

# BFB furnace bottom modification in Idbäcken CHP

Demo in NextGenBioWaste WP1.2

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# Idbäcken CHP in Nyköping

**1994, Bubbling Fluidised Bed: 70 MW<sub>heat</sub> 35 MW<sub>el</sub>**

**Steam data: 140 bar/540°C**

**NGBW targets:**

- ✓ Double the lifetime of heat exchanger components at existing steam temperatures
- ✓ Increase the electrical efficiency for biomass combustion plants from 33 to 35%, while making the systems more cost-effective by the use of more low-grade fuels
- ✓ Lower the fuel cost at least 1 mill. €/year for a 100 MWth biomass combustion plant while maintaining the two former subtargets (2 and 3)

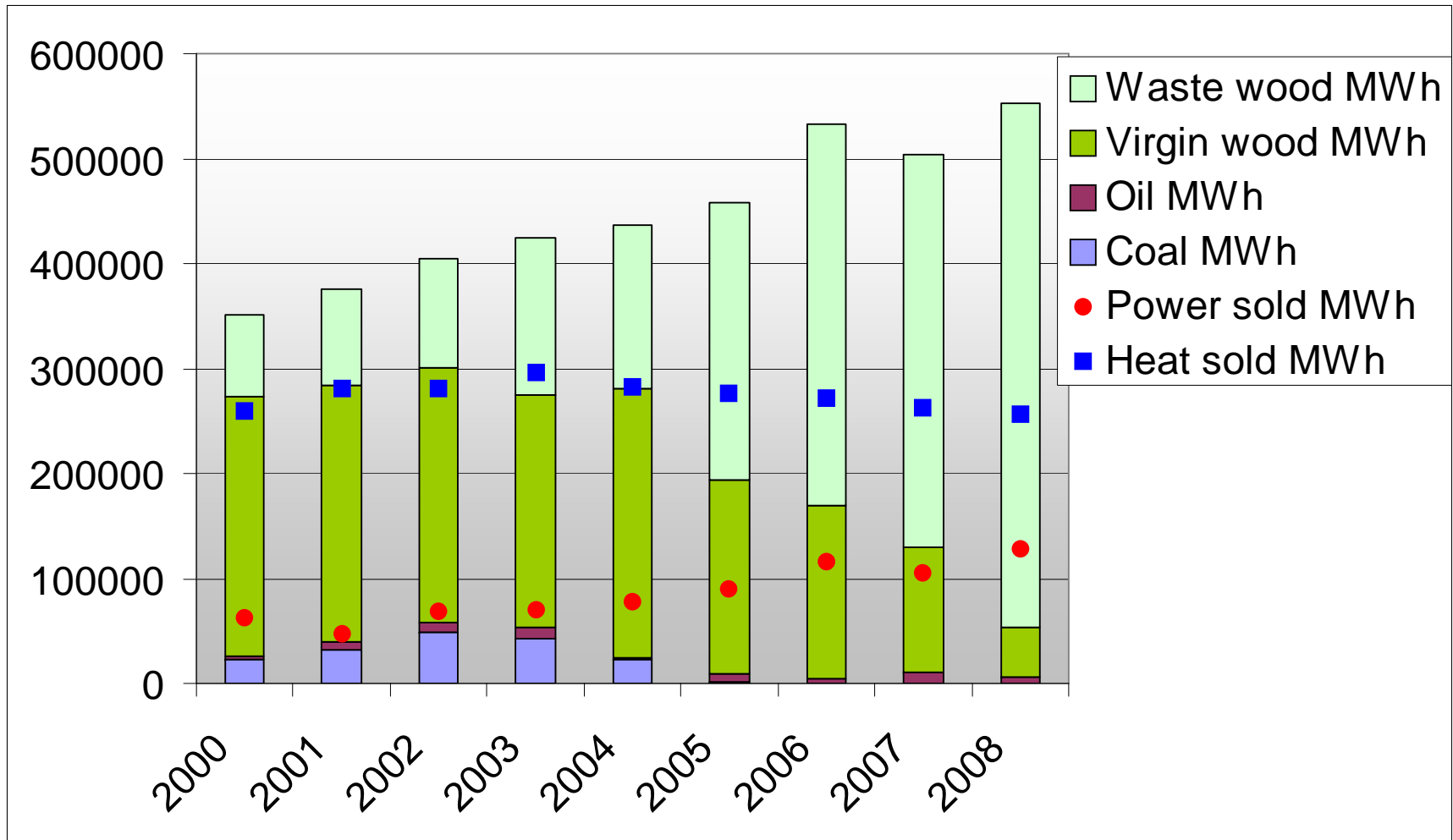
# Demolition waste wood



# Forest residues



# Fuel mixture



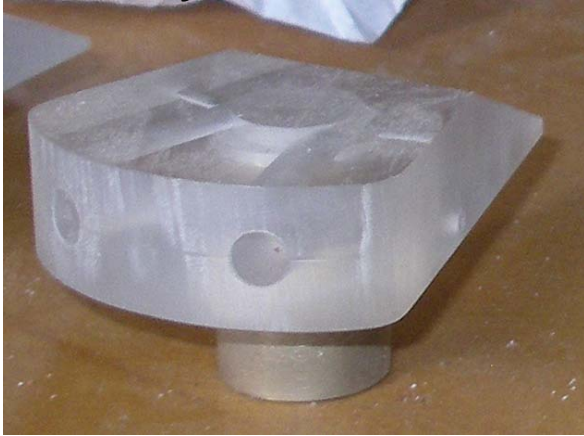
# Need for new bed bottom

- 50% waste wood => stop every month for bed cleaning
- Target: 100% waste wood!



