LULEÅ UNIVERSITY OF TECHNOLOGY

HIGHBIO - INTERREG NORD
2008 - 2011

Refining of Novel Products by Biomass Gasification

EUROPEAN UNION
European Regional Development Fund

Integration of biomass gasification in industrial processes

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Background

- The development of gasification processes where lignocellulosic biomass are used for combined heat- and power production and motor fuels is an important step towards a more sustainable society where fossil fuels are replaced.

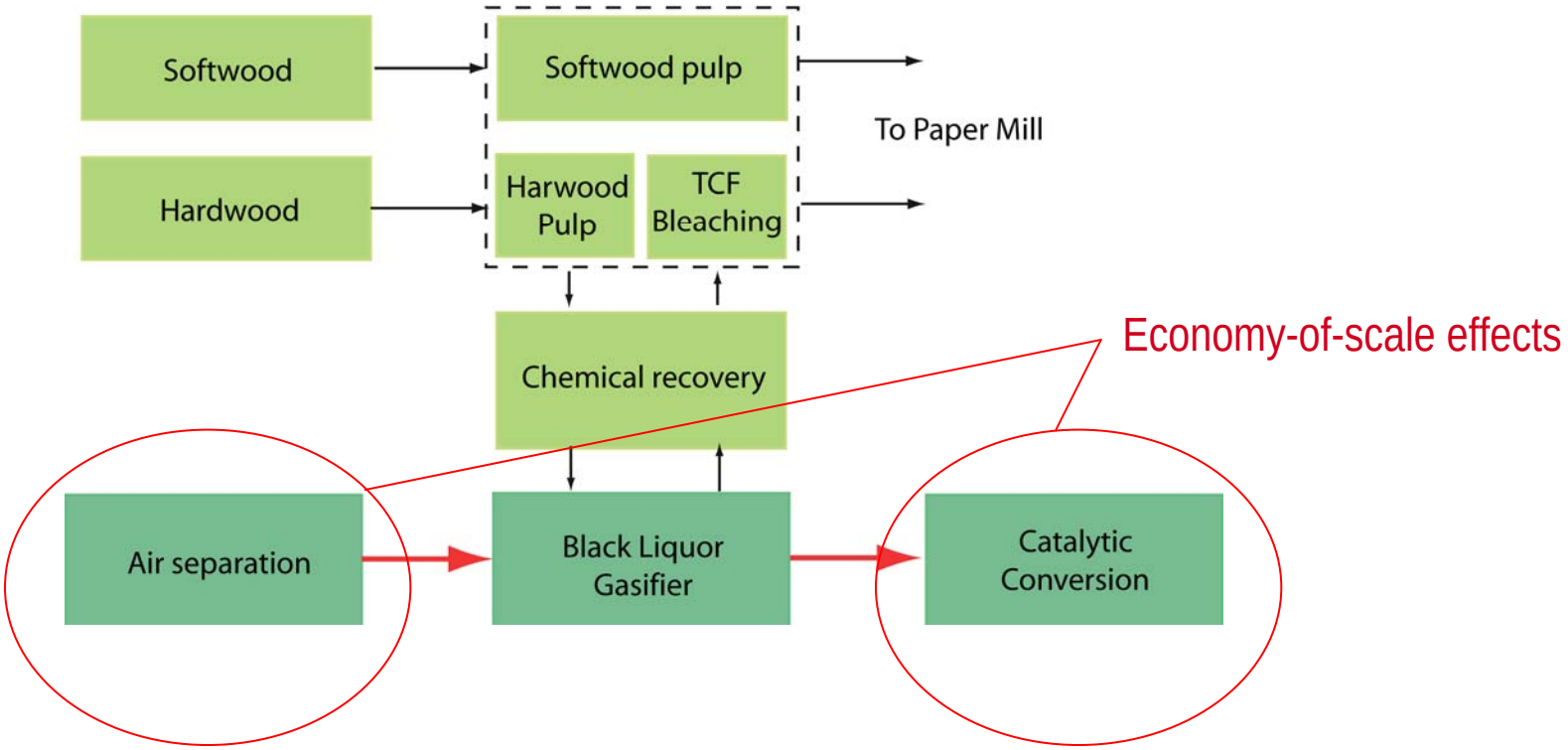
- To be able to compete with fossil resources, an efficient production of biomass based products is necessary to maximize overall process economics and to minimize negative environmental impact.

- Currently, very large biorefinery plants are required in order to reach reasonable production costs, which means that substantial infrastructure planning and development will be needed.

Background

- The residual heat must be sold as district heating or process heat.
- Integration of solid biomass gasification processes in existing industries may facilitate reaching those requirements.
- One of the objectives in the HighBio project is to investigate possibilities for industrial process integration.

