Chalmers Power Central

– A research facility at industrial scale

Thomas Allgurén, PhD
Adrian Gunnarsson, PhD
Saumitra Mishra, PhD
High Temperature Processes | 2026.02.03

Agenda

- Presenting the Power Central
  - History
  - Current research topics
- Splitting the group in two

  - Group 1
    - Visiting the Power Central
    - Presentation from Petro Bio
    - Coffee & tea
  - Group 2
    - Presentation from Petro Bio
    - Coffee & tea
    - Visiting the Power Central

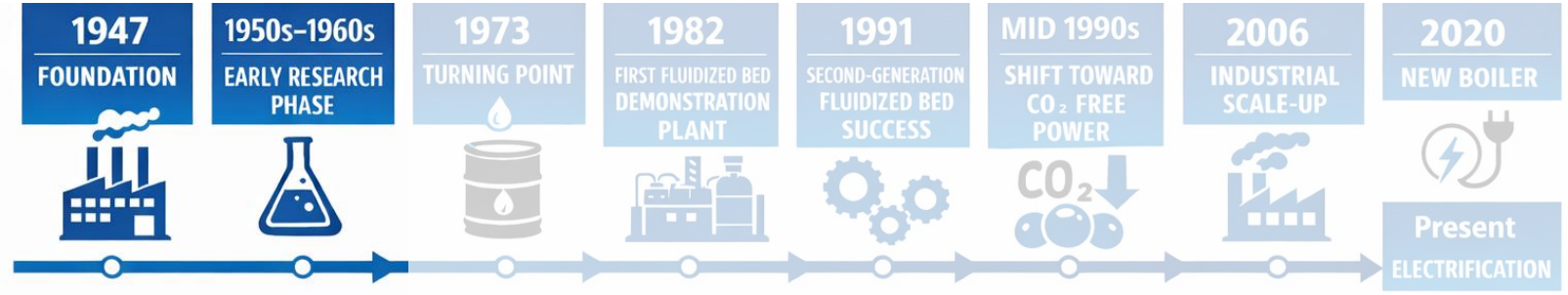
What is Chalmers Power Central?

- The Chalmers Power Central (CPC) is an advanced research facility focusing on energy conversion at the same time as it provides heat and power.
- Chalmers and Akademiska hus has a joint ownership of the CPC.

- One dual fluidized bed boiler
- One oil and pulverized pellet boiler
- One 100 kW pilot

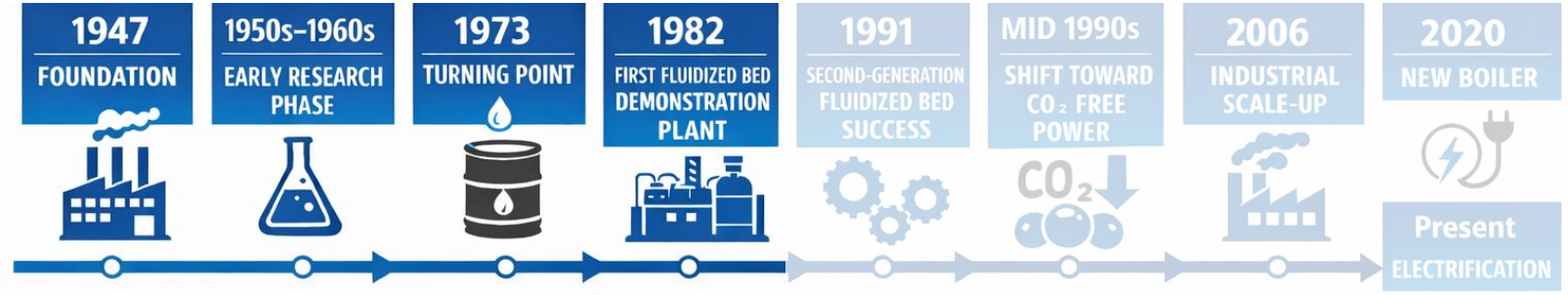
The history of CPC

- Founded in 1947
  - Coal fired steam boilers
  - Heat to campus buildings
- Examine characteristics and prove the concept of district heating systems



