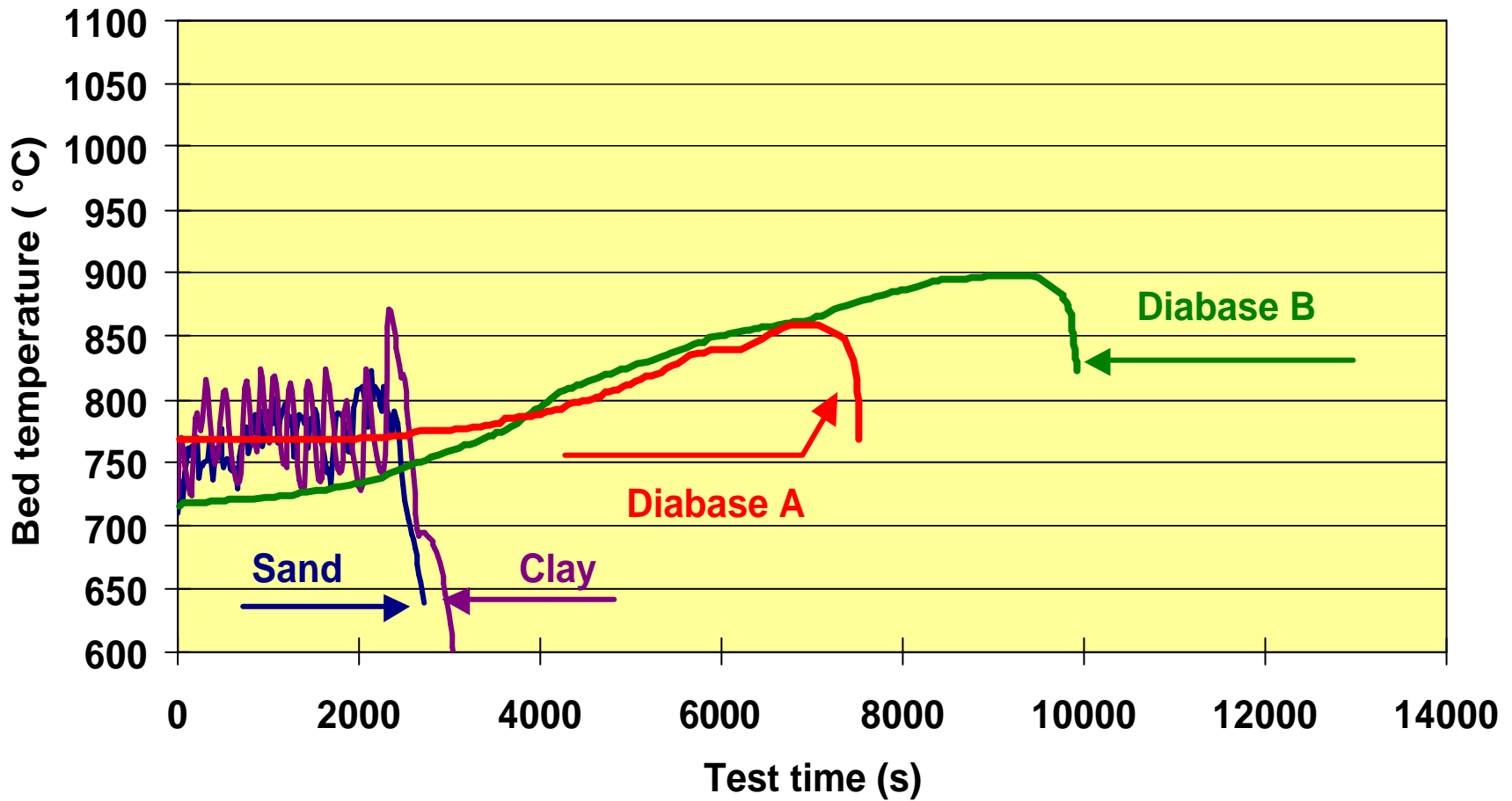
# Coarse removal



# Bed sintering due to alkalis



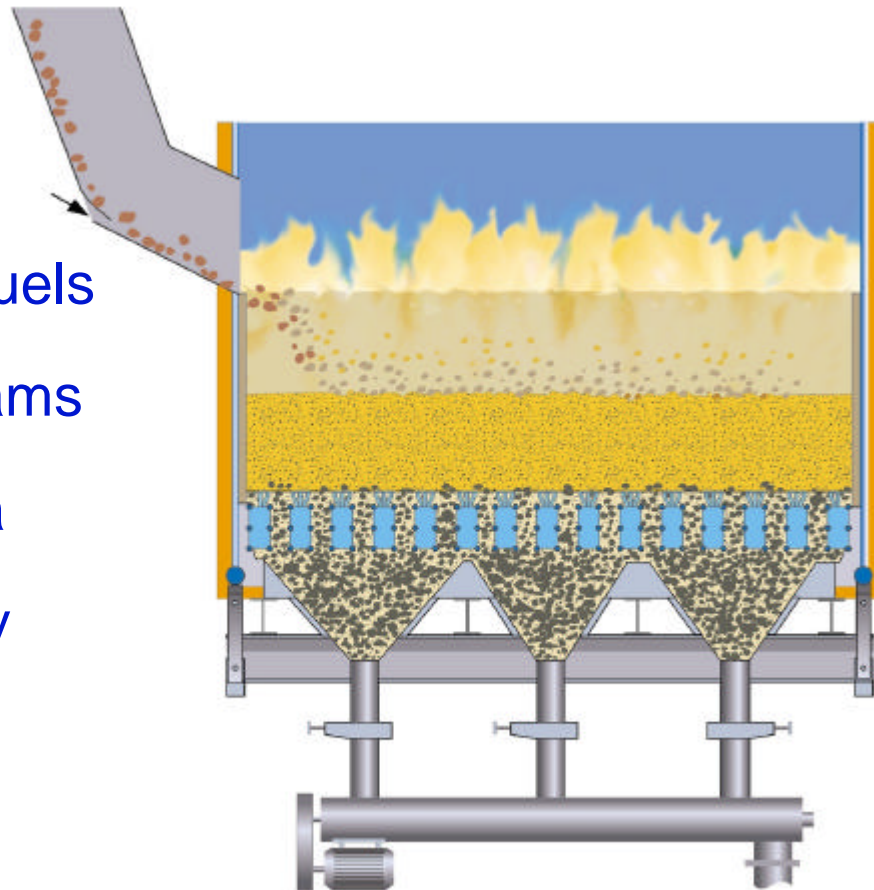
# Quartz free bed material



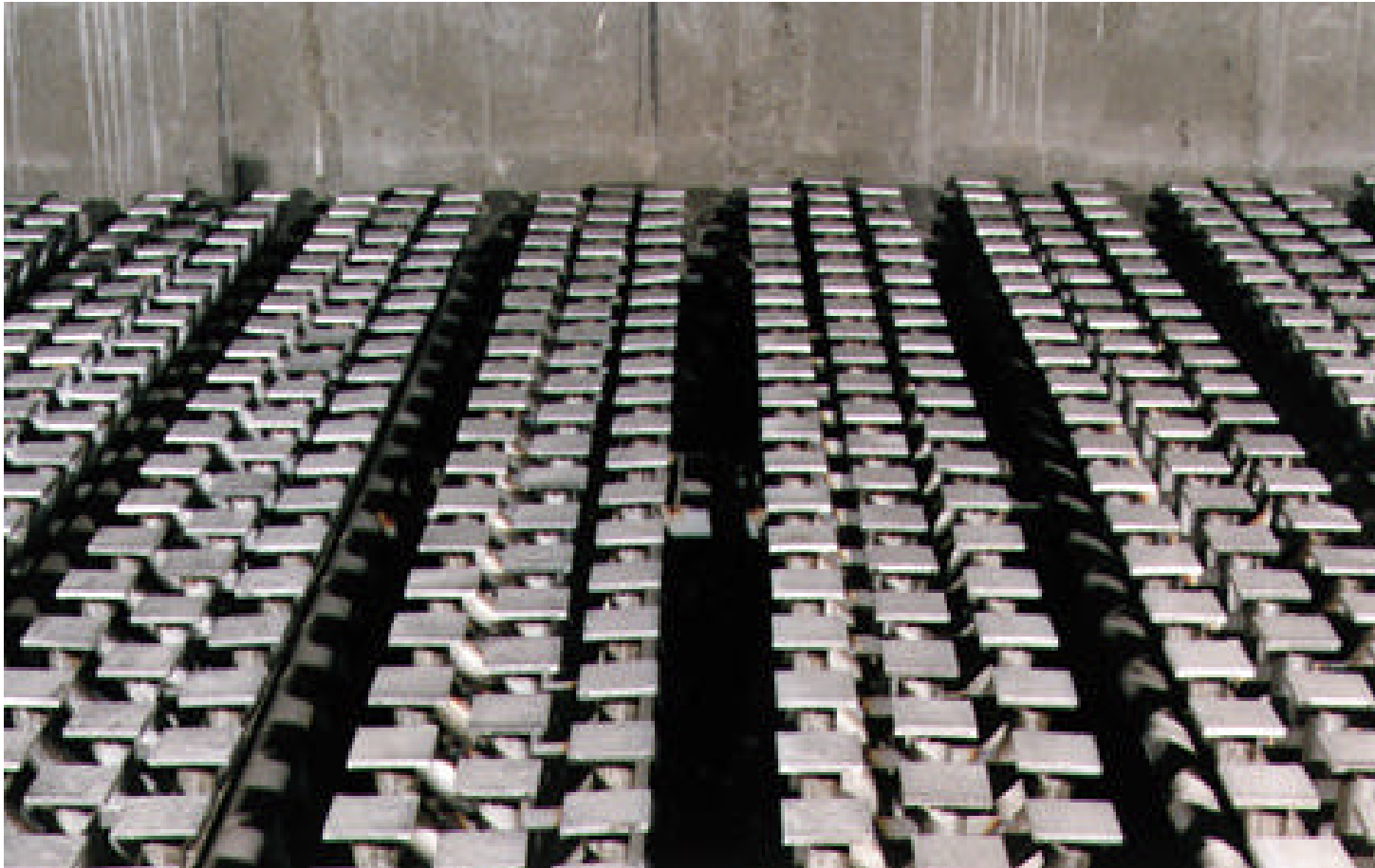


## Hydro beam floor

- Developed for demanding fuels
- Totally water-cooled air beams
- Extended free removal area
- Excellent removal efficiency
- Patented design



