PROCESS CHEMISTRY CENTRE

ÅBO AKADEMI UNIVERSITY

SKYREC Steering committee meeting, 15.12.2010, Pöyry-talo

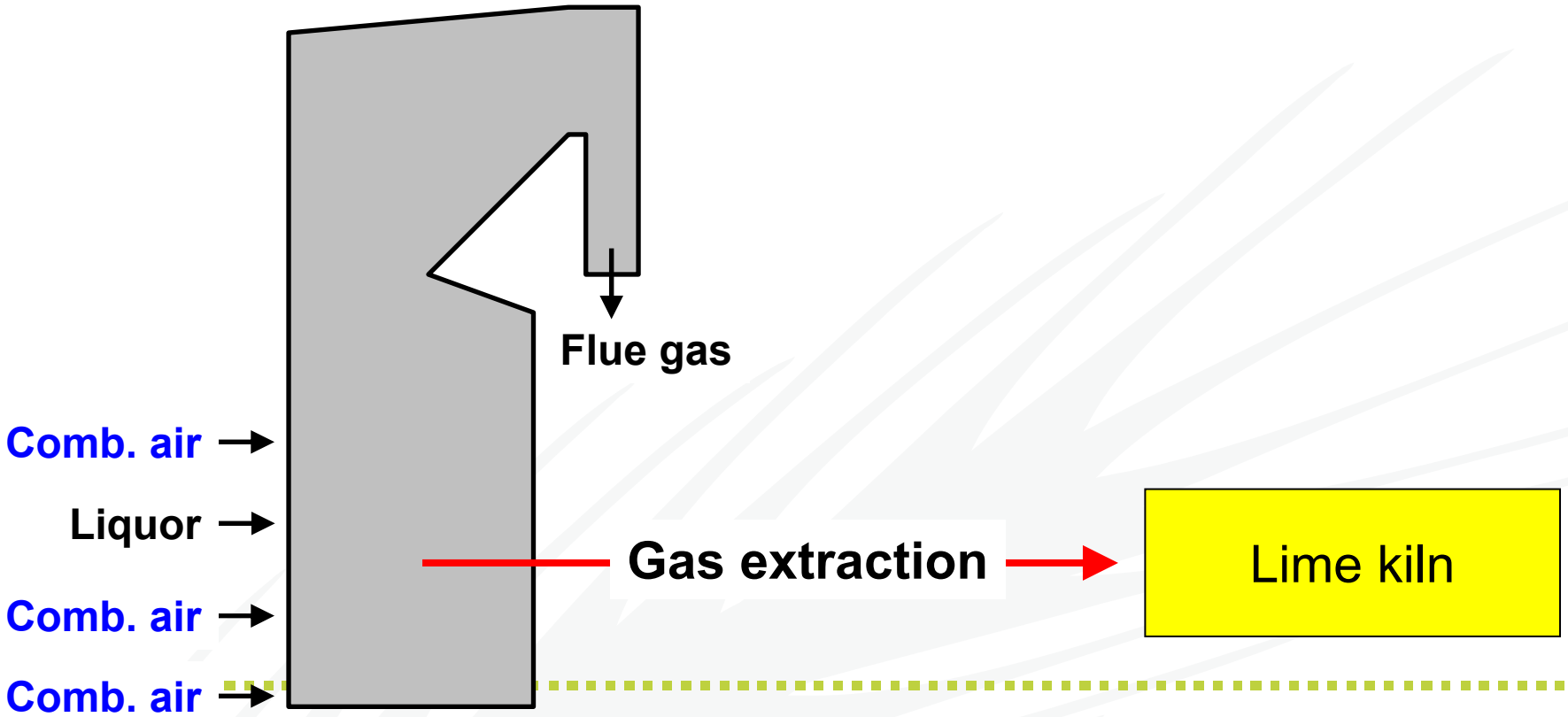
Utilization of Pyrolysis Gases from the Recovery Boiler

Work carried out for the
Finnish Recovery Boiler Committee
Within the framework of the
SKYREC project
by

Åbo Akademi University
Mikko Hupa, Nikolai DeMartini, Anders Brink, and Markus Engblom

Objective

- **Study possibilities for extracting gases from the lower furnace of the recovery boiler to be used as a fuel**



Tasks

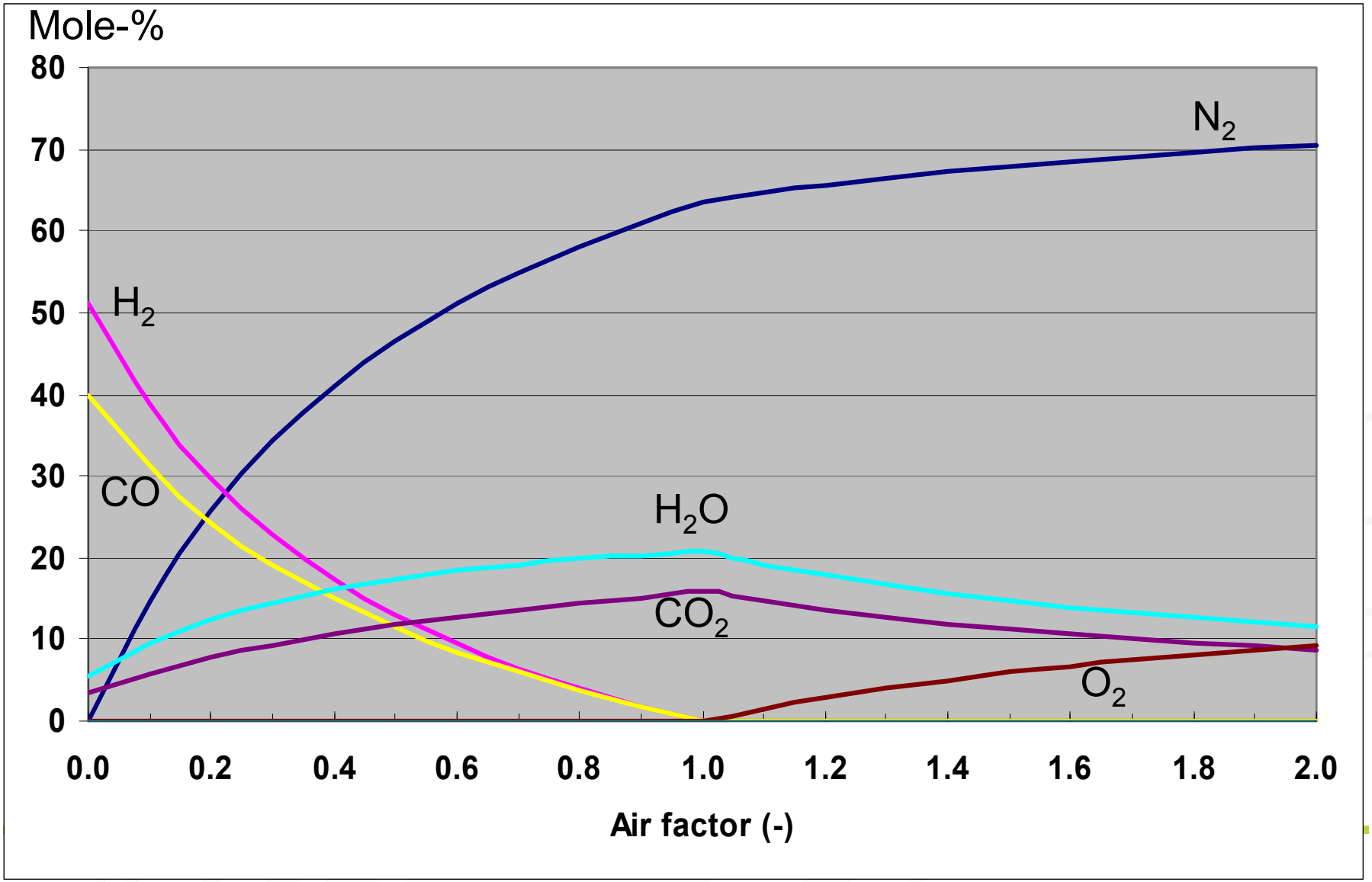
- Mass and energy balance calculations
– cover needs of the lime kiln (30 MW) at a 500 000 ADt pulp mill

