INNVENTIA

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Process simulation of pulp mills and biorefineries

Niklas Berglin, Innventia

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43º Congresso e Exposição Internacional de Celulose e Papel

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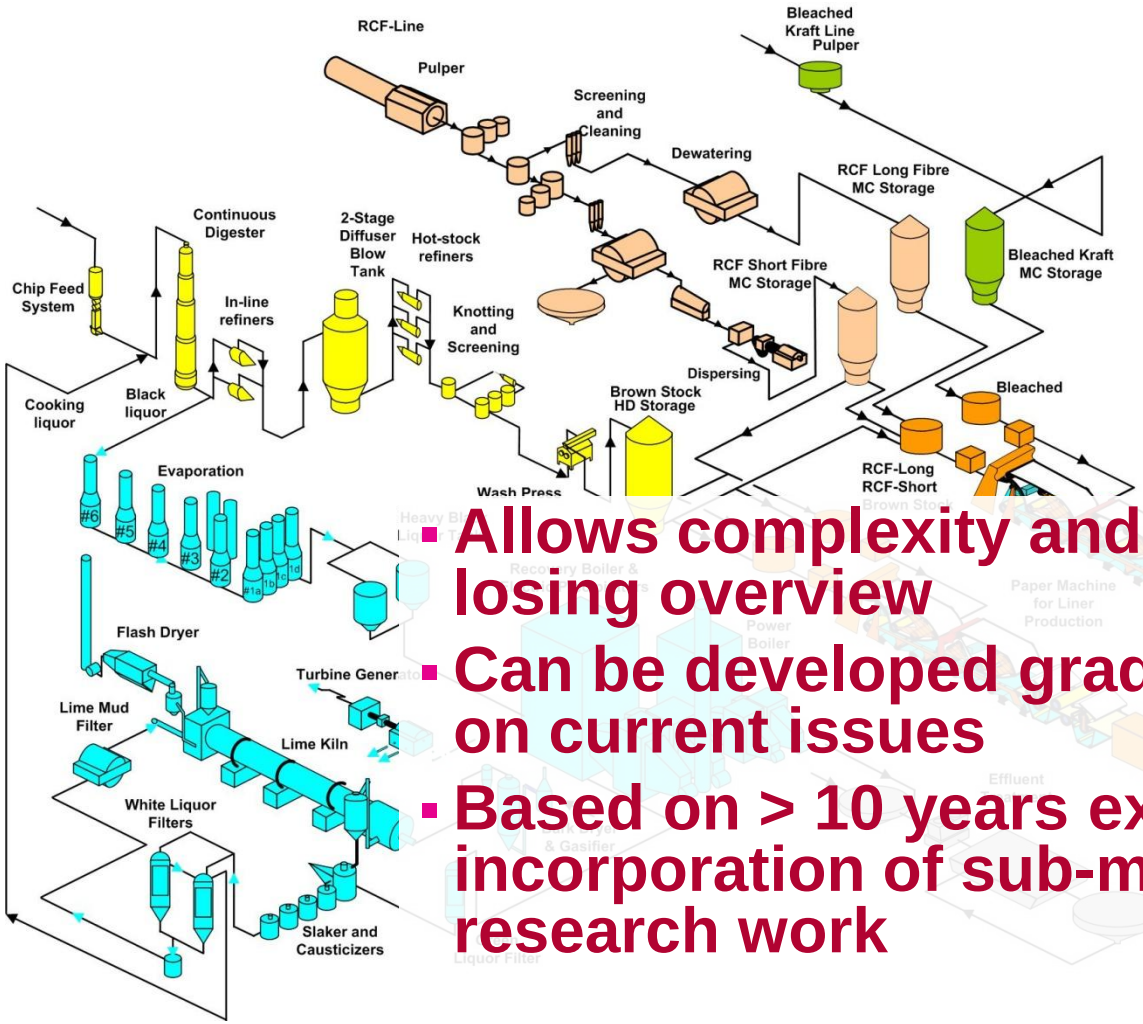
Our approach – full-mill process models