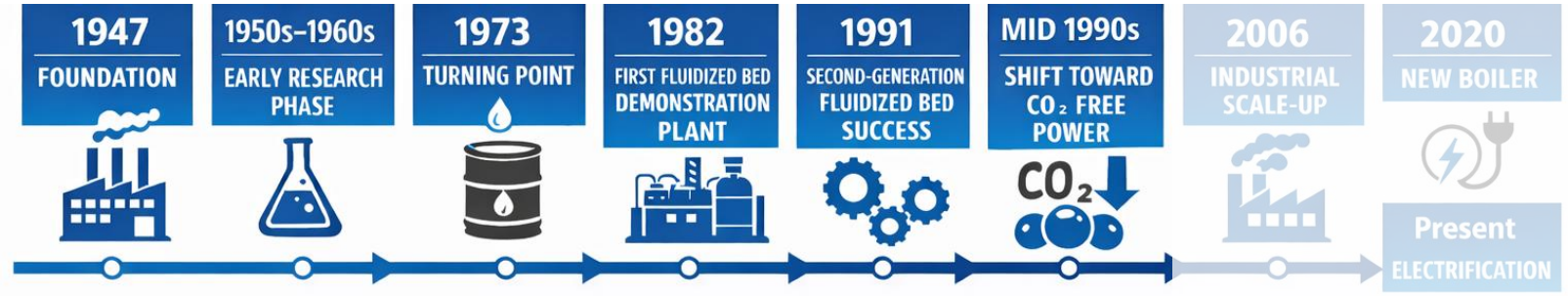
The history of CPC

- The oil crisis during the 1970s resulted in external funding for energy related research
- An early fluidized bed boiler was built in 1982
- Focus on energy conversion and fluidization characteristics



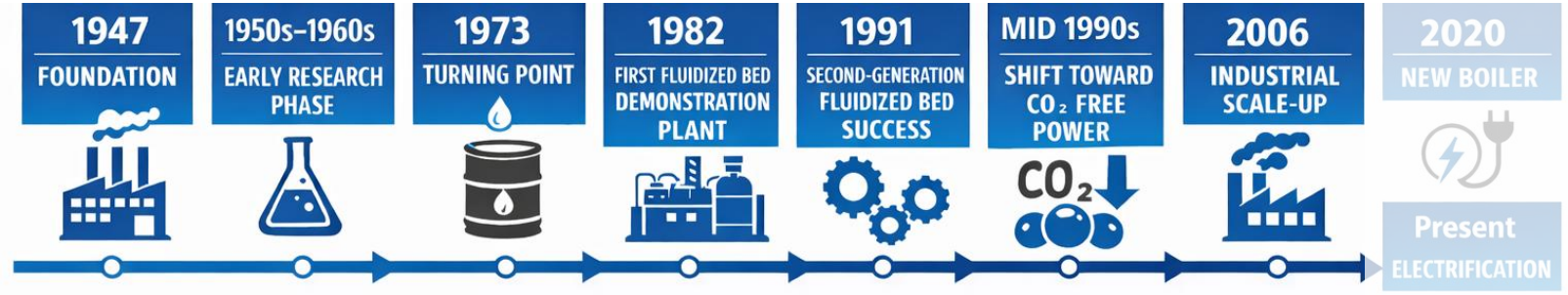
The history of CPC

- Circulating fluidized bed boiler built in 1991
  - Several external partners including Akademiska hus and Gothenburg Energy
- Continuing the work on fluidization
- New fuels, new chanalges



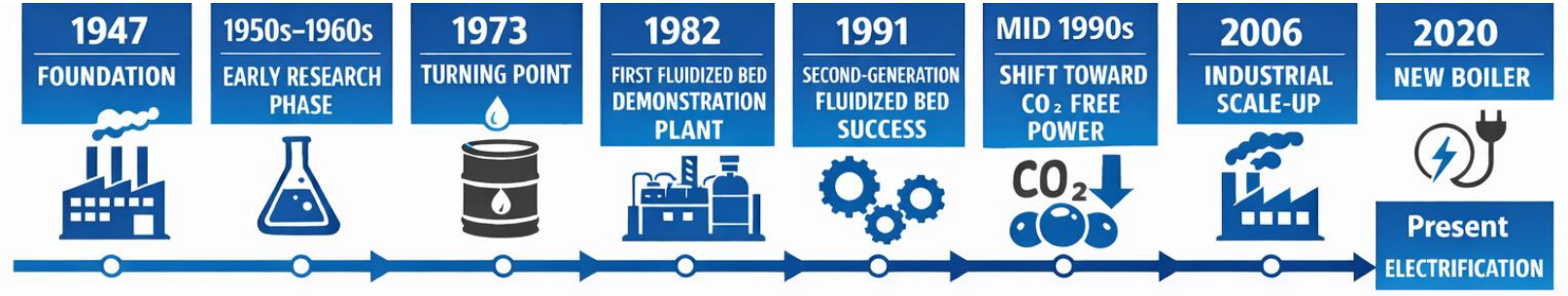
The history of CPC

- New 100 kW combustion unit for oxy-fuel combustion research in early 2000s.
  - Collaboration with Vattenfall
  - Providing input for the construction of the pilot plant Schwartze Pumpe.
- Dual fluidized bed used for gasification
  - Collaboration with Gothenburg Energy
  - Providing input for the construction of the GoBiGas plant



