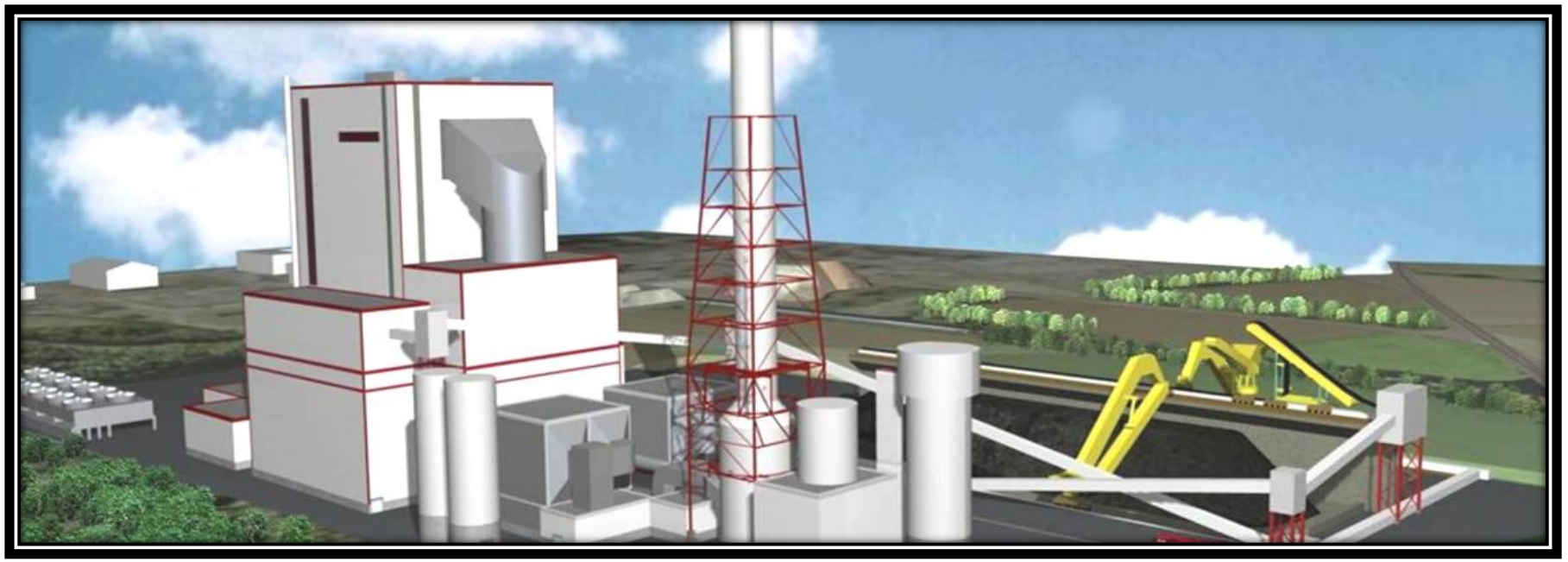
ANDRITZ Separation

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 Separation

ANDRITZ Group profile

A world market leader in its main business areas

ANDRITZ Hydro	ANDRITZ Pulp & Paper	ANDRITZ Metals	ANDRITZ Separation	ANDRITZ Feed & Biofuel
Electro-mechanical equipment for hydropower plants; pumps.	Systems for production of all types of pulp and certain paper grades.	Systems for production and processing of stainless steel and carbon steel strips.	**Systems for mechanical and thermal solid/ liquid separation. The most complete range available in the market.**	Systems for production of animal feed and wood/ biofuel pellets.
				

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.

Horizontal 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 m^2.
- At high throughputs investment costs are lower compared to centrifuges.

