Overview

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Introduction

What is OSB?

• Created in the late 1970’s
• Wood composite, evolved from waferboard
• Flakes strategically oriented, not random
Introduction

- Hemicelluloses extracted flake
  - Potential environmental/economic benefits
- Previous study revealed improved panel properties
  - Dimensional stability and mold resistance
- Hemicelluloses, a hydrophilic polymer in wood

Source: Hosseinaei et al. 2011

Introduction

- Reduction in hemicelluloses content via pretreatment
- Reduced inputs needed for meeting industry standards
  - Strength, water absorption, and thickness swell
- Reduction of inputs will likely lead to reduced environmental/economic impact

Introduction

- Previous work has also been done in Life Cycle Assessment (LCA) of OSB
- LCA is an all-inclusive approach for analyzing environmental impact
  - Allows comparison of goods and services on equal & holistic basis

Source: Kline 2005
Justification

• OSB is increasingly used as low cost alternative to plywood
  • Significant because amount of energy used is roughly double

<table>
<thead>
<tr>
<th>Energy Type</th>
<th>Plywood</th>
<th>OSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>776</td>
<td>1870</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1550</td>
<td>3706</td>
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<td>Uranium</td>
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<td>98</td>
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<td>Biomass</td>
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<td>3201</td>
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<tr>
<td>Hydroelectric</td>
<td>18</td>
<td>10</td>
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<tr>
<td>Electricity other</td>
<td>14</td>
<td>20</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>5649</strong></td>
<td><strong>11145</strong></td>
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</tbody>
</table>

Source: Puettmann and Wilson 2005

Justification

Major sources of impact
• Resin production
• Emissions control

• Resin production is the most energy intensive process
  • Consumes three times the energy than plywood in this area

Source: Puettmann and Wilson 2005

Justification

• Emissions control is important
  • Emissions include
    • Carbon monoxide
    • Particulate matter
    • Nitrogen oxide
    • Volatile organic compounds
  • Incineration of volatile organic compounds (VOC)
    • Big contributor of fossil energy use

Source: Paredes 2009
Justification

Research Objectives

• Use existing data to model environmental and economic life cycle of OSB production using hemicelluloses-extracted flakes

• Establish input minimums for resin and wax input for making acceptable OSB with hemicelluloses-extracted flakes

Proposed Methods

Hot water hemicelluloses-extraction

• Large spherical rotating digester

• 41.5kg of Southern yellow pine flake

• 90% moisture content

• Heated to 155°C and maintained for 30 min.

• Water to flake ratio of 20:1
Five treatments, two repetitions
• Normal flake 1% wax 4% resin (Control)
• Extracted flake 1% wax 4% resin
• Extracted flake no wax 4% resin
• Extracted flake no wax 3.5% resin
• Extracted flake no wax 3% resin

How the panel is cut is important
• Initial panel size is 24” x 24”
  • Panel trimmed to 20” x 20”
  • Cut to maximize testing repetitions
  • Five tests for bending strength
  • Six tests for internal bond
  • Two tests for water absorption

Panel Testing
• Bending Strength (MOR)
• Modulus of Elasticity (MOE)
• Internal Bond (IB)
• Water Absorption & Thickness Swell
• Mold Susceptibility
  • Measured using ASTM D1037 procedures
  • Analyzed using one-way analysis of variance
    • To be performed with SPSS
    • Duncan’s multiple range test
    • Used for comparing means
Works Cited


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