LCI as a tool in the environmentally oriented product development of paper products

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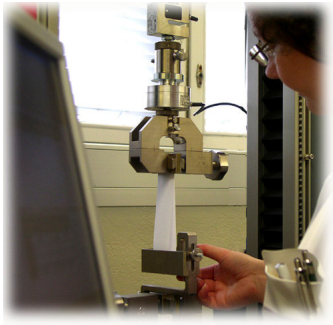
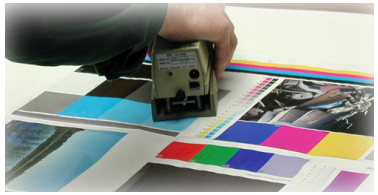
KCL – We drive science into paper

- Owners:
  Metsäliitto, Myllykoski, Stora Enso, UPM
- Staff 300
- Turnover in 2006: MEUR 24.0 (budget)
- Founded in 1916
- Research, Testing and Analysis, Pilot Services, Training, Consulting and Information





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I. Why we need new approaches in pulp and paper industry?

- Life cycle approaches increasingly important
  - Integrated Product Policy
  - Design for Environment, Ecodesign…
- Characteristics of process industry products
  - Product development = Process development
  - Product properties are bound to each others
- Customer information in product development
  - Considered important but not always gathered systematically

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I. Life cycle and value chain

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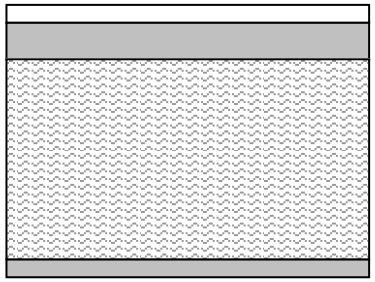
I. Folding boxboard

- Used for cartons
  (food, pharmaceuticals, cosmetics…)
- Critical property: stiffness
- Optimized properties achieved with
  three-layer structure:



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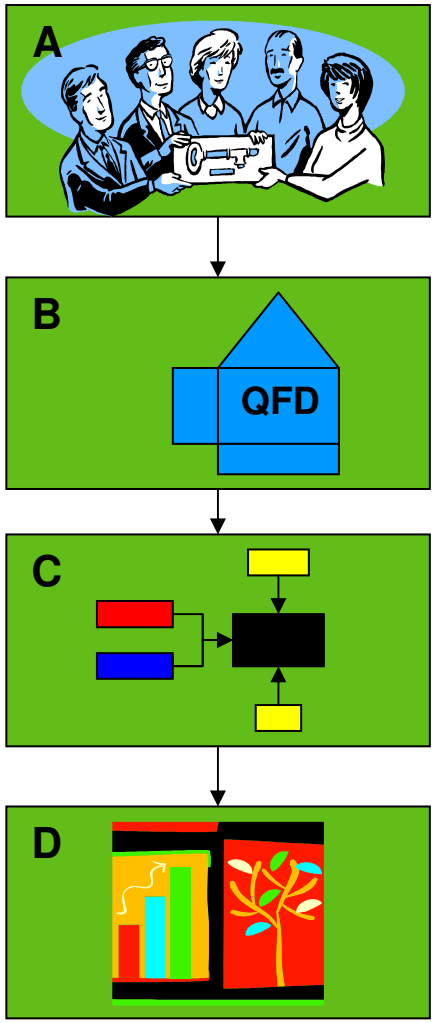
II. New approach to product development

- Developed in cooperation with industrial partners
- Four stages:
  A. Definition of customer requirements ->workshops, interviews
  B. Specification of product properties to be improved ->Qualitative requests to technical specifications (QFD)
  C. Definition of development actions and their consequences -> LCI
  D. Assessment of the results for decision-making -> Functional unit in comparison of the reference product to the improved version



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III. Results from a case study

Customer requirement:
Better print quality

Development action:
Uncoated board is replaced with coated one

- Consequences:
  Coating requires additional drying =>
  More energy, additional material use and transports
- Analysis:
  How the change from uncoated to coated board affects air emissions?