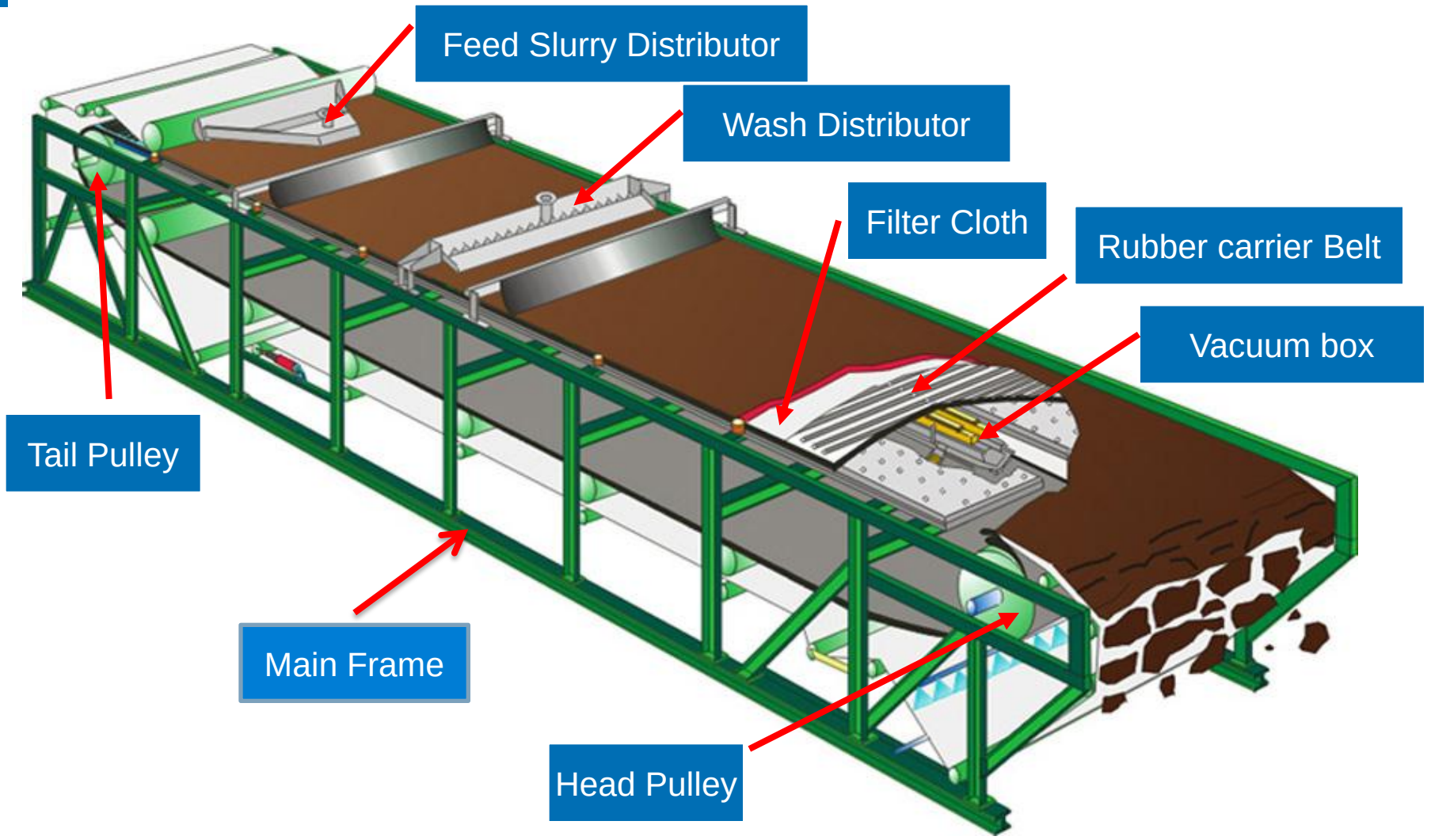
FGD / Gypsum Applications

ANDRITZ Horizontal Vacuum Belt Filter - HVBF

33 m^2 HVBF with 2m wide rubber