

# BF Indexing Belt Filter

Gentle filtration of sedimenting media

**BHS**  
SONTHOFEN

TRANSFORMING  
MATERIALS  
INTO VALUE



Administrative building of BHS-Sonthofen



TRANSFORMING MATERIALS INTO VALUE

**BHS**  
SONTHOFEN



### The company

BHS-Sonthofen, headquartered in Sonthofen, Germany, is an owner-operated group of companies in the field of machine and plant engineering. We offer technical solutions in the field of mechanical process engineering, with a focus on mixing, crushing, recycling and filtration. With over 300 employees and a number of subsidiaries, BHS-Sonthofen has a global presence.

### Cake filtration

BHS has specialized in cake filtration for more than 50 years. We supply a broad range of pressure and vacuum filters for both batch and continuous operation. There is a diverse spectrum of realized applications and we have accumulated a wealth of experience. A common feature of all BHS filters is that they work with a comparatively thin cake.

### Filtration tests

BHS has a range of pilot and lab filters available for customer-specific filtration tests. These are available for rent; BHS will be happy to advise you on all application-related matters.

### Worldwide service

BHS provides quick and reliable service worldwide with its technical customer support and a large stock of spare parts for all standard machine types, also for older machines.

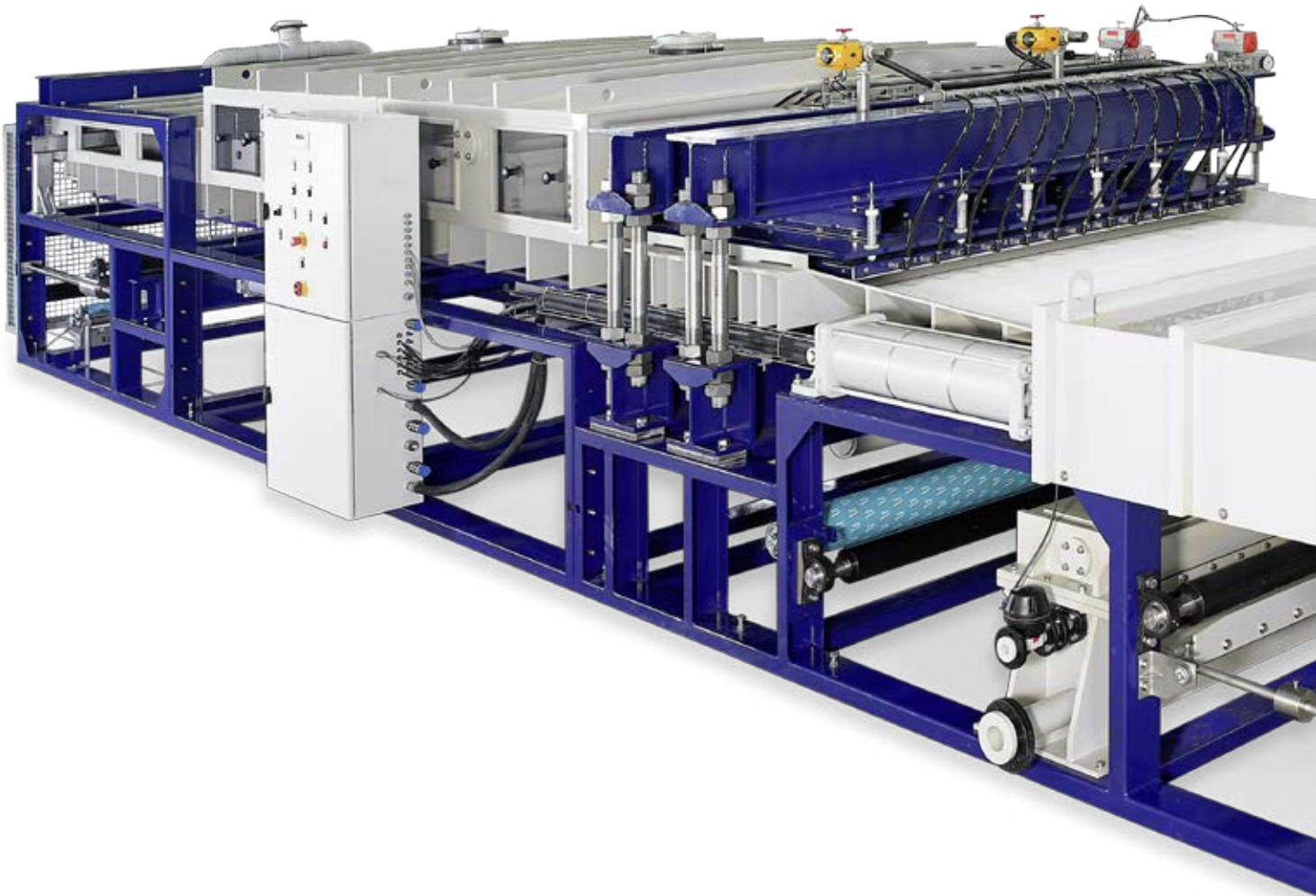
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[www.bhs-sonthofen.com](http://www.bhs-sonthofen.com)