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II. Development actions and their consequences – tools and resources

- KCL-ECO 4.0
  - Life-cycle assessment software
  - Applicable in all branches of industry
  - Developed since 1992
- KCL EcoData
  - Data for life-cycle inventories
  - More than 250 forest industry specific unit processes
  - Energy production
  - Transport

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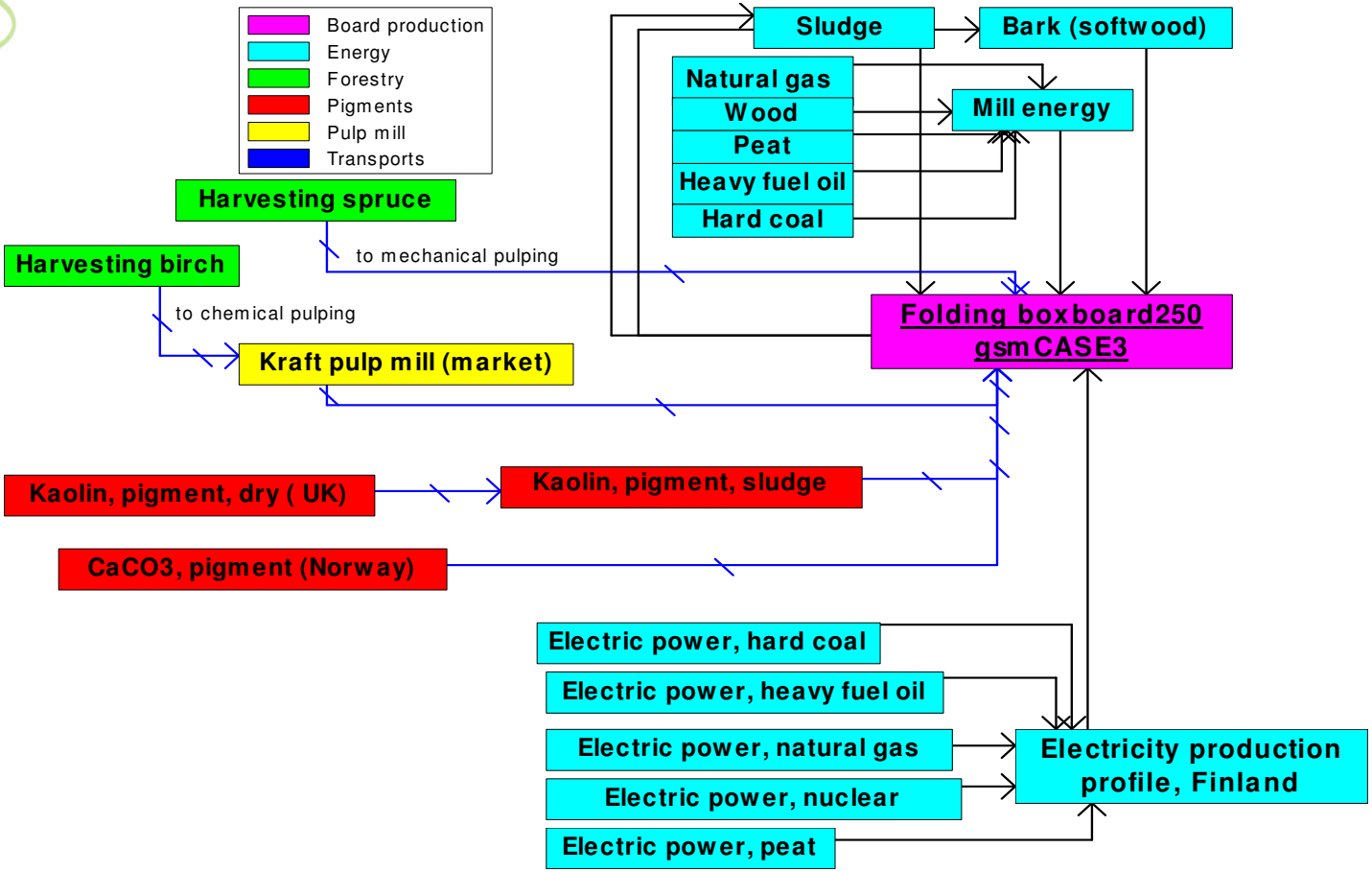
LIFE CYCLE STAGES INCLUDED IN THE CASE STUDY



