

BOKELA Rotary Drum Filters



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Rotary Vacuum Filters of BOKELA



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The continuous operation, high performance capacity and low space demand make rotary filters the most economical solution for a wide range of solid-liquid separation tasks.



Drum Filter



Disc Filter Boozer



Pan Filter

BOKELA drum, disc and pan filters define a new state of the art in rotary filter technology and surprise with numerous innovations. The superior process & mechanical design result in

- high hydraulic capacity
- minimal pressure loss
- high filter speed
- homogenous cake thickness
- 100 % cake discharge
- extraordinary high throughput capacity
- advanced process control system
- safe operation and high flexibility

New Generation of Rotary Vacuum Drum Filters



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The innovative filter design results in superior performance and operation characteristics which set a new standard for rotary drum filters.



BOKELA drum filters stand out by innovations like:

- exchangeable filter cells
- new cloth fixing methods
- connectible process zones

Impressive characteristics like

- **high performance capacity as result of the unique hydraulic design**
- **excellent & sharp cake washing**
- **safe & economical operation**
- **easy maintenance**

make BOKELA drum filters a superior technical and economical solution for

filtration, cake washing and dewatering

of numerous products in a wide range of industries.

Different Drum Filter Designs for Different Applications



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BOKELA drum filters are designed for different applications

- in the minerals, salt, ore, chemical, pharmaceutical and food industry



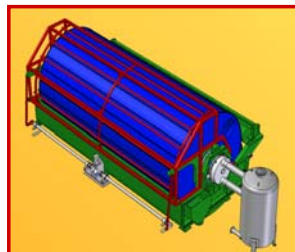
- for filtration, washing and dewatering of different products like
 - **crystallisation and precipitation products, pigments, food products, residues, ...**
- with filter sizes from 0.5 m² to 125 m²
- with special designs like standard and single filter cell types
- with different methods of cake discharge such as pressurized air blowback, roller discharge or knife discharge for precoat filters
- with different ancillaries like press rolls, press belt, wash hood, steam hood, insulation, ...

Innovative and Intelligent Answers to Today's Filter Challenges



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The high performance and excellent operation make BOKELA drum filters a superior technical and economical solution for separation tasks.



BOKELA drum filters excel with:

- high filter speed up to 3 rpm
- 50% to 75% increased throughput capacity
- improved cake wash without increase of cake moisture
- 100% cake discharge even at high filter speed
- high operational reliability and flexibility
- advanced process control system
- very long lifetime of filter cloth
- easy maintenance

Filter Cell Design

Exchangeable Single Cells – Innovative Cell Design



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Exchangeable filter cells
available for XS, S and M-type up to 7 m² filter area (chemical filter design)



The innovative BOKELA single cell design makes advantages of individual filter elements as known from disc filters. The filter cloth is made as filter bag like with disc filters and re-clothing is easily performed by exchanging of pre-clothed filter cells:

- quick cloth change of complete filter in about 1h
- easy repair of cloth damages by removal of single filter bags
- no wires around the drum, no sash cords for cloth fixing
- no power tools or excessive force

Filter Cell Design

Closed Drum



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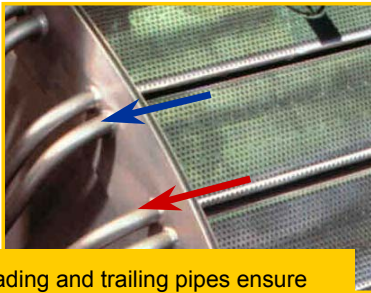


- New grids with low flow resistance design
- optimised filtrate drainage thanks to hydraulically optimised design with low flow resistance
- easy mounting of grids without special tool
- axial arrangement of grids
- smooth surface for protection of the filter cloth
- division strips are completely welded to the drum
- innovative cloth fixing system available

Filtrate Pipe Design

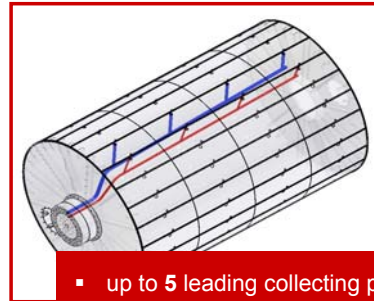


External filtrate pipes (single cell design)



