Future Directions of Production Planning and Optimized Energy and Process Industries

Case Malarenergi – large scale CHP plant optimization

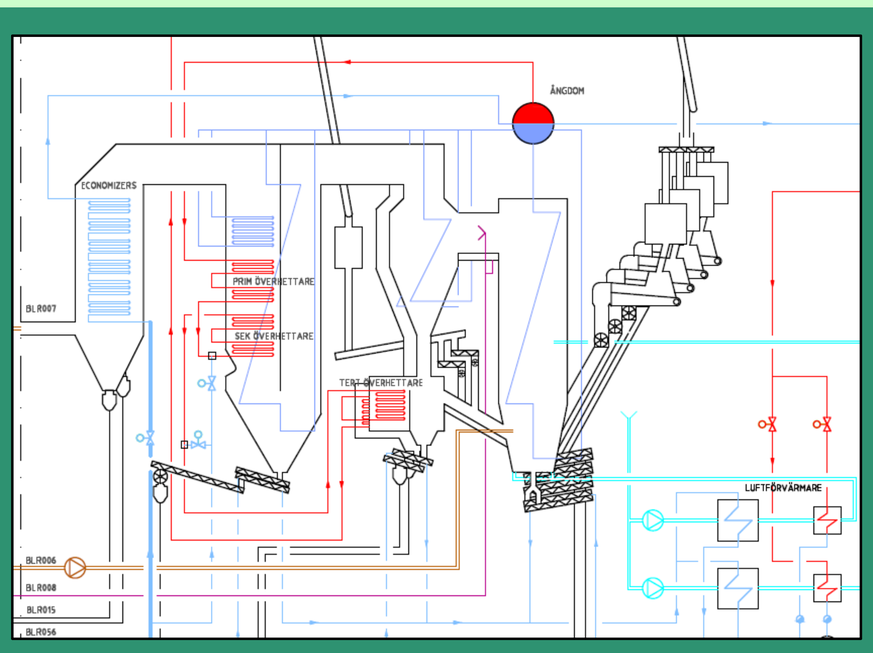
Heterogeneous nature of the biomass and waste fractions

Operational problems
- Variations in bed temperature
- Bed material agglomeration
- Ash handling
- Performance of the fuel preparation plant

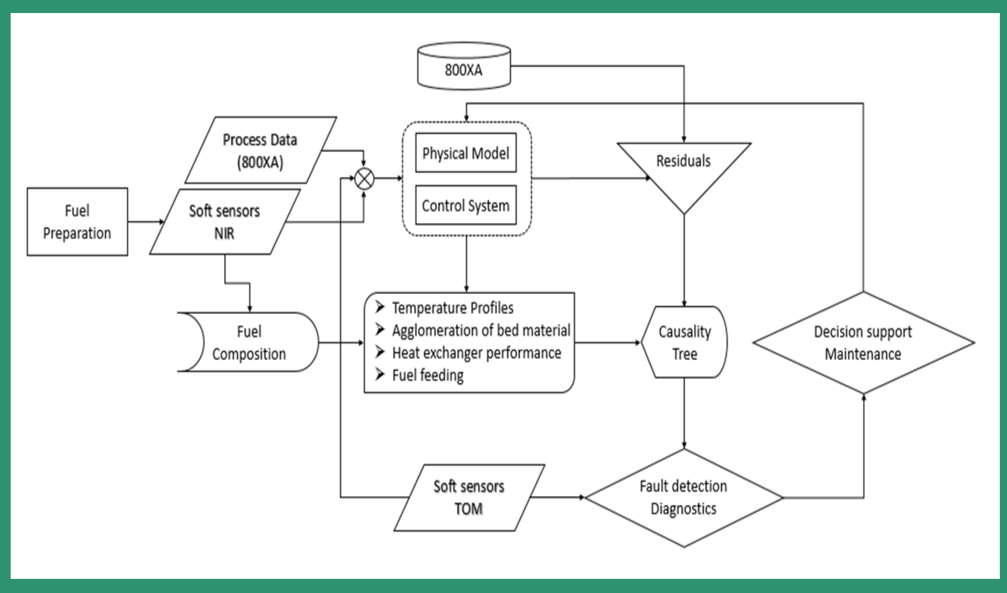
Challenges in emissions control
- Amount of chemicals used
- Identification of the fossil carbon in waste