# Tested nozzles

Ankfotsdysa



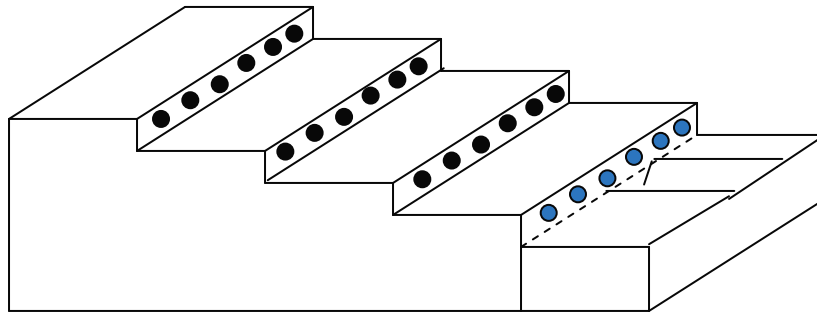
Originaldysa



Hög dysa



Trappstegsinsats

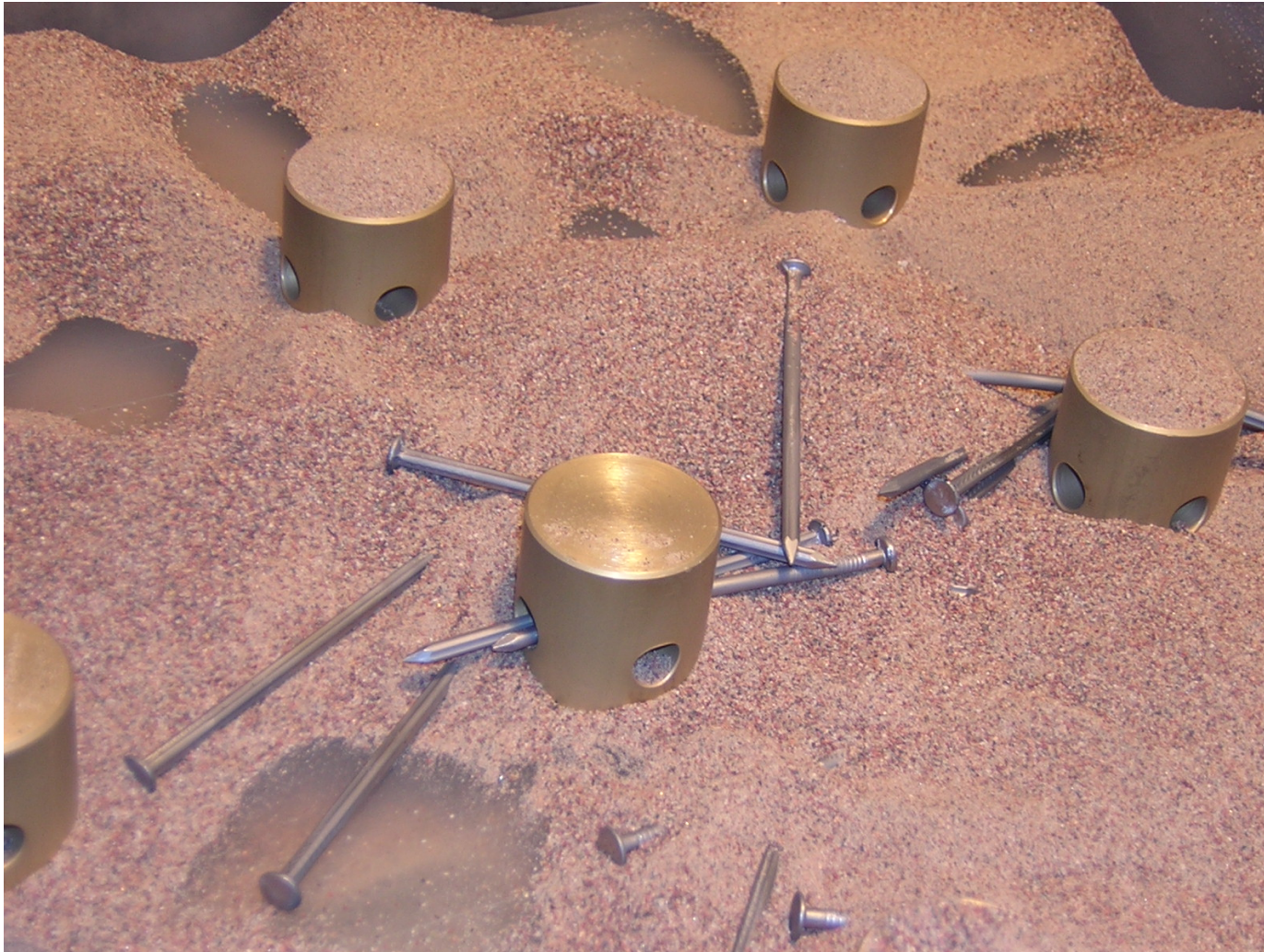


# Pilot scale test – nail transport





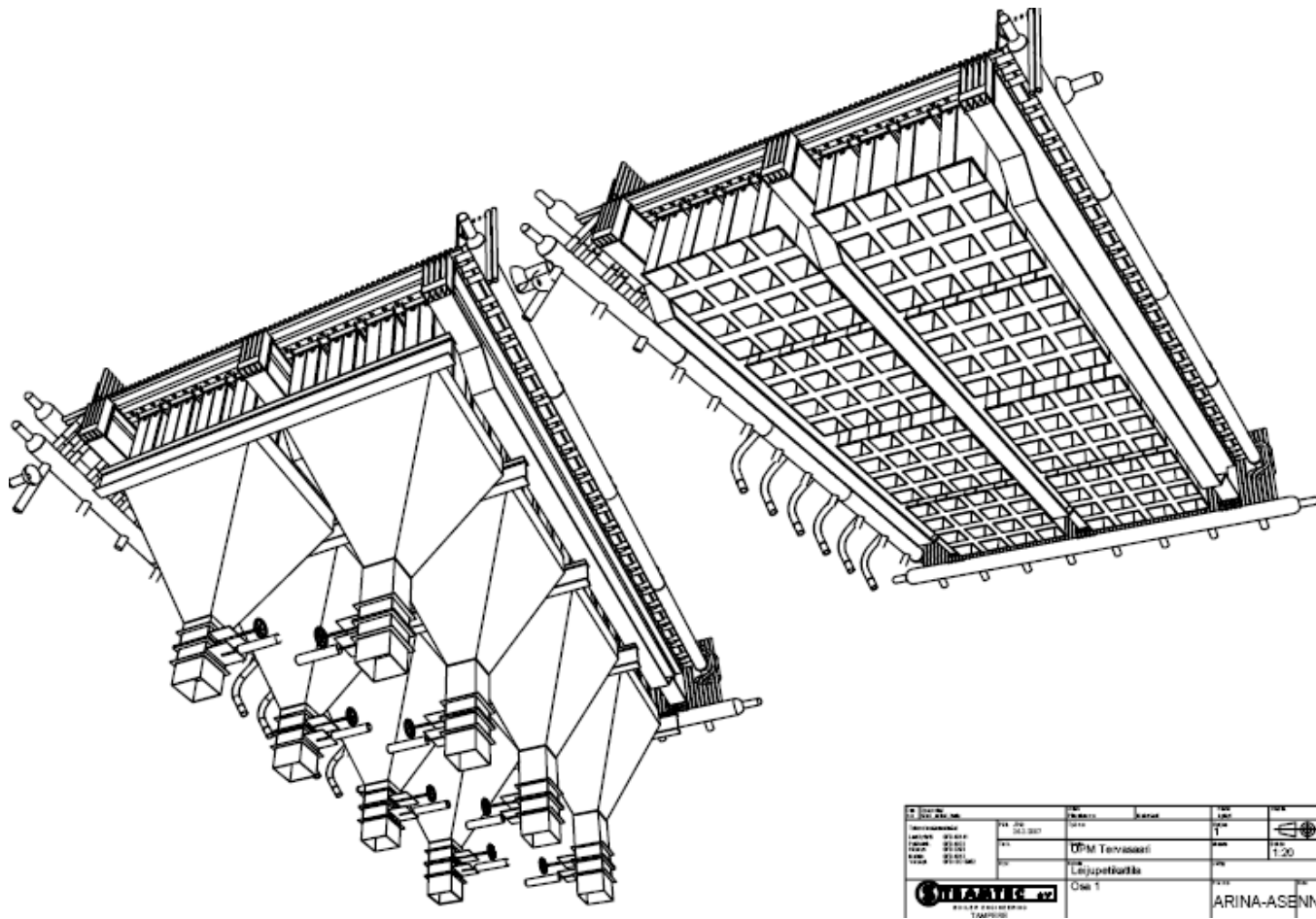
# Original nozzles



# Step grid



# New bed bottom design



# Installation summer 2007



# The problem to drain sand from all shutes...



