# Chapter Overview

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ANDRITZ RO-TEC DOLPHIN ROTOR

Improved screening capacity with less energy
ANDRITZ RO-TEC DOLPHIN ROTOR

Revolutionary foil shape

TECHNICAL FEATURES

• Optimum, streamlined shape for
  • Minimum drag
  • Minimum pumping effect

→ RESULTS IN
  • Decreased power requirement

• Optimum pressure pulse for
  • Smooth pressure at foil’s front end
  • Large suction zone

→ RESULTS IN
  • Improve debris removal efficiency
  • Increase in runnability (minimize plugging)
  • Handle higher consistency
ANDRITZ RO-TEC DOLPHIN ROTOR

First-class rotors for various screening applications

Consistency

Virgin Fiber
TMP / CTMP
Kraft / Sulfite

Recycled Fiber
Coarse Screening
Fine Screening

Ro-Tec Dolphin HC

Ro-Tec Dolphin LR

Ro-Tec Dolphin LRs/LRsb

1 %
2 %
3 %
4 %
Rotors retrofitted so far

- LR/LRs
- Gladiator
- Voith Multifoil
- Delta rotor
- BC 4 foil rotor
- Fiedler HC rotor
- VF rotor
- Lobed rotor

- **Straight rotor replacement**
  - ~15% power saving (at same speed, no negative impact on quality)

- **Combination of rotor replacement and speed reduction:**
  - ~45% energy reduction; average is ~25% (no negative impact on quality)
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<td>FIBER SAVING BY SCREEN REBUILDS</td>
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Case 1: High-efficiency screening at reduced energy consumption

OCC mill in Europe
- Primary stage, fine screening
- Local OCC
- Feed consistency: 3.5 %
- Metso FS-250 LF

→ Energy savings 24%

<table>
<thead>
<tr>
<th></th>
<th>Basket (Metso)</th>
<th># 0.20 mm</th>
<th># 0.20 mm</th>
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</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>Delta rotor</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Rotor tip speed [m/s]</td>
<td>21</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Capacity [bdmtpd]</td>
<td>240</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Power consumption [%]</td>
<td>67</td>
<td>52</td>
<td>52</td>
</tr>
</tbody>
</table>
**ANDRITZ RO-TEC DOLPHIN ROTOR**

**Case 2: High-efficiency screening at reduced energy consumption**

OCC mill in Europe
- Secondary stage, headbox screening
- OCC
- Voith VS20

→ Energy savings 20%

<table>
<thead>
<tr>
<th>Basket</th>
<th>Bar-Tec Nobilis # 0.25 mm</th>
<th>Bar-Tec Nobilis # 0.25 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>Multifoil rotor</td>
<td>Dolphin LRs</td>
</tr>
<tr>
<td>Rotor tip speed [m/s]</td>
<td>13.5</td>
<td>13.5</td>
</tr>
<tr>
<td>Capacity [bdmtpd]</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Power consumption [%]</td>
<td>66</td>
<td>55</td>
</tr>
</tbody>
</table>

Load reduction

9 / ANDRITZ STOCK PREP SEMINAR, LISBON / ENERGY SAVING AND HIGH EFFICIENCY OCC SCREENING / © ANDRITZ 2018
ANDRITZ RO-TEC DOLPHIN ROTOR

Case 3: High-efficiency screening at reduced energy consumption

OCC mill in Europe
• Primary stage, coarse screening
• Local OCC
• Feed consistency: 3.5 %
• 2x Voith MSS 12/10
→ Energy savings 44%
→ Capacity increase 28%

<table>
<thead>
<tr>
<th>Basket</th>
<th>Voith 1,8 mm Ø</th>
<th>Bar-Tec Rejector 0,45 # mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>Step rotor</td>
<td>Dolphin HC (Drum 440)</td>
</tr>
<tr>
<td>Rotor tip speed [m/s]</td>
<td>18.8</td>
<td>18.8</td>
</tr>
<tr>
<td>Capacity [bdmtpd]</td>
<td>600</td>
<td>768</td>
</tr>
<tr>
<td>Power consumption [%]</td>
<td>91.6</td>
<td>51.1</td>
</tr>
</tbody>
</table>
**Case 4: High-efficiency screening at reduced energy consumption**