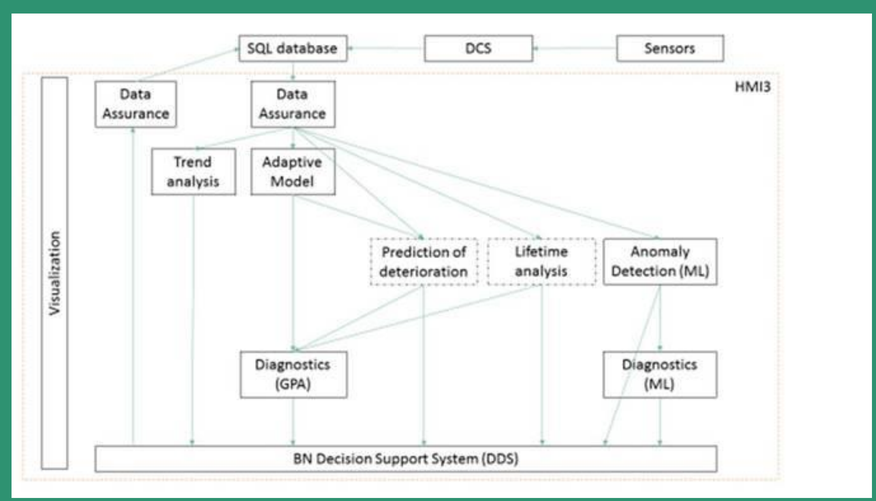
Life lenght of the equipment
- Fouling
- Decreased heat transfer capacity

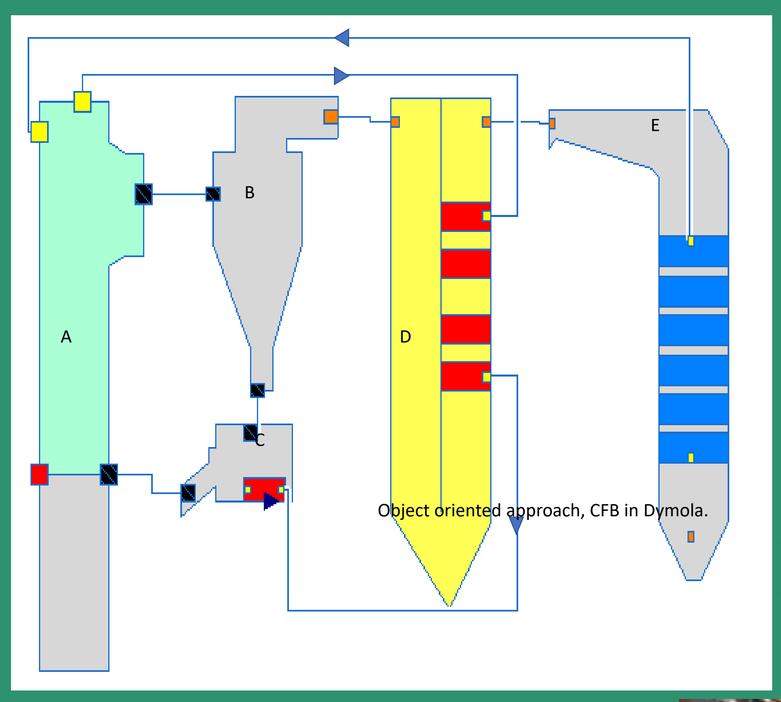
Production optimization and Energy efficiency potential improvement
- Production planning
- Retrofitting and Process Integration

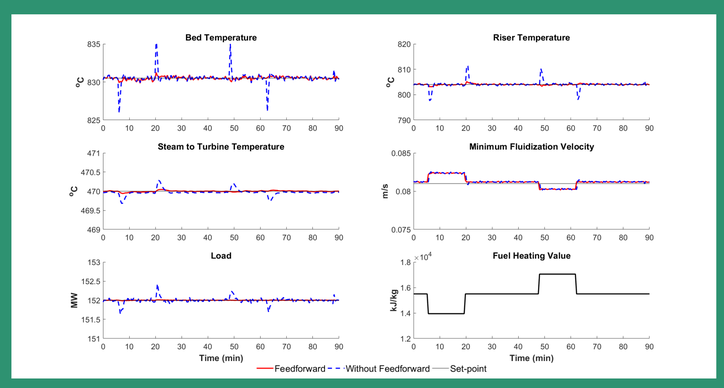


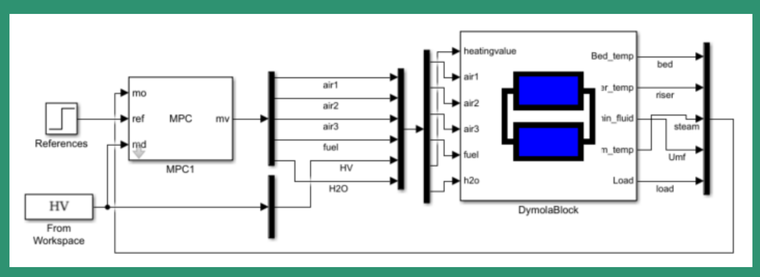
The demonstrator consist of:
- A **dynamic modelling library** for waste fuel combustion in fluidized bed boilers and future plant development and production optimization Incorporate **NIR measurements**, soft sensor, for the early detection of fuel characteristics. Incorporate **TOM**, soft sensors, for heat exchanger performance assessments.
- Integrate the **sensor data to the database**
- Statistical models/**regression** models
- **Machine learning** techniques. Make the models **adaptive**.
- **MPC** controller
- **Diagnostics, Early-warning and Decision support** tool
- Integration of the tool offline and **semi-online**