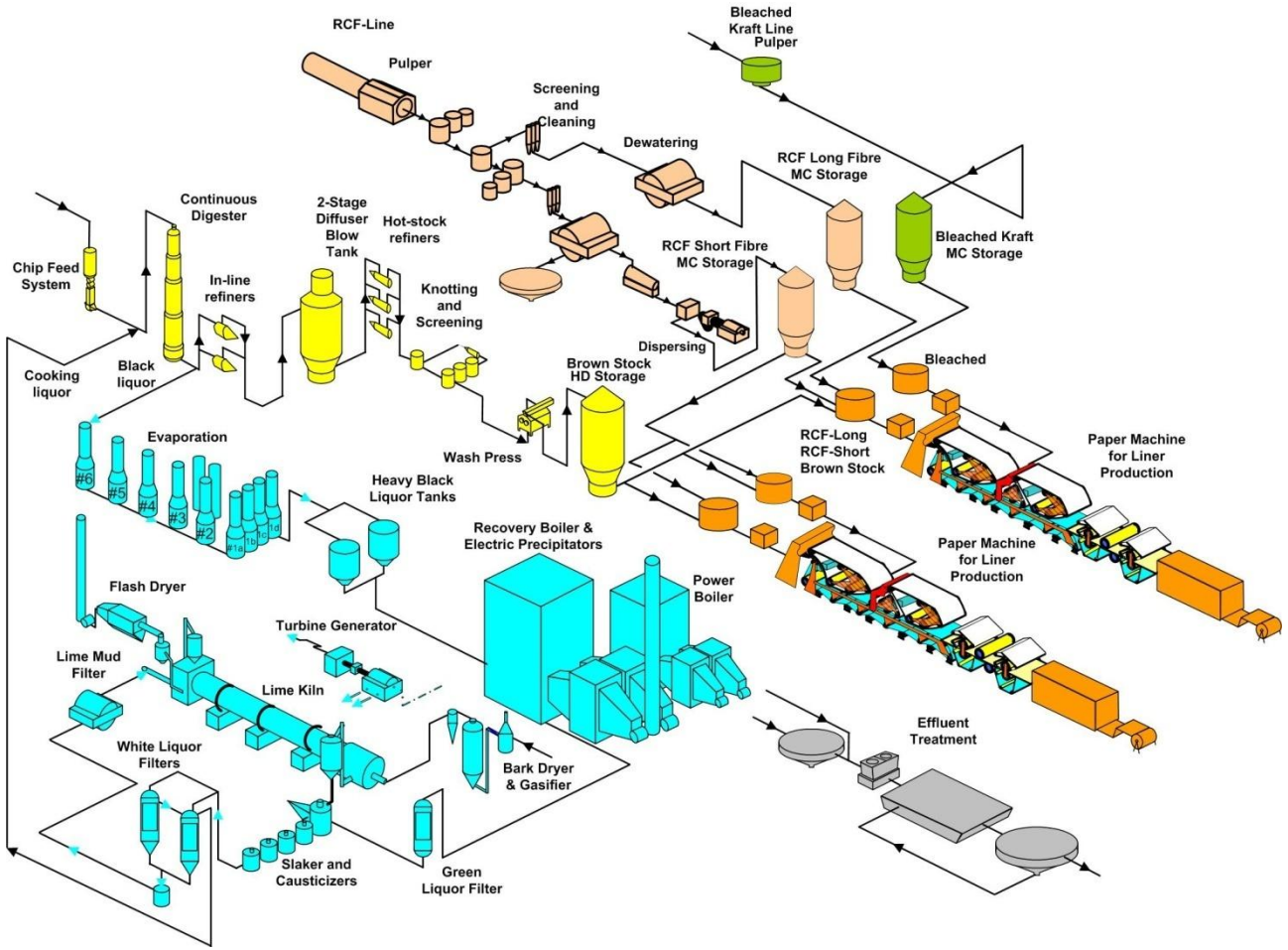


- **Allows complexity and detail without losing overview**
- **Can be developed gradually to focus on current issues**
- **Based on > 10 years experience and incorporation of sub-models from our research work**

Typical questions that can be answered with full-mill process models

- Where do Na, S and non-process elements go?
- Where is energy used and wasted?
- How will closure options affect chemical balances, organics to effluent?
- Where are the risks for precipitating salts?
- How can we optimize purge streams?
- How would the installation of a new process affect mass and energy balances of the mill?
- How can we improve our use of secondary heat and minimize cooling needs?
- What flow meters can we trust?
- …?