belt (1,85m effective) and 18 m long vacuum box

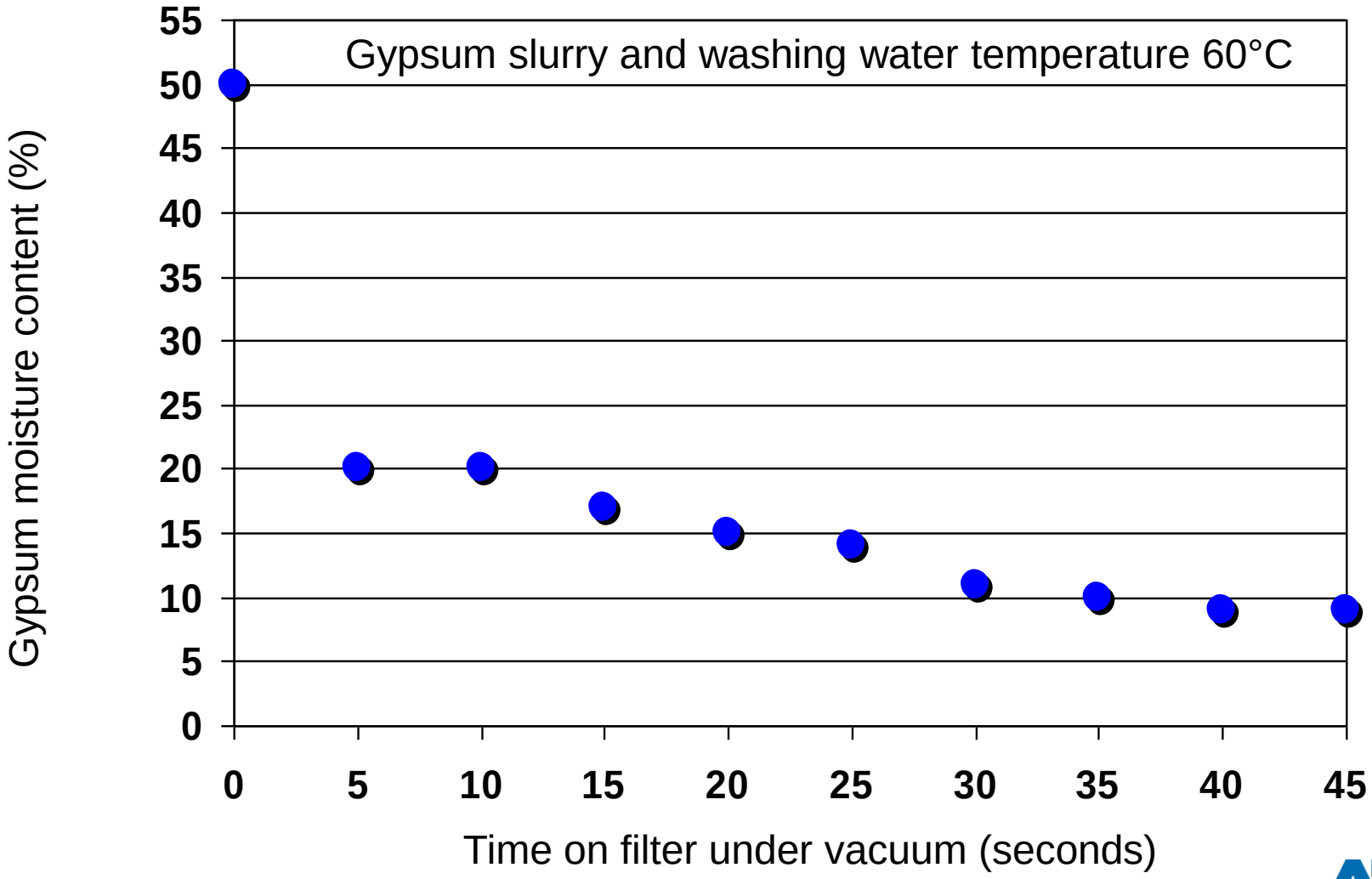
FGD / Gypsum Applications

ANDRITZ Horizontal Vacuum Belt Filter – HVBF