## 4:1 scale sand drain tests

Original design- empty hopper



'Kinesiska hatten' ver. 4 in hopper

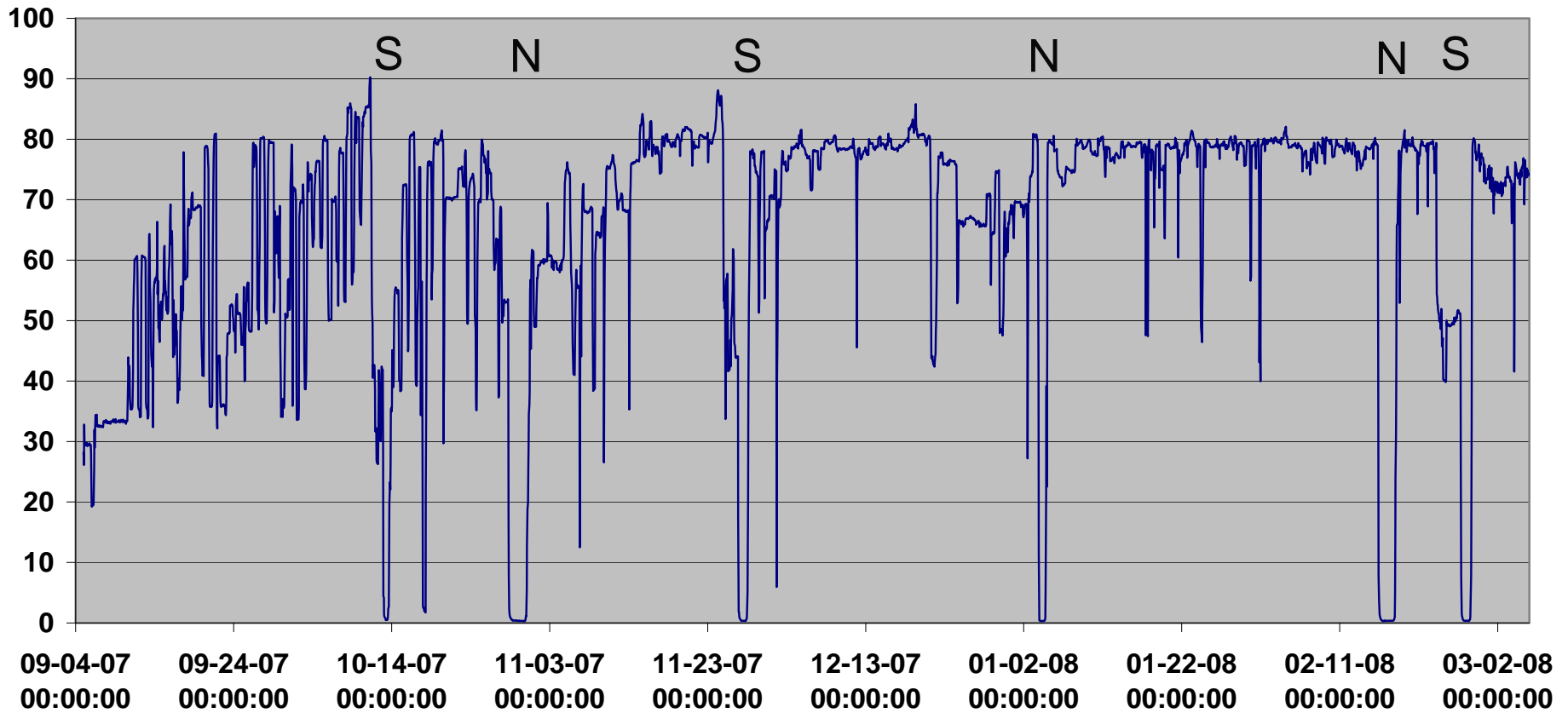


**Unfortunately, the sand don't behave the same in the full scale hopper...**

# Steam production BFB 2007-08

N= nozzle cleaning  
S= sintering

IDBACKEN.P3.CQI4039  
(Eff ånga e ÖH)



# Main bed bottom problems 2007-08

Primary reasons for unavailability:

- (Partial) defluidisation of bed (3 stops)
- Plugging of nozzles (3 stops)



Other problems/malfunctions:

- Bed sand drained only from 25% of the bottom ash chutes
- Extensive wear and high temperature in bottom ash chain conveyor



