

Presentation 3.1: Report on energy efficient technologies and CO₂ reduction potentials in the pulp and paper industry

Thore S. Berntsson

Professor

Chalmers University of Technology, Gothenburg, Sweden

E-mail: thore.berntsson@chemeng.chalmers.se

Abstract

A summary will be given of the workshop on Energy Efficient Technologies and CO₂ Reduction Potentials in the Pulp and Paper Industry, which took place on 9 October 2006, at the International Energy Agency in Paris. The goal of the workshop is to better quantify the global potential for energy efficiency and CO₂ emissions reduction in the Pulp & Paper sector and to discuss various approaches to overcome the barriers to improvements.

Important differences in energy use of pulp and paper making exist between countries. They can be explained by a range of factors such as product mix, typical processes used, plant size, technology, plant age, feedstock quality, fuel prices and management attention for energy efficiency. The goal of our indicators analysis is not benchmarking on a plant or machine level, but a cross country comparison of energy intensity.

Energy costs, energy supply and climate change are amongst the core issues impacting on the future of the forest products industry. They will have impacts on manufacturing costs, as well as on the allocation of investments around the globe. The increasing focus on biomass as an energy source may on the one hand increase wood prices for existing industries, but on the other hand open new markets to other parts of the forest cluster. Co-production of pulp and other biomass products may result in new business models and high overall energy efficiency.

The pulp and paper industry is in a unique position, both in terms of improving energy efficiency and reducing CO₂ emissions. The sector has the ability to become a net supplier of a range of energy products and it can become an important actor in removing CO₂ from the atmosphere. However this vision will not happen overnight, and it will imply a fundamental rethinking of the sector's strategy.



Report on Energy Efficient Technologies and CO2 Reduction Potentials in the Pulp & Paper Industry workshop

**Thore Berntsson
IEA / IETS IA**

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Presentation Outline

- **G8 Industry Task & Next Steps**
- **The Indicators Challenge**
- **Technologies and Systems**
- **IETS and International Coordination**
- **Workshop Conclusions**

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G8 Industry Task & Next Steps

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G8 Industry Task

- **Partner in the Dialogue - advise on alternative energy scenarios & strategies;**
- **Transforming the way we use energy (End-use efficiency), *amongst which industry:***
 - ◆ Develop indicators to assess energy efficiency
 - ◆ Assess energy efficiency performance in industry;
 - ◆ Identify areas for further analysis on energy efficiency and CO₂ emissions reduction;

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Next Steps

- **Indicators for Industrial Energy Efficiency and CO₂ Emissions**
 - ◆ Will be published April 2007
 - ◆ Submitted to G8 summit in Germany
 - ◆ Focuses on country comparison of indicators
- **Analysis of technology potentials for CO₂ emission reduction, including:**
 - ◆ New drying technologies (long-nip press, condebelt design and impulse drying)
 - ◆ CHP
 - ◆ CO₂ capture & storage
 - ◆ Industrial ecology (recycling, materials efficiency) /process integration
- **Energy Technology Perspectives 2008**
 - ◆ Updated scenario analysis
 - ◆ Competitiveness & strategy issues
 - ◆ Submitted to G8 summit in Japan

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The Indicators Challenge

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Issues

- Our current indicators track only energy use/value added
- Better indicators are needed
- The goal is country level analysis, NOT benchmarking (IETS IA Annex)
- Analysis includes 14 countries accounting for 90% of pulp and 80% paper market
- Bioenergy is also counted as energy
- Impossible to split energy data for individual products
- New indicator needed to track CHP properly
- No credit for higher recycling rates

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Proposed Approach

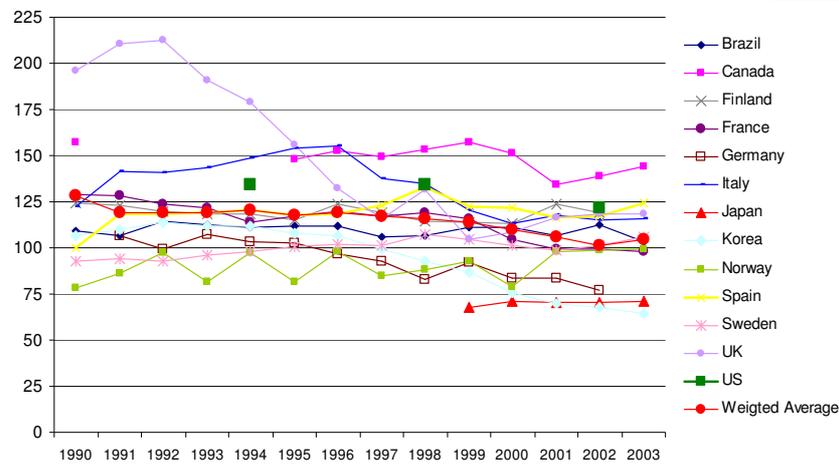
- Develop an aggregate index instead
 - ◆ Use BAT data for mechanical, chemical, waste paper pulp and 7 different paper making grades
 - ◆ No differentiation integrated/non-integrated mills
 - ◆ Multiply production volumes (FAO) and BAT
 - ◆ Combine country data & IEA statistics
 - ◆ Take statistical energy use data (based on net caloric value) & assume steam generation efficiency
 - ◆ Subtract estimated electricity use for printing (when no pulp & paper energy use data available)
 - ◆ Calculate the ratio of estimated energy use & BAT-based best case

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Heat (Steam) Use Index



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Heat (Steam) Use Index (cont.)