- leading and trailing pipes ensure quick and complete cell emptying
- excellent filtrate drainage
- no entrainment of filtrate
 - ➡ optimal filtrate separation
- pressurized air blowback parallel to cloth
 - ➡ protects cloth from damage

Internal filtrate pipes (closed drum)

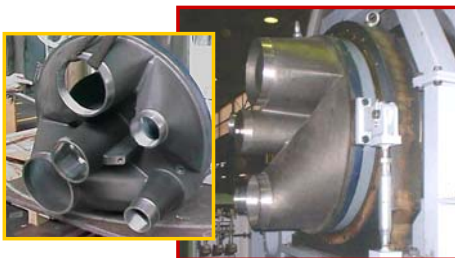


- up to 5 leading collecting pipes
- up to 5 trailing collecting pipes
- individual piping to control head
- large pipe diameter
- no dead & blind zones in the filter cells

Control Valve Design

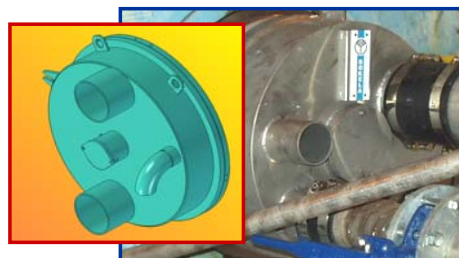


Design for High Hydraulic Capacity



The pressure loss of a two-phase flow is up to 10 times higher than the one of a single-phase flow. Therefore, the control head is designed to pre-separate as far as possible (>90 %) the incoming filtrate/air mixture into a gas and liquor flow. Entrainment of filtrate from the cake formation zone into wash and/or dewatering zone is prevented.

Design for Lower Hydraulic Capacity



- internal bridge blocks for variable process zones
- 2nd cake formation zone optional
- separate aeration pipe
- easy dismantling
- connection by rubber hoses

Homogeneous Filter Cakes

Effective Cake Wash



The unique hydraulic system with optimised design of filter cells, grids, filtrate pipes and control valve provides for:

- minimal pressure loss
- quick filtrate drainage
- complete cell emptying

The size and number of cells (up to 48) lead to:

- filter cakes of even thickness
- optimal division and use of process angles for cake formation, washing and dewatering
- exact separation of filtrates (pre-condition for effective counter-current cake wash)

These characteristics are the preconditions for:

- **effective cake wash**
- **intensive and uniform cake dewatering**
- **low gas throughput**
- **complete cake discharge without re-wetting**



Cake Washing Design

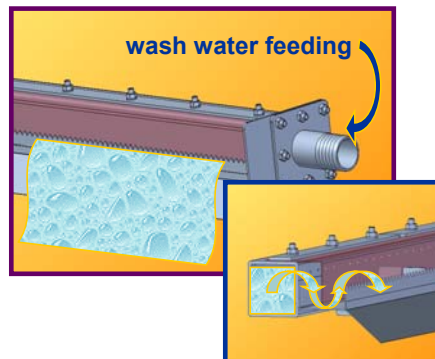


Design with Spray Nozzles



- optimised spraying of the wash liquid on the cake surface
- adapted to low wash ratios
- number of bars depends on application
- wide wash angle

Design with Overflow Weir



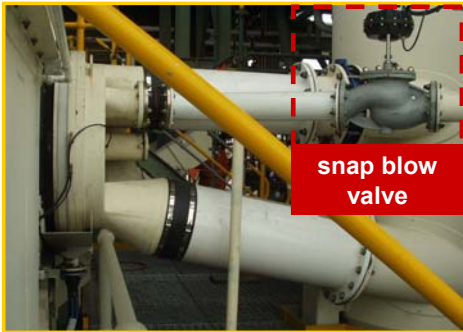
- no splashing of wash liquid
- adapted to high wash ratios
- even distribution of wash liquid