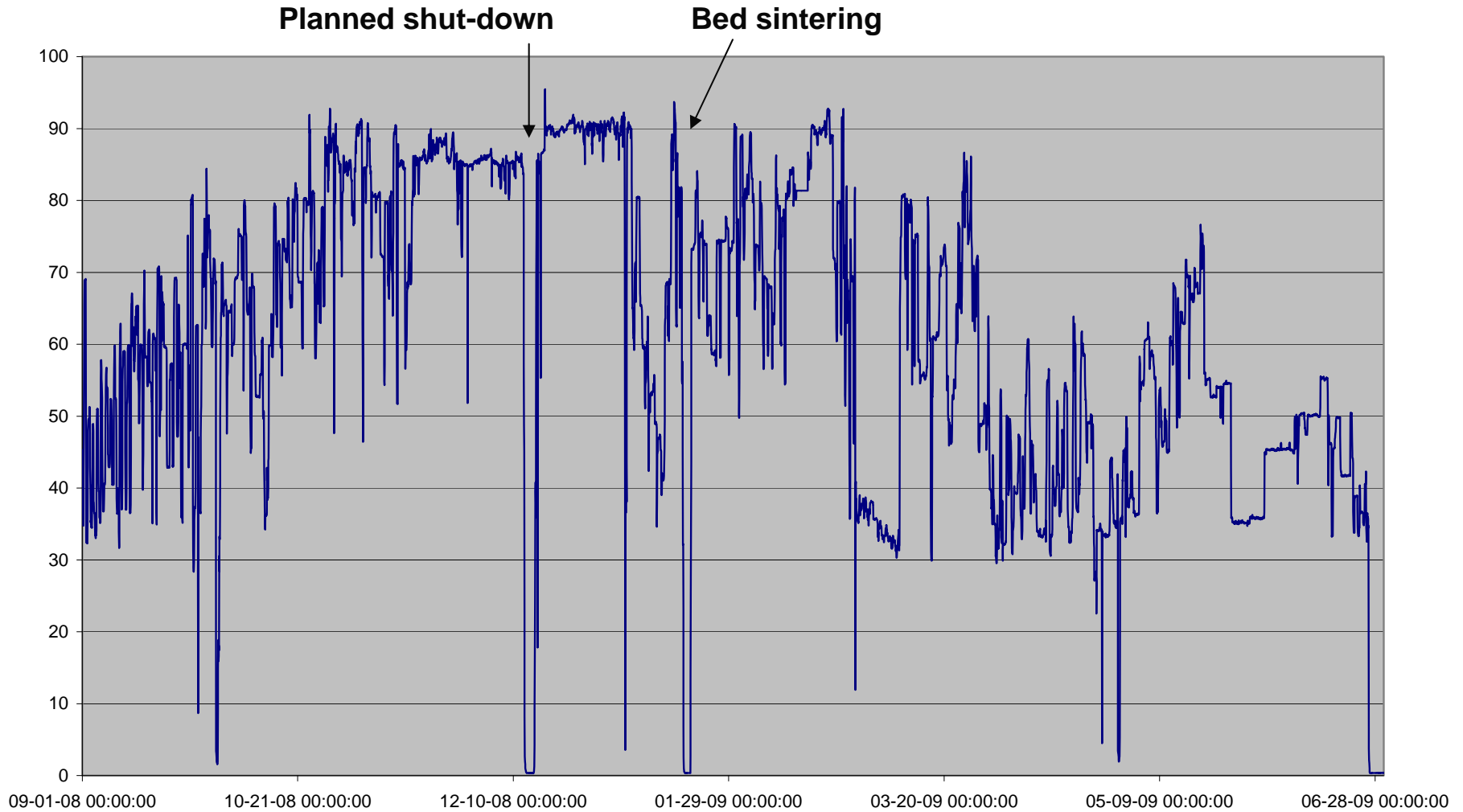
# Status March 2008

- Bed bottom not yet taken over by Vattenfall.
- Development and adjustments still made by the supplier.
- Neither test run period nor performance test has been possible to initiate.
- The boiler availability still lower than expected (~92%)
- Capacity still limited to 80 MWth