# Coarse removal - hydro beam grate

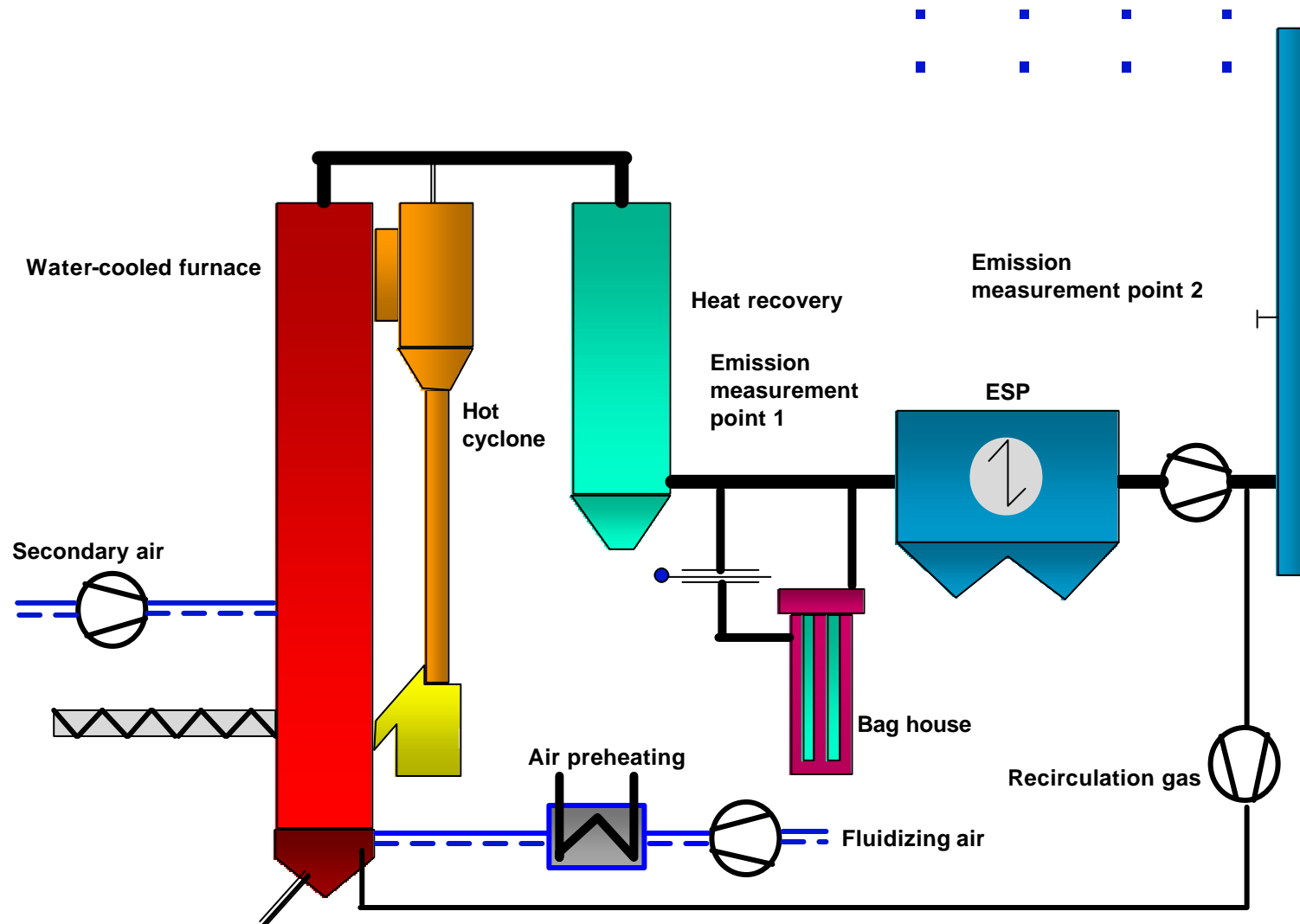


**Our core value:**  
Continuous development for  
sustainable development.

- Testing of new fuels
- Development of combustion technology
- Pilot plant
  - ✓ 2 MW BFB
  - ✓ 4 MW CFB



# Fluidized bed pilot(s)



# Demanding fuels – easy operation

Pulp & Paper

**The ultimate goal!**



Kvaerner Pulping - Power Division

**KVÆRNER**