## The BHS indexing belt filter (type BF)

The BHS indexing belt filter is a continuously operating, horizontal vacuum filter used for the efficient and at the same time gentle separation of sedimenting solids from suspensions. The filter cake forming on top of the belt can undergo further treatment in a wide range of process steps, demonstrating the high process versatility of the indexing belt filter. As a result, the filtrates can be individually recovered and processed.

Open indexing belt filter of type BF 200-080 in plastic version



### High process versatility

The filter design allows many process steps for treating the filter cake as the belt indexes forward: washing (co-current or counter-current), reslurrying, steaming, extraction, vacuum drying or pressing. The wash filtrates can be recovered individually in each indexing step and optimally further processed without any cross-contamination.

### Fixed vacuum trays

The vacuum trays and the associated filtrate outlets are fixed to the filter frame. Wear due to moving parts is not possible. The filter cloth with the filter cake moves stepwise over the trays. Each time the cloth stops, the filtrate is sucked downwards. The vacuum is then switched off, releasing the filter cloth to move forward again.

### Alternative drives

The indexing belt filter is advanced by the drive roller in conjunction with a downstream locking roller. Advancing is accomplished either by a direct electric drive or by pneumatically or hydraulically driven cylinders as a stroke movement.

### Gentle solids treatment

The design of the BHS indexing belt filters feeds the slurry evenly by optimized distribution devices which spread the solids gently. The filter cake build up by gravity and vacuum does not see any additional mechanical forces during transportation or further treatment. This makes the indexing belt filter among others suitable for pressure sensitive solids, which are processable without crystal breakage.

### Open or enclosed design

The indexing belt filter is available in various designs. In the standard configuration, it is open at the top and mounted on a sturdy steel frame. The filter can additionally be equipped with a closed hood. As a further alternative, we produce enclosed box-type filters, which can also be supplied in a pressure- and gas-tight design.

### Alternative materials

We have considerable experience in the selection of suitable materials for parts in contact with the product. If necessary, we use appropriate grades of stainless steel or plastics and corresponding seals. Depending on the requirement, ground and polished surfaces are possible.

### GMP and ATEX

For applications in the pharmaceutical, food or bioprocessing industry we provide special indexing belt filters in compliance with GMP requirements and equipped with CIP devices. We are also ATEX certified.



## How our indexing belt filters work

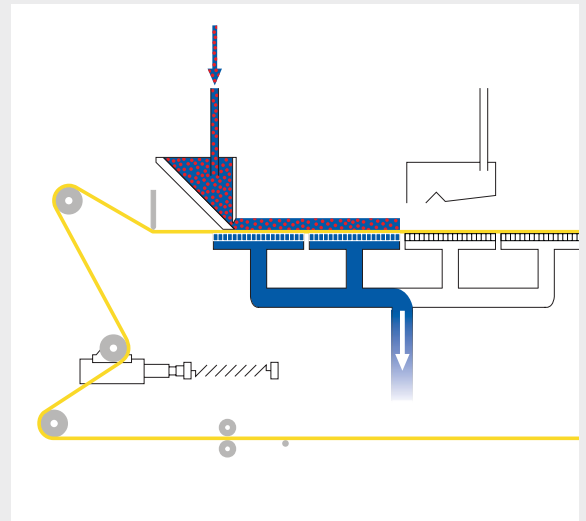
An endless belt with a stepwise movement is the filter medium. Feeding of the suspension is usually continuous. The vacuum trays are fixed in place on the frame. The filter cloth with the suspension moves stepwise over the trays. Each time the cloth stops, the filtrate is sucked downwards. Then the vacuum is switched off. This releases the filter cloth, which can be advanced again. The filter cake forms on top of the belt

and can undergo further treatment by washing (co-current or counter-current), reslurrying, steaming, extraction, vacuum drying or pressing. The wash filtrates can be recovered individually from each vacuum tray and further processed without any cross-contamination. The filter cake is discharged at the discharge roller. The cloth is cleaned as the belt returns.

