ANDRITZ - Guide for FGD / Gypsum Dewatering
Steve Myers – Industry Manager-Mining & Minerals
# ANDRITZ GROUP

## Overview

### Company
- ANDRITZ AG, Graz, Austria (Group headquarters).
- More than 180 production and service sites worldwide.
- Employees: ~17,000 worldwide (31/03/2012).

### Key figures 2011
- Order intake: 5,700 MEUR (7,200 MUSD)
- Sales: 4,600 MEUR (5,800 MUSD)
- Net income: 230 MEUR (275 MUSD)
- Equity Ratio: 21%.

### Products and services
Plants and services for the hydropower, pulp and paper, metals, **solid/liquid separation**, and other specialized industries.
# ANDRITZ Group profile

A world market leader in its main business areas

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<tr>
<th>ANDRITZ Hydro</th>
<th>ANDRITZ Pulp &amp; Paper</th>
<th>ANDRITZ Metals</th>
<th>ANDRITZ Separation</th>
<th>ANDRITZ Feed &amp; Biofuel</th>
</tr>
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</table>

![Image of hydroelectric plant](image1.png)
![Image of pulp and paper production](image2.png)
![Image of metal processing](image3.png)
![Image of separation systems](image4.png)
FGD / Gypsum Applications

FGD Process – Gypsum Dewatering

Gypsum slurry mostly dewatered by a two-stage process:

1. Slurry is pre-thickened and partly classified by a set of hydro-cyclones in first step.
   Though not very common, static thickeners can be used alternatively.

2. Further dewatering and cake washing in second step.
   - water content of commercial grade gypsum needs to be below 10% wt.
   - soluble constituents need to be removed, e.g. chloride content below 0.01 % wt.

Horizonal Vacuum Belt Filters or Vertical Basket Peeler Centrifuges are most commonly used.
FGD / Gypsum Applications
ANDRITZ Horizontal Vacuum Belt Filter - HVBF

- Preferentially used when requirements on product dryness are only moderate.

- At large throughputs, vacuum belt filters are sometimes preferred over centrifuges, since vacuum belt filters can be built with an active filtration area more than 100 m².

- At high throughputs investment costs are lower compared to centrifuges.
33 m² HVBF with 2m wide rubber belt (1,85m effective) and 18 m long vacuum box
FGD / Gypsum Applications
ANDRITZ Horizontal Vacuum Belt Filter – HVBF

- Feed Slurry Distributor
- Wash Distributor
- Filter Cloth
- Rubber carrier Belt
- Vacuum box
- Tail Pulley
- Main Frame
- Head Pulley
FGD / Gypsum Applications

HVBF – Effect of drying time on FGD gypsum cake moisture

Gypsum slurry and washing water temperature 60°C

Gypsum moisture content (%)

Time on filter under vacuum (seconds)
FGD / Gypsum Applications

HVBF – Effect of wash water temp. on gypsum cake moisture

Cake moisture (%) vs. Cake wash temperature (°C)

Cake wash rate 0.3 kg/kg solids
Total residence time on cloth: 50 seconds
FGD / Gypsum Applications

Why use Horizontal Vacuum Belt Filter HVBF?

Pro HVBF
- Commercial grade gypsum
  - 100 ppm Cl
  - 10% Moisture
- Inexpensive corrosion protection
  - Materials in contact with high chloride FGD slurry:
    - Rubber belt in SBR/ Natural rubber
    - Vacuum box in 2205 / SMO 254
    - Frames in carbon steel

Contra HVBF
- Very large footprint & building requirement
  - Filter area = +/- 1 m² per ton/h gypsum
  - Building area = 3-5 m² per ton/h gypsum
- Particularly when the filters are installed at an elevated position
FGD / Gypsum Applications

ANDRITZ KMPT Vertical Basket Peeler Centrifuge VZU-G

- Preferred when high product dryness is required.

- Flexible operation even at fluctuating process conditions (e.g. variable gypsum quality and/or changing throughput capacity.)

- Centrifuges need smaller footprint.

- Centrifuges do not necessarily require a pre-thickening stage and the slurry from the wash tower can be fed directly into the centrifuge.
FGD / Gypsum Applications

ANDRITZ KMPT Vertical Basket Peeler Centrifuge VZU-G

- Feed pipes
- Filter cloth
- Lubrication
- Wash pipe
- Visco spring damper
- Sight Glass
- Manhole
- Peeler
- Rubber Lining
- Overfill Detector
- Feed Pipes
- Heel Rinse Pipes
FGD / Gypsum Applications

Vertical Basket Centrifuge Cycle Diagram

Basket Speed [rpm]

Cycle Time [seconds]

1. Acceleration
2. Feeding
3. Washing
4. Dry Spinning
5. Braking
6. Discharge
7. Heel Rinising
# FGD / Gypsum Applications

## Why use Vertical Basket Peeler Centrifuge VZU-G?

<table>
<thead>
<tr>
<th>Pro VZU-G</th>
<th>Contra VZU-G</th>
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</table>
| - Commercial grade gypsum  
  - 100 ppm Cl  
  - 6-7% Moisture | - Limited throughputs  
  (< 11 ton/h gypsum @ 10% residual moisture) |
| - Low foot print & building requirement  
  - approx. 1/3 of HVBF installations | - Higher investment costs for large throughputs |
### Performance comparison of gypsum dewatering equipment

<table>
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<tr>
<th>Machine type</th>
<th>Mode of operation</th>
<th>Product dryness</th>
<th>Washing performance</th>
<th>Filtrate quality</th>
<th>Capacity</th>
<th>Costs</th>
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<tbody>
<tr>
<td>Horizontal vacuum belt filter</td>
<td>Continuous</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Vertical basket centrifuge</td>
<td>Discontinuous</td>
<td>+ +</td>
<td>+ +</td>
<td>+</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Vacuum drum filter</td>
<td>Continuous</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>- -</td>
<td>-</td>
</tr>
<tr>
<td>Decanter</td>
<td>Continuous</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
<td>+ +</td>
<td>+ +</td>
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</tbody>
</table>

*e.g. for decanter this means: - - highest moisture content; lowest washing performance; poorest filtrate quality (compared to others) + + highest capacity; lowest costs*
## Separation Technologies

**ANDRITZ Product Portfolio – for S/L Separation**

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<th>Centrifuges</th>
<th>Thickeners</th>
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<td><img src="image2" alt="Thickener Image" /></td>
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<th>CCD Circuits</th>
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<td><img src="image3" alt="Filter Press Image" /></td>
<td><img src="image4" alt="CCD Circuit Image" /></td>
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<th>Linear Screens</th>
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<td><img src="image5" alt="Belt Filter Image" /></td>
<td><img src="image6" alt="Linear Screen Image" /></td>
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<th>Hyperbaric &amp; Vacuum Disc Filters</th>
<th>Conveying Systems</th>
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<td><img src="image7" alt="Hyperbaric Filter Image" /></td>
<td><img src="image8" alt="Conveying System Image" /></td>
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<th>Fluid Bed Dryers</th>
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<td><img src="image9" alt="Drum Filter Image" /></td>
<td><img src="image10" alt="Fluid Bed Dryer Image" /></td>
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Thank you
Steve Myers (tel.no. 508-404-1402)
steve.myers@andritz.com

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