Automation and digitalization in pulp & paper logistics

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Focus of the presentation: Finished product logistics

• Conventional methods of storing, loading and transportation are not sufficiently meeting the needs of modern pulp and paper business

• There is great unrecognized potential to increase efficiency in pulp and paper logistics

• Some mills are already utilizing digitalization in their logistics with encouraging results
Mill performance is dependent on material flow efficiency

In-mill logistics

- Roll flow from
  - paper / board machine
  - coating / PE-coating
  - sheeting
  - unwrapped / packed

- Roll flow to
  - coating / PE-coating
  - sheeting
  - load forming
  - train and truck loading
In-mill logistics influence the whole logistics chain

- Turnaround and waiting times are often more than 50% of the total transportation time

**In-mill logistics**
- Turnaround time
  - In the mill

**Transportation**
- Transport time
  - Truck / Train

**Customer**
- Turnaround time
  - In the port
  - or at the customer
Potential of automation and digitalization

- **In-mill logistics**
  - Simplified material flows
  - Shortened lead times
  - Flexibility to all operations: sales, production, logistics
  - Real-time inventory and full traceability

- **Transportation**
  - Shortened turnaround times
  - Awareness and change management

- **Customer**
  - Better customer service

**Payback time 3-5 years**
- Automated unmanned operations
- Increased operational efficiency

**Payback boost 1-5 M€ annually**
- Savings in transportation cost
- Example loading time reduced to 20 min

**Payback €**
- Loyal customers
What can be done?

- In-depth feasibility study
- Automation of in-mill logistics and shipping functions
- Digitalization, system integration and networking
Feasibility study for investment guidelines

• Questioning status quo and looking across borders in organization
  • Sales / customer interface
  • Production
  • Transportation / logistics

• Actual 3D-simulation model of production and material flows
  • Real and planned operation data
  • Logistics and buffering functions
  • Future plans
  • Validation through simulation

→ Resulting in "Digital Twin" with optimized processes
### Automation of paper mill logistics

Storing method efficiency: overhead crane storage vs. high bay storage

<table>
<thead>
<tr>
<th>Item</th>
<th>Overhead crane storage Palm, King’s Lynn, UK</th>
<th>Comparison</th>
<th>High bay storage APRIL, Xinhui, China</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage volume</td>
<td>65,000 t</td>
<td></td>
<td>60,000 t</td>
</tr>
<tr>
<td>Throughput capacity</td>
<td>380 r/h</td>
<td>2 x TR</td>
<td>320 r/h</td>
</tr>
<tr>
<td>Floor space</td>
<td>12,000 m²</td>
<td>2 x TR</td>
<td>6,000 m²</td>
</tr>
<tr>
<td>Number of cranes</td>
<td>6</td>
<td>3 x TR</td>
<td>2</td>
</tr>
<tr>
<td>Feed-in conveyors</td>
<td>220 m + 6 x 4 m</td>
<td>24 x TR</td>
<td>2 x 5m shuttle</td>
</tr>
</tbody>
</table>
Automation of pulp mill logistics
Storing method efficiency: traditional storage vs. high bay storage

Height
4-5 units

3 ton / m2

6 x
= 1 x

Height
14-16 units

10 ton / m2
Digitalization, system integration and networking

Awareness and change management
Forecasting and learning

Business
Information sharing
Instructions, reporting

Logistics Control

Information sharing
(Instructions, reporting)

Customer

Instructions
Reporting

GPS (location info)

In-mill logistics
Roads and rails
Customer

Material Flow How®
Case examples
Case Metsä Group – customer need

Develop an efficient logistics chain to new pulp mill

1,3 Mton production
- 0.8 Mton 320 km by rails to Helsinki
- 0.5 Mton by trucks to local customers

Logistical challenge
- State railways standard service: average round trip time for train 96 hours → 5-4 locomotives + apr. 150 wagons
- Customer requirement: round trip time for train 36 hours → 3 locomotives + 66 wagons
- Cost for double track over 1 BEUR
Case Metsä Group - solution

Automated distribution center

Main elements:
- 25,000t high bay, 2 stacker cranes
  - Handling capacity 1000 ton / h
- 2 automatic loading cranes
- WMS Warehouse Management System
Case Metsä Group - solution
Automated distribution center, WMS Networking
Case Metsä Group – Achieved Results

Automated distribution center

Significant OPEX savings
- Unmanned warehouse operations at the mill
- Train frames reduced 4 → 3 to manage shipments (CAPEX)
  - 1408 t loaded in 3 hours
- 500,000 liters fuel per year
- Lower maintenance and service cost
- Truck loading time < 20 min

Enables / Improves
- Flexibility to production and logistics
- Better customer service
- Reliable and error-free deliveries
- Improved safety

Source: Fisher Solve, 2018
Board Mill: Revolution in mill logistics

1.4 Mton mill in Spain
- Over 4000 stock keeping units
- Shipping by trucks to over 40 customers
- 250 – 300 trucks daily, served in random order

Target:
- Increase efficiency of the storing and shipping functions
- Minimized turnaround times at the mill
  → Truck loading in 20 minutes after gate arrival
- Better customer service
  → Fast and flexible deliveries

Running mill - implementation in two phases P1+P2
Board Mill: Revolution in mill logistics

Solution: Automated Distribution Center
• 70,000 ton AS/RS
• 4 stacker cranes and 4 sorting carriages
• 12 loading positions (load to truck by forklift controlled by WMS)
• Trucks identified automatically at the mill gate by plate reading
Summary

• There is great potential to increase efficiency in pulp and paper logistics
• Well planned investments in automation will enhance the entire logistics efficiency
• The results of utilizing digitalization in logistics are promising