Detailed analysis of the dewatering process on a CrescentFormer tissue machine

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Tissue Forum @ PaperCon 2011

Pulp & Paper
Detailed analysis of the dewatering process

Contents

Background

Trial data collection
  Measuring approach
  Methodology
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Modeling
  Impact of variables

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Detailed analysis of the dewatering process

Background

Starting point
- Crescent former
- Single side dewatering

Papermaker issues
- Water handling
  - Optimized white water tray design
  - Speed up capability
- Dewatering performance of different fabrics
  - Fabric characteristics ≠ dewatering capacity

![Diagram of papermaking process]

- wire
- felt
- paper
Detailed analysis of the dewatering process

Background

Approach

- Literature study
- Selection measurement equipment
- Trial methodology
- Modeling as part of master thesis
## Detailed analysis of the dewatering process

### Trial data collection

<table>
<thead>
<tr>
<th>What to measure</th>
<th>Dewatering pressure through process</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forming length</td>
</tr>
</tbody>
</table>

### Variables

- wire tension, basis weight, consistency
- speed, furnish, forming fabric design

### How to measure

- RadiAnalyzerX (ultra thin pressure sensing)
- Physical measurement
- Strobe & camera
Detailed analysis of the dewatering process

Line measurement
Detailed analysis of the dewatering process

Pressure measurement
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Trial data collection

How to measure

*RadiAnalyzerX*

Physical measurement

Strobe & camera

A  B  C

![Graph showing pressure vs. forming length]

![Bar chart showing forming length vs. trial number]
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Experimental findings

Dewatering pressure

2 wire tension levels

Good correlation with theoretical model

\( p = \frac{T}{r} \)
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Experimental findings

Forming length vs. machine speed and wire tension

![Graph showing forming length vs. machine speed and wire tension.]

- **Forming length**
  - Wire tension

![Bar chart showing forming length for different combinations.]

- **Combination #**
  - 1
  - 2
  - 3
  - 4
  - 5

- **Length forming zone [m]**
  - Low
  - High
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Experimental findings

Forming length

Fabric comparison
A…triple layer, 500 cfm
B…triple layer, 530 cfm
C…triple layer, 440 cfm
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Experimental findings

Forming length

Furnish, wire tension

Speed, basis weight

<table>
<thead>
<tr>
<th>Trial #</th>
<th>Wire tension</th>
<th>V jet [m/min]</th>
<th>v wire [m/min]</th>
<th>BW Y. [g/m²]</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Water</td>
</tr>
<tr>
<td>1</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
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<td>Low</td>
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<tr>
<td>5</td>
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<td>High</td>
<td>Low</td>
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<tr>
<td>0-11</td>
<td>High</td>
<td>High</td>
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<td>Water</td>
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<tr>
<td>6</td>
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<td>7</td>
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<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>8</td>
<td>High</td>
<td>Middle</td>
<td>Middle</td>
<td>High</td>
</tr>
</tbody>
</table>
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Modeling

Creation of a dewatering calculation tool based on fundamental physics

Good correlation of measured and calculated values
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Model outputs - limits

Consistency

- Graph showing consistency against basis weight and machine speed.
  - Blue line: $c = 0.4\%$
  - Green line: $c = 0.3\%$
  - Red line: $c = 0.2\%$
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Model outputs - limits

Wire tension

- T = 9 kN/m
- T = 7.5 kN/m
- T = 6 kN/m
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Conclusions

Insight to the crescent dewatering characteristics

Measured dewatering pressure fits conventional theory for roll forming

<table>
<thead>
<tr>
<th>Increased:</th>
<th>required forming length:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire tension</td>
<td>(↓)</td>
</tr>
<tr>
<td>Speed</td>
<td>(↑)</td>
</tr>
<tr>
<td>BW</td>
<td>(↑)</td>
</tr>
<tr>
<td>Freeness</td>
<td>(↓)</td>
</tr>
<tr>
<td>Retention</td>
<td>(↓)</td>
</tr>
<tr>
<td>Consistency for given BW</td>
<td>(↓)</td>
</tr>
</tbody>
</table>
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Saveall Optimization
Thank you for your attention