CONVERTING A MILL FROM WRITING & PRINTING TO PACKAGING GRADES - A CASE STUDY

MEYER KEITH, RICHARD TURNBULL, CHANDRAKANT NAIK

8-9 MARCH 2019, AHMEDABAD, INDIA
The reduction in the Printing & Writing grade markets, and the expansion of the Containerboard markets, has led many mills worldwide to convert their operations.

The furnish conversions have usually included an OCC system utilizing new and/or existing equipment.

The Board Machine conversions have included Fourdrinier and Twin Wire formers to multi-ply linerboard, test liner and corrugating medium.

This paper will review a Case Study for the Heinzel Mill in Austria where a successful €100M conversion was completed, with Andritz as the OCC, Approach Flow, and Paper Machine conversion supplier, in late 2017.
**CASE STUDY - SCOPE OF SUPPLY**

Heinzel Group, Laakirchen AG, Austria

**OCC Stock Preparation**
- ANDRITZ FibreGuard system: 130 m³ FibreSolve FSR pulper with detrashing system
- Rebuild of existing 1st and 2nd stage coarse screening as well as new ModuScreenTD tail screen for the 3rd stage
- New 5-stage cleaner plant
- Rebuild of fractionation and fine screening: New ModuScreens, type F and A and rebuild of existing screens

**Approach Flow System**
- Rebuild – enlargement approach flow system: Rebuild of Deculator and new ModuScreens HBE for the base ply

**Paper Machine**
- Wet end: PrimeFlow TW double-layer headbox
- PrimeRun Evo web stabilization system
- PrimeDry Steel cylinders
- PrimeFilm film press
- PrimeAir Glide AirTurn and PrimeFeeder sheet transfer system

**Sludge – Reject System**
- New sludge and reject handling: New reject compactor, sand separators and sludge screw press

**Automation**
- PrimeControl automation package

**HIGHLIGHTS**
- Production of 450,000 t/a of high-grade fluting and testliner with a grammage of 70-140 g/m² from 500,000 tons of recycled fibers (RCF)
- Rebuilt completed within 10 weeks!
HEINZEL GROUP, LAAKIRCHEN, AUSTRIA

OCC System Flowsheet Using Existing, Rebuilt, and New Equipment
OCC PULPER AND DETRASHING SYSTEM
Laakirchen 130m³ Pulper, 2 x FibreGuard Detrashers, 2 x FibreWash Drums
HD CLEANING SYSTEM
Laakirchen HD Cleaner System for Coarse Debris Removal

- Single Stage HD Cleaner with junk trap for high efficiency at higher consistencies (3.5-4%) 

- Efficient coarse particle removal and high wear resistance parts 

- Protection of downstream equipment by removing glass, metal, staples, rocks, etc 

- Duo-Clean™ Option = Low consistency secondary cleaners with intermittent rejects to further improve debris removal and minimize fiber loss 

HD Cleaner with Junk Trap 

Laakirchen Stainless Steel HD Cleaners 

Laakirchen Sand Separator™ for collecting HD Cleaner rejects
Vortex Control

Pipe/tube to control the length of the vortex

Dilution water/filtrate

Vortex in the center of cleaner

Adjustable nozzle

SC133VC - stabilized air core

Vortex Hydrocyclone Vacuum

Vortex Control Nozzle

Reject Port
Vortex Control

- High reject concentration (high mass reject rates) = high fiber loss
- Vortex / air core extends all the way to sightglass
- Impurities can be re-entrained with vortex into the accept flow
- Higher probability for cone plugging

- Better accept pulp quality
- Reject thickening is reduced
- Improved operational reliability due to less plugging in the reject end
- Reduced reject rates
- Reduced fiber loss

Debris is held on the cone wall with the vortex dilution
Two Stage Fiber Recovery System

- Jet pump
- SC 133 FR cleaners
- Feed to final Stages
- 40 psi WW Injection point
COARSE, FRACTIONATION, LONG FIBER SCREENING
Screening System for Maximum Debris Removal and Separation of Long vs. Short Fiber

- **Coarse Screening** with 0.4mm slots (= higher efficiency than holes) using special Rejector™ Baskets and Dolphin™ low-energy, high efficiency Rotors

- **Fractionation** using 0.15mm slots, high-efficiency Bar-Tec Valeo™ Baskets and Dolphin low-energy, high efficiency Rotors

- **Fine Screening** on Long Fiber fraction only (less equipment needed, saves on energy and maintenance) using 0.15mm slots, high-efficiency Bar-Tec Valeo™ Baskets and Dolphin low-energy, high efficiency Rotors
Typical improvement going from holes to slots

- **Benefits:**
  - Improved stickies removal efficiency = less stickies to fine screens/paper machines
  - Higher capacity
  - Longer basket life time (fine screens)
  - Less energy consumption
  - Less wear on downstream equipment

