Forming Fabric Applications for Tissue Making

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Key to Success → Engineered Approach

Fabric Selection

Furnish

Operation

Drainage Pressure is defined as P=T/R

Fiber Length Analyzer

Kajaani

FIBER LENGTH ANALYSIS

Stone Container Corp.
Tissue Forming Operations

Getting the most out of a any forming fabric design requires careful attention to the fabric run

- Headbox set up and jet impingement
  - Crescent Former
  - Twin Wire
  - Stratification
- Fabric tension measurement and control
- Cleaning shower design and operation
- Separation Angles
- Know your furnish
  - Fiber length
  - Virgin vs. recycled
  - Contaminants
  - Chemicals
- Tissue Product Target
Jet Impingement – need to look from both sides

- Impingement control critical for good formation
- Jet tangential to drainage surface
- Avoid roll surface impingement
- Avoid mixing stratified furnish jets

Stock Splash – Flocculation
Poor Formation

Fingering effect
Ridge the Fabric – Poor Formation

Good Formation
Fabric Tension Measurement

- New tissue formers designed for fabric tensions up to 14daN/cm (80pli)
- Huyck tensometer insensitive above 9daN/cm (60pli)
- Forming results greatly affected by the tension changes

- Digital tensometer accuracy confirmed
- Measure slow or machine crawl speeds for safety,
- Calibrate the on-line system for high speed operation.
Shower Application

High Pressure Needle

- **Forming**
  - HP cleaning of fabric drainage channels
  - Removes contaminate from surface
  - Always locate near a roll for fabric stability
  - Should follow knock off shower when possible

- **0.040 Inch nozzles**
- **3 inch spacing - Oscillated**
- **3” to 5” from fabric – 0-15 into run**
- **350 to 450 psig pressure**
Shower Application

High Pressure Needle  Effective Cleaning Distance

Distance:  Comments:

0 - 3”  Most effective cleaning – Distance & Pressure
3 - 6”  Cleaning area: Medium cleaning action.
> 6”  Jet breaks up: Hammer effect fibrillates yarns
Shower Application

*High Pressure Needle Shower Damage* = Warp Fibrillation
Shower Application

*Roll Lubrication Shower*

- Lubricates the doctor blade, allowing it to clean better and help reduce wear on the roll cover.
- Located as shown

<table>
<thead>
<tr>
<th>45 degree nozzles</th>
</tr>
</thead>
<tbody>
<tr>
<td>6” - 8” spacing</td>
</tr>
<tr>
<td>8” from roll (100% coverage)</td>
</tr>
<tr>
<td>25 to 35 psig pressure</td>
</tr>
</tbody>
</table>

Note: shower can be located in either position
**Shower Application**

**High Pressure Flooded Nip**
- Push fibers out to sheet side – improve he chisel and HP showers efficiency
- Flush ash and other contaminates that plug and wear base of the fabric.
- Located in a nip with a good amount of wrap for better hydraulic action.

30 degree nozzles
3 inch spacing
4” to 10” from fabric (double coverage)
200 to 400 psig pressure

**High Pressure Chisel**
- HP cleaning of fabric drainage channels
- Removes contaminates from surface
- Locate near roll for effective cleaning
- Follow knock off shower when possible

30º Fan nozzles
3 inch spacing - Oscillated
5.5” from fabric
15º- 30º Angle into run
200 to 400 psig pressure
<table>
<thead>
<tr>
<th>No</th>
<th>Application</th>
<th>Function</th>
<th>Shower Type</th>
<th>Space Ø</th>
<th>PSI</th>
<th>GPM / IN</th>
<th>Nozzle</th>
<th>Distance</th>
<th>Water Quality</th>
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<tbody>
<tr>
<td>1</td>
<td>Fiber/Sheet Chisel</td>
<td>Knockoff Contamination</td>
<td>Stationary 30° Fan</td>
<td>3°</td>
<td>200 to 400 PSI</td>
<td>1.0 - 2.0</td>
<td>0.125°</td>
<td>3° - 4°</td>
<td>CWW</td>
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<tr>
<td>2</td>
<td>In-Side HPN</td>
<td>Fabric Cleaning</td>
<td>Oscillating Needle Jet</td>
<td>3°</td>
<td>200 - 300 PSI</td>
<td>.18 - 20</td>
<td>0.040°</td>
<td>3° - 4°</td>
<td>Fresh</td>
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<tr>
<td>3</td>
<td>Sheet Side HPN</td>
<td>Fabric Cleaning</td>
<td>Oscillating Needle Jet</td>
<td>3°</td>
<td>200 - 300 PSI</td>
<td>.18 - 23</td>
<td>0.040°</td>
<td>3° - 4°</td>
<td>Fresh</td>
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<tr>
<td>4</td>
<td>Flooded Nip</td>
<td>Knockoff Contamination</td>
<td>Stationary 25° Fan</td>
<td>3°</td>
<td>150 to 250 PSI</td>
<td>2.0 - 3.5</td>
<td>0.141°</td>
<td>4° - 6°</td>
<td>CWW &lt;150-PPM</td>
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<td>5</td>
<td>Lube Shower</td>
<td>Lubrication</td>
<td>Stationary 45° Fan</td>
<td>6° - 8°</td>
<td>25 - 30 PSI</td>
<td>.07 - .09</td>
<td>0.055°</td>
<td>6° - 8°</td>
<td>CWW</td>
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<td>6</td>
<td>Headbox Apron</td>
<td>Fiber Build up Removal</td>
<td>Stationary 45° Fan</td>
<td>6°</td>
<td>30 - 40 PSI</td>
<td>.06 - .07</td>
<td>0.055°</td>
<td>8°</td>
<td>CWW</td>
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<td>7</td>
<td>Release Shower</td>
<td>Coating Application to Fabric</td>
<td>Stationary 45° Fan</td>
<td>6°</td>
<td>40 - 60 PSI</td>
<td>.07 - .09</td>
<td>0.055°</td>
<td>8°</td>
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<td>8</td>
<td>Tail Cutter</td>
<td>Threading the Sheet</td>
<td>Intermittent Needle Jet</td>
<td>N/A</td>
<td>60 - 80 PSI</td>
<td>1.5 - l/min</td>
<td>0.040°</td>
<td>5° - 6° Distance With 5° angle into Run</td>
<td>Fresh</td>
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<tr>
<td>9</td>
<td>Suction Breast Roll</td>
<td>Cleaning Contamination</td>
<td>Oscillating Needle Jet</td>
<td>3°</td>
<td>350 - 600 PSI</td>
<td>.21 - .25</td>
<td>0.040°</td>
<td>4°</td>
<td>CWW</td>
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<td>10</td>
<td>Chemical Cleaning</td>
<td>Oscillating 45° Jet</td>
<td>3°</td>
<td>40 - 60</td>
<td>Calculate</td>
<td>0.094°</td>
<td>4°</td>
<td>Fresh</td>
<td></td>
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<td>11</td>
<td>Wire Edge Cleaning</td>
<td>Edge build-up</td>
<td>Stationary Fan 45° Tilt</td>
<td>N/A</td>
<td>150 – 200 PSI</td>
<td>Calculate</td>
<td>Calculate</td>
<td>3°</td>
<td>CWW</td>
</tr>
</tbody>
</table>