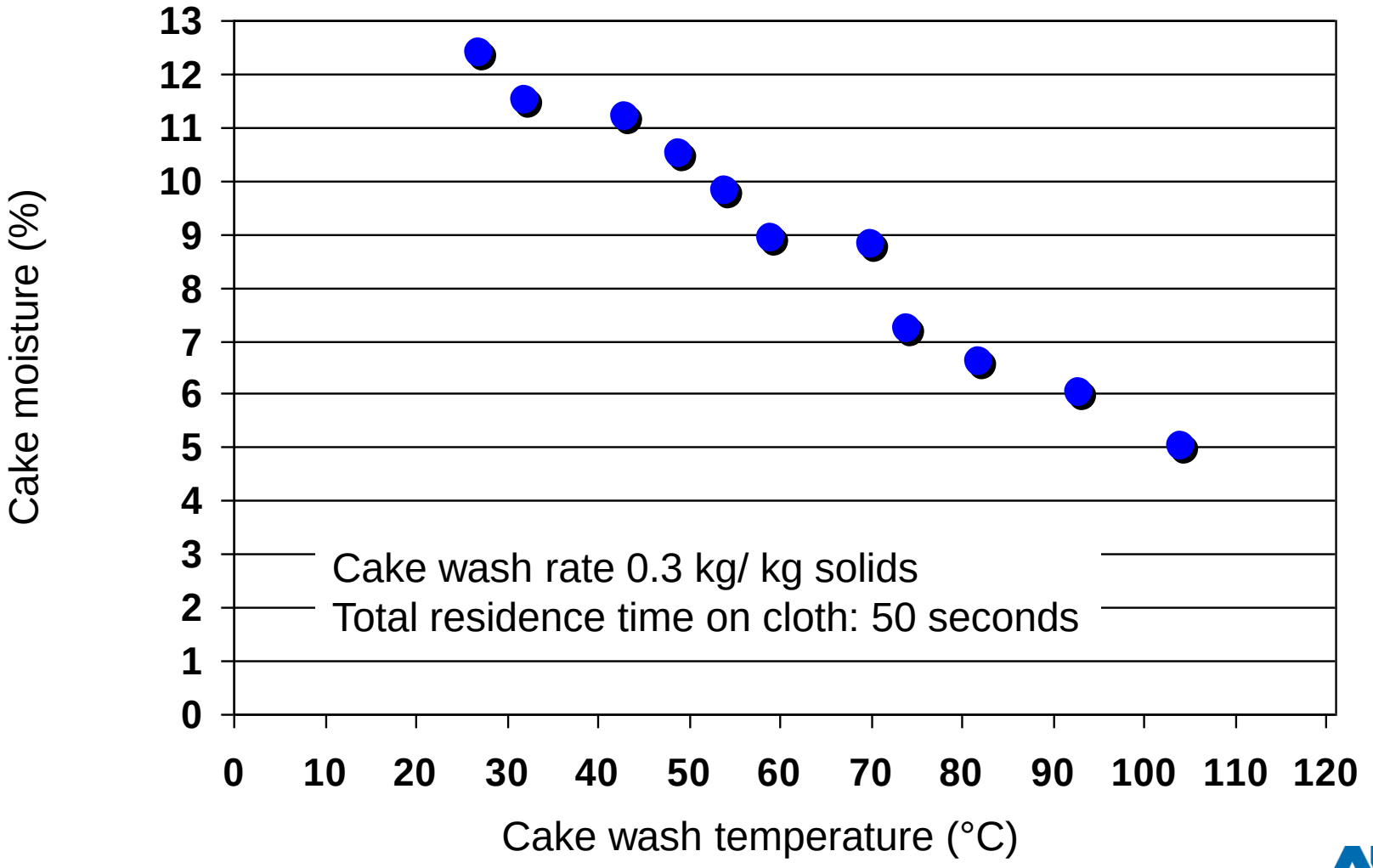
FGD / Gypsum Applications

HVBF – Effect of drying time on FGD gypsum cake moisture