The history of CPC

- Newest boiler - 2020
  - Multi fuel burner
- Updated pilot unit – 2026
  - New energy carriers



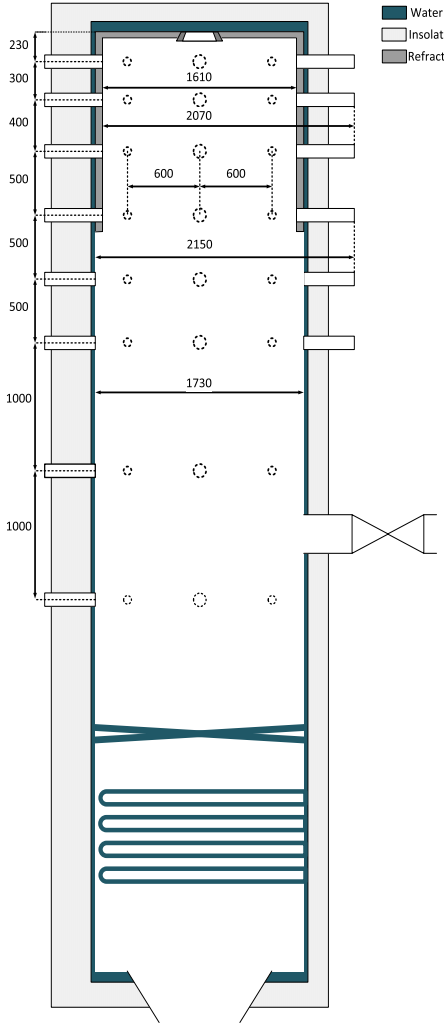
CPC today

- Three boilers
  - CFB (with gasifier)
  - Combi burner
  - Pilot unit
- Still providing heat and electricity

- Research topics
  - Flexibility – fuel and operation
  - Gasification – biomass and waste
  - Electrification
    - Indirect – Hydrogen combustion
    - Direct – Plasma
  - Heat transfer
  - Emission formation and cleaning
  - Active bed materials
  - Aerosol and deposition formation