- Equilibrium calculations of gas composition as function of air factor

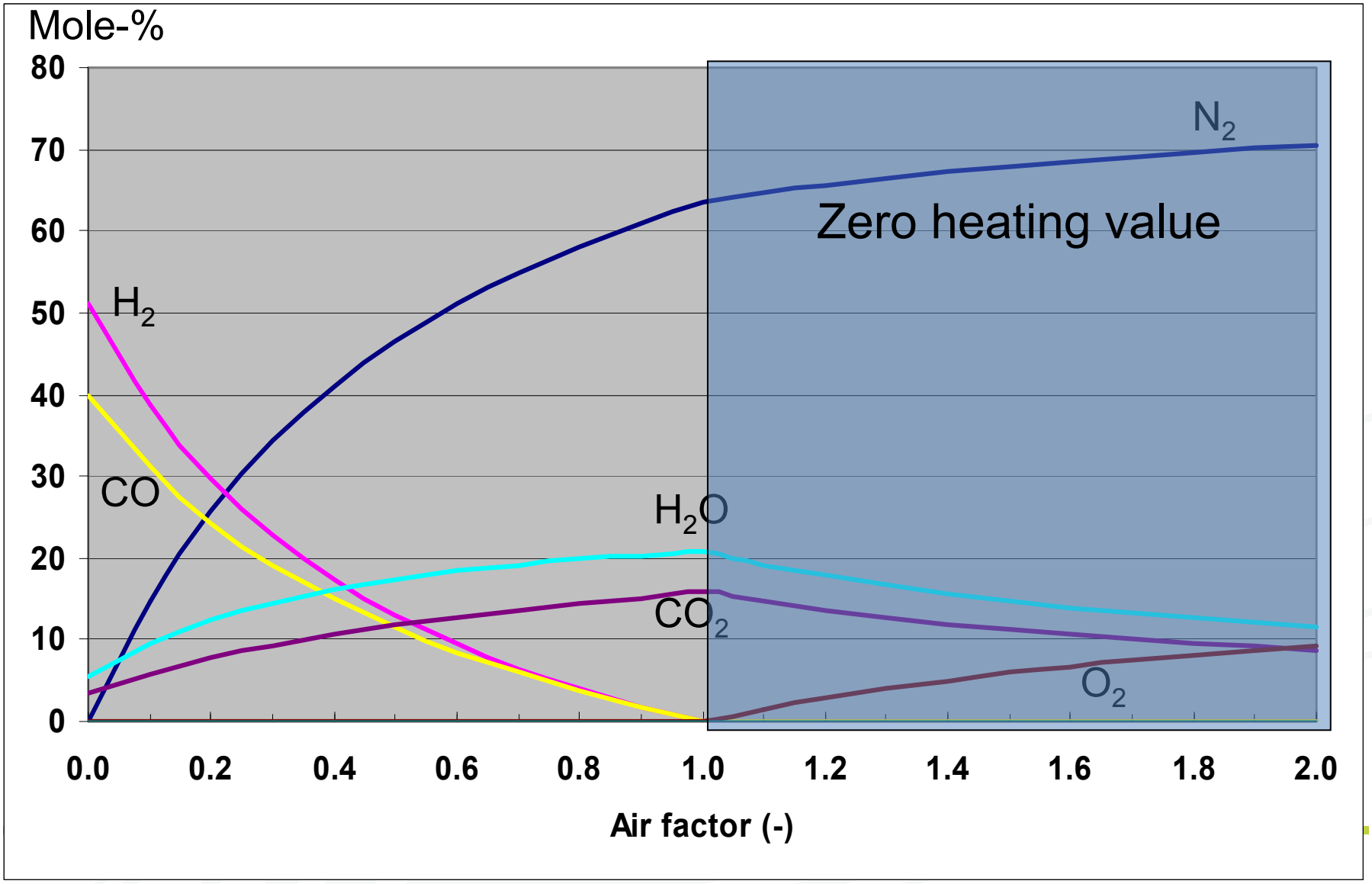
- Typical variations in gas composition as predicted by CFD simulations