FGD / Gypsum Applications

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



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

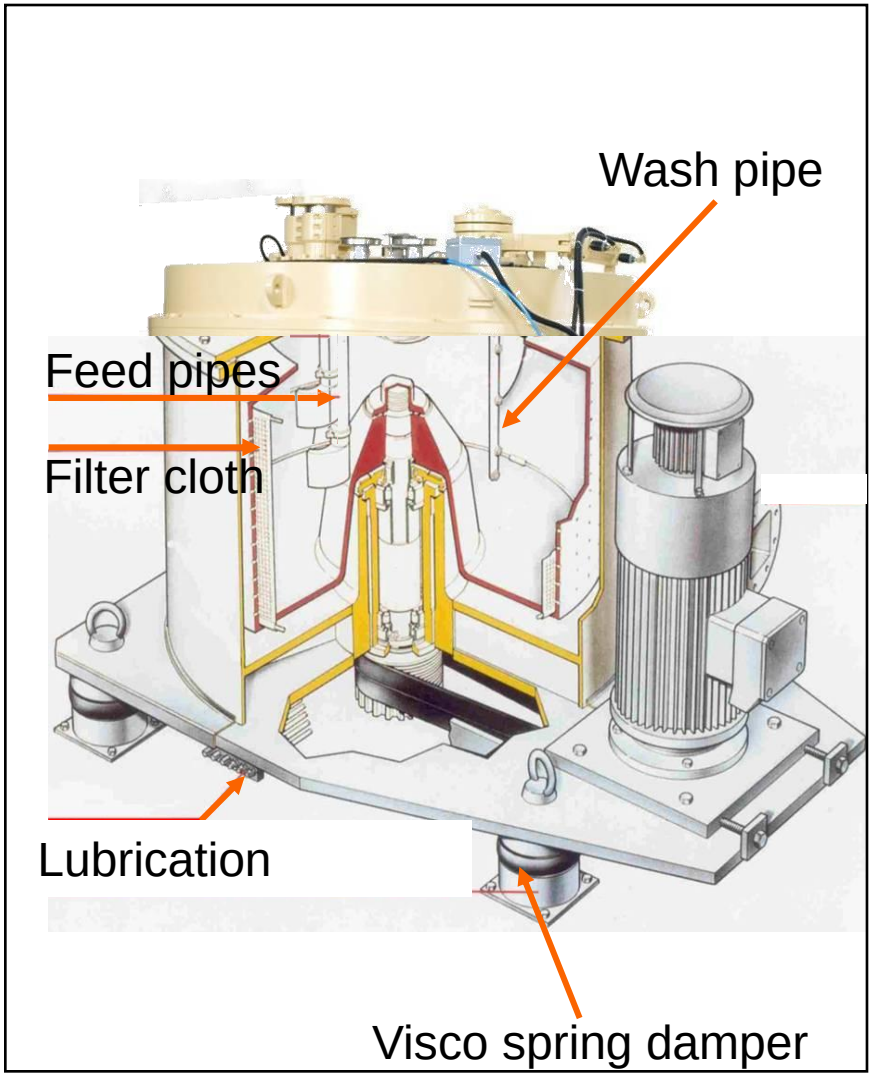
FGD / Gypsum Applications

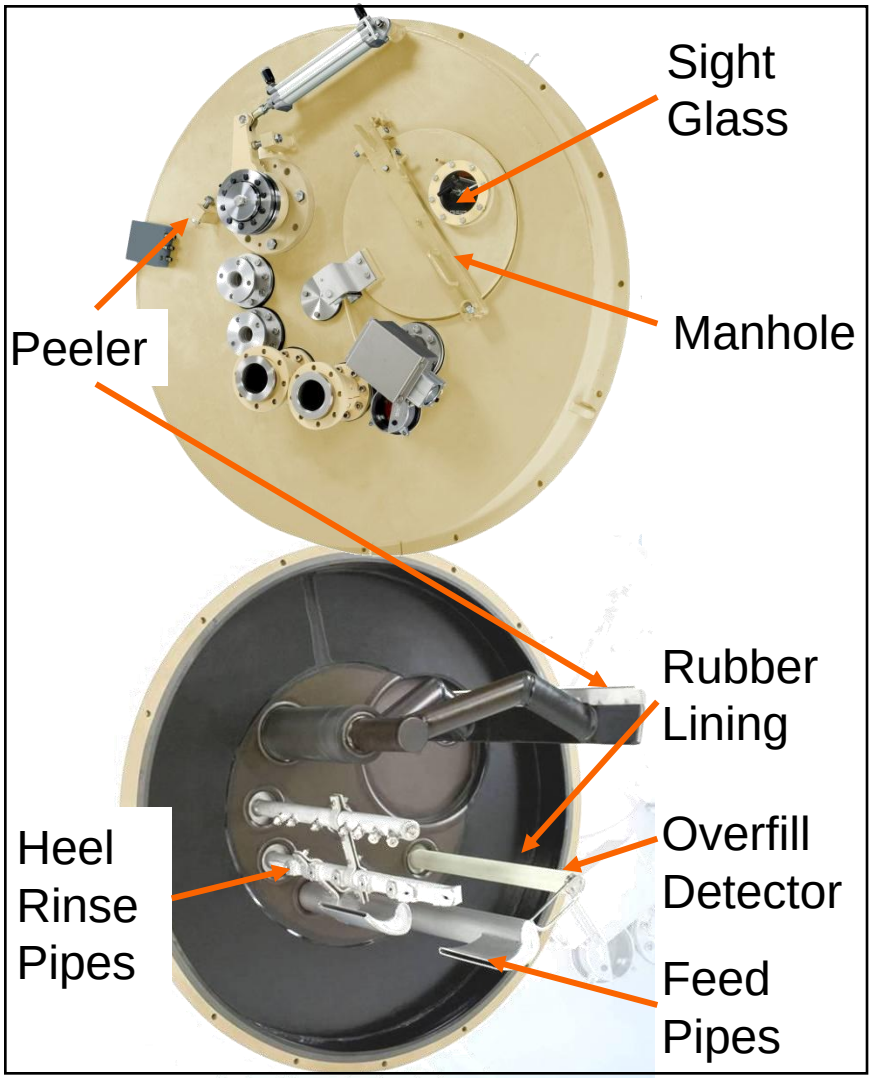
ANDRITZ KMPT Vertical Basket Peeler Centrifuge VZU-G