OCC mill in Europe (F)
- Primary stage, coarse screening
- Local OCC
- Feed consistency: 2.3 %
- 2x Voith MSS 12/10

→ Energy savings 38%
→ Capacity increase 12%

<table>
<thead>
<tr>
<th>Basket</th>
<th>Voith 1,8 mm Ø</th>
<th>Bar-Tec Rejector 0,45 # mm</th>
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</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>Step rotor</td>
<td><strong>Dolphin HC</strong> (Drum 440)</td>
</tr>
<tr>
<td>Rotor tip speed [m/s]</td>
<td>18.8</td>
<td>18.8</td>
</tr>
<tr>
<td>Capacity [bdmtpd]</td>
<td>624</td>
<td>696</td>
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<tr>
<td>Power consumption [%]</td>
<td>88</td>
<td>55</td>
</tr>
</tbody>
</table>
Case 5: High-efficiency screening at reduced energy consumption

OCC mill in Europe
• Fractionation
• Local OCC
• Feed consistency. 3.5 %
• ANDRITZ ModuScreen A43
→ Energy savings 25%

<table>
<thead>
<tr>
<th></th>
<th>Bar-Tec Valeo # 0.20 mm</th>
<th>Bar-Tec Valeo # 0.20 mm</th>
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<tbody>
<tr>
<td>Basket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rotor</td>
<td>ANDRITZ PD1</td>
<td>Dolphin HC (Drum 440)</td>
</tr>
<tr>
<td>Rotor tip speed [m/s]</td>
<td>18.3</td>
<td>18.3</td>
</tr>
<tr>
<td>Capacity [bdmtpd]</td>
<td>720</td>
<td>720</td>
</tr>
<tr>
<td>Power consumption [%]</td>
<td>57</td>
<td>43</td>
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12 / ANDRITZ STOCK PREP SEMINAR, LISBON / ENERGY SAVING AND HIGH EFFICIENCY OCC SCREENING / © ANDRITZ 2018
Case 6: Broke screening, 220 tpd, before

Broke Screen 1. Tampella TAS200E
Broke Screen 2. Tampella TL100
Broke Screen 3. Tampella TL25

Continuous rejecting:
1.1 l/s @ ~1.5 %
⇒ 500 t/year
Case 6: Broke screening, 300 tpd

Broke Screen 1.
Tampella TAS200E

Broke Screen 2.
Tampella TL100

Laimennus

Reject from machine screening

Discontinuous rejecting, every 20 minutes ➔ ~70 t/year

Dosing chest

Reject Tank

Dosing tank

Broke thickener
ANDRITZ RO-TEC DOLPHIN ROTOR

Case 6: Broke screening – Modification

New rotor
- Lower rotation speed
- Lower reject rate
- 2-stage screening with intermittent rejecting

\[ \text{Savings 430 t/year (160 k€), with 80 tpd higher throughput} \]
Case 7: Broke screening, 320 btpd, before

Broke Screen 1. Tampella TL340E
Broke Screen 2. Tampella TL120
Broke Screen 3. Tampella TL50
Broke Screen 4. Tampella TL25

2 x Deflaker

Continuous rejecting 1.0 l/s @ 1.0 % → 300 t/Year

Reject from machine screening

Broke Thickener

Dosing tank

Broke dosing chest
Case 7: Broke screening, 320 btpd, after

Broke thickener

Broke dosing chest

Broke dosing tank

Broke screen 1.
Tampella TL340E

Broke screen 2.
Tampella TL50

Broke screen 3.
Tampella TL25

Intermittent reject to sewer
Sequence 10 min
→ 30 t/Year

Reject from machine screening

2 x Kuidutin

Dosing tank

Laimennus

Reject Tank
ANDRITZ RO-TEC DOLPHIN ROTOR

Case 7: Broke screening – Modification and savings

New Rotor to 1. and 2. broke screen
→ Fiber savings 270 tpd, ~100 k€ / year
→ Energy savings 120 kW, ~50 k€ / year
BAR-TEC SCREEN BASKETS

