# Voorspelling van het gedrag van biomassa in de kolenketel: de Co-firing Advisory Tool - CAT

Christine Bertrand (ECN)

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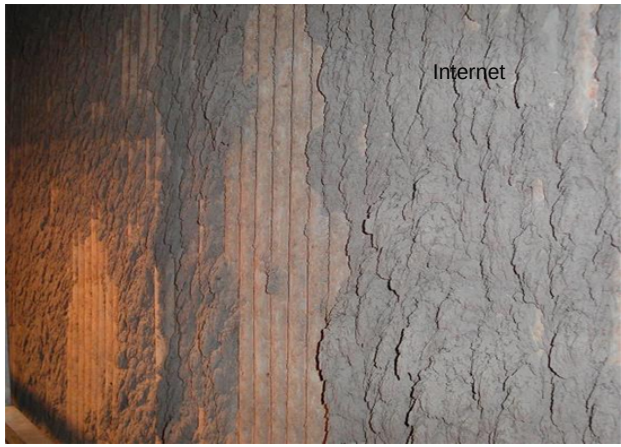
# The issue : deposition

- With coal firing in Heat & Power Plant
  → ash deposition (slagging & fouling - vervuiling)
  → reduced boiler performances
    - decreased efficiency
    - increased emissions
    - damages and outage of the plant
    - increased maintenance costs




- Now even more prominent problem when biomass (co-)firing because of
  – high content in salts
  – low melting temperature of the ashes

# The predictive tool : CAT

- Co-firing Advisory Tool : CAT for support of plant operation and design
  - Choice of the fuel blend
  - Impact onto the process of changes in operating conditions e.g. percentage, type of co-fired biomass.
- Looking at the:
  - Geometry of system
  - Impact of fuel properties
  - Operating conditions
- Advantages:
  - Reduced risk
  - Cheap
  - Quick

# The predictive results : CAT

- Provide qualitative information: (slagging &) fouling of each heat exchangers in terms of:

NOT RECOMMENDED

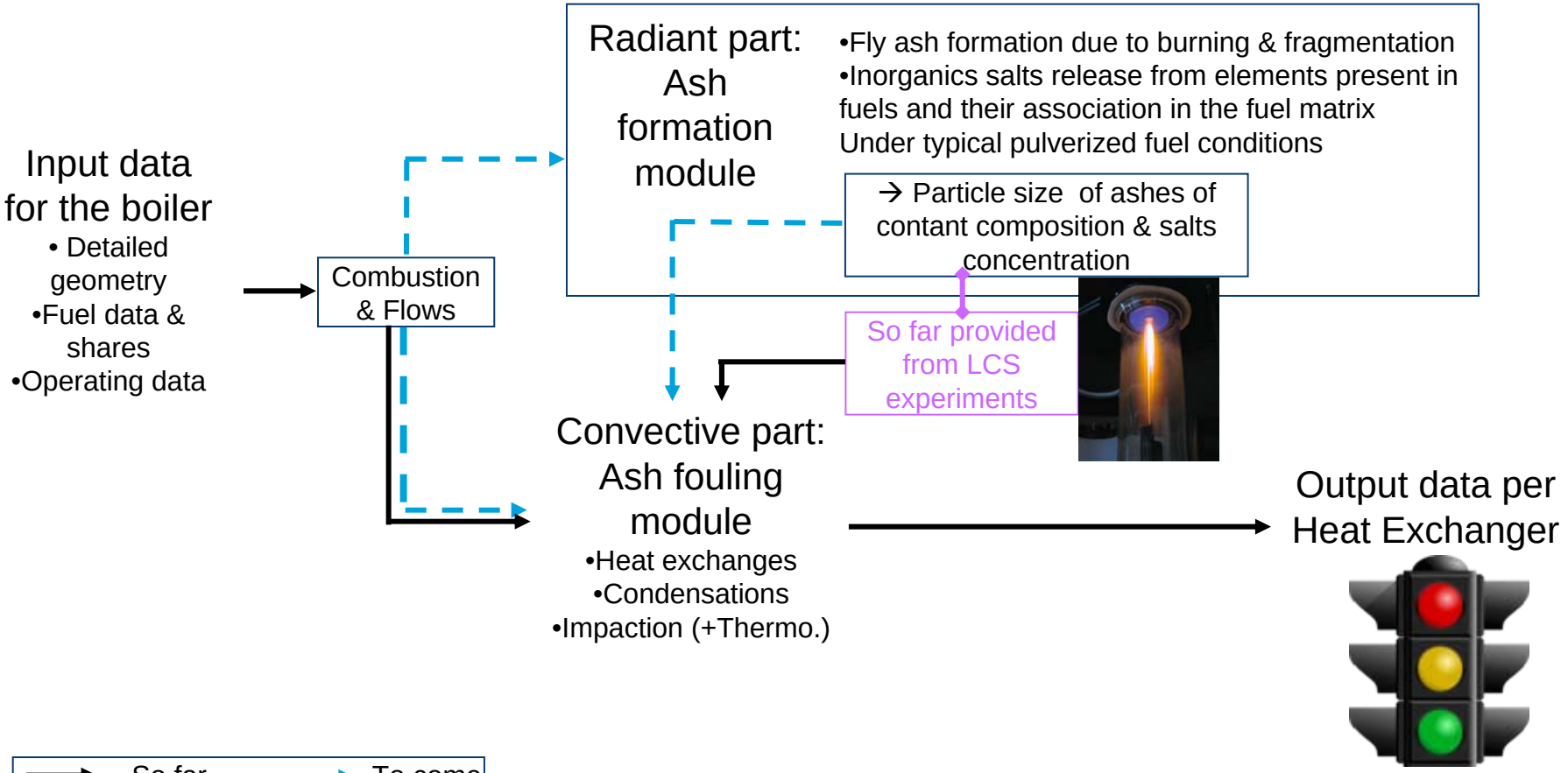
BEWARE

GO

- …further evolve to give quantitative information to drive the cleaning sequence (soot blowing) sequences and optimize heat transfers to tubes