### Phase 1: Suspension feed & cake formation

The indexing belt filter optimally meets the process requirements for a wide range of separation tasks. One advantage is the controlled feed of suspension from above. This ensures that the solid matter is evenly distributed and has a slightly layered structure from coarse to fine, if applicable. This serves to achieve optimal permeability in terms of filtration.

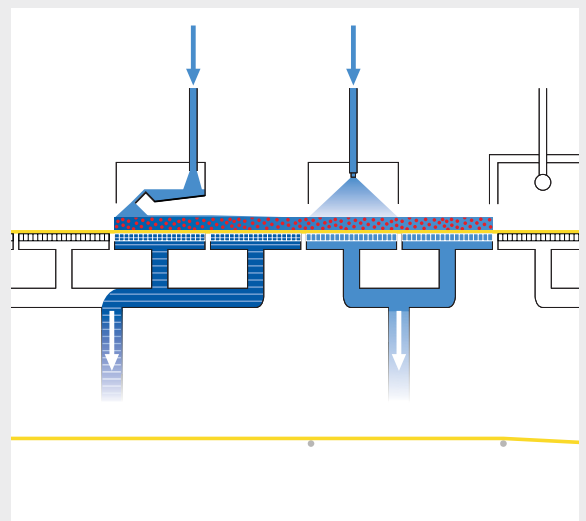
As filtration takes place in the direction of gravity, the pressure difference of the vacuum system is utilized to the full. No additional forces are needed to assist cake formation or filtrate flow, due to the horizontal orientation of the cake. The suspension is filtered to the required residual humidity of the filter cake.

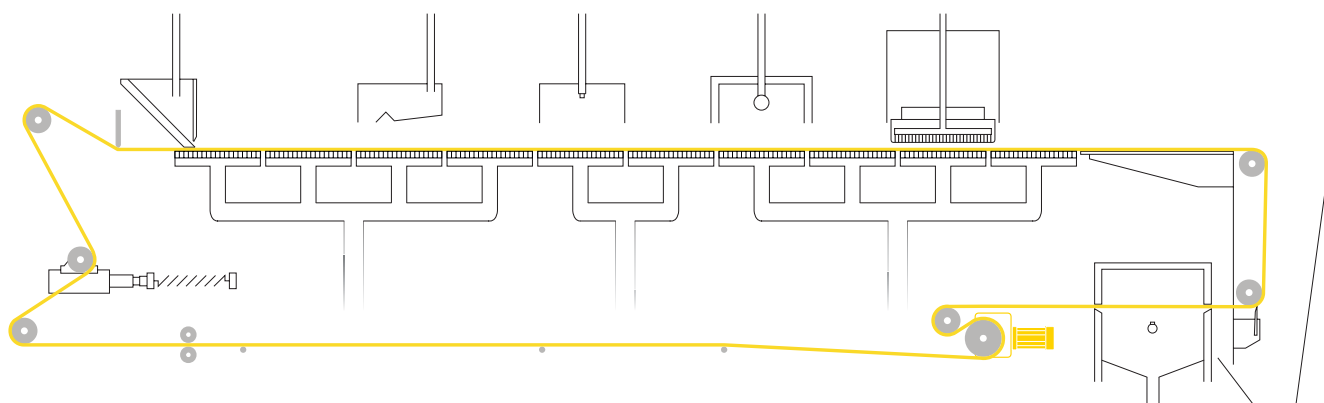


### Phase 2: Washing

On the indexing belt filters, dissolved contaminants can be washed out of the pore structure of the filter cake by dilution or displacement washing, as appropriate for the respective requirements. In all cases, the filter cake is uniformly and completely washed in the washing zones. On indexing belt filters, the well-defined pore structure produced by light compaction of the filter cake during the filtration/cake formation cycle makes the displacement washing process extremely efficient.

The washing liquid, the washing filtrates from counter-current washing, or the different media for extraction or ion-exchange processes are fed to the filter via distribution and feed channels.