**Shower Recommendation for Machine Clothing**

- **Edge Cooling Sprays**: Cool the edge of the felt. Stationary 45° Fan 2° 15 - 25 .07 - .09 0.055° 4° Fresh
- **Lube Shower**: Lubrication. Stationary 45° Fan 6° - 8° 25 - 30 PSI .07 - .09 0.055° 8° CWW
- **Flooded Nip**: Knockoff Contamination. Stationary 25° Fan 3° 150 to 250 PSI 2.0 - 3.5 0.141° 4° - 6° CWW <150-PPM
- **In-Side HPN**: Felt Cleaning. Oscillating Needle Jet 3° 200 - 250 PSI .17 - 20 0.040° 3° - 4° Fresh
- **Vacuum Box Lube**: Lubrication. Oscillating 45° Fan 6° - 8° 25 - 30 .07 - .09 0.055° 8° CWW
- **Fiber/Sheet Chisel**: Knockoff Contamination. Stationary 30° Fan 3° 100 to 200 PSI 0.5 - 1.0 0.125° 3° - 4° With 30° angle CWW
- **Sheet Side HPN**: Felt Cleaning. Oscillating Needle Jet 6° 150 - 250 .06 - .07 0.040° 3° - 4° Fresh
- **Chemical Cleaning**: Threading the Sheet. Intermittent Needle Jet N/A 60 - 80 PSI 1.5 - l/min 0.040° 5° - 6° Distance With 5° angle into Run Fresh
- **Tail Cutter**: Protect Metal Surface. 110° Fan & 10° Off Center 6° 50 - 90 3° / sec 0.62° 4° - 7° Fresh
Transfer Geometry

Observations
Separation angle may need to be re-evaluated.

Observations
Bleed thru after transfer, notice carry back on outer fabric above.

Recommended Separation angle 3°-7°
Twin Wire Former

Fabric Requirements

**Outer Position:**
- Fast Drainage
- High Fiber Support
- High Fabric Stiffness and Stability
- Low Fabric Stretch
- Easy to Clean

**Inner:**
- Easy to Clean
- Low Fabric Stretch
- Good Durability for Life
- High Fiber Support (TAD and Suction)
Stiffer fabric means better CD profile!

Fabric stiffness has become more important with new ultra dilution head boxes (up to 200 gpm per inch)
Fabric Stiffness = Tissue Uniformity
Fabric Design Impact on Tissue Sheet Formation

Same fiber, same fabric....different results...Why?

- Frame orientation is different
- CD orientation is critical
Crescent Former

Fabric Requirements
Width Stability – Sheet Width Control
High Fabric Stiffness – CD Profile
Fast Drainage – High Speed Operation
High Fiber Support – Formation and Retention
Low Fabric Stretch – High Tension Operation
Easy to Clean – Efficient Showering
Low Water Carry back – Dry Return Run

Recommended separation angle 6º- 6½º
Crescent Former Edge Trim Recommendations

Edge Trim Options

- Trim squirt on Press Felt
- Trim with Wire
  - a. Filled edges
  - b. Edge beads
  - c. No edge discontinuity
  - d. 2-Sided trim needs stable width fabric design
Suction Breast Roll Former

Fabric Requirements

- Fast Drainage – Very Short Forming Zone
- High Fiber Support – Formation and Retention
- Low Caliper – Drainage and Showering
- Fabric Durability - Life