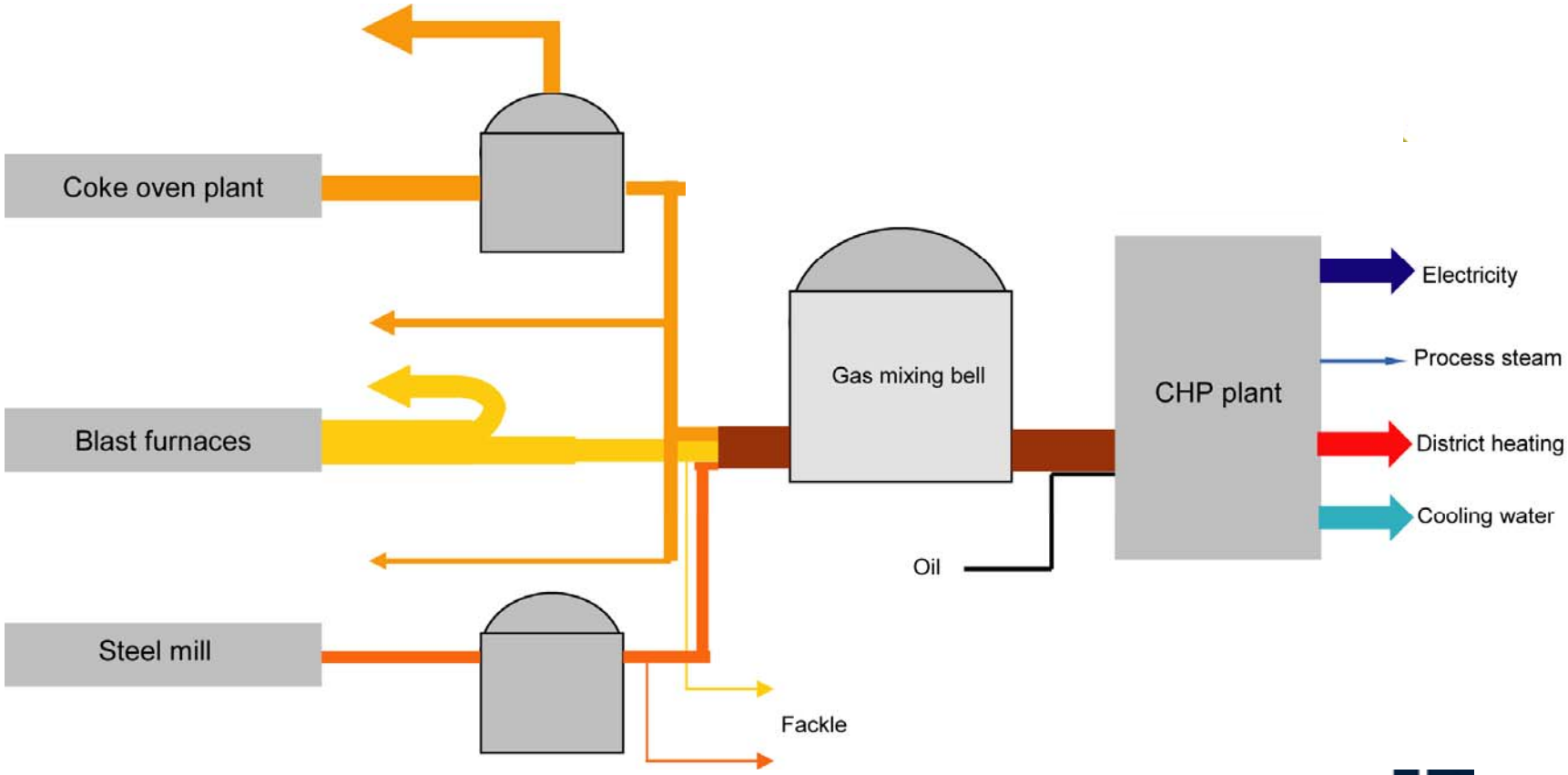
Solid biomass gasification in the forest industry



Solid biomass gasification in the forest industry

- Biomass gasification integrated in forest industries, e.g. paper- and pulp results in other important benefits such as:
  - The competence and infrastructure for biomass handling and fuel preparation already exists and is easily expanded at low investments
  - The residual heat from the gasifier may be utilized in the existing processes – pulp mill is a heat sink the main part of the year

