THE FULL STORM OF STRUCTURAL CHANGE

NEW PLAYERS
China, Latin America
Subsidies:
China 33 bill. (2002-09)

RAW MATERIAL
• Increased competition/cost
• Recycling reaches limits

TECHNOLOGICAL CHANGE
Hardwood instead of softwood

STRUCTURAL CHANGE OF INDUSTRY

MARKETS
• Shift in geographical consumption
• Strong decline in certain products
• New societal demands on products

SUBSTITUTE
• ICT
• Growing substitutes (e.g. plastic)

UNSATISFACTORY
Economic performance
SYSTEMIC CHANGE

• Only systematic change, as opposed to incremental changes, will make it possible to keep pace in the rapidly changing world

• Creative destruction would be a sign of progress

• USA is not alone – all of the Northern Hemisphere industry is in the same situation

• The Nordic industry has started to transform, Canada is trying, but not much transformation in US is being observed, apart from closing down capacities

• Why is the transformation not happening?
OUTPUT OF THE US FOREST PRODUCTS INDUSTRY DECLINING

Source: Peter J. Ince, USFS, Forest Products Lab and Prakash Nepal, Louisiana State University, 2012
## RELATIVE GDP CONTRIBUTION IN CURRENT US$ – 2000-2010  (2000 = 100)

<table>
<thead>
<tr>
<th>Industry</th>
<th>2000</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing – all durable goods</td>
<td>100</td>
<td>104</td>
<td>111</td>
<td>113</td>
<td>114</td>
<td>108</td>
<td>119</td>
</tr>
<tr>
<td>Mining – oil &amp; gas</td>
<td>100</td>
<td>184</td>
<td>217</td>
<td>211</td>
<td>263</td>
<td>199</td>
<td>232</td>
</tr>
<tr>
<td>Agriculture – Farms, forestry, fishing, hunting</td>
<td>100</td>
<td>136</td>
<td>125</td>
<td>171</td>
<td>162</td>
<td>143</td>
<td>160</td>
</tr>
<tr>
<td>Wood products</td>
<td>100</td>
<td>117</td>
<td>119</td>
<td>99</td>
<td>87</td>
<td>72</td>
<td>79</td>
</tr>
<tr>
<td>Paper products</td>
<td>100</td>
<td>87</td>
<td>91</td>
<td>95</td>
<td>84</td>
<td>91</td>
<td>92</td>
</tr>
</tbody>
</table>

ROCE OF AMERICAN COMPANIES IN 100 TOP FOREST COMPANIES WORLDWIDE


Range of cost of capital
TECHNICAL AGE OF PAPER MACHINES

Source: Pöyry, 2013
CAPACITY CHANGES IN USA

• Net loss of paper and paperboard capacity 2000-2012: 13.5 MMt or ~ 15% of the total capacity
• Reduction of the number of pulp mills: ~ 25% = 15% in capacity
• Reduction of number of saw mills: ~ 18% = 25% in capacity
• Due to the capacity reductions, the American industry has made substantial money in 2011 and 2012
• How much must the capacity shrink for a sustainable economic performance?
• Is the long-term strategy just to reduce capacities?