Theoretical mills are defined with major unit operations, mass and energy flows



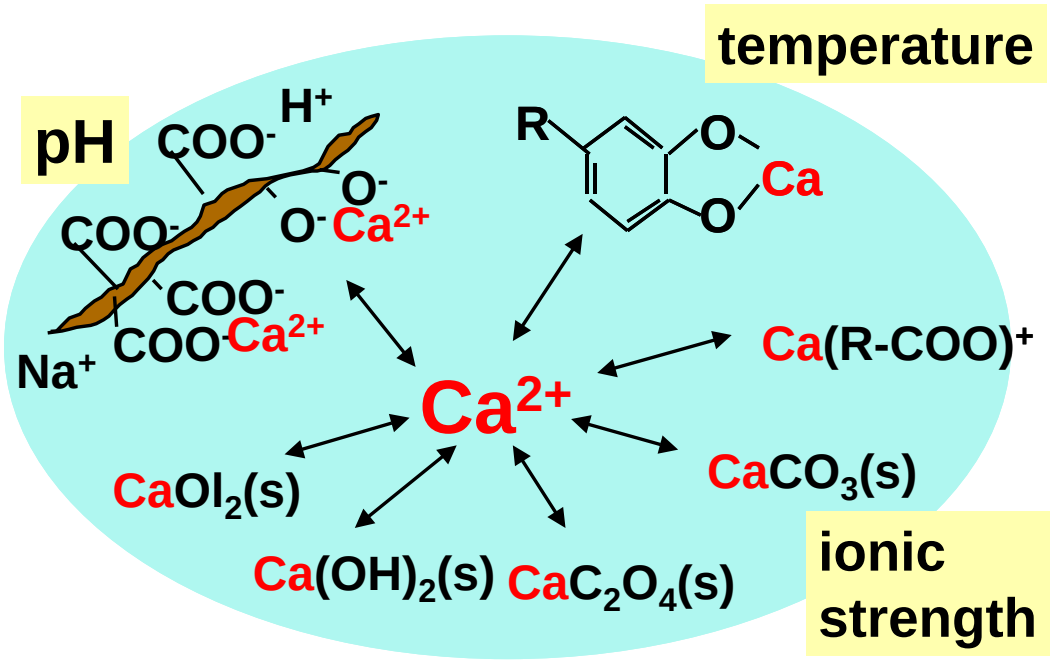
But don’ t forget that Non-Process Elements (NPEs) are important too!

- Scaling problems (Al, Si, Ca, Ba, Mn)
- Plugging in the recovery boiler (K, Cl)
- Corrosion (K,Cl)
- Inerts in lime cycle (P, Mg, Al, Si)
- Peroxide bleaching (Mn, Fe, Cu)
- Environment (N, P, Cd, Pb, etc.)