Cake Discharge

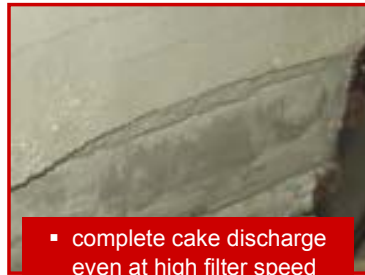
Pressurized Air Blowback with Snap Blow



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- complete cake discharge with low overpressure by quick blow back impulse
 - ➔ protects cloth from damage
- exactly timed by snap blow valve
- electronic adjustment of the precise timing for pressurized air blow back



- complete cake discharge even at high filter speed
- no re-wetting of the filter cake



Cake Discharge

Roller Discharge System



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- adjustable gap between filter drum and roller
- cake discharge by combs
 - no clump building
 - very resistant material with long lifetime
 - easy change
- roller discharge coupled to main drive unit – no additional drive necessary
- roller speed adapted to filter speed



Cake Discharge

Precoat Filtration with Knife Discharge



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cake discharge area
knife feed: 25 $\mu\text{m}/\text{rev}$.

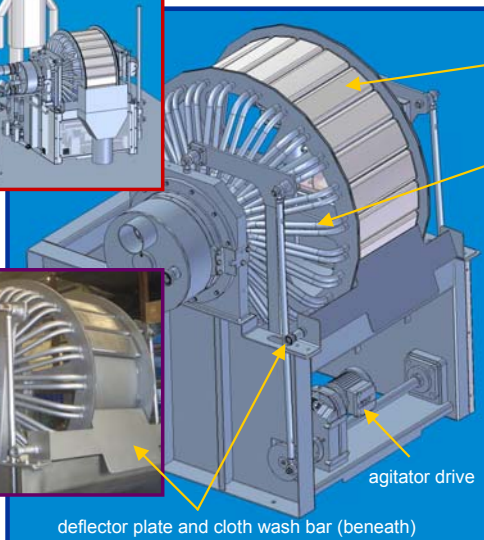
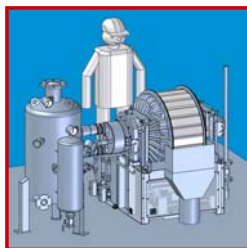
- **Example: yeast filtration**
- filter area: 16 m²
- filter with cake wash and cake equalizer
- throughput: 7 t/h yeast suspension
- cake thickness: < 1 mm
- precoat thickness: 30 mm at start, 3 mm at the end of the cycle
- drum roundness: 0.5 mm (0.025 %)
- knife data:
 - low knife feed motion
→ minimum precoat consumption
 - quick knife motion
→ quick filter start and stop
 - complete knife made of stellite
→ long lifetime, low maintenance

Case Study: Filtration of Chemical Gypsum (1/2)

Vacuum Drum Filter XS-Type



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- data:
 - 1 m² filter area
 - 24 single cells
 - discharge by air blow back
- leading & trailing filtrate pipes
- optimal hydraulic design
- large cake dewatering angle α_2
- encased bearings
- no grease or oil lubrication
- excellent accessibility
- easy maintenance & cleaning

Operational Data:

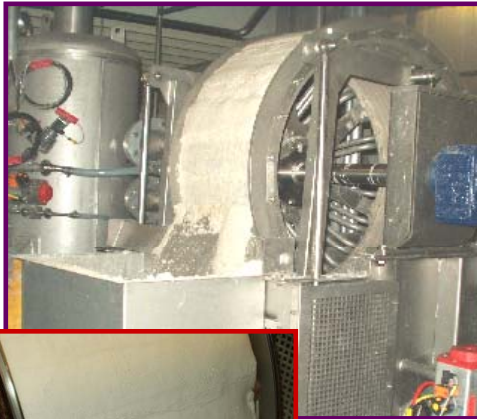
Filtration area:	1 m ²
Solids throughput:	1,750 kg/h
Residual moisture:	20 - 22 %

Case Study: Filtration of Chemical Gypsum (2/2)