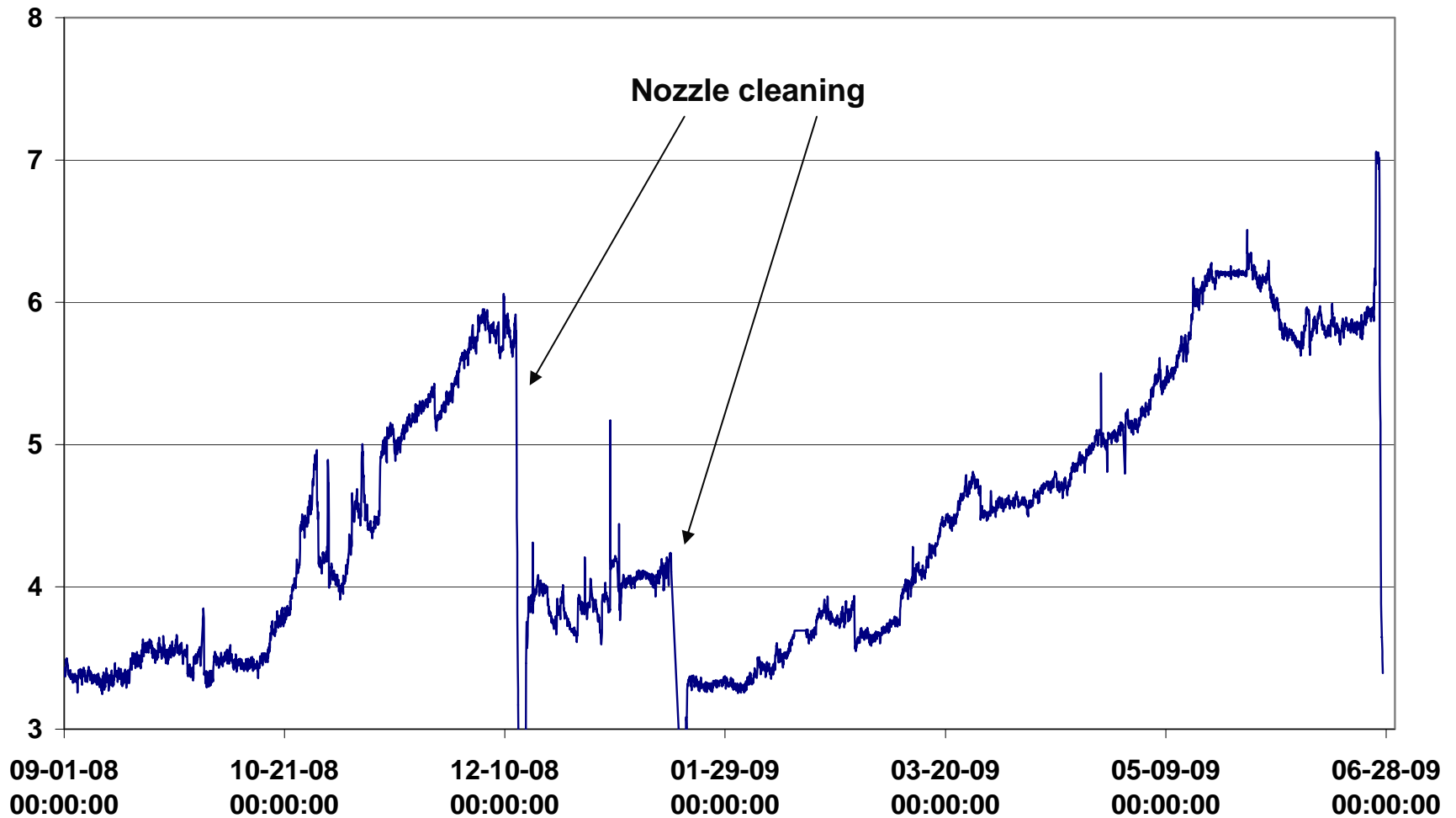
# Modifications summer 2008

- New bottom ash hopper design installed in all 8 hoppers
- All nozzles replaced by new design with 9 mm holes
- All furnaces walls replaced (due to corrosion)
- Two water washing robots installed in furnace

# BFB steam production Sept 08 – June 09



# BFB operation 2008-09 – nozzle pressure drop



# Inspection at summer overhaul 2009

About 2x2 m totally plugged area outside all fuel feeding chutes



# Inspection at summer overhaul 2009

Edge of plugged area – nozzles outlet still above layer



# Inspection at summer overhaul

Partially plugged nozzle holes



# Summary operation season 2008-09

- Modifications performed summer 2008 made significant improvements to the bed bottom operation.
- Only one unscheduled shut-down (16-20 Jan).
- Two nozzle cleanings needed.
- Nozzle pressure drop increase ~ 1 kPa/month (compare to ~6 kPa/month 2007-08)
- Performance tests and test run approved, delivery taken over by Vattenfall.
- Operation at 90 MWth proven possible.
- Washing robots in furnace important additional measure.
- Corrosion on furnace walls worse than expected, next challenge..



**Thank you!**