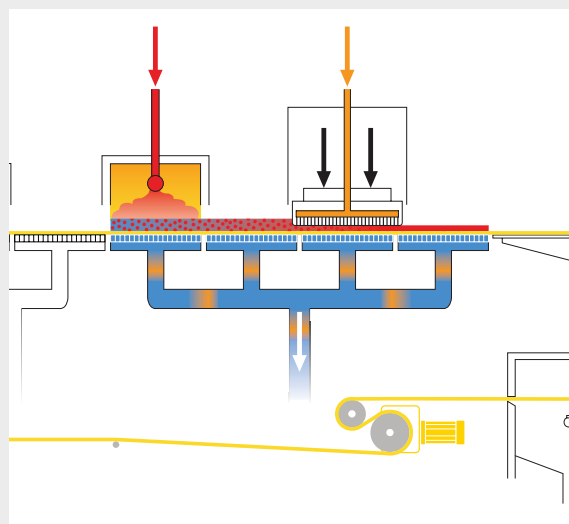




### Phase 3: Drying

Following the filtration and washing stages, various dewatering systems can be employed to dry the filter cake.

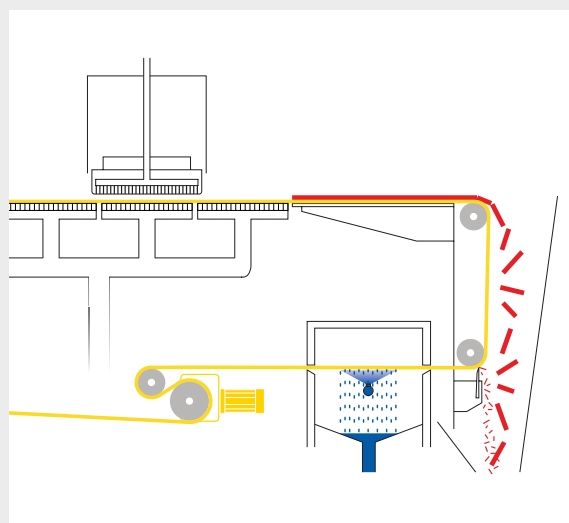
Besides the purely vacuum-based technique of dewatering with air, other drying systems are also available. Hot air or steaming hoods can be used to generate additional drying energy for reducing the moisture content. The optional pressing device allows mechanical compaction with or without blowing for increased pressure gradient. Thermal and mechanical systems can also be combined.



### Phase 4: Cake discharge & cloth cleaning

The filter cake is discharged at the discharge roller as the belt advances. To assist the discharge function, a scraper is installed that strips off any cake residue still adhering to the filter cloth. All indexing belt filters are configured in such a way that the filter cloth is not damaged by auxiliary discharge equipment, such as scraper knives or discharge wires.

The filter medium is cleaned in the downstream cloth rinse box, where the cloth is sprayed at high pressure on the cake side, the reverse side or on both sides and, if necessary, dried by the vacuum system. This maximizes filter cloth life and permeability to ensure efficient operation of the indexing belt filter in the long term.



### 1 Suspension feed

Depending on the consistency of the suspension, it is possible to use distribution channels with a baffle plate, plate distributor or spoon nozzles. Slurry-feed designs are available even for viscous and rapidly settling products.

### 2 Cake washing

The cake is normally washed with full-cone nozzles for solid-free washing liquid. Overflow channels or sieve plate distributors are used for multi-stage counter-current washing by means of washing filtrates.

### 3 Vacuum tray

The fixed vacuum tray is installed beneath the filter cloth over the full length from the feed area to the cake discharge. It is divided into segregated zones corresponding to the indexing advance of the filter belt, which is supported on exchangeable grids in the vacuum tray and transported gently. Located beneath the support grids in each zone are filtrate collecting channels that are connected to the filtrate manifold via the tray outlet pipe.

### 4 Cloth tensioner

The cloth is tensioned either pneumatically or by spring assist and can be adapted to suit the respective properties of the products.