- 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

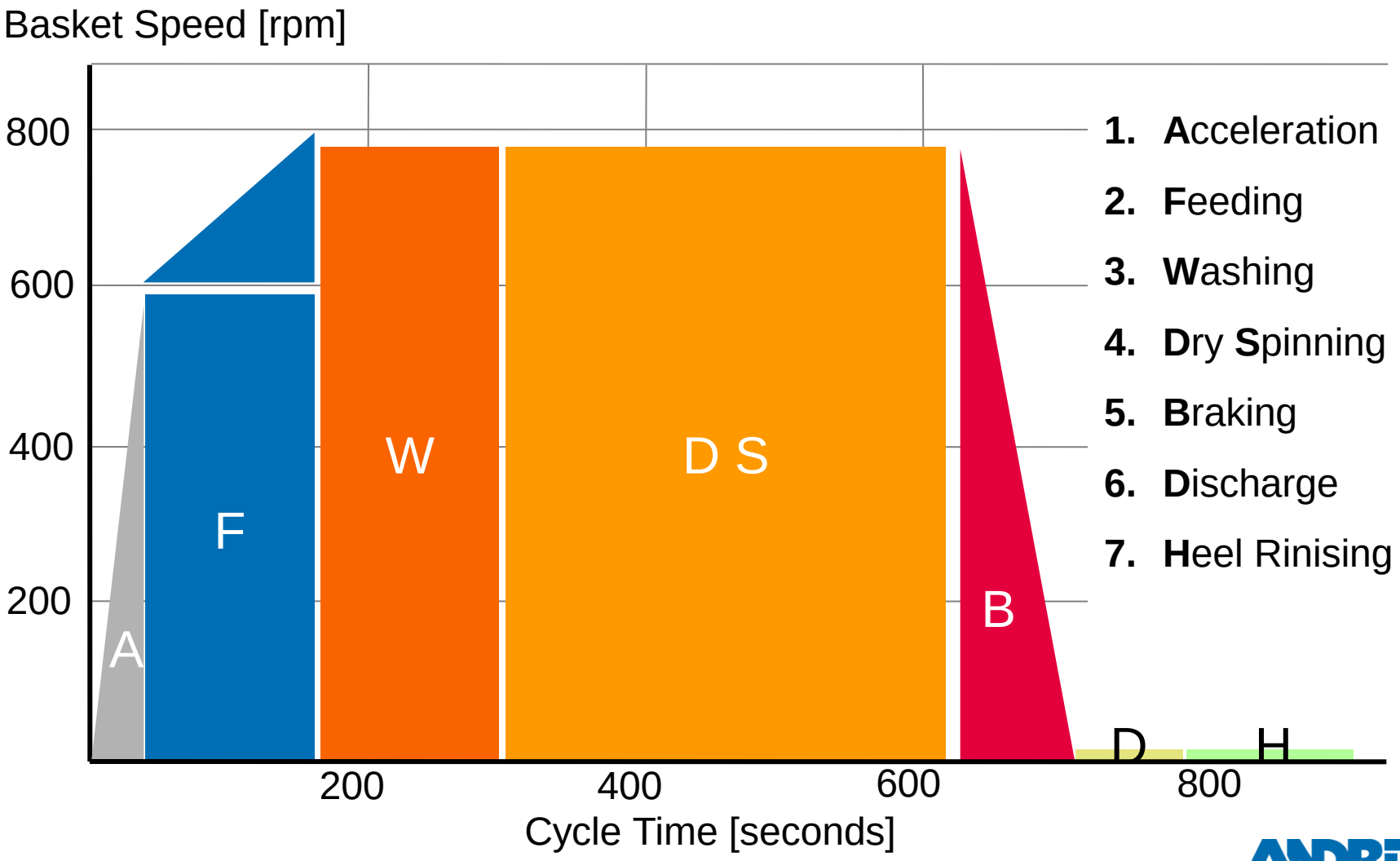
ANDRITZ KMPT Vertical Basket Peeler Centrifuge VZU-G





FGD / Gypsum Applications

Vertical Basket Centrifuge Cycle Diagram



FGD / Gypsum Applications

Why use Vertical Basket Peeler Centrifuge VZU-G?

Pro VZU-G

- Commercial grade gypsum
  - 100 ppm Cl
  - 6-7% Moisture
- Low foot print & building requirement
  - approx. 1/3 of HVBF installations

Contra VZU-G

- Limited throughputs
  (< 11 ton/h gypsum @ 10% residual moisture)
- Higher investment costs for large throughputs

FGD / Gypsum Applications

Performance comparison of gypsum dewatering equipment

Machine type	Mode of operation	Product dryness	Washing perfor-mance	Filtrate quality	Capacity	Costs
Horizontal vacuum belt filter	Continuous	+	+	+	+	+
Vertical basket centrifuge	Dis-continuous	+ +	+ +	+	-	-
Vacuum drum filter	Continuous	-	-	+	- -	-
Decanter	Continuous	- -	- -	- -	+ +	+ +

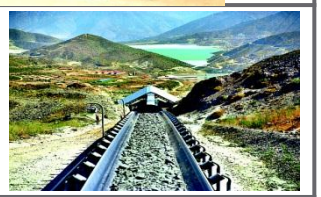
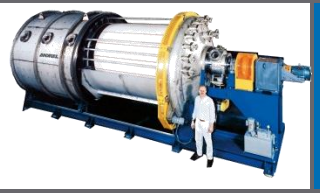
e.g. for decanter this means: - - highest moisture content; lowest washing performance; poorest filtrate quality

(compared to others) + + highest capacity; lowest costs

ANDRITZ Separation

Separation Technologies

ANDRITZ Product Portfolio – for S/L Separation

Centrifuges			**Thickeners**		
Filter Presses			**CCD Circuits**		
Belt Filters			**Linear Screens**		
Hyperbaric & Vacuum Disc Filters			**Conveying Systems**		
Drum Filters			**Fluid Bed Dryers**		

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Thank you

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