Wood yard design methodology for improved supply chain performance

Marta Trzcianowska
PHD student
Research Consortium FORAC
Université Laval

Director : Daniel Beaudoin
Co-director : Luc LeBel

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Why care about wood yards?
Multiple roles within wood supply chain

- According to their position in the wood supply chain

  - Reloading point
  - Log sorting and pre-processing of raw material
  - Storage
  - Decoupling point

- Costs vs value creation?
- Are their activities and design efficient?
Wood yards in Quebec, Canada

395 000 m³ on 20 ha:
1 (2) grapple loader(s)

450 000 m³ on 31 ha:
4 grapple loaders,
1 loader,
2 trucks

420 000 m³ on 12 ha:
2 grapple loaders,
2 loaders,
1 self-loading

Which one is the most efficient?

Wood yard dynamic – Seasonal adaptation

D.G. Sawmill, Southern Quebec

end of April

mid-July

Source: Google Earth Pro 2016
How to design for best performance?

- Wood supply characteristics
- Localization
- Available area

Wood yard design

Wood yard operations

Performance

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Outline:

- Problem definition
- Materials and methods
- Results
  - « General portrait of wood yards »
- Conclusions

Phot. Marta Trzcianowska
Problem definition
Efficient wood yard design

- Number, length, width and direction of aisles
- Door location
- Product allocation

- Material flow selection
- Departments identification
- Relative location of departments

- Size of warehouse
- Size and dimensions of departments

- Reception and expedition strategy
- Storage strategy
- Order-picking strategy

- Equipment selection for unloading operation
- Equipment selection for handling operation
- Level of automation

Available design methods?

Objectives

Global analysis to delineate the issue of wood yard performance:

- Document the current industrial practices in wood yard operations, management and design.

- Determine the key performance indicators that can serve to evaluate different wood yard designs.
Materials and methods
Survey of wood yards characteristics

- Softwood mill yards (Fir-Spruce-Pine-Larch)
- Capacity > 100 000 m³

Sample selection

Survey application

+ site visits

59 wood yards

Survey creation and validation

Required data

Site
Wood supply
Resources
Inventory management
Wood yard design
Wood yard performance

General portrait of wood yards

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General potrait of wood yards
Raw material characteristics

LOGS LENGTH HANDLED

VOLUME [%]

WOOD YARD

Cut-to-length

Tree-length logs

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Seasonality of wood supply

TRUCK ARRIVAL FREQUENCY

WOOD YARD

TRUCK PER DAY

No difference

Major difference

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Operational costs

AVERAGE OPERATIONAL COSTS
[$CA/m^3$

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<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
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<td>2,81</td>
<td>3,50</td>
<td>3,83</td>
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- A – unloading, log storage, intrayard transport
- B – unloading, sorting, log storage, intrayard transport
- C – unloading, scaling, classification, sorting, log storage, intrayard transport
Volume to wood yard area [m³/m²]
Conclusions
Conclusions

1) Wood yards are often a result of punctual and «unruly» extensions
   - Managers are keen on obtaining design guidelines
   - Gap in scientific literature

2) Heterogeneity in designs and operations strategies poses a challenge when evaluating key performance indicators.
   - Benchmarking will require further clustering
   - Wood yard performance consideration requires to include wood supply network context
Supply network performance

Supply network

Mill design

General structure determination

Layout determination

Sizing and dimensioning

Operational strategy selection

Equipment selection

Reconsideration Modifications?

UNSATISFACTORY PERFORMANCE

Reconsideration Modifications?
References


Thank you!

marta.trzcianowska.1@ulaval.ca