GLOBAL GROWTH RATES FOR COMMODITY PRODUCTS TO 2025 COMPARED WITH EXISTING US INDUSTRIAL CAPACITY

<table>
<thead>
<tr>
<th></th>
<th>News-print</th>
<th>Un-coated wood containing P&amp;W</th>
<th>Coated wood containing P&amp;W</th>
<th>Un-coated wood free P&amp;W</th>
<th>Coated wood free P&amp;W</th>
<th>Hygiene</th>
<th>Liner &amp; fluting</th>
<th>Folding box board</th>
<th>Sack paper</th>
<th>Other paper and paperboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global growth rates</td>
<td>-1.4</td>
<td>-1.2</td>
<td>-0.8</td>
<td>+0.5</td>
<td>+0.6</td>
<td>+3.2</td>
<td>+2.8</td>
<td>+2.4</td>
<td>+0.8</td>
<td>+0.4</td>
</tr>
<tr>
<td>(average %/yr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US current capacities</td>
<td>3.4</td>
<td>2.1</td>
<td>3.3</td>
<td>10.3</td>
<td>3.9</td>
<td>7.8</td>
<td>32.6</td>
<td>9.6</td>
<td>1.3</td>
<td>4.1</td>
</tr>
<tr>
<td>(in million tons)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Some 28 million tons will be stressed for structural change
- This corresponds to 33% or current total US capacity of paper and paperboard
- Very difficult to increase prices under negative or low growth rates (Rennel, 2010)

GLOBAL GROWTH RATES FOR PULP DEMAND (in tons) BY 2020 AND EXISTING US PULP CAPACITIES

<table>
<thead>
<tr>
<th>Unbleached kraft – unchanged demand 2010-2020</th>
<th>Bleached hardwood kraft – substantial increased demand</th>
<th>Bleached softwood – slightly decreased demand</th>
<th>Mechanical and semi-mechanical – unchanged demand</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Internal</strong></td>
<td><strong>Market</strong></td>
<td><strong>Internal</strong></td>
<td><strong>Market</strong></td>
</tr>
<tr>
<td>US current capacities (in million tons)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.9</td>
<td>13.9</td>
<td>13.5</td>
<td>8.3</td>
</tr>
<tr>
<td>---</td>
<td>2.0</td>
<td>6.8</td>
<td>---</td>
</tr>
</tbody>
</table>

- Brazil – increasing capacity of BEK of 18 MMt; export increase 6 MMt in 2020
- Russia – increasing NBSK of 2 MMt by 2016
- US – pulp capacities will also depend on the structural changes taking place in paper and paper board (see earlier slide)

CONSUMPTION OF PAPER AND PAPERBOARD IN USA (in MMt/yr)

Source: Peter J. Ince, USFS, Forest Products Lab and Prakash Nepal, Louisiana State University, 2012; and FAOSTAT (historical); and USFPM/GFPM (projections).
PULP PRODUCTION AND CONSUMPTION IN USA (in MMt/yr)

Source: Peter J. Ince, USFS, Forest Products Lab and Prakash Nepal, Louisiana State University, 2012; and FAO (historical) and USFPM/GFPM (projections)
The demand pattern for domestic consumption of printing papers is a permanent decrease.

International competitors also have big problems. Theirs will become yours, as they look at your fully supplied markets.

There are more problems than solutions for US pulp & paper mills.

Capacities will be decreased by some 50% by 2020.

Only the lowest cost producers will survive.
Market adaptation
Increased innovation
Alternative use of fibers and byproducts
Utilized environmental advantages
Increased productivity
Cost cutting
Competence development
Acquisition/mergers

Source: Opticom International Research AB, 16 September 2009
http://www.papernet.se/iuware_files/user/papernet.se/pdf/framtidsstudie.pdf
CONCENTRATING ON THE CUSTOMER...

100% of forest, paper & packaging CEOs say that customers have a ‘significant’ influence on their strategy.

INVESTING IN CUSTOMERS

- Enhancing customer service
  - Forest, paper, & packaging: 16
  - Total sample: 38

- Growing your customer base
  - Forest, paper, & packaging: 32
  - Total sample: 51

Source: PwC 16th Annual Global CEO Survey, 2013
WHY IS IT SO?

