Utilizing OptiCoat Layer curtain coater in production of recycled grades

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Today’s topics

- OptiCoat Layer curtain coater
- Cost saving potential for recycled board grades
- Production experience
  - Dong IL, South Korea
  - Ji’an, China
  - Ponderosa, Mexico
- Summary
What is OptiCoat Layer?
OptiCoat Layer curtain coater

Advantage of multilayer over single die
• Each layer tuned for desired property and cost
• High total coat weight achieved with good profiles
Curtain coating quality

- A complete contour coating
- Smoothness to be done somewhere else in the machine
Blade vs. curtain coating

Principle pictures

**BLADE COATING**
- High variation in coating thickness
  + good smoothness
  - poor coverage

**CURTAIN COATING**
- Even coating thickness
  + good coverage
  - rough surface

Structure of blade coating

Structure of curtain coating
2-layer Curtain coated

Blade + Blade coated
OptiCoat Layer multilayer curtain coating

Best applications for OptiCoat Layer

- Specialty papers
  - Functional properties with multilayering
  - Cost savings with thinner layers compared with traditional coating applications
  - 3 OptiCoat Layer deliveries

- Coated cartonboard
  - Good coverage
  - Tailored properties with multilayering
  - Air knife replacement
  - 2 OptiCoat Layer deliveries

- Coated white top liner
  - Replacing high cost bleached fiber layer with opacifying curtain coating layer
  - 2 OptiCoat Layer deliveries
Cost saving potential for recycled board grades
Machine lay-out for coated white top liner
Design speed >1000 m/min

Bleached fiber
Conventional concept

Coated white top testliner 175 g/m²

- Film precoating 8 g/m²
- Blade topcoating 14 g/m²
- Bleached hardwood and softwood fiber 28 g/m²
- Selected office waste or DIP 27 g/m²
- Old corrugated medium 95 g/m²
- Starch 3 g/m²

= >

157 €/t

300 €/t
290 €/t
300 €/t
200 €/t

60 €/t
OptiCoat Layer concept

Coated white top testliner 175 g/m²

- Opacifying curtain bottom layer 11 g/m²
- Curtain toplayer 11 g/m² tuned for surface properties
- Mixed waste or OCC 27 g/m²
- Old corrugated medium 95 g/m²
- Mixed waste or OCC 28 g/m²
- Starch 3 g/m²

Cost saving:
- 320 €/t
- 700 €/t
- 60 €/t

= > 124 €/t
Production experience

DONG IL, Korea
Coated Liner
OptiCoat Layer at DONG IL, Ansan, South Korea

- PowerDry Classic air dryers
- Gas infrared dryer
- OptiCoat Layer coating station

Web direction
Quality development and challenges

DONG IL

- The mill is focusing on two main grades:
  - Uncoated white top testliner replacement
  - Coated white top liner and coated white lined chipboard replacement
- The "uncoated" grade should perform as an uncoated grade in flexo printing
  - The coating must be very absorbent
  - Smoothness and appearance is superior
- The "coated" white top liner grade should perform like a coated sheet
  - Smoothness is a challenge
  - The coating should be "closed" like a blade coated sheet
  - In this grade, the cost advantage over conventional sheet is more significant
Excellent coverage of curtain coated products

Top bleached pulp

OCC, 100%

Bleached pulp white top liner

Curtain coated white top liner

<table>
<thead>
<tr>
<th></th>
<th>Bleached pulp top liner</th>
<th>Curtain coated white top liner (coat weight, 16 gsm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bleached pulp (Top, 40 gsm)</td>
<td>Base paper (OCC only)</td>
</tr>
<tr>
<td>Whiteness(%)</td>
<td>105.5</td>
<td>-</td>
</tr>
<tr>
<td>Brightness(%)</td>
<td>80.5</td>
<td>29.3</td>
</tr>
</tbody>
</table>
Printing quality

Blade coated & curtain coated top liner

Color density : 1.25

Curtain coated top liner

Color density : 1.16

Blade coated
Project summary

DONG IL

1. Project goal - to turn brown to white - has been accomplished successfully.

2. OptiCoat Layer coverage turned out to be as good as expected.

3. OptiCoat Layer coating concept, including degassing, machine circulation, station and die is functioning reliably, has excellent runnability and is easy to operate.