### 5 Belt tracking

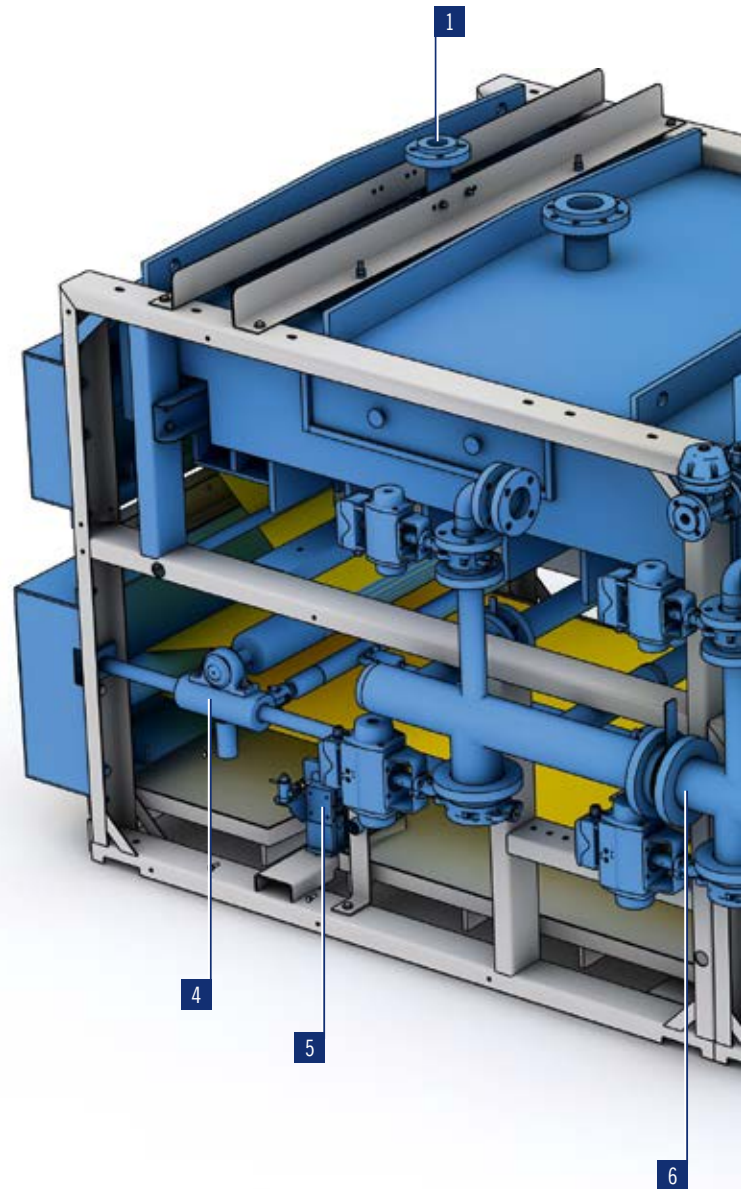
Two opposite roller pairs keep the filter belt exactly on track. If the filter belt leaves its preset path, a belt-edge sensor issues a signal to release the roller tension on the affected side. The second roller pair still active on the opposite side returns the belt to its intended position. Both roller pairs are set at a slight angle to stretch the filter belt laterally and keep it crease-free.

### 6 Filtrate outlet

Each zone of the vacuum tray is connected separately to the filtrate manifold. If different filtrates are to be exactly separated, the filtrate manifold can be divided into segments to match the process step allocation on the vacuum tray. Rapidly opening and closing shut-off valves release the vacuum while the belt is being indexed and briefly vent the filtrate chamber.

### 7 Drive & motor

The filter is equipped with an electric drive for changing throughput rates and filtration properties. This drive consists of a reduction gear unit with a directly connected frequency-controlled drive motor. Alternative drive systems utilizing a pneumatic or hydraulic stroke of the drive roller are also available.