- Flue gas dust content – estimates of Min & Max

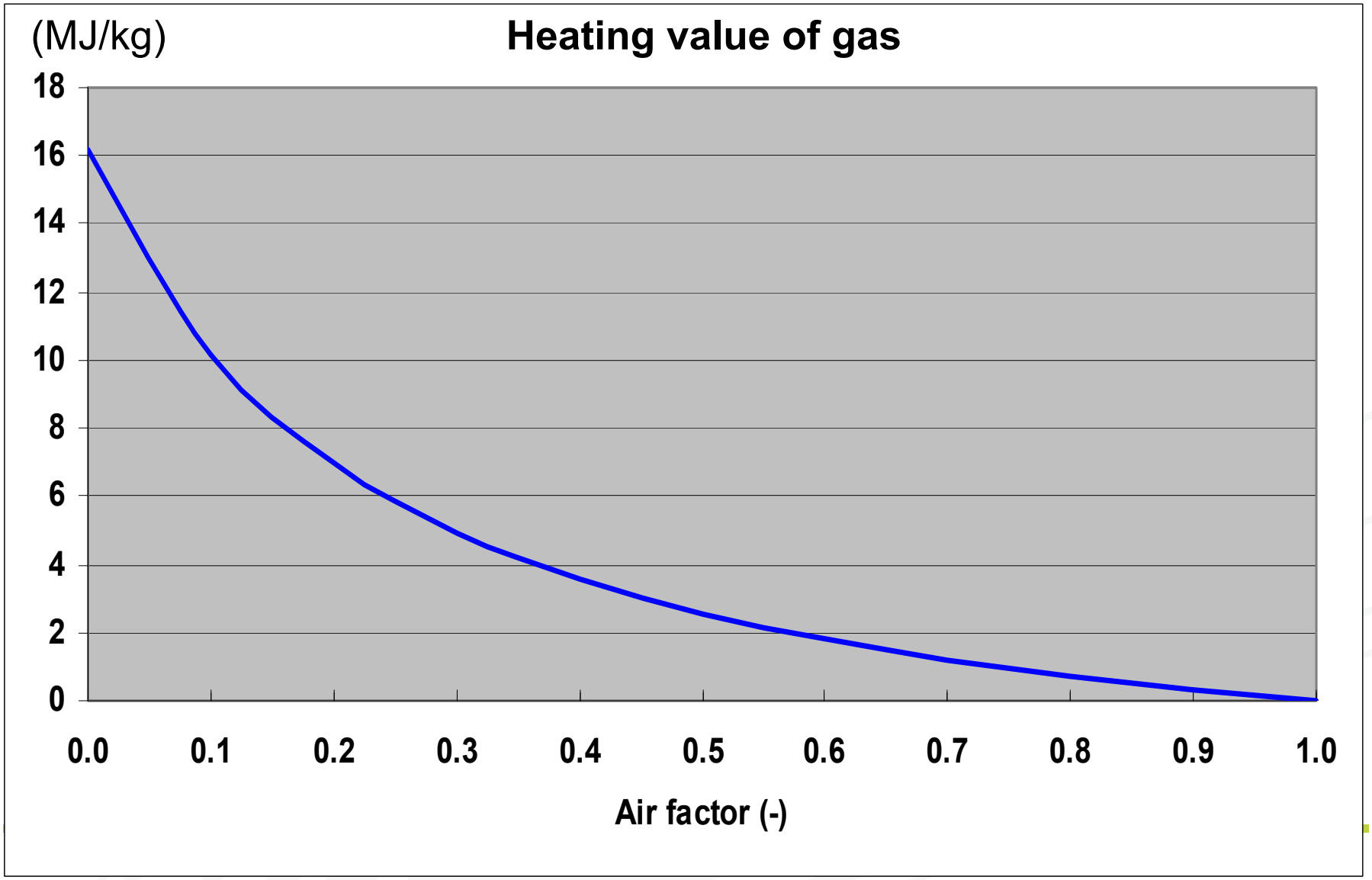
Equilibrium gas composition at 900 °C



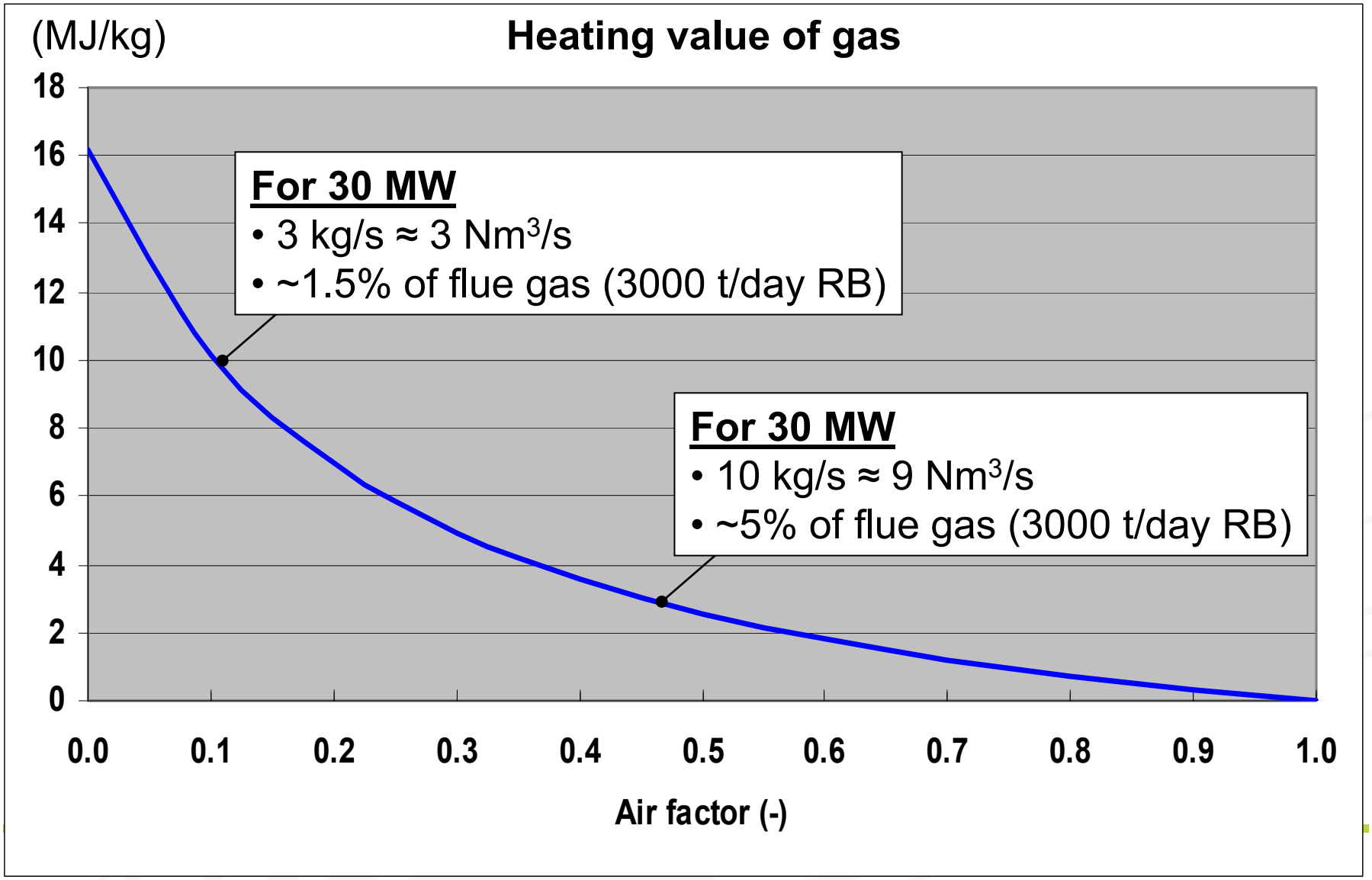
Equilibrium gas composition at 900 °C



Equilibrium gas composition at 900 °C