4. Important factors influencing curtain stability are surface tension, rheology, temperature and solids content of coating color.

5. The print quality targets have been achieved. The print density of the color on the curtain coated paperboard has in fact been higher than in blade coated one.
   • But smoothness is not as good

6. Co-operation between Dong IL Metso and Styron teams has been excellent throughout the project.

Due to Korean market limitations, only 20% of production is coated today.
Production experience
Ji’an PM3, China
Coated Liner
Ji’an PM 3 – lay out

Coating section:

Blade

2-layer curtain

Blade

Web direction
Ji’an PM3 coating concept
Coated White Top Liner

• Design concept:
  - Base Paper without white fibers
  - 1\textsuperscript{st} Blade coating generate smoothness before curtain
  - 2 layers curtain generate enough whiteness and coverage
  - 2\textsuperscript{nd} Blade reduces PPS roughness and increases paper gloss for printing
With 2-layer the brightness will be totally uniform as the shade of outmost curtain layer can exactly match the top blade layer.

⇒ 2-layer curtain enables coating even appearance.
The opacifying layer by curtain has a special shade which is difficult to exactly match with the top blade coat

⇒ results in non-uniform brightness
Base paper

1st Blade

Blade+Curtain

Blade+Curtain+Blade

Final blade improves smoothness
Conclusion: Blade coating is very effective in reducing PPS value; curtain coating does provide PPS reduction to some extent as well.
Learnings

Ji’an

• It is possible to produce coated white top liner board that meets market requirements with 100% recycled fiber and a titanium-dioxide-free coating formulation.

• Calcined clay and delaminated clay, used in combination, provide better cost performance in terms of coating coverage than titanium dioxide does.

• To improve PPS roughness, blade coatweight is critical, and it is beneficial to have a blade bottom coating layer.

• It is also possible to improve the final smoothness of coated board by optimizing the pre- and final calendering.
Production experience
Cartones Ponderosa
Mexico
Coated WLC
Cartones Ponderosa S.A.
PM1 Rebuild - WLC

Web direction

Blade

2-layer curtain

Rod
Ponderosa

Investment objective

- Increase production capacity by installing OptiDry in the dryer section
- Reduce cost by replacing the middle rod with a curtain coater in 2 steps.

**STEP 1**
- Reduced coating cost, either by
  - reduced coat weight
  - lower cost coating material

**STEP 2**
- Reduce or fully eliminate the use of white fiber, utilizing the opacifying capability of 2-layer OptiCoat Layer
Ponderosa
Coater rebuild project

- The machine started up in May 2012
- The curtain coater was partly installed while machine was running
- Total shut down time was 6 days
- Machine efficiency was the same as before rebuild 2 months after start-up
- The quality is the same as before the rebuild
  - Curtain replaces the middle rod
  - With rod as a topcoater PPS increased 0.3 PPS
  - Top rod was this year replaced with blade
- Coating chemical cost has been reduced in all 3 coating layers
- STEP 1 target with reduced coating cost has been fulfilled
Ponderosa

STEP 2

- Trials are ongoing targeting complete elimination of white fiber in the base sheet
- 2-layer curtain is necessary for success
- Significant fiber cost savings are achieved
Project summary

Ponderosa

1. Project goal - to reduce coating cost has been achieved.

2. Installation and start-up of OptiCoat Layer went very smoothly.

3. The OptiCoat Layer has been fully in use since the start-up.

4. Target to maintain the same product quality at reduced cost has been achieved.

5. The secondary development target to eliminate use of white fiber in the base sheet proceeds successfully.
Summary
Summary

- The main driver for installing OptiCoat Layer curtain coater on a recycled base sheet is to reduce use of costly bleached fiber.
- Dong IL has succeeded in turning "brown into white" at a significant cost advantage compared to competition.
- Ji’an is able to produce coated white top liner at lower cost using curtain and reduced bleached fiber.
- Market availability for coated white top liner limits the coated production portion in both Dong IL and Ji’an.
- Ponderosa runs curtain full time at reduced cost with the concept "Rod + Curtain + Blade", compared to "Rod + Rod + Rod" before the rebuild.