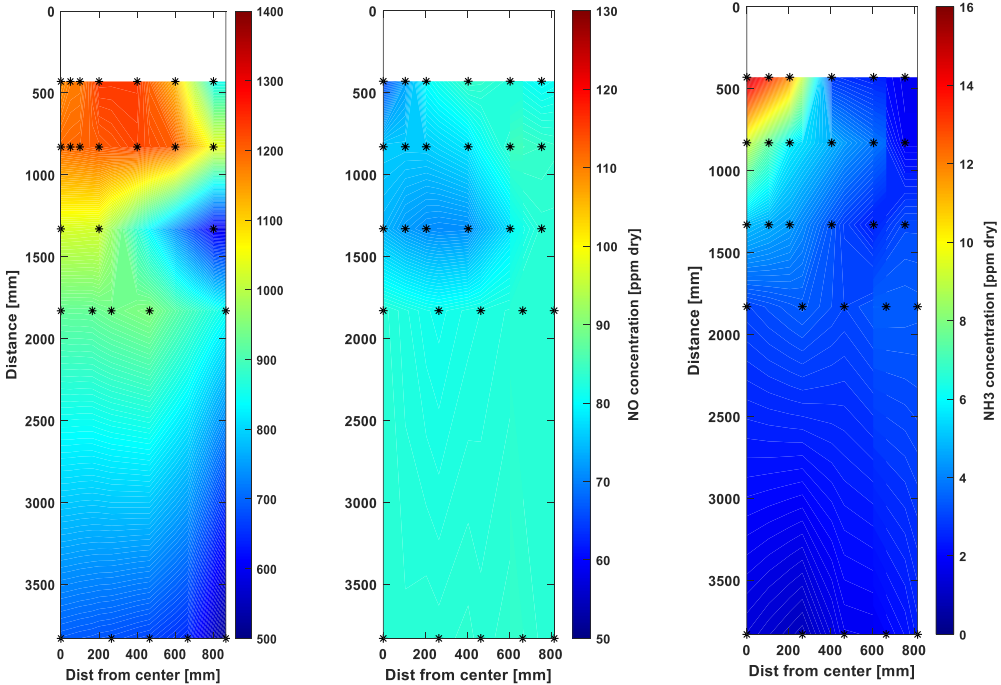
Panna 2

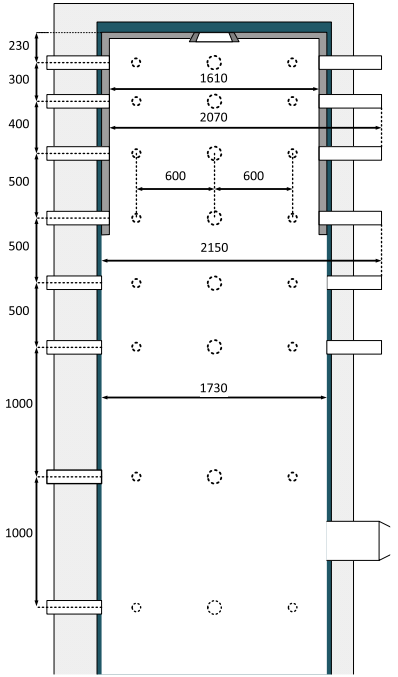
- Newest boiler - 2020
  - Up to 3 MW with pulverized pellets
  - Up to 6 MW in combination with bio-oil
- Producing heat and steam
  - 1 MW steam turbine
- Designed for research
  - Measuring access on 8 different levels on all four sides