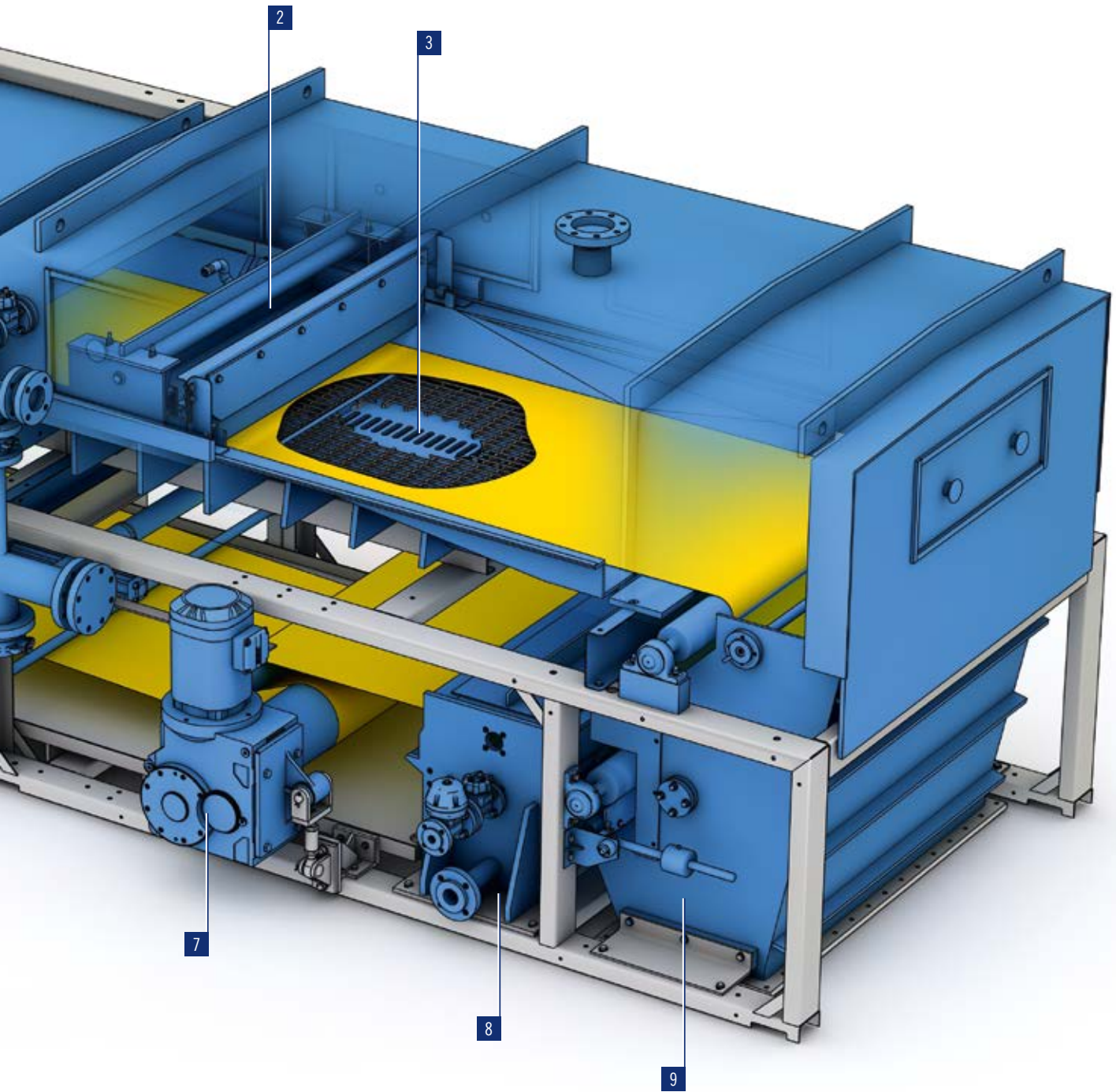
### 8 Cloth washing

Following discharge of the cake, the filter medium is cleaned in a separate cloth rinse box, where the cloth is sprayed at high pressure on the cake side, the reverse side or on both sides and, if necessary, dried by the vacuum system.

### 9 Cake discharge & scraper

The filter cake is removed from the cloth as the belt indexes over the discharge roller. Due to the small radius of this roller, cake discharge is achieved almost completely. A pivot-mounted scraper removes any residual cake adhering to the cloth.







## Pharmaceuticals

Our indexing belt filter of pharmaceutical design is state of the art and meets GMP, CIP and ATEX requirements. Our filter systems can be validated and are manufactured under the strictest quality guidelines.

Suspensions are processed in closed and inerted systems. This ensures that the final product is absolutely pure and that product quality is consistently high.

**Examples: antibiotics, natural extracts, hormone derivatives, statins**



## Biofuels

Filtration, extraction and washing of solids from liquids are the primary methods for producing biofuels and other alternative products made from renewable resources. For this application our indexing belt

filter is characterized by high performance with optimum efficiency. We offer customer-oriented machine solutions, whether for producing alternative energies or for the recycling of residuals.

**Examples: bioethanol, biodiesel**

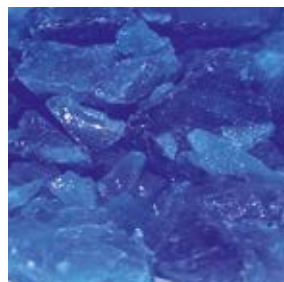


## Minerals & zeolites

Our indexing belt filters are a major component in the production process for many types of minerals and zeolites. Our filters and filtration systems ensure excellent product purity, even for thin cake layers, through

single or multiple cake washing steps (including counter-current), integrated vacuum drying and pressing.

**Examples: bleaching earth, mixed silicates, molecular sieves, alumina, FCC, catalysts, ores, lime, diatomite**



## Metal salts

Metal salts have a wide variety of applications in the chemical industry. These salts are usually separated and treated using solid-liquid separation systems. Our continuous indexing belt filter meets these processing and

treatment requirements.

**Examples: nickel salts, copper salts, aluminum salts, iron salts, magnesium salts, manganese salts, barium salts, soda**



## Cellulose products

Production of cellulose and cellulose derivatives requires special expertise with solid/liquid separation as well as appropriate machines and plant components. Our indexing belt filters have been integrated successfully

in this application around the world for many years. They meet every requirement, from single or multiple cake washing to steam drying and pressing. These systems are also certified and suitable for pharmaceutical-grade production.