Technology for high-efficiency screening
BAR-TEC SCREEN BASKET MANUFACTURING

High-quality manufacturing by ANDRITZ Fiedler

Extraordinary roundness: No irregular seams – No slot distortion – No profile change

- Laser cut rings in one piece
- Basket inner diameter fixed
- Better roundness
  - No residual stress generated
The solution for highest mechanical strength - NOBILIS / VALEO baskets

Calculation acc. to finite elements method

Fixing principle

Area of highest stress

Optimum surface contact

Laser cut support ring

Profile wire
BAR-TEC SCREEN BASKET MANUFACTURING

Slot width precision: Bar-Tec W vs. Bar-Tec Valeo

<table>
<thead>
<tr>
<th>Slot Width</th>
<th>Average for 500 baskets</th>
<th>Average for 200 baskets</th>
</tr>
</thead>
<tbody>
<tr>
<td>+/-0.01</td>
<td>60.64%</td>
<td>91.04%</td>
</tr>
<tr>
<td>+/-0.02</td>
<td>28.99%</td>
<td>8.61%</td>
</tr>
<tr>
<td>+/-0.03</td>
<td>7.54%</td>
<td>0.35%</td>
</tr>
<tr>
<td>+/-0.04</td>
<td>2.12%</td>
<td>0.00%</td>
</tr>
<tr>
<td>+/-0.05</td>
<td>0.63%</td>
<td>0.00%</td>
</tr>
<tr>
<td>+/-0.06</td>
<td>0.08%</td>
<td>0.00%</td>
</tr>
</tbody>
</table>

* Laser slot width measurement after e-polishing
**Case 8: High-efficiency screening**

DIP plant in Europe
- Fine screening
- ONP / OMG
- Primary screen: ANDRITZ **ModuScreen HB7**
- Secondary screen: Metso **MuST Screen 503**
→ Improved sticky removal

<table>
<thead>
<tr>
<th>Position</th>
<th>Primary</th>
<th>Secondary</th>
<th>Secondary</th>
<th>Secondary</th>
</tr>
</thead>
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<tr>
<td>Screen</td>
<td>ANDRITZ ModuScreen HB 7</td>
<td>Metso MuST 503 top</td>
<td>Metso MuST 503 middle</td>
<td>Metso MuST 503 bottom</td>
</tr>
<tr>
<td>Basket</td>
<td>Nobilis PG25-05 (12,5°) # 0.15 mm</td>
<td>Nimega 2.3 mm wire, 0.8 mm step (20°) # 0.15 mm</td>
<td>Nimega 2.3 mm wire, 0.8 mm step (20°) # 0.12 mm</td>
<td>Nimega 2.3 mm wire, 1.0 mm step (25°) # 0.10 mm</td>
</tr>
<tr>
<td>Sticky reduction</td>
<td>86 %</td>
<td>78 %</td>
<td>65 %</td>
<td>71 %</td>
</tr>
</tbody>
</table>
UTWIST SCREEN BASKETS

For a plus in screening performance
Impact of step height

Sticky reduction vs. step height

Example: OCC pilot plant trials

lab screen trials, Graz pilot plant, PG35; 0,16 mm #; 1% Cs, OCC
UTWIST BASKET

Design features – Adjustable profile height without changing the slot width
Design features – Adjustable profile height without changing the slot width

Feed end profile

Pitch: 3.040 mm
Angle: 18.184°
Profile height: 0.780 mm

Reject end profile

Pitch: 3.019 mm
Angle: 27.080°
Profile height: 1.101 mm
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**Case 9: High-efficiency screening**

ANDRITZ pilot plant
- OCC
- ModuScreen A12

→ Improved sticky removal

<table>
<thead>
<tr>
<th>Basket</th>
<th>P05-30-06 # 0.16 mm</th>
<th>Nobilis PGR30 04/07 # 0.16 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>ANDRITZ PD3 (Foil 130)</td>
<td>ANDRITZ PD3 (Foil 130)</td>
</tr>
<tr>
<td>Rotor tip speed [m/s]</td>
<td>15.3</td>
<td>15.3</td>
</tr>
<tr>
<td>Slot velocity [m/s]</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Sticky reduction [%]</td>
<td>78.3</td>
<td>86.0</td>
</tr>
</tbody>
</table>
ANDRITZ NOBILIS UTWIST BASKET