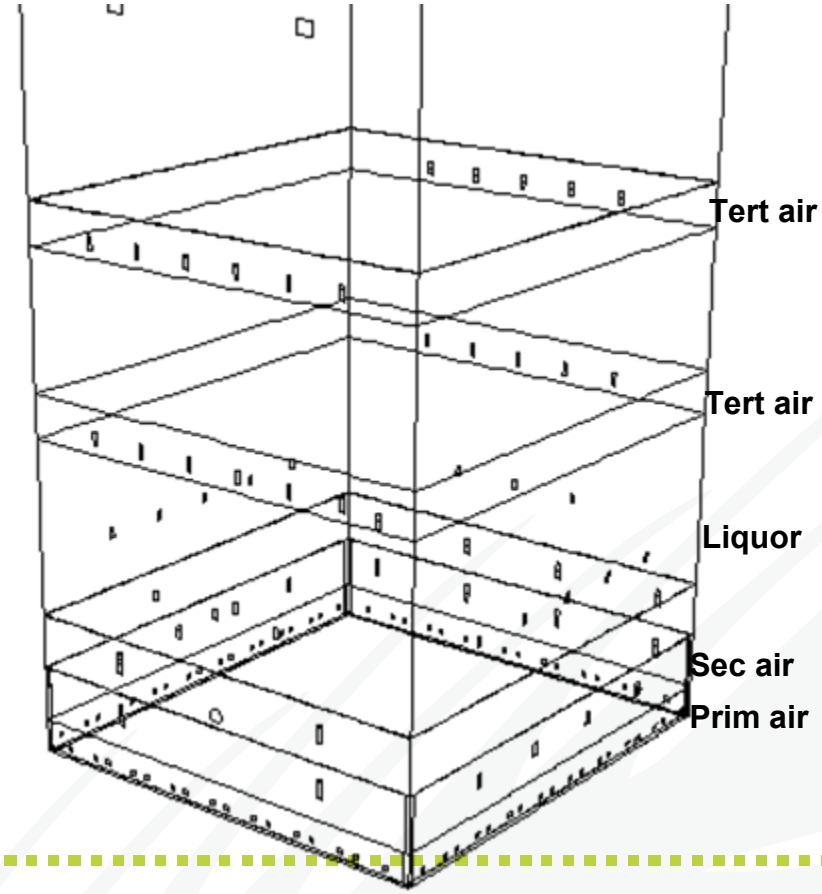


Equilibrium gas composition at 900 °C

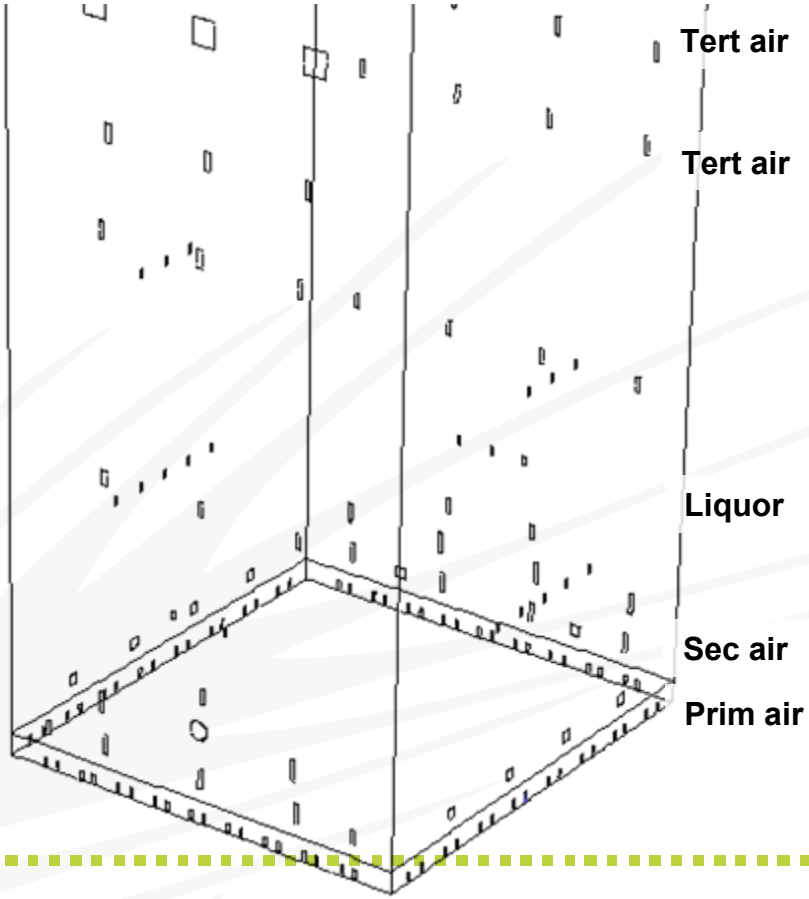


Existing CFD simulations of two recovery furnaces

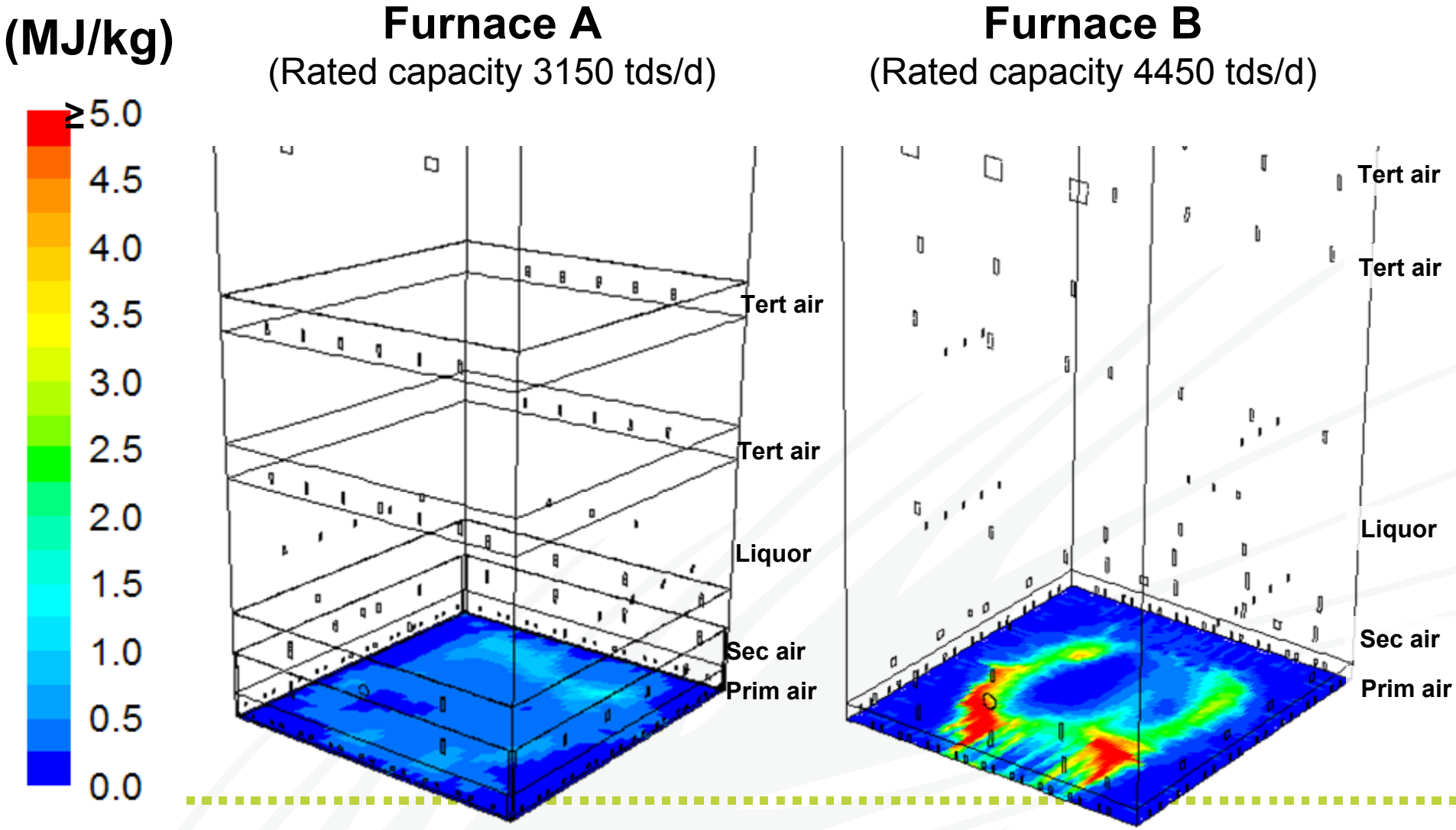
Furnace A
(Rated capacity 3150 tds/d)