• Conservative and risk-adverse owners, boards, and financial analysts
• ‘Vertigo’ – uneasiness with changing dynamics of business landscape and best path forward
• Manufacturing ‘holiness’ – the idea of manufacturing being the central economic activity and all else is somehow subordinate
• The value chain of manufactured goods consumed today – the process of manufacturing and assembly constitute a small value of the process
• The value is in efficient functions, design, style, precision, quality, etc.
• Lack of champions for change
• Lack of partnerships outside the sector
AVOID THE ‘KODAK MOMENT’

• The company laid out a timeline already in 1979 of Kodak’s digital transition
• Kodak developed, together with Apple, a digital camera in the early 1990s
• “Maximize what you can earn out of a traditional business”
• Financial analysts argued “…preserve and extend the old technology, Kodak should not squander investors’ money on digital nonsense…”
• The transformation “would destroy margins and values”
• The transformation failed to breakdown the structural, cultural, and strategic obstacles inside the company
• We need, every day, to ask the question: What is the ‘Kodak moment’? How can we avoid it?
The New Integrated Forest Industry

Technical Breakthroughs

Traditional Forest Products
- Lumber
- Wood Panels
- Pulp
- Paper
- Paperboard

Advanced Forest Products
- Wood products → construction products
- Newsprint and P&W → media products
- Paperboard → packaging products
- Tissue → hygiene, health
- Pulp → NCC, composites, specialty pulp
- Textiles

Biorefineries
- Advanced biofuels
- Biochemicals
- Food, cosmetics and medicine ingredients

Bioenergy
- Pellets
- CHP
- Green coal (torification)
- Green electricity
- First generation biofuels

PATHWAYS TO SUCCESS
How companies are transforming

Conventional Forest Industry

Up-starters

New Bio-Products

Advanced Forest Products

New Bio-Products

Advanced Forest Products

Conventional Forest Industry
CASCADING AND TOMORROW WILL BE A BETTER DAY

Advanced bio-fuels

Advanced Forest Products

Bio-Energy

Conventional Forest Products

Bio-chemicals

Bio-Ingredients

Bio-Composites

Bio-materials (Plastics, Carbon Fibre)
VOLUMES AND VALUE CREATION FROM ADVANCED FOREST PRODUCTS AND NEW BIOPRODUCTS

Each block works under different conditions: cost structures, configurations of production, partnerships, customers and markets, competences, business models, players, cultures, etc.
R&D INTENSITY AND INNOVATIONS GIVE PROVEN RESULTS – Experiences from the bioproduct industry

High intensity R&D (8-12%)

Innovation-oriented R&D

Conventional R&D intensity (1-2%)

Higher value for the customer

Source: Peter Wållberg, BIM, 2013
THE TRANSFORMATION PROCESS

Source: Sten Nilsson, April 2011
Thank you for your attention!

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Phone/Fax: +46 225 381 02 – Cell: +46 70 381 02 14
Email: stenbnilsson@gmail.com

and

Guest Scholar, International Institute for Applied Systems Analysis
A-2361 Laxenburg, Austria – www.iiasa.ac.at
APPENDIX I
INDUSTRIAL WOOD DEMAND INCREASE TO 2030 IS SIZEABLE

<table>
<thead>
<tr>
<th>Product Area</th>
<th>RWE Increase 2010-2030(^A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulp &amp; Paper(^B)</td>
<td>150 million m(^3) sub</td>
</tr>
<tr>
<td>Sawnwood(^C)</td>
<td>250 million m(^3) sub</td>
</tr>
<tr>
<td>Wood-based panels</td>
<td>400 million m(^3) sub</td>
</tr>
<tr>
<td>TOTAL (gross)</td>
<td>800 million m(^3) sub</td>
</tr>
<tr>
<td>TOTAL (net)(^D)</td>
<td>700 million m(^3) sub</td>
</tr>
</tbody>
</table>

A) Increase according to Pöyry scenario in KSLA presentation
B) Virgin pulp based demand increase
C) Softwood & hardwood sawnwood including demand recovery 2020
D) Including utilization of sawnwood residues in pulp and panels