**Examples: HEC, CMC**

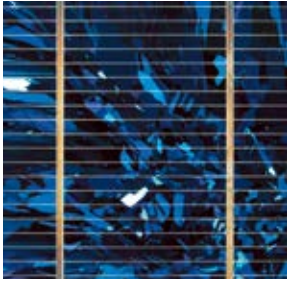


## Dyes & pigments

The production of dyes and pigments requires efficient filter systems for essential process steps such as filtration, washing and pre-drying. Our indexing belt filters cover these requirements efficiently.

Typically, a thin cake and a high level of purity are required, and our systems easily meet these requirements thanks to a variety of cake treatment options.

**Examples: azo dyes, mineral pigments, phthalocyanine, indigoids, sulfonic acid, metallic pigments**



### Silicon industry

In the silicon industry special processes have been developed to ensure optimal use of primary materials and to recover the valuable raw materials. Our indexing belt filters enable cost-effective recycling and reuse

of raw materials. Whether you want to recover silicon or the additives used in silicon processing, our systems allow for efficient processing with many different cake treatment options.

**Examples: silicon carbide, silicon, polyethylene glycol**



### Fly ash

Fly ash is either immediately disposed of or processed for use as a bonding agent in the building materials industry. BHS supplies systems for both disposal and processing. Our indexing belt filters are well-

proven solutions for treatment of fly ash, especially ash from waste incineration plants. They enable cake washing and dewatering for further processing of fly ash.



### Grease, oil & foodstuffs

Filter systems must be able to process products in compliance with food industry standards, such as an inerted environment, to ensure separation of sensitive agglomerations or gentle processing of crystalline

products. For this type of problems the indexing belt filter is the optimal solution.

**Examples: pectins, lecithins, cooking oil, cocoa butter, ascorbic acid, tartaric acid, citric acid, caffeine, starch derivatives**



### Mining

Wet mechanical separation procedures are often used in the processing of ore or industrial minerals. Our indexing belt filters or rubber belt filters are well-proven solutions for this application. The

belt filters are characterized by outstanding reliability, efficient consumption of utilities and high throughput rates. Thanks to a wide range of options, the filter can be specially configured to meet specific requirements. The filter is designed for very easy assembly, allowing cost-effective transportation even to inconvenient locations and installation on site.



### Flue gas desulfurization

Large quantities of gypsum are formed during flue gas desulfurization by cake washing. To ensure high-quality gypsum, the limit values for chlorides and residual moisture must be reliably met. Our

indexing belt filters or rubber belt filters have been well-proven solutions in this application for many years. Due to integrated washing and drying zones, the required limit values are reliably met so that the gypsum can be easily marketed or processed.

## Cake pressing device

A cake pressing device can be optionally employed to achieve an additional reduction of the moisture content by up to 50%. Pneumatic or hydraulic pressing up to 10 bar (g) as well as pressing and blowing of the filter cake are possible. Compacting rollers and press rollers are further options that can be implemented.



## Filtrate separator station

Filtrate separator stations are used for the separation of gaseous and liquid media. The filtrates are pumped out of the separators using appropriate pumps or barometrically drained. The gas is conveyed to the vacuum pump unit through a common manifold. BHS offers complete solutions tailored to the individual requirements, including piping, measurement and control technology.



## Vacuum pump unit

An optionally available vacuum pump unit can be used to generate the vacuum for the belt filter. This creates the vacuum pressure required for the belt filter to operate correctly. Liquid ring pumps are normally used for this purpose. Besides the actual pump with its drive, the unit also comprises the separator on the pressure side, the operating liquid cooler, internal piping and the required measuring and control equipment.



### Pharmaceutical version

The pharmaceutical version of an indexing belt filter is certified to EN ISO 22716 and disposes of smooth-polished surfaces. FDA-certified materials are employed and the design complies with the required GMP guidelines. In addition, a surface finish with a mean roughness index  $< 0.8 \mu$  is achieved.



### Enclosed version

Indexing belt filters of enclosed design are made of stainless steel or plastic, depending on the requirements, and ensure gas-tightness up to  $\pm 100$  mbar. Sealed systems and nitrogen circuits optimized to suit the application can likewise be incorporated. It is additionally possible for customer-specific enclosures and hood versions to be implemented, for example as a vapor-proof enclosure.