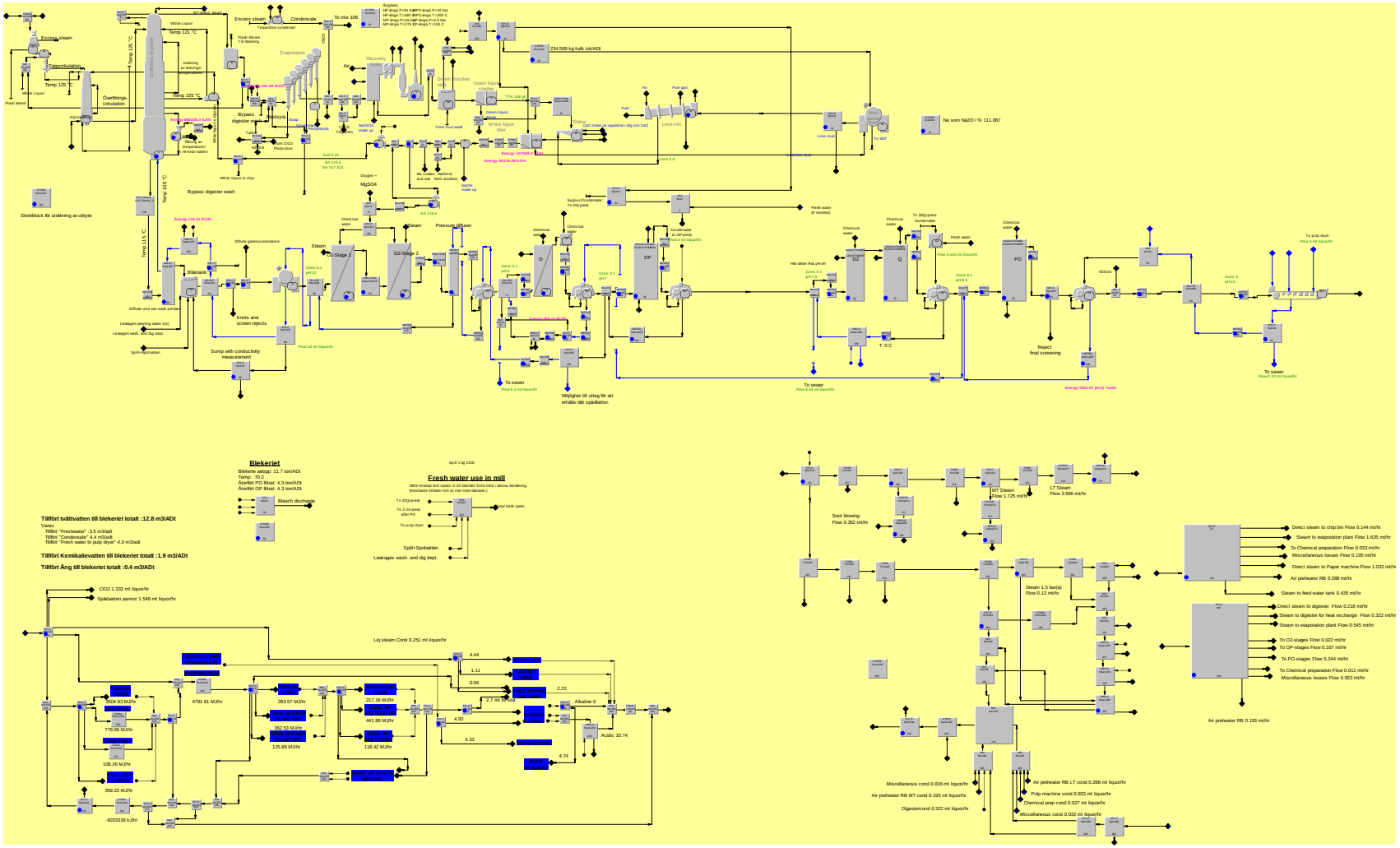
Much detail hidden in the full-mill models

Mass balances
- Flow and fibre
- Na, S, K and Cl
- COD
- NPE (Ca, Mg, Mn, Ba, etc.)