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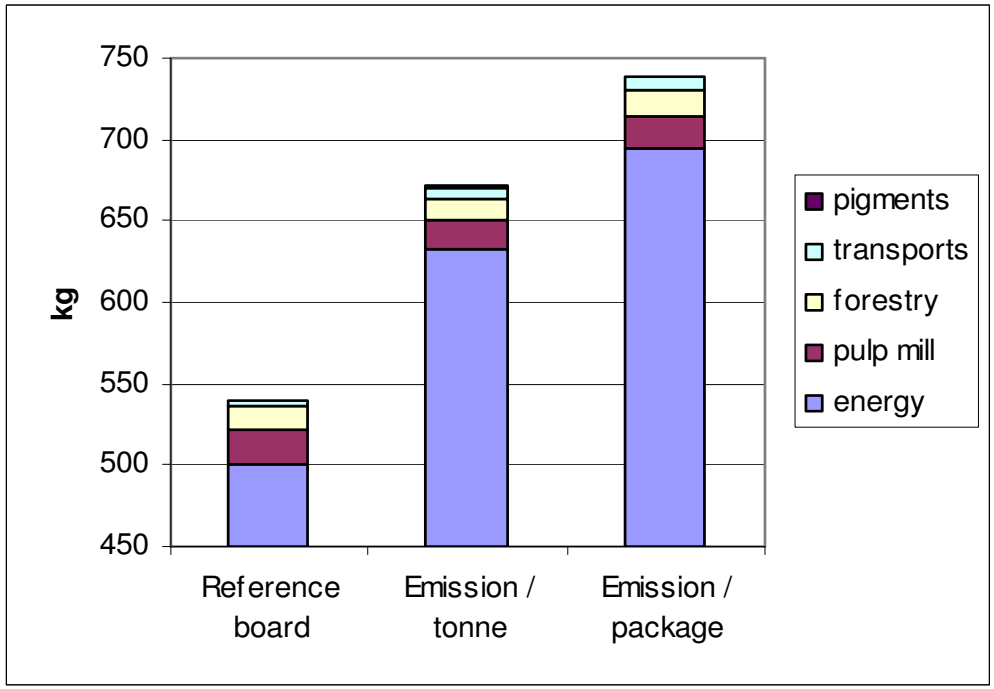
III. Results – CO_2 emissions



Remark I: Energy production is the most significant life cycle stage causing emissions

Remark II: More emissions when comparison is done per number of packages

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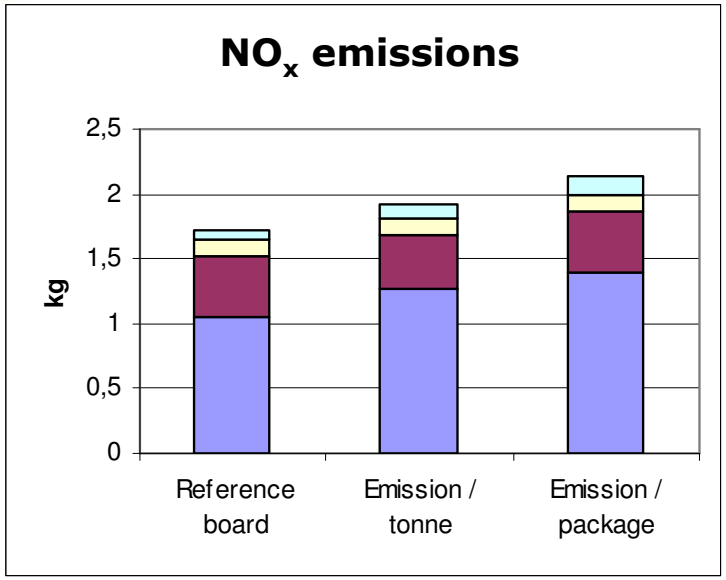
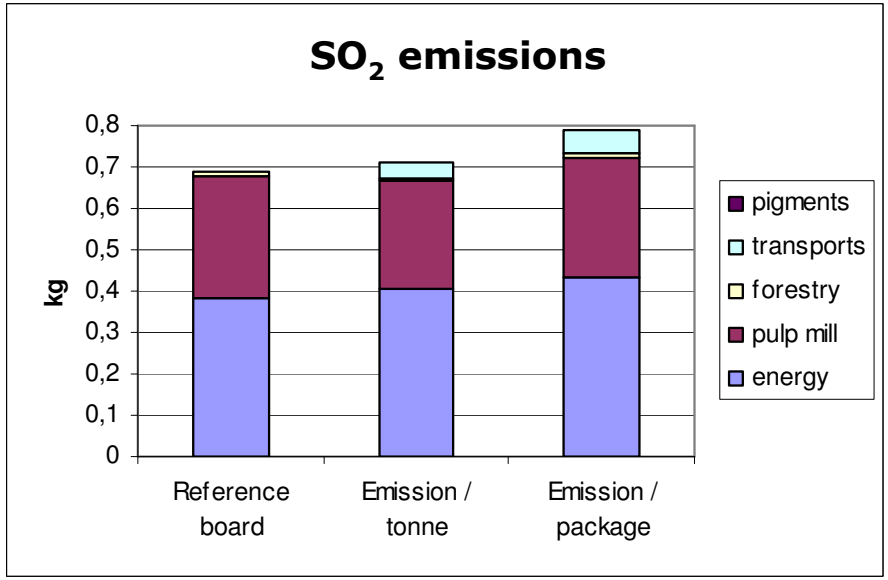
III. Results – NO_x and SO_2 emissions