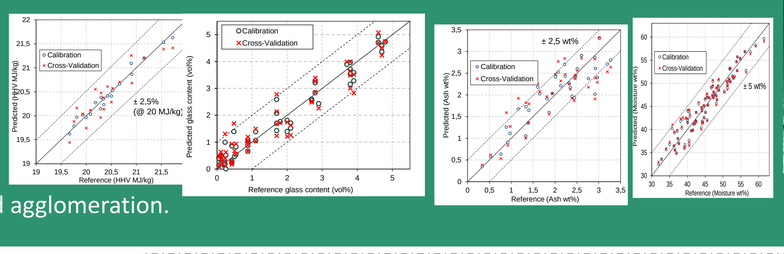




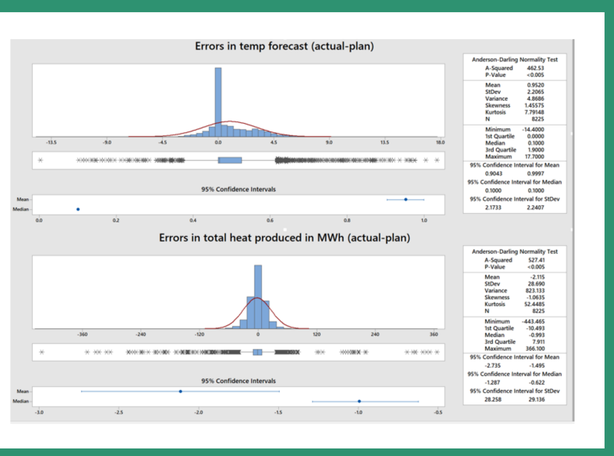




Implementation in SIMULINK with DYMOLA block

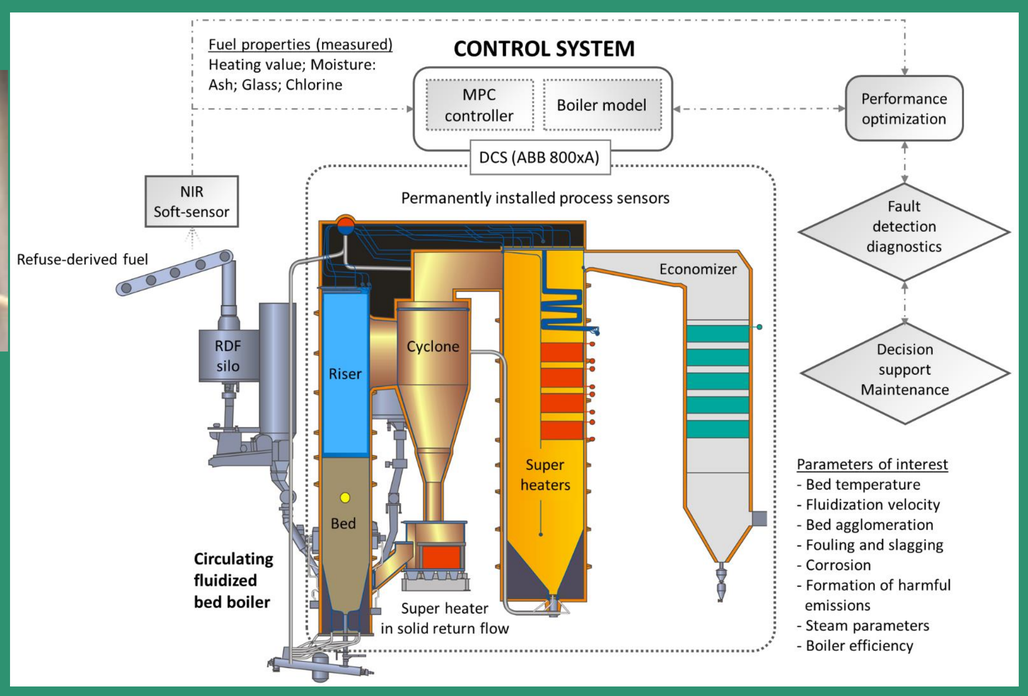


- Physical model of the boiler has been developed and validated.
- The integration in the HMI3 platform is ongoing.
- MPC has been implemented to control boiler fluidization as well as bed agglomeration.



Sensor development, TOM, High temperature corrosion

Production planning: There is hardly no correlation between the weather forecast and the errors in heat production. A better distribution of the production among the units is required



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