- Organic compounds
  (Lignin, Hemi, Xylan, etc.)

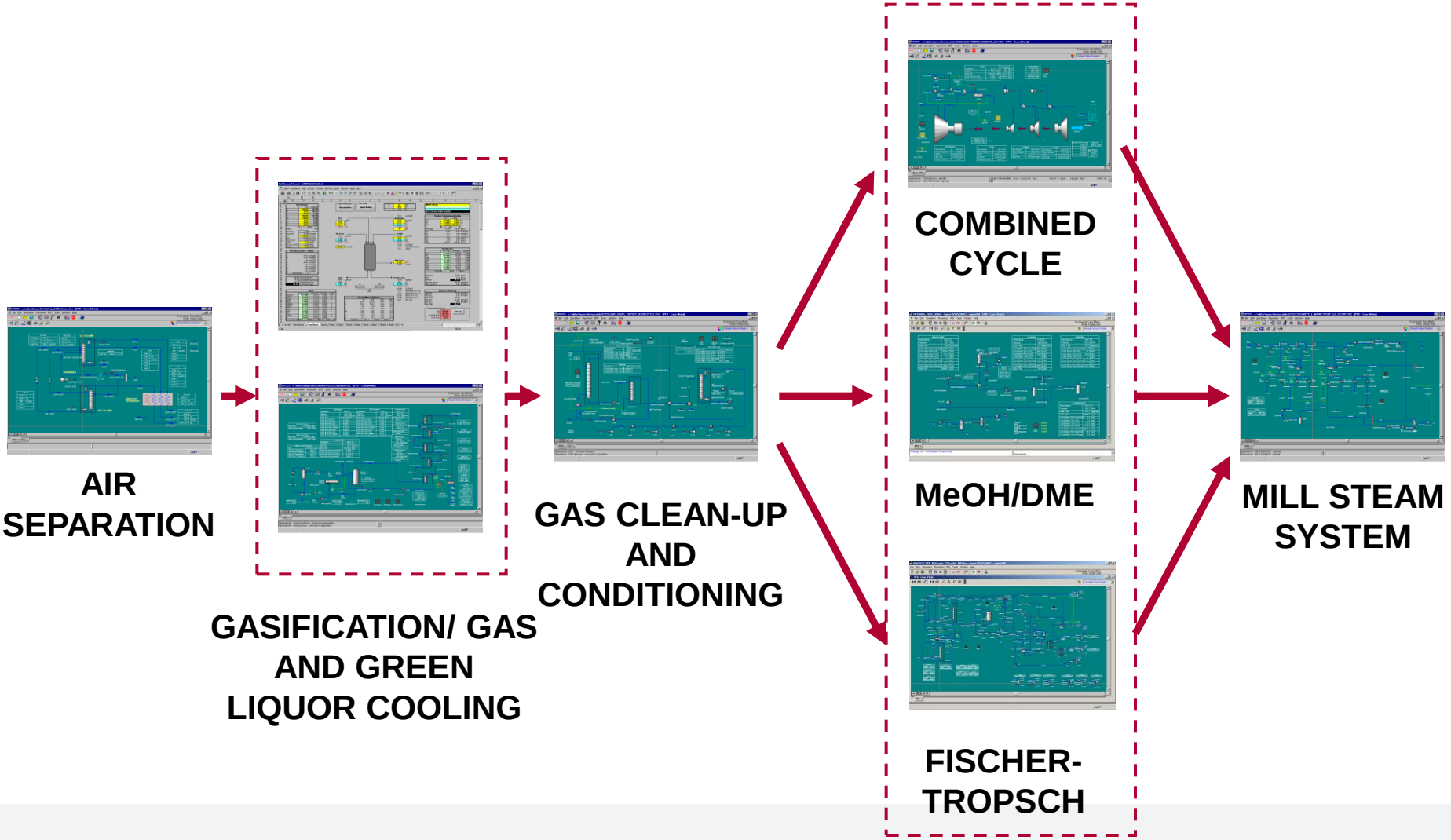
Energy balances
- Steam
- Secondary heat
- Power