Remark I: Energy production and chemical pulp production cause most of the emissions

Remark II: As before, more emissions when comparison is done per number of packages

Why?
One tonne of coated board has a smaller area than equal amount of uncoated board

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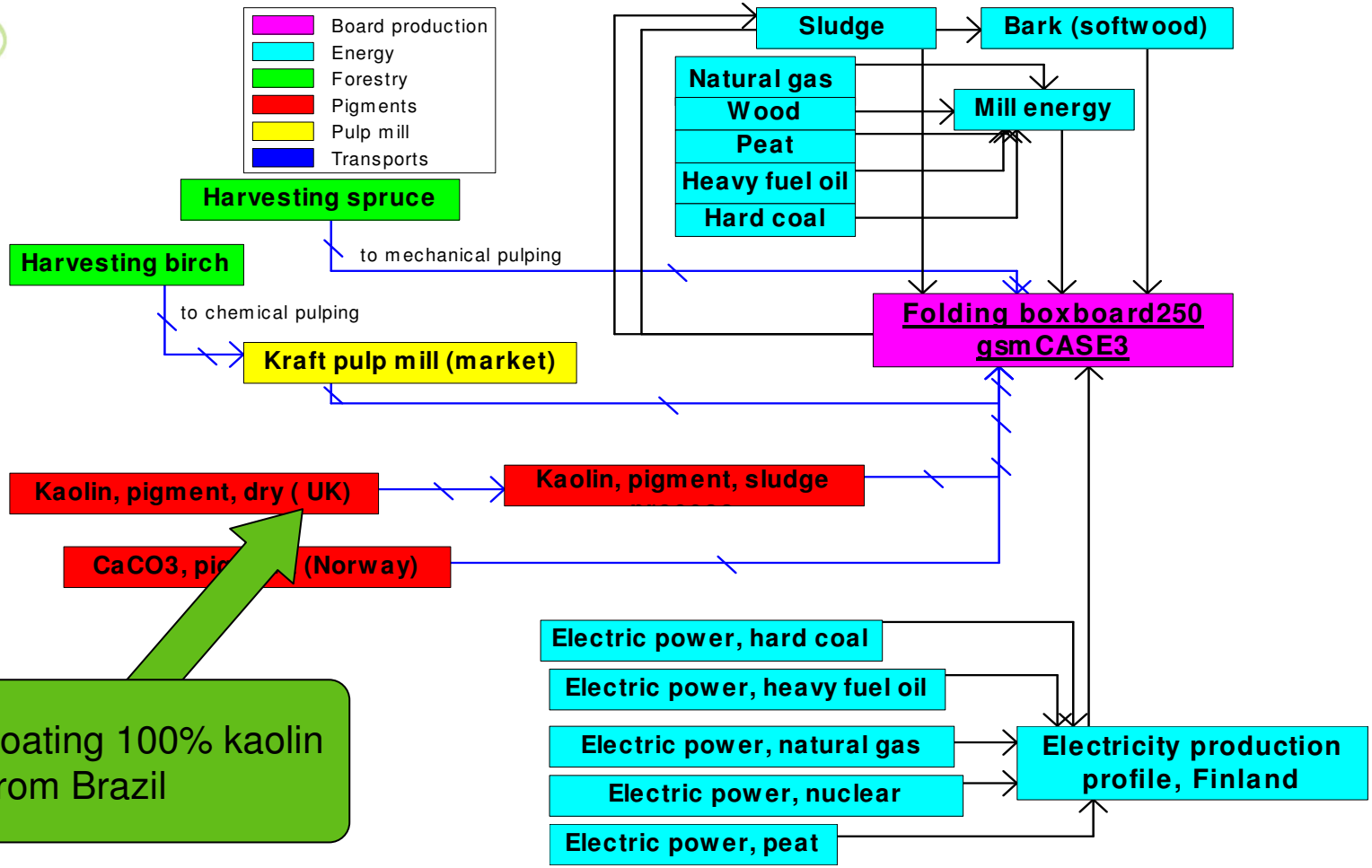
LIFE CYCLE STAGES INCLUDED IN THE CASE STUDY