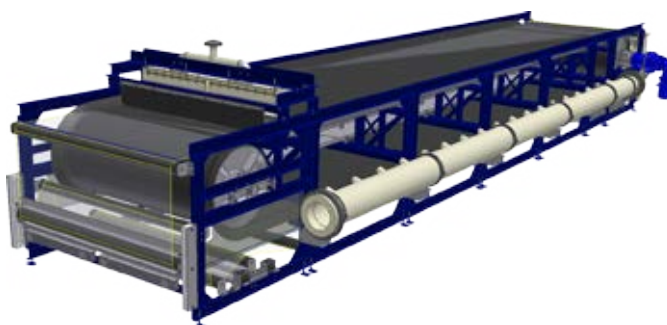


### Rubber belt filter

For high throughput rates or rapidly settling solids, BHS offers the rubber belt filter of type BFR as a continuously operating, horizontal vacuum belt filter.

An endless filter cloth with a continuous movement serves as the filter medium. A rubber belt gives the filter medium mechanical support. The rubber belt is provided with milled grooves for filtrate discharge; it runs on a roller conveyor and on wearing and sealing belts over a stationary vacuum box, where the filtrates are collected and discharged. The filter cake forms on top of the belt and can undergo further treatment by washing, steaming, extraction or vacuum drying.

BHS eliminates the sliding water with a roller system, combining higher reliability with lower water usage as compared with conventional designs.



## Tests give certainty

We perform initial tests with our pocket leaf filters. These tests can be performed quickly and easily at your location or in our well-equipped laboratory in Sonthofen. Through these tests, you can gain basic data about the filterability of a suspension and the general process information for a production filter.

For more advanced tests, even lasting for several weeks, we can rent out pilot and lab filters for all BHS filter types. Even filters of different materials are available. If necessary they can be configured client-specifically.

These filters can be used to examine filter behavior methodically and reliably. Machine parameters can be varied and alternative materials can be explored. The test results provide a sound basis for the layout of a production machine and for determining the ideal mode of operation. Therefore your decision about the investment is reliably covered.

Pilot indexing belt filter plant in closed hood for tests



## Performance data and dimensions

Type	Active filter width	Active filter length	Active filter area	Dimensions		
				Length	Width	Height
BF 010	0.1 m	1 m	0.1 m <sup>2</sup>	1.7 m	0.6 m	0.7 m
BF 025	0.25 m	2 - 5 m	0.5 - 1.25 m <sup>2</sup>	4 - 8.3 m	1.3 m	1.7 m
BF 050	0.50 m	3 - 10 m	1.5 - 5 m <sup>2</sup>	5.4 - 12.4 m	1.8 m	1.9 m
BF 100	1 m	3 - 12 m	3 - 12 m <sup>2</sup>	5.4 - 14.4 m	2.3 m	1.9 m
BF 150	1.5 m	3 - 16.5 m	4.5 - 24.8 m <sup>2</sup>	5.4 - 18.9 m	2.8 m	1.9 m
BF 200	2 m	4 - 18 m	8 - 36 m <sup>2</sup>	6.4 - 20.4 m	3.3 m	1.9 m
BF 250	2.5 m	6 - 21 m	15 - 52.5 m <sup>2</sup>	10 - 25 m	4 m	2.3 m
BF 300	3 m	6 - 25.5 m	18 - 76.5 m <sup>2</sup>	10 - 29.5 m	4.5 m	2.3 m
BF 350	3.5 m	9 - 30 m	31.5 - 105 m <sup>2</sup>	13 - 34 m	5 m	2.3 m
BF 400	4 m	9 - 36 m	36 - 144 m <sup>2</sup>	13 - 40 m	5.5 m	2.3 m

## Process criteria


Mode of operation	continuous
Operating pressure	vacuum
Operating temperature	up to 90 °C
Solids content (suspension)	up to 50% (weight)
Cake thickness	up to 50 mm
Particle size	1 - 100 µm
Filtration capacity – suspension	up to 10 m <sup>3</sup> /m <sup>2</sup> h
Filtration capacity – dry solid	up to 1,000 kg/m <sup>2</sup> h
Active filter area	0.1 - 144 m <sup>2</sup>

All specifications apply to the standard version.  
 Technical data for customized designs may differ from the specified data.  
 All technical data may change due to development.  
 Subject to modification without notice.

# BHS FIELDS OF COMPETENCE



MIXING  
TECHNOLOGY



CRUSHING  
TECHNOLOGY



RECYCLING  
TECHNOLOGY



FILTRATION  
TECHNOLOGY