Mill configuration described in WinGEMS



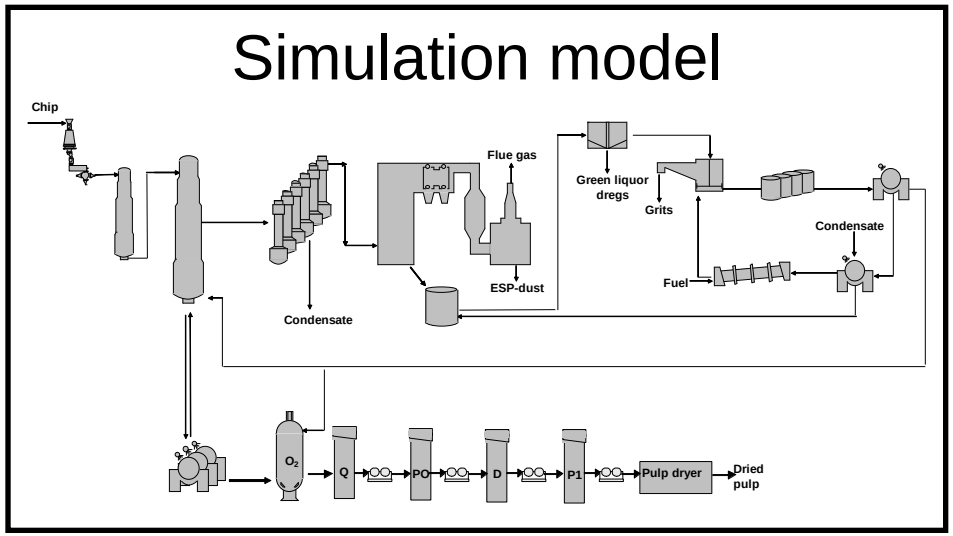
Biorefinery options modeled in UniSim



Applications for the full-mill models

Optimization of the process

Bench-marking

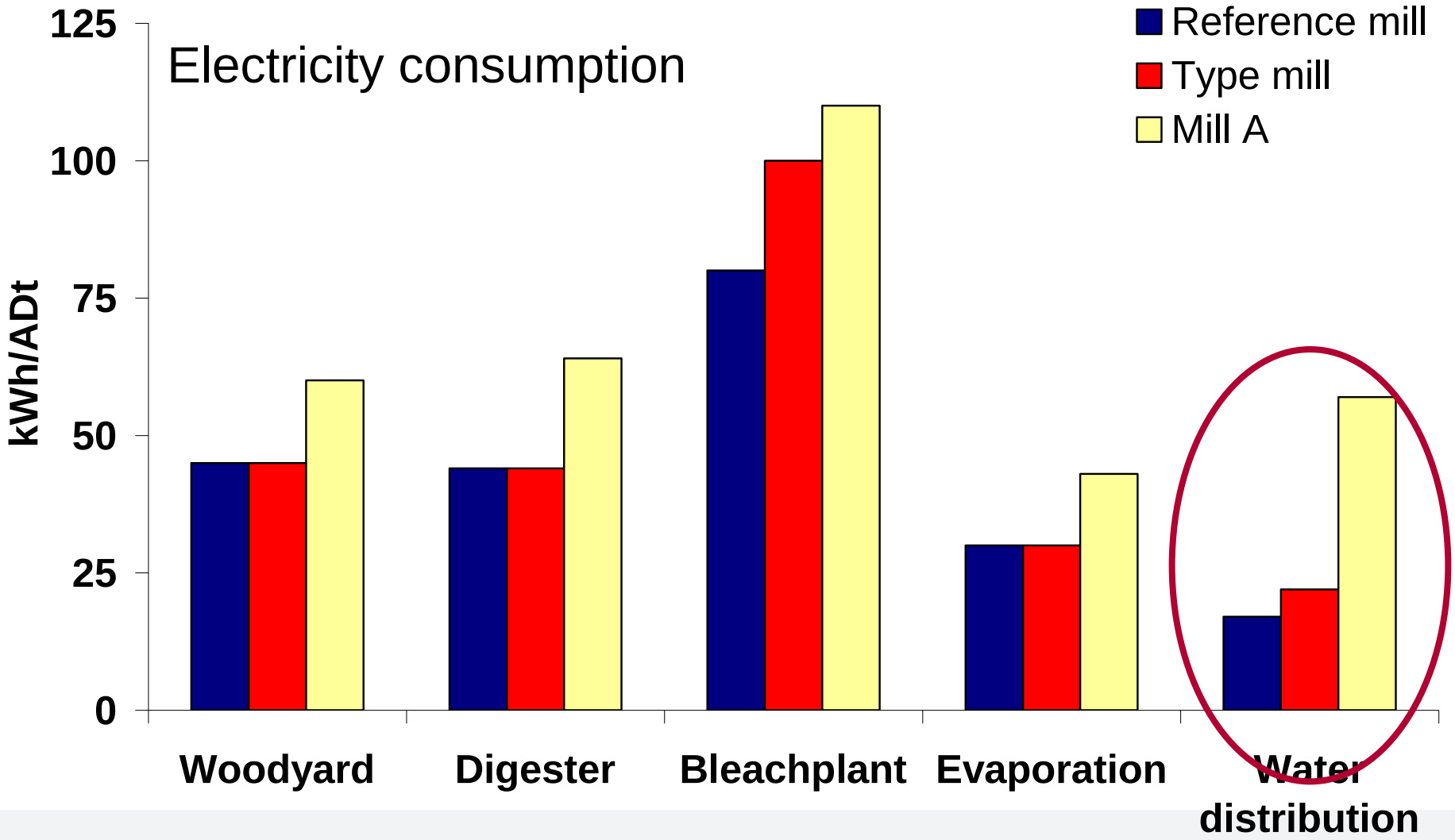


Trouble shooting

Evaluations of new equipment or new process strategies