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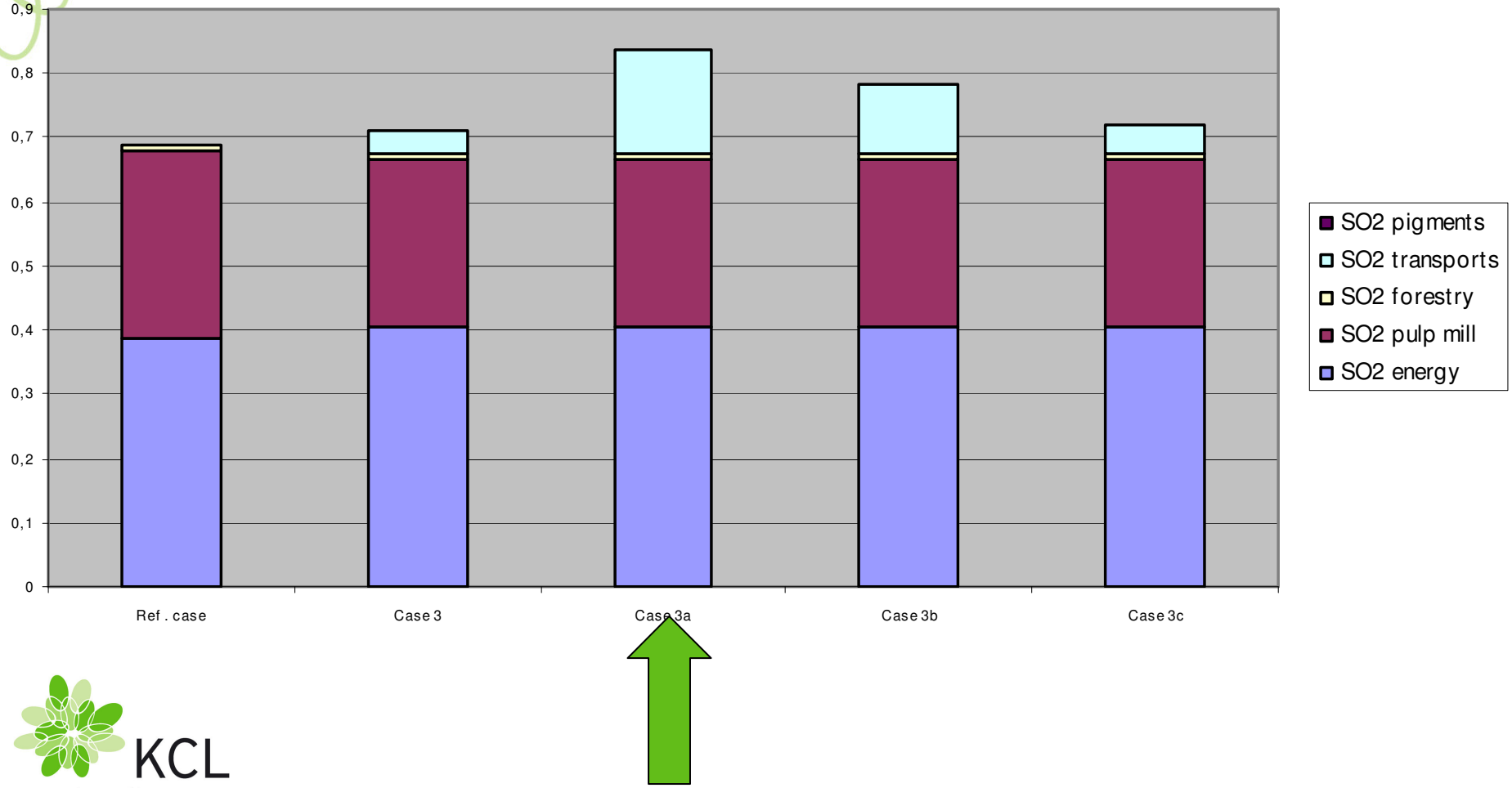
SO2 emissions of coated cases with different pigment suppliers



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IV. Conclusions

- New approach to environmentally oriented product development of paper products
  - Customer focus
  - Life cycle thinking
- Concrete base for industrial decision-making
  - Transformation of qualitative information into quantitative data
  - Visualization of environmental consequences in early stages of the development process
  - Direction of emissions to end product

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