<table>
<thead>
<tr>
<th>Region</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>Wood/biomass deficit 100-150 million m³/yr</td>
</tr>
<tr>
<td>RUSSIA</td>
<td>Same harvest level as today, or lower</td>
</tr>
<tr>
<td>JAPAN</td>
<td>Wood deficit: 50-60 million m³/yr</td>
</tr>
<tr>
<td>CHINA</td>
<td>Wood deficit: 150-200 million m³/yr</td>
</tr>
<tr>
<td>OCEANIA</td>
<td>+ 40 million m³/yr of industrial wood</td>
</tr>
<tr>
<td>SE ASIA</td>
<td>Deficit. 20 million m³/yr lower harvest</td>
</tr>
<tr>
<td>INDIA</td>
<td>Wood deficit: 20-30 million m³/yr</td>
</tr>
<tr>
<td>AFRICA</td>
<td>Wood deficit: 35 million m³/yr</td>
</tr>
<tr>
<td>LATIN</td>
<td>+ 190 million m³/yr of industrial wood; domestically consumed</td>
</tr>
<tr>
<td>AMERICA</td>
<td></td>
</tr>
<tr>
<td>U.S.A</td>
<td>???</td>
</tr>
<tr>
<td>CANADA</td>
<td>Reduced harvest by 50-70 million m³/yr of industrial wood</td>
</tr>
</tbody>
</table>
**DEMAND OF WOOD FOR ENERGY**  
*(Whiteman, A., 2011 – in billion m3 RWE)*

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat &amp; Power (primary solid biomass)</td>
<td>3.0</td>
<td>3.25</td>
</tr>
<tr>
<td>Traditional solid biomass</td>
<td>5.3</td>
<td>5.0</td>
</tr>
<tr>
<td>Coal replacement</td>
<td>1.5</td>
<td>2.95</td>
</tr>
<tr>
<td>Biofuels</td>
<td>0.9-1.25</td>
<td>1.25-1.75</td>
</tr>
</tbody>
</table>
APPENDIX II
CONTINUED CONSUMPTION GROWTH IN PAPER AND PAPERBOARD

Global demand for paper and paperboard 1990-2010, outlook to 2025

- Million tons
- 387 million ton
- 496 million ton
- 540 million ton
- 1.6%/a

CONTINUED GROWTH IN SAWNWOOD DEMAND, MAINLY SOFTWOOD

Source: Wintzell, J., Poyry, 2011, and FAO.
RAPID GROWTH IN WOOD-BASED PANELS DEMAND – SW SUBSTITUTE

Source: Wintzell, J., Poyry, 2011, and FAO.
FUTURE FIBRE SUPPLY MAINLY FROM “URBAN FORESTES”

Source: Wintzell, J., Poyry, 2011, and FAO.
APPENDIX III
LATIN AMERICAN MARKET PULP EXPANSION - CURRENT CAPACITY 15 m/ton

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Capacity (thou tons)</th>
<th>Startup Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eldorado</td>
<td>Três Lagoas, MS, Brazil</td>
<td>1,500</td>
<td>2012/Q4</td>
</tr>
<tr>
<td>Montes del Plata</td>
<td>Punta Pereira, Uruguaya</td>
<td>1,300</td>
<td>2013/Q2</td>
</tr>
<tr>
<td>Suzano</td>
<td>Maranhão, Brazil</td>
<td>1,500</td>
<td>2013/Q4</td>
</tr>
<tr>
<td>Fibria</td>
<td>Três Lagoas II, MS, Brazil</td>
<td>1,500</td>
<td>2014/Q3</td>
</tr>
<tr>
<td>CMPC</td>
<td>Guaíba II, RS, Brazil</td>
<td>1,500</td>
<td>2015/Q1</td>
</tr>
<tr>
<td>Suzano</td>
<td>Piauí, Brazil</td>
<td>1,500</td>
<td>2016/Q2</td>
</tr>
<tr>
<td>Veracel II</td>
<td>Eunápolis, BA, Brazil</td>
<td>1,500</td>
<td>n/a</td>
</tr>
<tr>
<td>(Fibria &amp; Stora)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Klin</td>
<td>Paraná, Brazil</td>
<td>1,400</td>
<td>n/a</td>
</tr>
<tr>
<td>Cenibra</td>
<td>Belo Oriente, MG, Brazil</td>
<td>800</td>
<td>n/a</td>
</tr>
<tr>
<td>Suzano</td>
<td>Maranhão or Piauí, Brazil</td>
<td>1,500</td>
<td>n/a</td>
</tr>
<tr>
<td>Fibria</td>
<td>Barra do Riacho, ES, Brazil</td>
<td>1,500</td>
<td>n/a</td>
</tr>
<tr>
<td>BRAXCEL</td>
<td>Peixe, TO, Brazil</td>
<td>1,500</td>
<td>2018/Q4</td>
</tr>
<tr>
<td>LWARCEL</td>
<td>Lencois Paulista, Brazil</td>
<td>900</td>
<td>2016</td>
</tr>
</tbody>
</table>