Furnace B
(Rated capacity 4450 tds/d)



Gas heating value in lower furnace

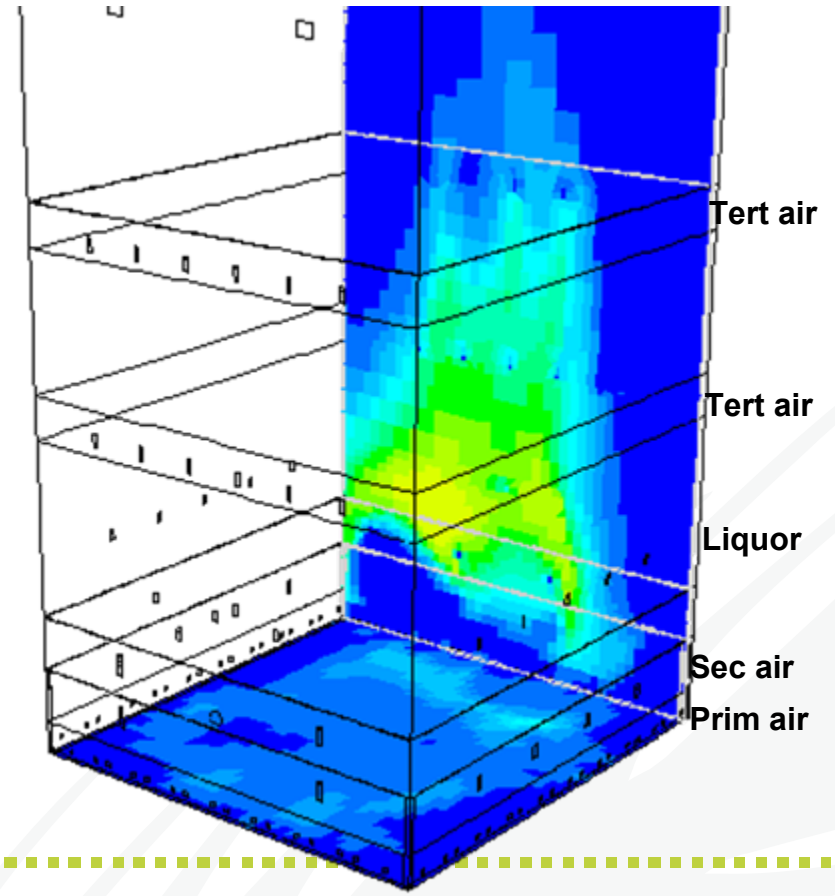


Gas heating value in lower furnace

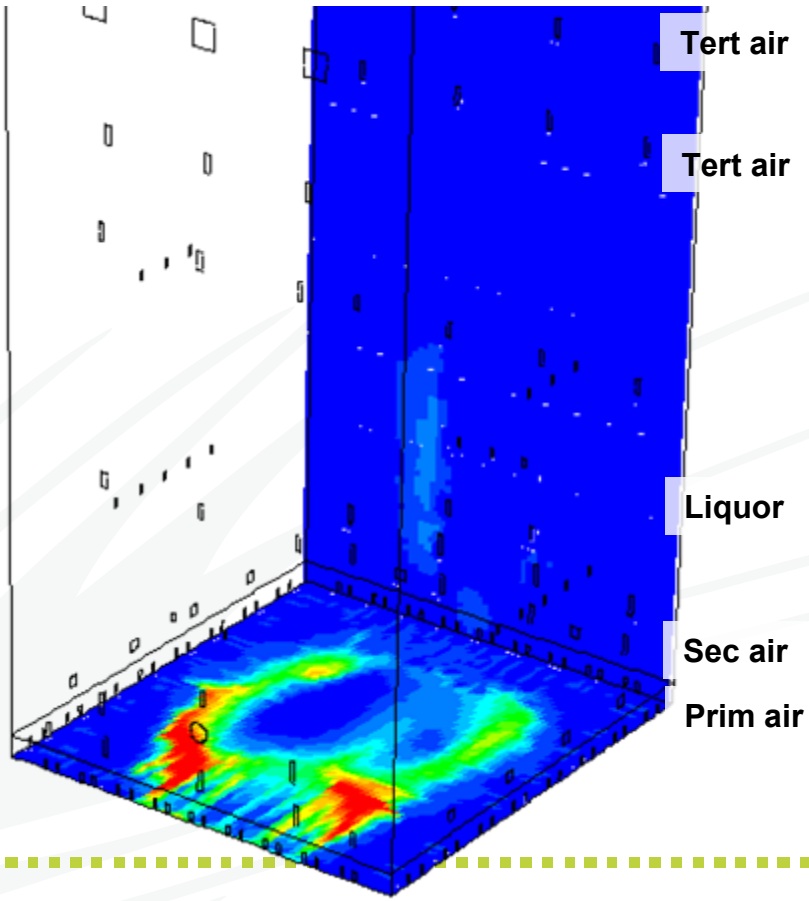
(MJ/kg)