Case 10: High-efficiency screening

DIP plant in Europe
• Fine screening
• ONP / OMG
• Primary screens: 2x CH7 in parallel
→ Improved sticky removal

<table>
<thead>
<tr>
<th>Basket</th>
<th>Nobilis PG 30-09 # 0.18 mm</th>
<th>Nobilis PGR30 08/11 # 0.18 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>ANDRITZ Ro-Tec LCs (Foil 120)</td>
<td>ANDRITZ Ro-Tec LCs (Foil 120)</td>
</tr>
<tr>
<td>Rotor tip speed [m/s]</td>
<td>19,7</td>
<td>19,7</td>
</tr>
<tr>
<td>Slot velocity [m/s]</td>
<td>0,65</td>
<td>0,65</td>
</tr>
<tr>
<td>Sticky reduction [%]</td>
<td>76</td>
<td>85</td>
</tr>
</tbody>
</table>
ANDRITZ VALEO UTWIST BASKET

Case 11: High-efficiency screening

OCC mill in Europe
• Primary stage, fine screening
• Local OCC
• ANDRITZ ModuScreen F50

Customer agreed on repeated supply

Suggestion: next supply with lower profile, (PGR35-05/08) for even better efficiency

<table>
<thead>
<tr>
<th>Basket</th>
<th>Valeo PG35-09 # 0.20 mm</th>
<th>Valeo UTwist PGR35-07/09 # 0.18 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>Closed rotor (local repair)</td>
<td>Closed rotor (local repair)</td>
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<tr>
<td>Rotor tip speed [m/s]</td>
<td>23</td>
<td>23</td>
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<tr>
<td>Feed consistency [%]</td>
<td>2.0</td>
<td>2.0</td>
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<tr>
<td>Volume reject [%]</td>
<td>7.5</td>
<td>7.5</td>
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<tr>
<td>Sticky area reduction [%]</td>
<td>73</td>
<td>77</td>
</tr>
</tbody>
</table>

UTwist accept
Standard accept
Case 10: High-efficiency screening

OCC mill in Europe
- Primary stage, fine screening
- Local OCC
- Feed consistency: 2.6%
- Voith SS 23
  - Trouble free run
  - Lifetime increase 20%
  - Repeated order received

<table>
<thead>
<tr>
<th>Basket</th>
<th>Valeo PG30-07 # 0.25 mm</th>
<th>Valeo UTwist PGR30-07/09 # 0.25 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotor</td>
<td>Dolphin (Drum 431)</td>
<td>Dolphin (Drum 431)</td>
</tr>
<tr>
<td>Rotor tip speed [m/s]</td>
<td>17.0</td>
<td>17.0</td>
</tr>
<tr>
<td>Slot velocity [m/s]</td>
<td>0.4</td>
<td>0.4</td>
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</tbody>
</table>
CHAPTER OVERVIEW

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FIBER SAVING BY SCREEN REBUILDS

The solution for most of the screens

- Dilution pipe and sealing ring are added to the bearing unit housing
- Upgrade of existing bearing unit or new improved ANDRITZ bearing unit available
- New ANDRITZ rotor is equipped with sealing ring and dilution holes in the Rotor shell

Stock can be diluted directly in the screening area
Example calculation – OCC mill

- Last stage, fine screening
- Local OCC
- ANDRITZ ModuScreen F20 converted to F20W

→ Trouble free run
→ Fiber savings: 35,000 €/year
→ Additional reject disposal saving

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of fiber</td>
<td>100 €/ton</td>
</tr>
<tr>
<td>Losses in fine screening</td>
<td>2 t/d</td>
</tr>
<tr>
<td>Losses after rebuild</td>
<td>1 t/d</td>
</tr>
<tr>
<td>Total fiber savings</td>
<td>350 t/a</td>
</tr>
<tr>
<td></td>
<td>35,000 €/a</td>
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</table>
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