### Debris removal efficiency

- **With basket using 0.070” (1.8mm) holes**
- **With Rejector basket using 0.016” (0.40 mm) slots**
Slotted Basket for Coarse Screening

Conventional Wire

No Channel

Rejector Wire

Channel

Slot channel
### Slotted Basket for Coarse Screening

- Primary Coarse - OCC
- Dolphin - Rotors

<table>
<thead>
<tr>
<th>Basket</th>
<th>Drilled baskets 0.051” (1.3mm) hole Profiled</th>
<th>Rejector Slot 0.020” (0.4mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>S Type-3 vanes</td>
<td>LR Drum</td>
</tr>
<tr>
<td>Tip speed</td>
<td>23.2 m/s</td>
<td>23.2 m/s</td>
</tr>
<tr>
<td>Capacity per screen</td>
<td>~ 227 t/d</td>
<td>~ 417 t/d</td>
</tr>
<tr>
<td>Diff. Pressure (psi)</td>
<td>3.5-4.0</td>
<td>2.7</td>
</tr>
<tr>
<td>Power consumption</td>
<td>60-63%</td>
<td>54% on 200HP</td>
</tr>
<tr>
<td>Consistency feed</td>
<td>2.5 %</td>
<td>2.5 %</td>
</tr>
<tr>
<td>Consistency accept</td>
<td>2.4 %</td>
<td>2.3 %</td>
</tr>
<tr>
<td>Debris Removal %</td>
<td>42%</td>
<td>69 %</td>
</tr>
<tr>
<td>Screens Required</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Power Savings</td>
<td>NONE</td>
<td>Shut down a 200HP motor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>~ $ 60,000 / yr</td>
</tr>
<tr>
<td>F-A Freeness Drop</td>
<td>Normal 50-80 ml</td>
<td>NONE</td>
</tr>
</tbody>
</table>
FORWARD CLEANING USING COMBINATION CLEANER

Excellent Sand and Lightweight Removal with Minimal Fiber Loss

- Full-Flow Forward Cleaner System (instead of using on Long Fiber only) for the best in sand and debris removal
- 5 Stages used to insure minimum good fiber loss
- Use of Combination Cleaner provides additional lightweights (and air) removal without requiring separate Cleaner stage
- Compact Cleaner System design minimizes floor space, piping and valve requirements, etc
Combination Cleaner (SC133LH)

• Three way cleaner to remove light and heavy debris
• Horizontal/vertical compact cleaner modules
• Excellent cleaning efficiency and low energy consumption
• Pressurized reject cleaner
• Easy to operate
• Advanced wear warning
• Sight glasses for observing cleaner operation
• Unplugging while running
• Durable plastic and ceramic materials
Combination Cleaner (SC133LH)

- Light rejects
- Feed
- Accepts

- Discharge from the bottom prevents dirt sedimentation in the feed manifold
- Head design with plug-in feed and accept connections
- Assembly locking, no special tools required for cleaner removal

Heavy rejects

OK-cone
Disc Filters provide water (loop) separation between OCC System and Paper Machine and to increase consistency before Storage

- Short Fiber Disc Filters: 2 required = 1 x rebuilt and 1 x new
- Long Fiber Disc Filter: 1 required = existing (no rebuild required)
- Center Shaft / Double Valve design offers maximum hydraulic capacity, identical bearings on both ends, etc
REFINING
Improving Pulp Quality Before Paper Machine

- Optimizing Tensile strength via refining minimizes need for starch, etc

- Splined shaft insures “free-float” of disc, simplifies operation and minimizes maintenance

- Andritz LeMaxx Spiral™ Refiner Plates for maximum strength development at minimal specific energy consumption

- Controls package included for Controls Packages for Specific Energy, Plate Clash Protection, Bearing Monitoring, and Vibration
**MAGNUS** starts with a thorough LCR System Analysis, collecting information about:

- Refiner, RPM, Inst. Power
- Operating condition (flow range, consistency)
- Hydraulics and energy consumption
- Freeness development
- Plate design
- fiber types & mixtures of recycled fiber
General facts about Intensity

- As the refiner load increased – the intensity will increase
- Higher edge length results in lower intensity
- With increasing RPM the intensity will reduce
Advantage of 200 series with VP:

- Higher open area even with a high number of bar edges
- High bar edge length for energy savings and higher paper strength
- Lowest refining intensity
- Less risk of bar breakage
  - Use of more wear resistant alloys to achieve higher plate life time
- Patent 5,893,525
CASE STUDY
Mill: New Board Mill  Heinzel group in Austria
End Product: Linear Board
Furnish: OCC+ Mixed Office waste

Position: primary and secondary filler refiners
Refiner: TwinFlo Andritz
Size: 30”
Current pattern: 30415/416
Changed pattern: LemaxX 30JA109/110