≥5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

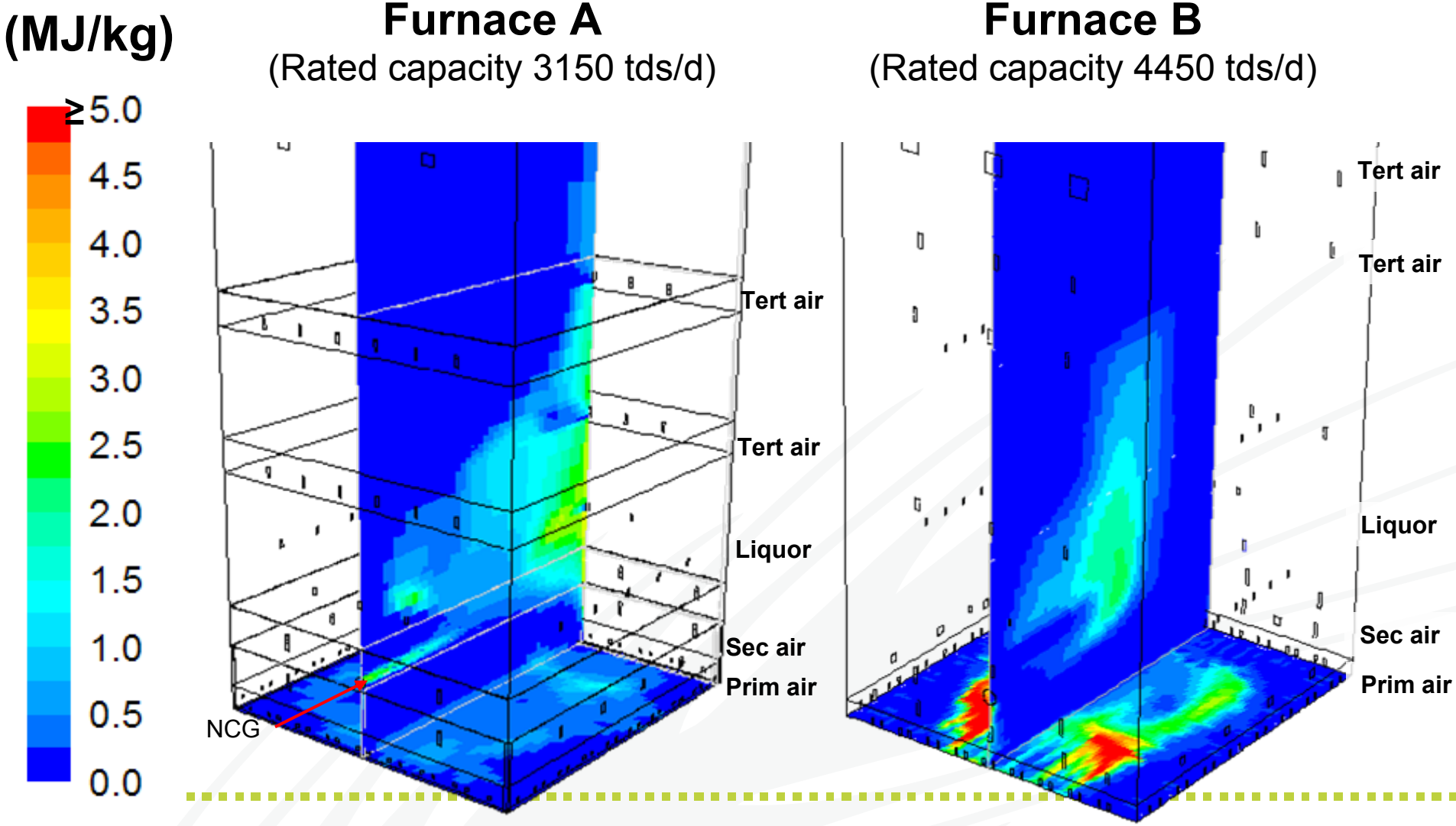
Furnace A
(Rated capacity 3150 tds/d)



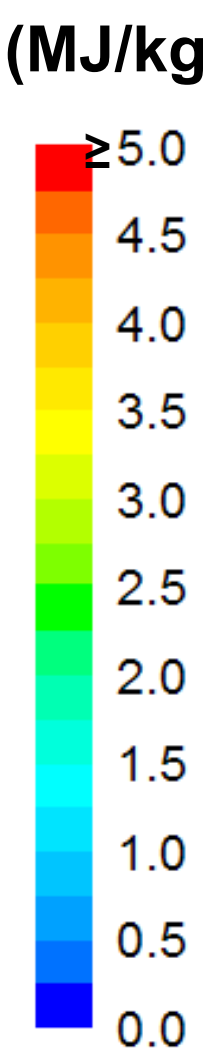
Furnace B
(Rated capacity 4450 tds/d)