This is a country comparison of energy intensity (compared to BAT) and not intended for benchmarking.

G8 has specifically asked the IEA to "develop indicators to assess energy efficiency".

Energy data for these graphs come from national statistics and Odyssee for Europe. All figures have been adjusted to reflect Net Caloric Value.

80% efficiency was assumed for steam generation in all countries.

Data quality is a major concern in this analysis. There may be under reporting of energy use in countries with indices below 100.

(The curve for China was removed due to poor quality of energy data. We hope to correct this in our future analysis.)

This index does not take into consideration integrated mills where energy use is significantly lower. An adjustment for integrated mills would change many of the curves for key pulp producing countries. We decided not to make this adjustment so that all countries were compared on a consistent basis. From an energy efficiency view point the split of integrated and non integrated mill should be considered.

Our weighted average index is very close to 100 which may indicate that our BAT figures are too low or that the impact of integrated mills needs to be considered in this analysis.

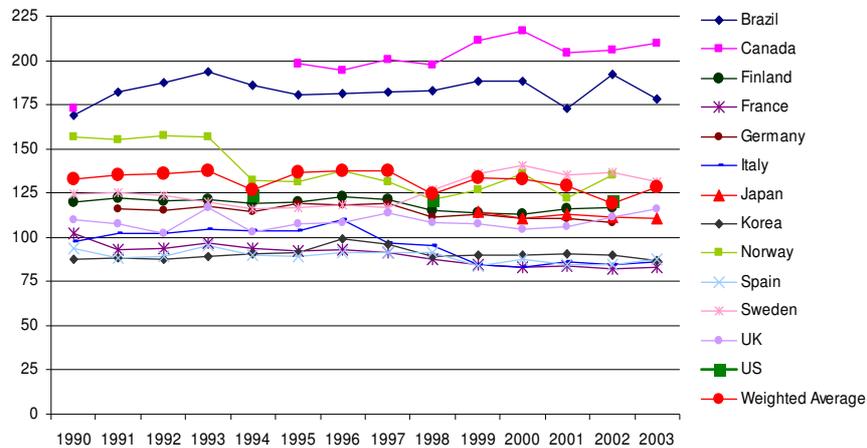
In general most countries show an improvement in heat use between 1990 and 2003.

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Electricity Use Index



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Electricity Use Index (cont.)

Unlike heat where a significant improvement was noted, electricity use has remained relatively constant showing little improvement over this period.

Higher electricity use for paper recycling could be masking improvements in electricity use in paper and pulp production.

Cheap hydro power in Brazil and Canada could explain the relatively high curves for these countries. In addition Canada's pulp production is weighted a lot more on mechanical pulp than chemical pulp.

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Way Forward on Indicators

- Begin with an analysis on country trends
- Goal of indicators analysis is a cross country comparison of energy intensity
- Work closely with industry to ensure energy data consistency across countries
- Refinement of methodology to ensure differences in product mix reflected
- Two additional indicators to be developed:
 - ◆ Primary energy equivalent / ton of product (to capture CHP and recycling benefits)
 - ◆ CO₂ / ton of product (based on WBCSD tool)

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Technologies and Systems

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Technologies and systems

- Existing technologies can already provide significant efficiency gains
- Heat recovery systems should be more widely applied
- CHP deployment suffers from power market distortions, regulation and plant systems optimisation
- Future technologies focus on black liquor gasification, lignin extraction and biorefinery concept
- Financing investment risk is an important issue for costly demonstration plants

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CHP

- CHP use is still low despite higher efficiencies and lower environmental impacts
- Potential to triple CHP use in the industry (Europe)
- Current regulation is a major obstacle to increasing CHP deployment
- CHP is a non-core issue for most companies
- In Europe, Finland, Germany, Sweden and Spain offer most potential to increase CHP

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Black liquor gasification

- **BLGCC offers an opportunity for a range of products**
- **Can be combined with CO₂ capture and storage**
- **Gasification allows for greater energy recovery**
- **Sweden and US offer promising developments**
- **No consensus yet if this technology is the best way forward**

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Biorefinery

- **US Agenda 2020 biorefinery platform:**
 - ◆ **Focus on lignocellulosic ethanol for value prior to pulping (VPP);**
 - ◆ **Black liquor gasification dominant technology evaluated under new value stream (NVS);**
 - ◆ **Report on commercial scale biorefinery due in Nov.**
- **Swedish programme focuses on:**
 - ◆ **Energy exports from modern mills;**
 - ◆ **Lignin removal from black liquor; and**
 - ◆ **Black liquor gasification.**

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IETS and International coordination

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What is an Implementing Agreement

- 40 IEA Implementing Agreements (IA)
- Industrial Energy-Related Technology Systems (IETS) is a new IA
 - ◆ Broad cooperation for different types of industries and technologies / systems
 - ◆ On going planned cooperation for the pulp and paper industry
 - Benchmarking
 - Black liquor gasification
 - Process integration
 - Biorefineries

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Workshop Conclusions

- 1st step in data collection & validation
- IEA and Industry will work together on indicators methodology (2007)
- Both existing and new technologies offer significant energy efficiency gains
- Important improvements have been made and there is a strong focus on energy efficiency in the industry
- Sector has the ability to become a net supplier of energy products and CO₂ sink

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Thank You

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