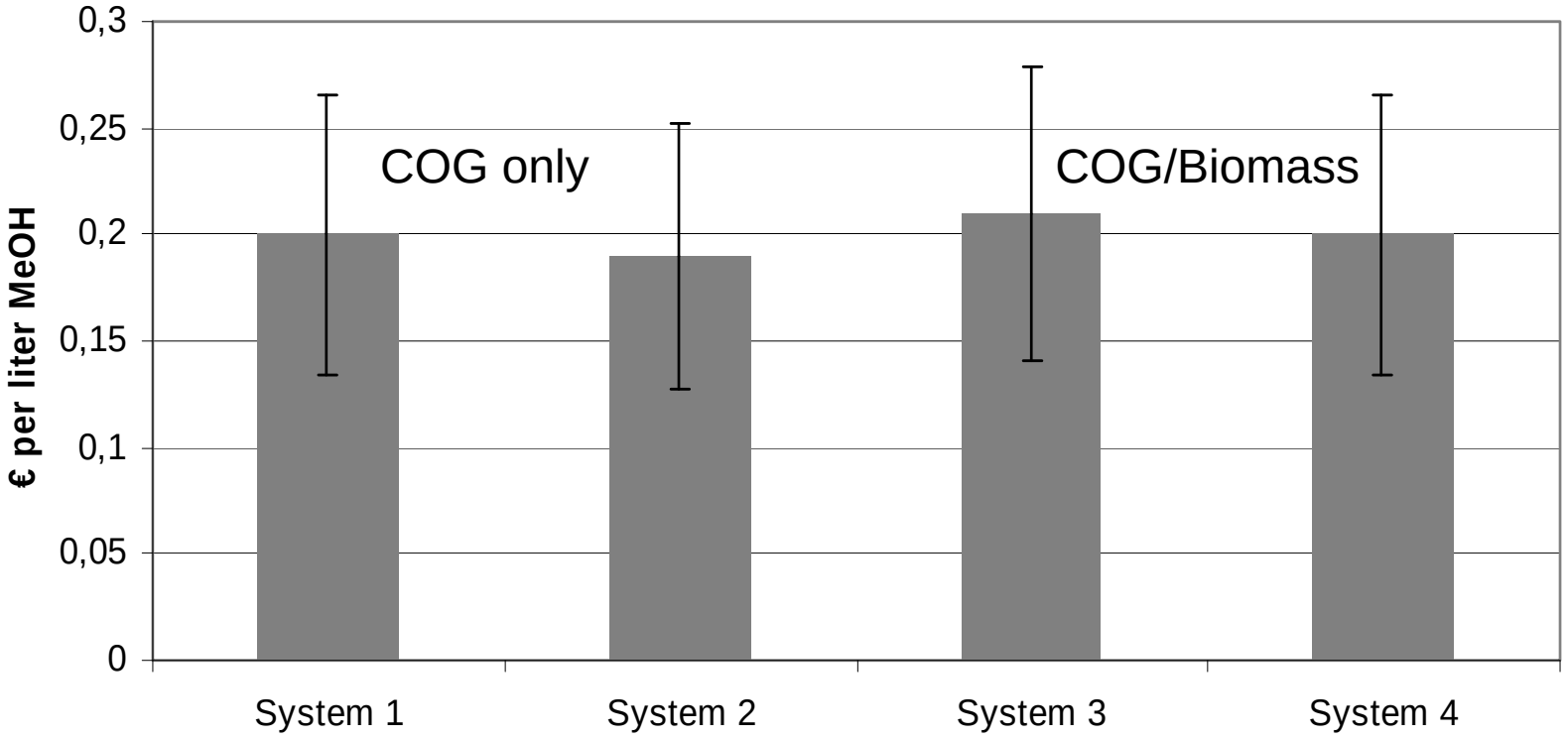
Process integration in the steel industry



SSAB Case study

- Around 300 GWh per year of COG is available without any major process changes. Four different production systems have been considered in this case study:
  - System 1 COG: Hot gas cleaning, autothermal methane reforming, conventional solid bed MeOH catalyst with syngas recycling and power generation via steam cycle.
  - System 2 COG: Cold gas cleaning, steam methane reforming, conventional solid bed MeOH catalyst with syngas recycling and power generation via steam cycle.
  - System 3 COG/Biomass: pressurised oxygen blown gasifier, hot gas cleaning, autothermal methane reforming, partial H_2/CO shift, conventional solid bed MeOH catalyst with syngas recycling and power generation via steam cycle.
  - System 4 COG/Biomass: atmospheric air blown biomass gasifier, cold gas cleaning, steam methane reforming, conventional solid bed MeOH catalyst with syngas recycling and power generation via steam cycle.

Results SSAB case study



Ref: Lundgren J., Asp B., Larsson M., Grip C-E. Methanol production at an integrated steel mill. Proceedings of the 18th International Congress of Chemical and Process Engineering, 24-28 August, 2008, Prague, Czech Republic

Conclusions

- The integration of solid biomass gasification processes in existing industries may result in many technical and economic advantages.
- Solid biomass gasification is an excellent complement to black liquor gasification in the paper- and pulp industry as
  - Much larger plants are possible
  - Synergistic use of air separation unit and catalytic conversion process
  - The pulp mill is a heat sink
  - Competence and infrastructure for biomass handling and fuel preparation already exists
- Introducing biomass gasification in the steel industry for mixing with COG is of great interest. The economic assessment shows on competitive production costs and many technical benefits.

Thanks for your attention!

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