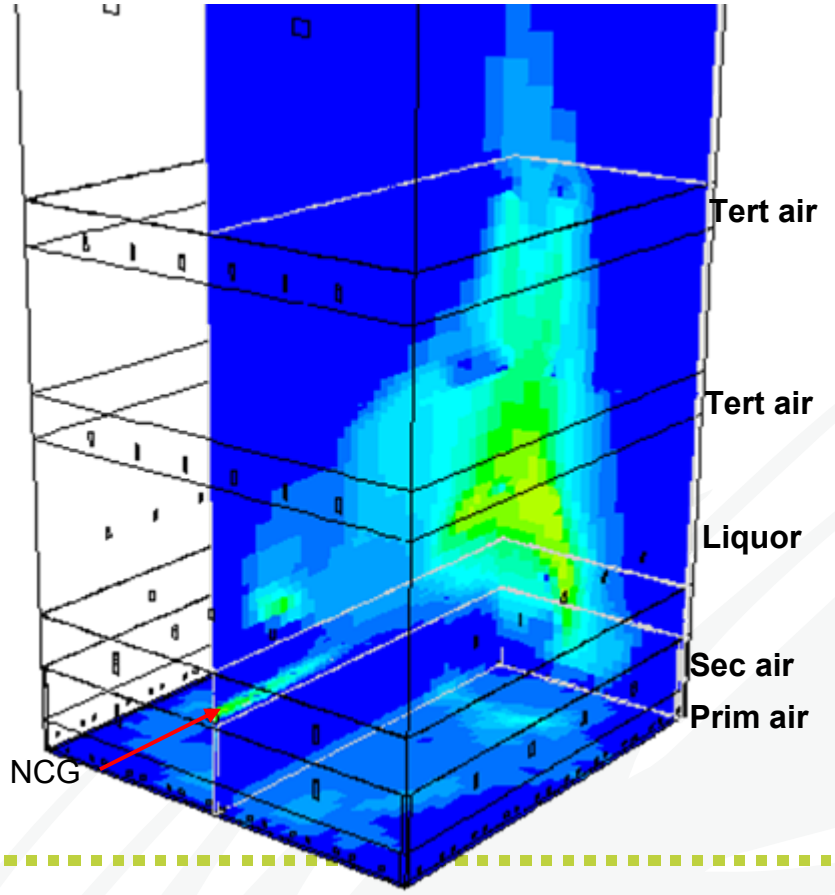
Gas heating value in lower furnace



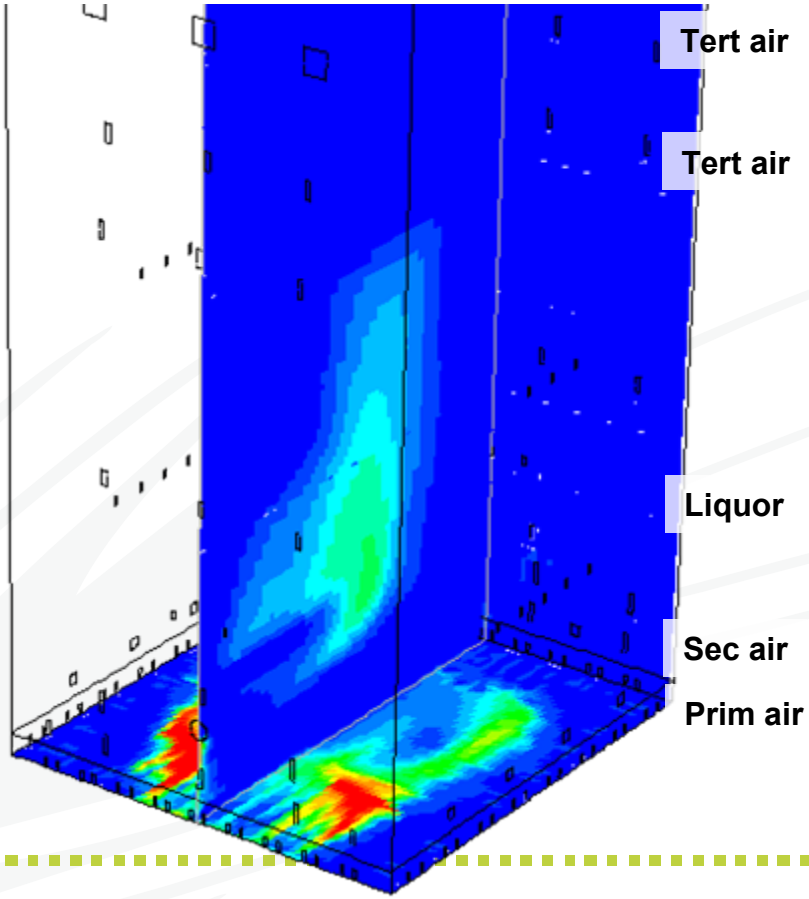
Gas heating value in lower furnace



Furnace A
(Rated capacity 3150 tds/d)

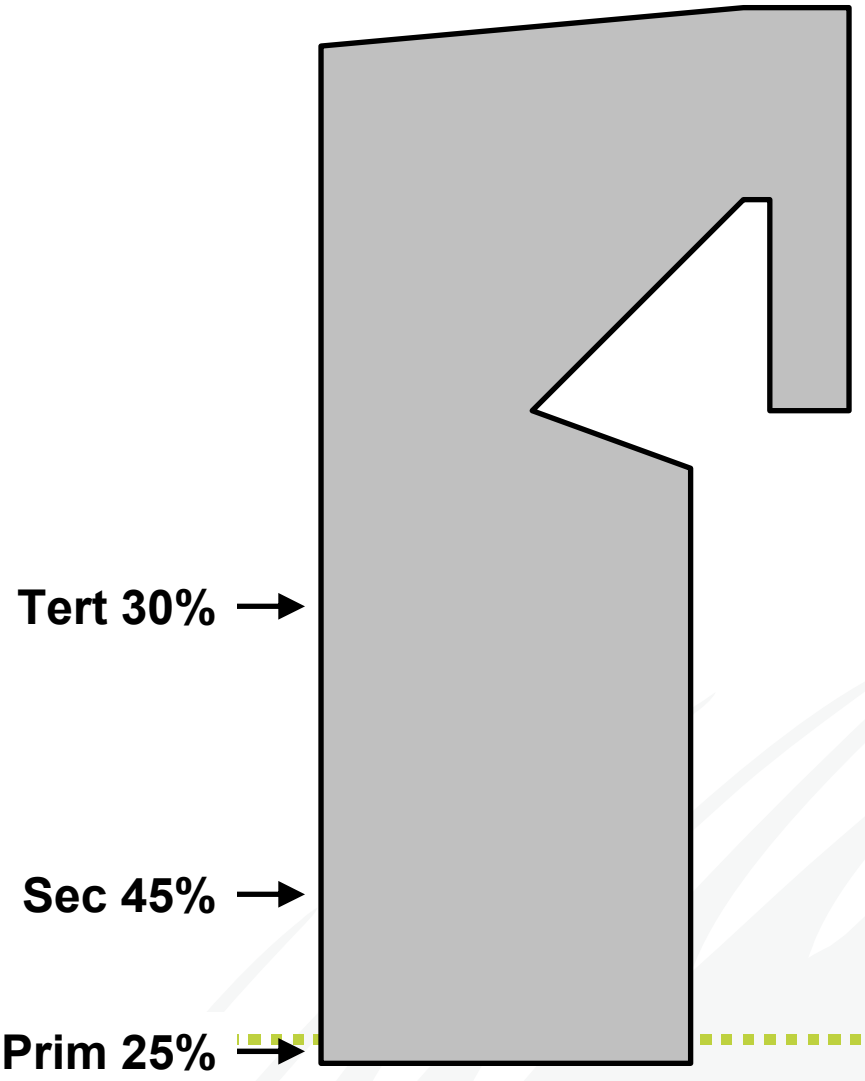


Furnace B
(Rated capacity 4450 tds/d)