Magnus Simulation current Vs Proposed

<table>
<thead>
<tr>
<th></th>
<th>Current</th>
<th>Proposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compression Index</td>
<td>2.2</td>
<td>3.0</td>
</tr>
<tr>
<td>No of Treatments</td>
<td>15.9</td>
<td>12.9</td>
</tr>
<tr>
<td>Net Specific energy</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Edge Load Ws/m</td>
<td>1.4</td>
<td>1.1</td>
</tr>
</tbody>
</table>

Results:
- Wet end strength improved
- Compressing of fibers harder improved wall flexibility and stronger bonding
- Primary refiner is adequate for 70% grades
- Reduction high priced OCC% resulted in reduced furnish cost
CHAPTER OVERVIEW

01 INTRODUCTION

02 OCC SYSTEM

03 APPROACH FLOW SYSTEM

04 PAPER MACHINE

05 QUESTIONS
Conversion from Graphic Grades to Containerboard

- **Primary** 60NP72 Screen 0.30 mm slots
- **Secondary** TAP200 Screen 0.30 mm slots
- Modified Existing Deculator for WW
- Vacuum System
- Base Sheet
- Top Sheet
- To Presses
- Approach Flow Cleaners Removed
- New Primary HBSE Screen 0.30 mm slots
- New Fan Pump
- Base Ply Thick Stock
- New secondary HBSE Screen 0.30 mm slots
- New Tertiary F20WScreen 0.30 mm slots
- Existing TL200 CP Dil Screen 1.4 mm holes
- New Tertiary F20WScreen 0.30 mm slots
- WW Deculator

Diagram details:
- Top Ply Thick Stock
- New Primary HBSE Screen 0.30 mm slots
- New Fan Pump
- Base Ply Thick Stock
- New secondary HBSE Screen 0.30 mm slots
- New Tertiary F20WScreen 0.30 mm slots
- Existing TL200 CP Dil Screen 1.4 mm holes
- New Tertiary F20WScreen 0.30 mm slots
- WW Deculator

Diagram keywords:
- LAAKIRCHEN PM 10 APPROACH FLOW SYSTEM
- Conversion from Graphic Grades to Containerboard
Key Points:

- Top Ply Screening using 2 x new Andritz Inward Flow HB Screens with 0.3mm slots
- Base Ply Screening re-using existing Screens (retrofit with Andritz Baskets); new Andritz Tertiary Screen using special Dilution Rotor for Fiber Recovery
- All of the ww is deaerated, then split between plies
- Separate profile control ww deaerator for the dilution control headbox
- Machine originally had Flying Wing Deculator Cleaner System (5 stages)
CHAPTER OVERVIEW

01 INTRODUCTION

02 OCC SYSTEM

03 APPROACH FLOW SYSTEM

04 PAPER MACHINE

05 QUESTIONS
ANDRITZ CONTAINERBOARD MACHINE CONVERSION
HEINZEL GROUP, LAAKIRCHEN, AUSTRIA
PAPER MACHINE
Conversion from Graphical Grades to Packaging

- A PrimeFlow™ TW double-layer headbox with PrimeProfiler F consistency profiling system was added; stiff separating lamellas separating the layers and allowing for optimum profiles and flexibility over the full grade range.

- The new PrimeForm™ TW gap former with specially-designed suction roll surfaces and forming shoes on both sides of the sheet provides high dewatering capacity and gentle dewatering at the same time and insures high first-pass retention.

- In the first drying section PrimeFlow™ Evo web stabilizers, with step-by-step reduction of vacuum in the free draw, are used to control and improve runnability after the press section.
PAPER MACHINE
Conversion from Graphical Grades to Packaging

- *PrimeRun™* Duo web stabilizers were used in the pre-drying section and new after-drying section to enable an even web run throughout the dryer section.

- *PrimeDry™* steel cylinders were used (instead of conventional cast iron) due to better drying performance to allow increased production and energy savings.

- A new air system, including heat recovery for the rebuilt dryer section, was supplied to optimize energy costs and a new *PrimeFilm™* film press applies starch simultaneously to both sides of the sheet for strength at speeds up to 1,600 m/min.

- A *PrimeAir™* Glide AirTurn and *PrimeFeeder™* sheet transfer system ensures gentle turning as well as safe and rapid transfer of the web through the machine.
Heinzel's Laakirchen Papier celebrates successful start up of 450,000 tonnes/yr containerboard PM 10 in Austria
December 04, 2017 - 04:05
LAAKIRCHEN, Austria, Dec. 4, 2017 (Press Release) - Last year, Laakirchen Papier AG invested around EUR 100 million and now possesses one of Europe’s most modern containerboard machines. This is intended to enable the Upper Austrian mill’s owner, the Heinzel Group, to achieve its objective of becoming one of the top players in the European packaging market. The main target markets for the containerboard, which is to be sold under the “starboard” brand name, are Austria, Germany, CEE and Italy.
ANDRITZ CONTAINERBOARD MACHINE CONVERSION
HEINZEL GROUP, LAAKIRCHEN, AUSTRIA