Softness of Your Paper Making the Difference in the Market
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Ashland Hercules Water Technologies
Engineer Tissue Properties

Raw materials → Tissue manufacturing → Converting

Where can we make the maximum impact?
Holistic Approach to Softness in Tissue

- Pulper
- Refining
- Stock approach
- Forming and pressing
- Yankee cylinder – Creping, Drying
- Post crepe and converting

Strength in Unity: A Holistic Approach to Softness in Tissue
Gabriele Gessini and Ian Padley, Tissue World 2004
Comprehensive Approach in Creping

- Coating product development
- Lab evaluation
  - Adhesion/Release Test (ART)
  - Crepe simulator
  - Coating performance database
- Drying model
Crepe Simulator

- Top speed: 1500m/min
- Sheet dimensions 6.4 cm x 68 cm
- Tissue to towel BW range
- Control of initial & final sheet moisture
- Control of coating weight & cure time

![Diagram of Crepe Simulator]

- **F_c**: Creping force
- **F_n**: Normal force

![Graph showing Creping force and Normal force vs Time]

- **F_c**: Creping force
- **F_n**: Normal force

![Yankee Dryer Diagram]

- Yankee Dryer
- Crepe blade
- Load cell
- Blade angle control
Effect of Temperature & Release Aid

Constant modifier content – 30%

Optimum operating range

Crepe Force

Crepe Rating
Benefits and Impact

• New products development

• New technology and application
  – Expand operating window through improved adhesion, better rheology.
  – Improve productivity and consistency in sheet quality – operation speed, reduced sheet break, longer blade life.
  – Improve softness through uniform coating and consistent adhesion.

• Effective troubleshooting
  – Reduce chatter
Case History #1
Chatter in Dryer 1

Dryer #1
Machine: Large Crescent Former
100% Virgin Fiber
Went to low moisture creping 3.8-3.5%
Using oil release instead of modifier

After sanding: Still there but it was able to be covered with AHWT coating package

After switch over to modifier and plasticized program
Case History #2
Chatter in Dryer 2

• Background
  – Crescent Former 1830 mpm
  – Coating: three component program
    • Hard base coat, soft coating, non-oil release
  – Frequent Yankee grinds due to significant chatter
  – Unable to use cleaning blade- loss of coating carbon marks
  – Last grind lasted less than 1 week

• Crepetrol™ 9717 crepe aid introduced with non oil release
  – Dramatic improvement in blade life
  – Cleaning blade loaded for first time since start of machine
  – Improved runnability
  – Increased speed
  – Appears to have eliminated chatter (needs long term validation)
Yankee Drying Model

- Splits sheet into 11 layers – thermal and moisture profiles
- Tracks sheet, coating, shell through each zone for temperature and moisture

Selecting optimum coating & optimizing machine performance
Drying Model Output

Comparison of Hood and Yankee Energy Use

Energy Use

- Energy
- Percent of Total Energy

Specific Energy (J/cm²)

<table>
<thead>
<tr>
<th></th>
<th>Energy From Yankee</th>
<th>Energy From Hood</th>
<th>Total Energy</th>
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<tbody>
<tr>
<td>Specific Energy</td>
<td>1.27</td>
<td>3.06</td>
<td>4.34</td>
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<tr>
<td>Percent of Total</td>
<td>29.4%</td>
<td>70.6%</td>
<td>4.34%</td>
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Energy Use
Case History #3: Drying Model

- During coating trial, the drying model showed roughly 80% hood, 20% Yankee drying.
- Machine was at the maximum speed allowed by the hoods.
- Recommendation: shift the drying effort towards a ~70-30% split
- With 70:30 split; immediately 7% gain in line speed at no additional cost.

7% production speed gain at no additional cost
Converting Solutions

Why Lotions?

• Market Drivers
  – Market is demanding products of higher quality at reasonable price. Value is the key.
  – Very costly to establish higher quality from a manufacturing standpoint
  – Secondary fiber quality continues to deteriorate, making it more difficult to achieve hand feel required
• Solution - Addition of lotions in a converting operation
  – Enhances hand feel on any base sheet.
  – Capital investment is significantly less than the investment required to improve the base sheet quality during manufacturing

*Lotion enhances hand feel with low capital investment.*
How do I make the connection?

What Equipment?

- Slot Die?
- Atomized Shower?
- Roll Application?
- Weko Spray?

What Product is right choice?

- Wax?
- Emulsion?
- Surfactants?
- Silicone?
- Liquid?

What does my customer require?

- Drape?
- Slickness?
- Surface smoothness?
- Silkiness?
- Enhanced softness?

What solids?

What Equipment?
Secret to Success

Matching Needs with products and application technology

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<thead>
<tr>
<th>Product</th>
<th>Type</th>
<th>Solids</th>
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<tr>
<td>Dimension TL1034</td>
<td>Emulsion</td>
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<tr>
<td>Dimension TL1070</td>
<td>Liquid</td>
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<td>Dimension TH3023</td>
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<td>Dimension TH3045</td>
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<td>Dimension TH3060</td>
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<td>Ashland DP313</td>
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<td>Ashland DP317</td>
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<td>Ashland DP320</td>
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<td>Ashland DP519</td>
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<tr>
<td>Dimension TL1082V</td>
<td>Liquid</td>
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- **Equipment**
  - Weko
  - Atomizing shower
  - Slot Die
  - Roll Applicator
  - Standard Spray

- **Quality Characteristic**
  - Drape
  - Slickness
  - Surface Smoothness
  - Surface Tension
  - Skin Transfer
Services Available

- Base Sheet Evaluation
  - Paper lotionizing
  - Handfeel paneling
  - Image Analysis
  - Paper testing (strength, caliper, drape, COF)

- Equipment
  - We can work with suppliers to ensure product compatibility and additional testing (Weko, Nordson and spraying systems)
  - We can get quotes on different application alternatives

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<th>C</th>
<th>D</th>
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<td>Klemm [cm]</td>
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<td>8.4</td>
<td>11.8</td>
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<tr>
<td>Density [kg/m3]</td>
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Case History #1

- NE U.S. Converter desired to develop a private label lotion facial grade for a local store.
- Ashland provided several different materials to be applied through a standard spraying system nozzle.
- Evaluation resulted in the ongoing use of Ashland DP317 - a 100% active material.
  - Provided superior surface smoothness at a reasonable add on rate of 2%.
  - The local private label product was a success.

Case History #2

- Independent converter approached Ashland to help develop a store brand lotionized facial tissue.
- Screening indicated that two lotions performed well on their base sheet (100% recycle).
- A trial was conducted with the two identified products.
  - Dimension™ TL1045 lotion and Ashland DP313 were applied using a flexo-roll applicator.
  - Both performed to expectations and the store brand launch is moving forward.
Summary

• The market place continues to demand high quality products at a reasonable price. “Value” is key.

• Holistic approach in tissue

• Comprehensive approach in creping
  – Lab creping evaluation
  – Comprehensive drying model

• Lotions: Cost effective way to add significant value
  – Wide range portfolio of products is important.
  – Clear understanding of application methods is essential.
  – Comprehensive evaluation/service capabilities for better product selection and optimization of the programs.