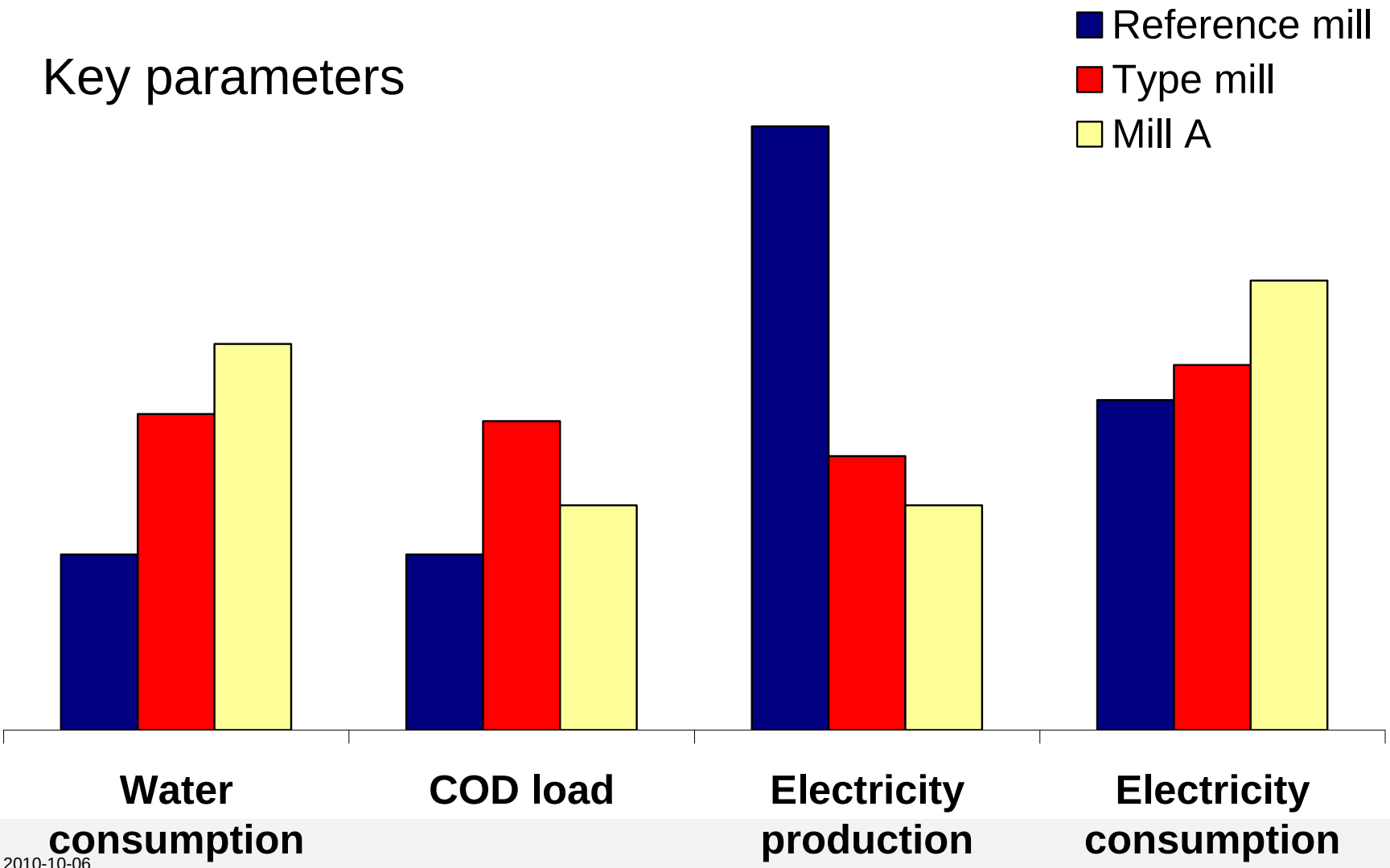
Evaluation of implementation of new sub-processes

Example: Benchmarking



Example: Benchmarking

Key parameters



Example: New process

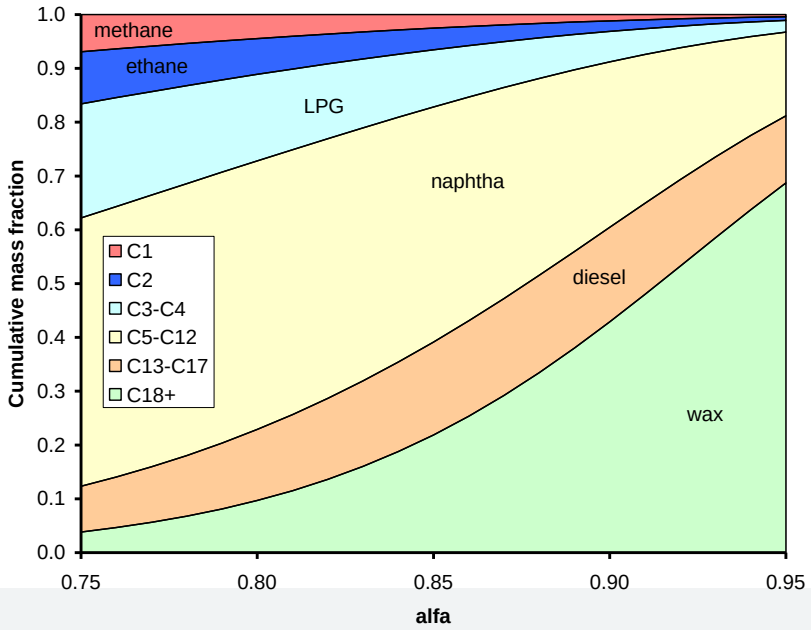
Example: Integration of new process

- Methanol and DME are simple molecules that can be synthesized with high selectivity