Panna 2

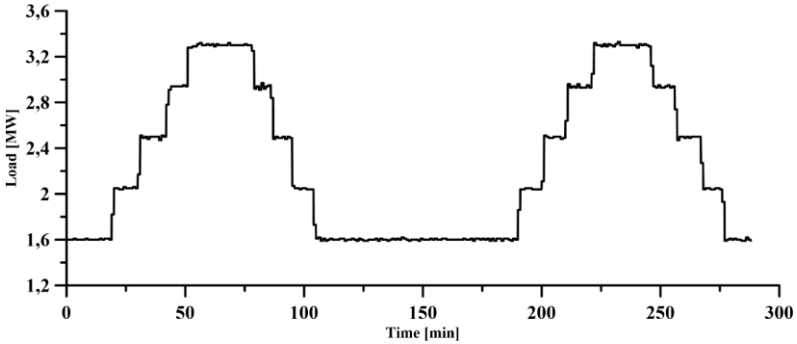
Temperature and gas composition

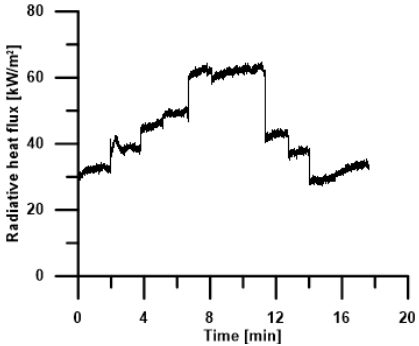




Panna 2

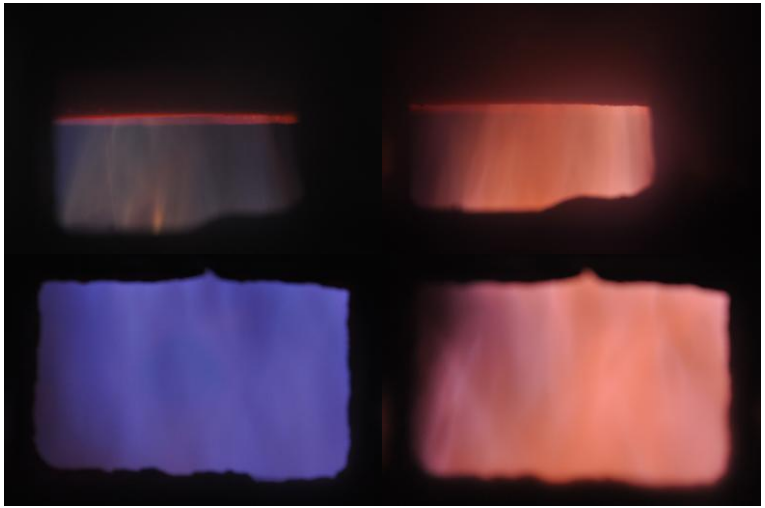
Load variations





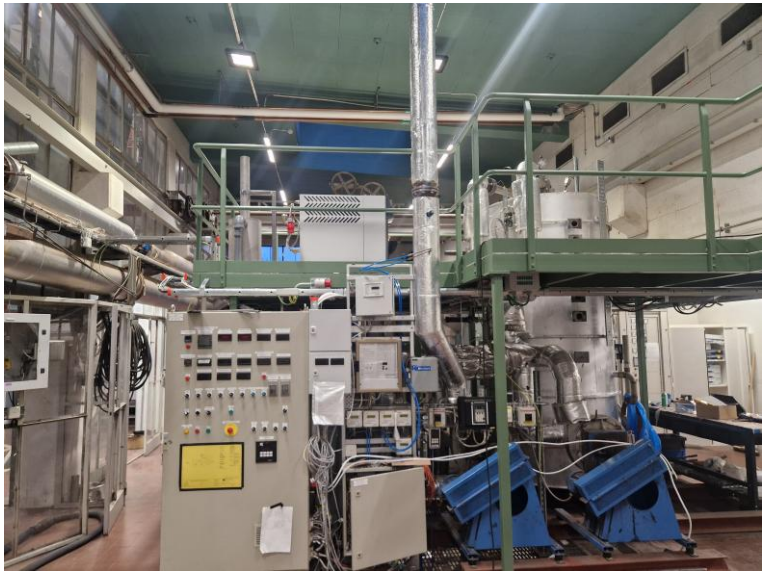
Panna 3 – 100 kW pilot

- Oxy-fuel combustion
  - Lignite
  - Propane
- Bio CCS
  - “Artificial” fuels – doped propane flames
- Smelting furnace
  - Oxy/ oxygen enriched combustion
- Rotary kilns
  - Iron pellet production – LKAB
  - Clinker production – Heidelberg Materials



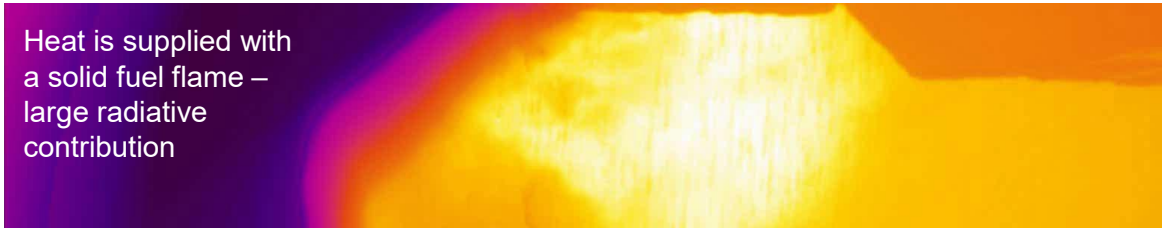
Panna 3 – 100 kW pilot

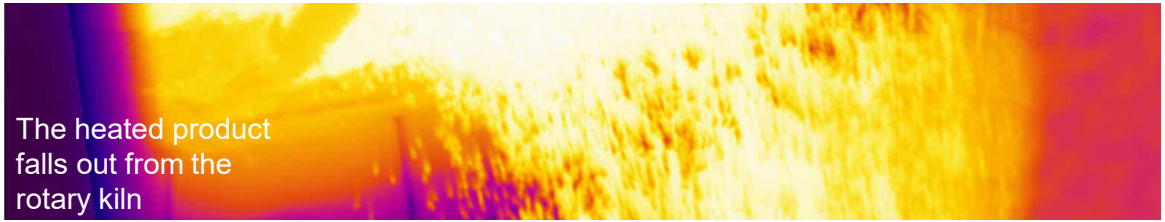
- Under reconstruction
- Will be possible to operate with:
  - Propane
  - Hydrogen
  - Thermal plasma
  - Solid fuels



Fuel comparison

- Alternative fuels for iron ore pellet production
  - Coal (reference)
  - Steam exploded
  - Torrefied
- Important parameters
  - Heat transfer
  - Ash formation
  - Emission formation





Fuel comparison

- Co-combustion for power generation
  - Coal (base fuel)
  - Steam exploded (only in pilot tests)
  - Torrefied
- Hunter power plant, Castle Dale, Utah
  - 1 320 MWth
  - 20% biomass
- Important parameters
  - Efficiency
  - Ash formation and deposition
  - Emission formation

CHALMERS