TOTAL ~18,000

Source: Roberts, D. CIBC, 2012; and Pulp and Paper Products Council (PPPC) and FPM Research.

Russia: Expansion of NBASK by 2 million tons [Bratsk (currently) and Lesosibirsk (2016)]
CHINESE PRINTING AND WRITING PAPER CAPACITY EXPANSIONS (m/tons)

APPENDIX IV
LUMBER CONSUMPTION AND PRODUCTION IN USA (in MM$^3$/yr)

Sources:
1. FAOSTAT(Historical),
2. USFPM/GFPM (Projections)

Source: Peter J. Ince, USFS, Forest Products Lab and Prakash Nepal, Louisiana State University, 2012; and FAO (historical) and USFPM/GFPM (projections)
US CONSUMPTION AND PRODUCTION OF WOOD PANELS (in MM$^3$/yr)

Sources:
1. FAOSTAT (Historical),
2. USFPM/GFPM (Projections)

Source: Peter J. Ince, USFS, Forest Products Lab and Prakash Nepal, Louisiana State University, 2012; and FAO (historical) and USFPM/GFPM (projections)
US WOOD FUEL FEEDSTOCK PRODUCTION BY REGION AND SOURCE (in MM$^3$/yr)

Production by region

Production by Source

Source: Peter J. Ince, USFS, Forest Products Lab and Prakash Nepal, Louisiana State University, 2012; and FAO (historical) and USFPM/GFPM (projections)
ANNUAL TIMBER HARVEST VOLUMES IN USA (in MM$^3$/yr)

Source: Peter J. Ince, USFS, Forest Products Lab and Prakash Nepal, Louisiana State University, 2012; and FAO (historical) and USFPM/GFPM (projections)
APPENDIX V
## Innovation Modes in OECD Countries Based on Factor Analysis

<table>
<thead>
<tr>
<th>Industry</th>
<th>Technology Innovation</th>
<th>Market Innovation</th>
<th>Process Modernization</th>
<th>Wider Innovation</th>
<th>Network Innovation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood pulp, paper, publishing</td>
<td>-0.14</td>
<td>-0.13</td>
<td>+0.23</td>
<td>-0.02</td>
<td>-0.24</td>
</tr>
<tr>
<td>2,842 firms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machinery, electrical,</td>
<td>+0.39</td>
<td>+0.22</td>
<td>-0.07</td>
<td>-0.13</td>
<td>+0.14</td>
</tr>
<tr>
<td>communication, industrial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>equipment</td>
<td>5,930 firms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petroleum, chemicals, rubber,</td>
<td>+0.21</td>
<td>+0.12</td>
<td>-0.07</td>
<td>-0.07</td>
<td>+0.15</td>
</tr>
<tr>
<td>plastic</td>
<td>3,756 firms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor vehicles, transport</td>
<td>+0.26</td>
<td>-0.06</td>
<td>+0.05</td>
<td>-0.09</td>
<td>+0.25</td>
</tr>
<tr>
<td>equipment</td>
<td>1,476 firms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+ averages indicate specialization in the innovation mode  
- averages indicate less relevance for firms in the innovation mode