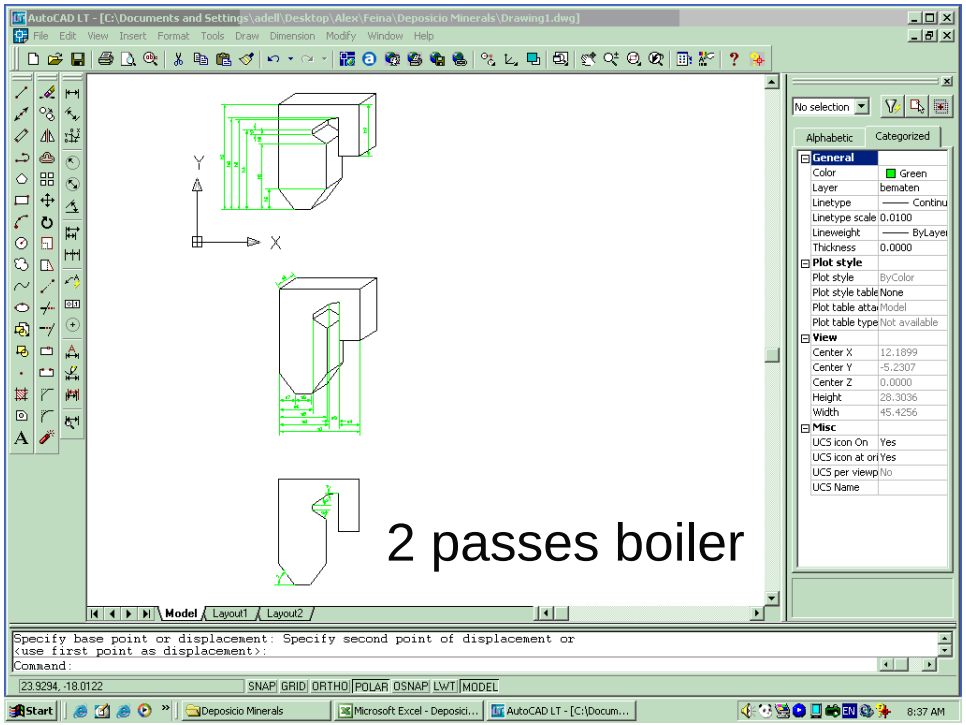
# CAT : The structure

- Decomposition in two modules developed separately



# CAT : The status so far

- Ash formation module
  - Tested (2 coals + 6 biomasses)
  - Needs automation and to be complemented with other fuels (more blends)
- Ash fouling module
  - **Comparative results on deposition extent by reference to a base operating or design case**
  - Programmed → verify and test on real plant data then “play”




ECN TU Delft Delft University of Technology KEMA

# CAT : The future

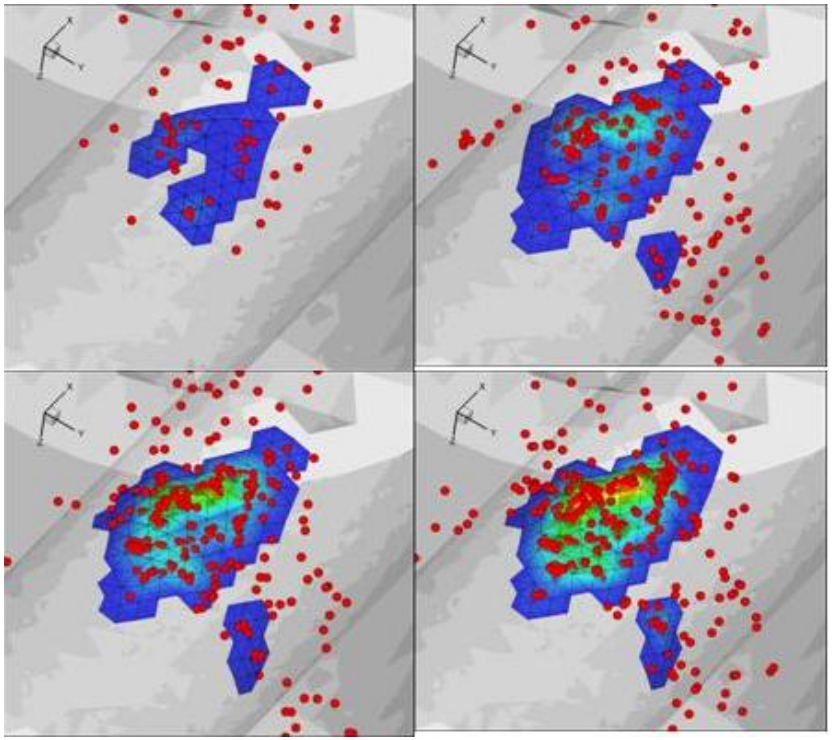
- Link the ash formation section of CAT to the fouling tool
- Bridge to more precise advice
- Many further developments are planned …

# CAT : The conclusion so far

- CAT is available to give:
  - Comparative results
  - Deposition extent on heat exchangers by reference
  - To a base operating or design case
  - Need testing

# But also … CAT CFD counter-part: the ADP

- From in-house full CFD simulation of combustion systems
- Model deposition using the Ash Deposition Predictor
- Example *(Losurdo, 2007)* :
  - deposition of glass beads
  - 105 µm particles in a 6.2 m/s combustion products stream
  - @ $T_{inlet}$~1015°C impinging on a probe at 500°C.
  - thickness of the peak:
    - Simulated : 1.9 mm
    - Measured : 2.8 mm
  - Mass deposited:
    - Simulated : 2.8 g
    - Measured : 2.6 g



# Dank jullie wel voor uw aandacht

## Questions, discussion…

- CAT was developed within the frame of the USC project under the support of AgentschapNL (previously SenterNovem).
- For further information on CAT, please contact me at bertrand@ecn.nl