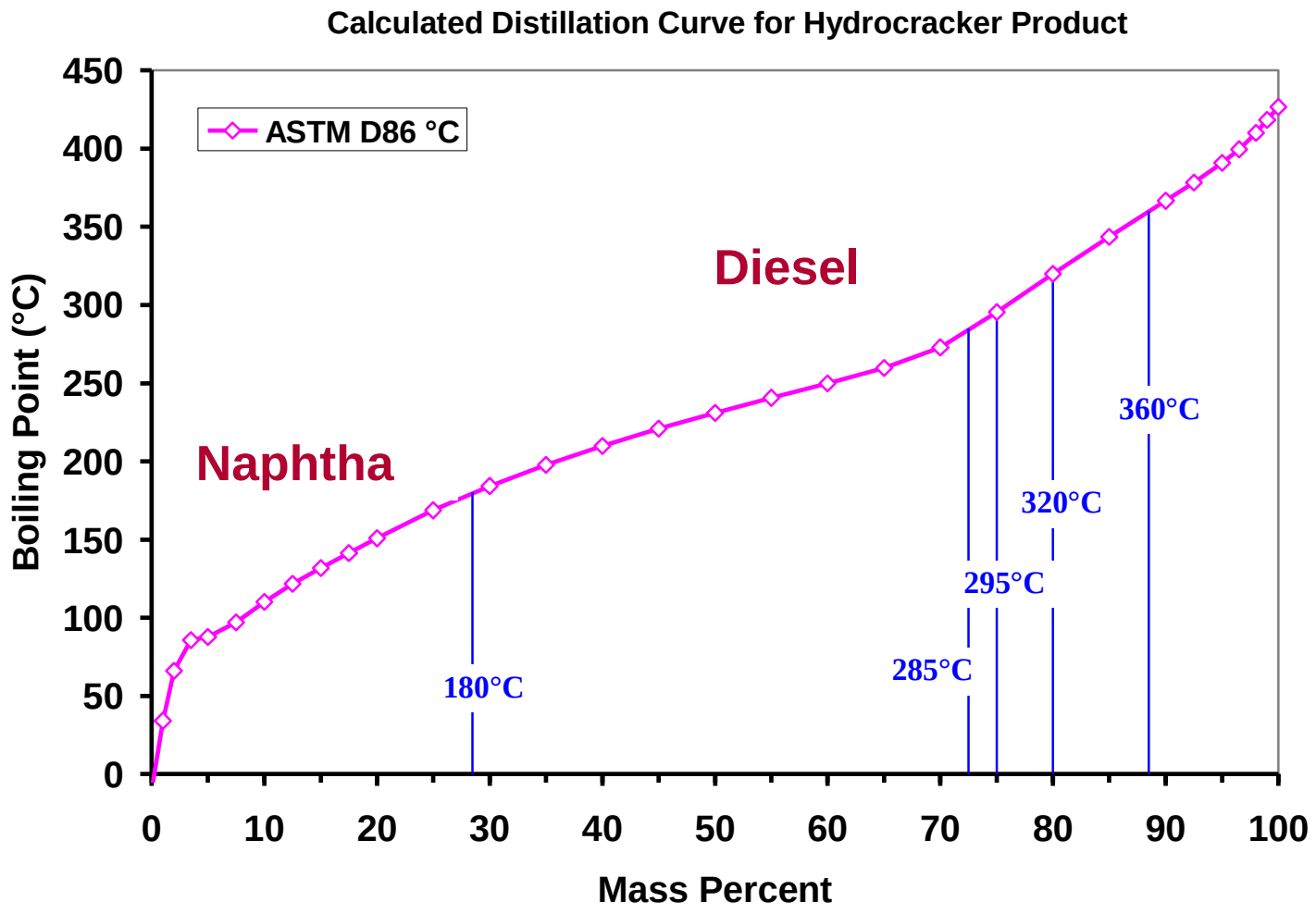
CH_3OH

$CH_3\text{-}O\text{-}CH_3$

- Fischer-Tropsch gives mixture of products



Example: Integration of new process



Bio-DME plant starting up fall of 2010


Thank you!
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