- Gas extraction likely to affect local gas composition

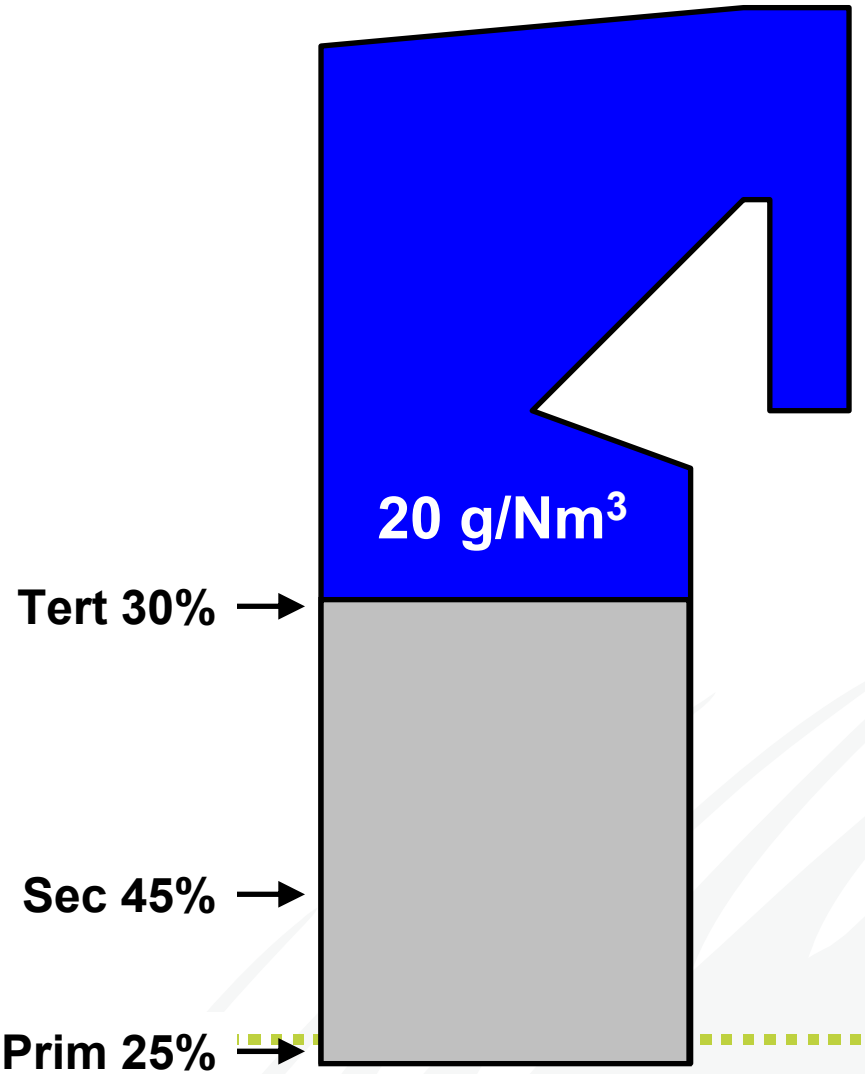
Dust content



ESP dust

- 20 g/Nm^3

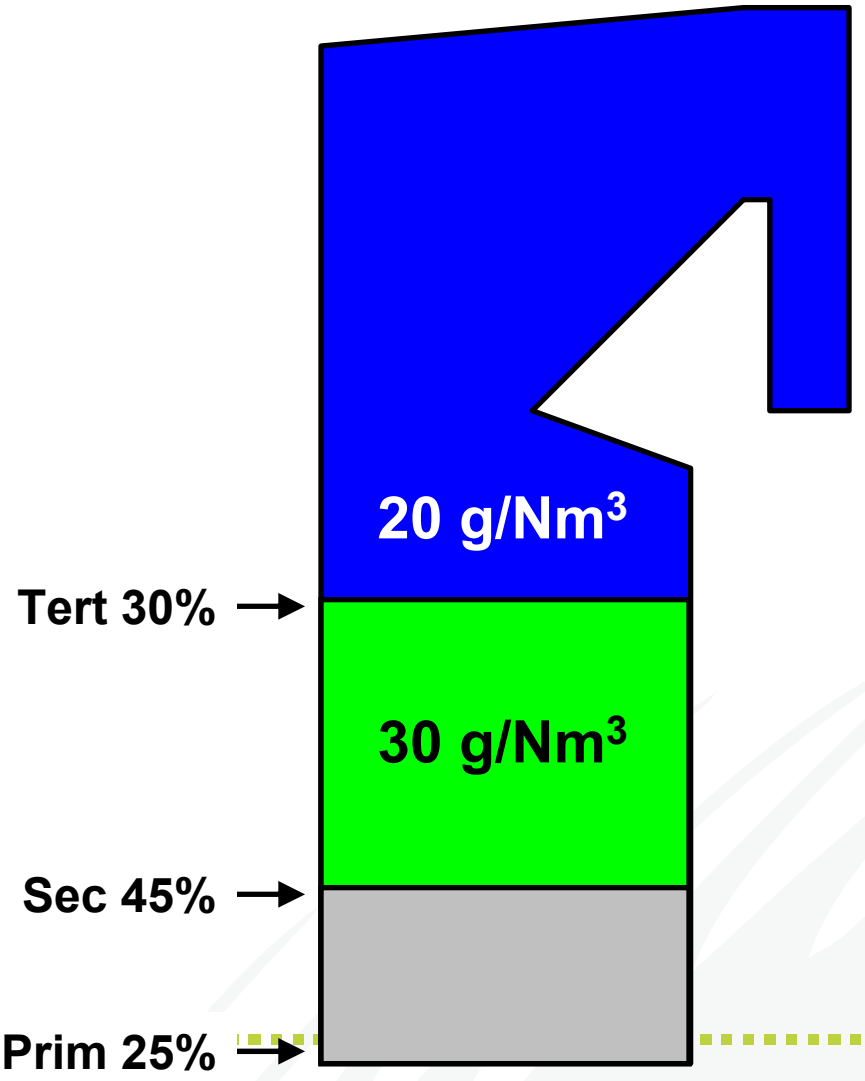
Dust content



ESP dust

- 20 g/Nm^3

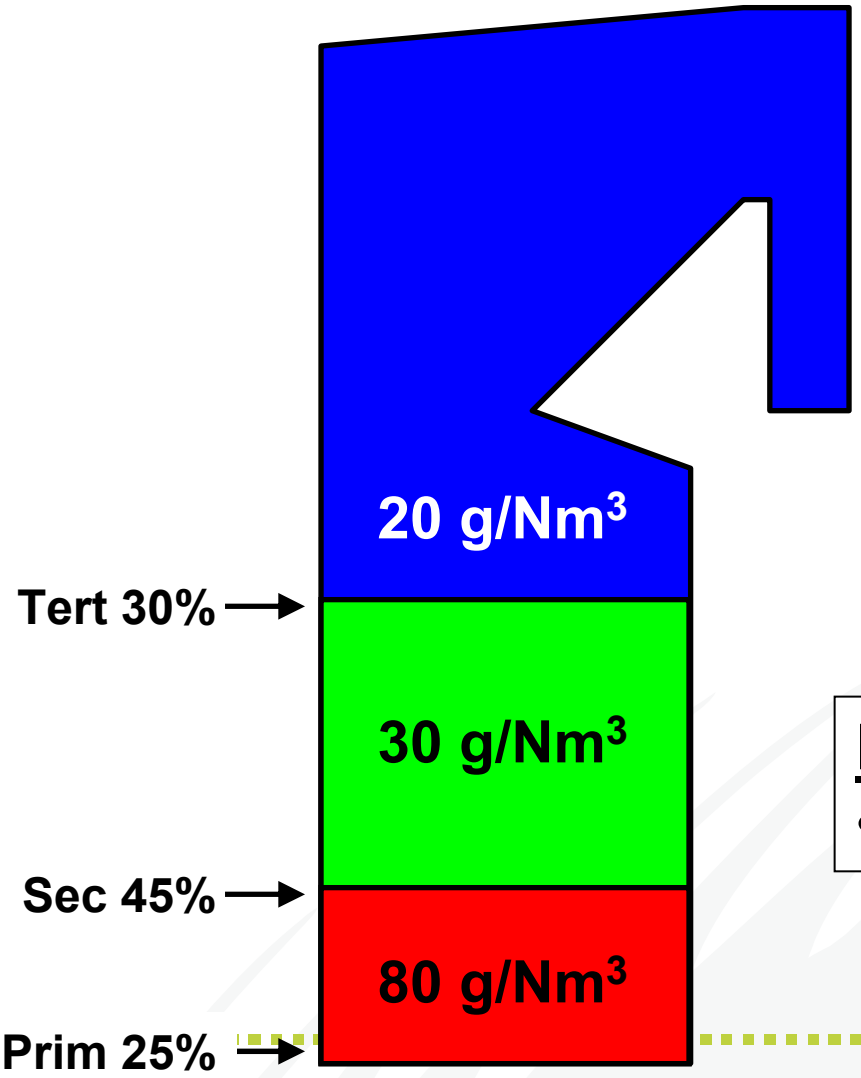
Dust content



ESP dust

- 20 g/Nm^3

Dust content



ESP dust

- 20 g/Nm^3

Lower Furnace Dust

- Min-Max: 30-80 g/Nm^3

Summary and conclusions

- Potential for extracting fuel gases from RB studied by means of
  - Equilibrium calculations
  - Examination of existing CFD simulations of two RB:s
- Gas with 3 MJ/kg appears feasible with normal RB operation
- Existence of a suitable location (low air factor) for gas extraction depends on RB operation
- Dust load 30-80 g/Nm^3
- Actions that could change gas composition – not studied yet
  - Changes in RB operation/design toward maximizing gas HV
  - Gas extraction