Vacuum Drum Filter XS-Type



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cake discharge

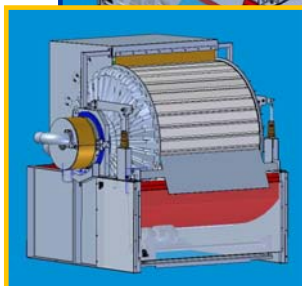
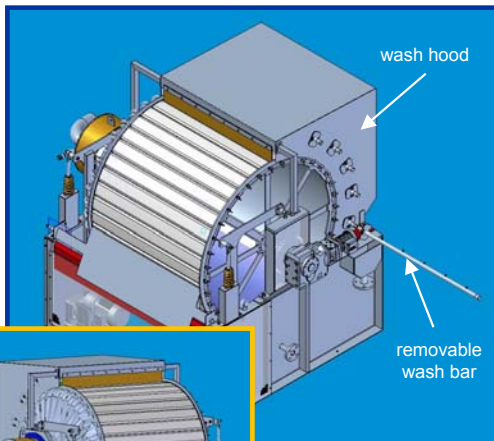
- savings of invest costs
 - 1 m² drum filter has same capacity as 12 m² belt filter
 - foot print: 4.2 m² instead of 24 m² (belt filter)
 - no new filter building necessary
 - reduced peripheral equipment
- savings of energy costs
 - smaller vacuum pump
 - smaller drive units
- ease of maintenance
 - re-clothing time: 1 h instead of 8 h
 - maintenance per week: 5 h instead of 10 h

Case Study: Filtration of Pigments

Vacuum Drum Filter S-Type



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- pigments with $x_{50} \leq 7 \mu\text{m}$
- data:
 - 5m² filtration area
 - 36 single filter cells for quick exchange of filter cloth
 - adjustable wash bars for effective cake washing
 - discharge by air blow back
- four BOKELA high performance drum filters with 5m² each handle the same slurry throughput as the four drum filters of old design with each 8m² they replaced
- wash hood for clean and safe workplace

Case Study: Filtration of Hot Salt Slurry Vacuum Drum Filter L-Type



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- filtering of a 90°C hot and highly corrosive salt slurry
- data:
 - 25 m² filter area
 - 30 cells with exchangeable plates
 - wash bars for cloth washing
 - discharge by steam blow back
- one BOKELA drum filter replaces 2 old filters of 20 m² each
- interval between 2 filter washings could be doubled
- construction is resistant against corrosion and abrasion
- simple and fast maintenance by
 - special cloth fixing
 - liftable agitator
 - automatic operation



Case Study: Washing of Oxalate Drum Filter XXL-Type



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- data:
 - 86m² filtration area
 - 24 filter cells with optimised hydraulic design for low flow resistance
 - wash bars for very effective cake washing
 - discharge by air blow back
- new design of cloth fixing system:
 - improved cloth fixing
 - optimal cloth lifetime
 - easy exchange of filter cloth
- high efficient and reliable cake discharge by air blow back and new designed scraper that avoids cake sticking
- pre-separation of liquid and gas in the control head for increased acting vacuum



Case Study: Filtration of Red Mud Drum Filter XXL-Type



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- data:
 - up to 125m² filtration area
 - 24 filter cells with leading and tailing filtrate pipes individually piped to the control head
 - wash weirs for very effective cake washing and low maintenance
 - discharge by discharge roller
- cell breathing without extra control head
- online cloth washing
- agitator can be dismantled without drum dismantling



BOKELA Drum Filters Overview Sizing, Layout & Auxiliaries



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Filter Type	[-]	XS	S	M	L	XL	XXL
Drum Diameter	[m]	0.9	1.4	1.8	2.4	3.2	4.2
Filtration Area	[m ²]	0.5 – 3.2	2.5 – 8.0	6 - 20	16 - 40	40 - 81	76 - 125
Number of Cells (closed drum)	[-]	16	20	20	24	24	24
Number of Cells (single cells)	[-]	24	36	48	-	-	-

method of cake discharge	scraper / air blow off	roller discharge	precoat
exchangeable single filter cell	+	-	-
steam cabin / gas tight	+	+	+
agitator	pendulum	pendulum	- / pendulum
press rollers / belt	+	-	-
wash water distribution	wash weirs / spray bars	wash weirs / spray bars	wash weirs / spray bars
online cloth washing	pipes / spray bars	pipes / spray bars	-
filter size	0.5 - 125 m ²	16 - 125 m ²	6 - 18 m ²



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