PF
Pressure Plate Filter

Recovery of clear filtrates

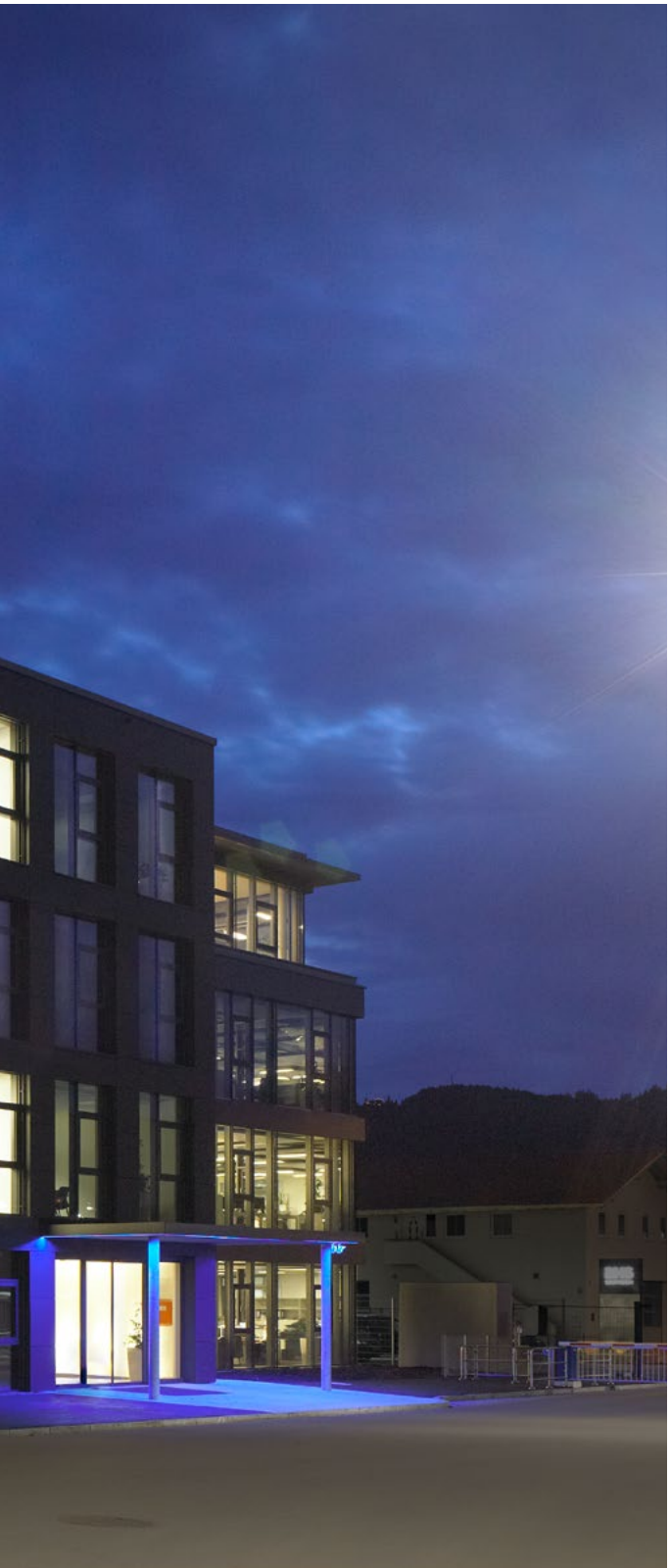
BHS SONTHOFEN

TRANSFORMING MATERIALS INTO VALUE

Headquarters 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. We have accumulated a great wealth of experience. The number of applications that have been implemented is in four figures. All BHS filters are characterized by the fact that they work with a comparatively thin cake.

System solutions

BHS has experienced project engineers at its disposal for planning and implementing complete filtration solutions. Numerous references all over the world testify to our broad expertise and experience. We are well-versed in all customary standards, including country-specific norms such as API, CSA, ASME etc.

Worldwide service

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

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BHS Pressure Plate Filter (PF)

The Pressure Plate Filter is a batch-operated filter. The plate-shaped filter elements are arranged horizontally as a plate stack inside a pressure vessel. Typical process steps are filtration, washing, drying and discharging. All these steps are carried out under pressure.

The filter is used primarily for cake-forming solid-liquid separation of suspensions with a low solids content that are moderately or extremely difficult to filter. It is also suitable for adsorptive filtration (as a deep bed or precoat filter). The BHS Pressure Plate Filter is frequently used for clarifying filtration. It is a compact unit, operates fully automatically and allows high throughput rates.

Pressure Plate Filter of type PF 1018 with 14.1 m² filter area (left) and Pressure Plate Filter of type PF 1019 with 14.9 m² filter area (right)

High process versatility

A variety of options are available for treating the filter cake, enabling the individual process requirements to be met. The cake can be washed in one or more stages. Air, nitrogen or other gases can be passed through the filter cake to achieve a greater degree of dewatering. If required, precoat filtration by means of filter aids is possible.

Vibration discharge

The filter cake can be removed by means of either slurry discharge or dry discharge. The complete set of plates with hollow shaft and drive head is placed on a flexible elastomer ring that is not in contact with the product. Two unbalance motors subject the entire set of plates to defined horizontal and vertical vibrations, causing the filter cake to break up and fall off the filter plate in a spiral pattern.

Safe pressure filtration system

The entire filtration process takes place under pressure – up to a pressure differential of 10 bar g – in a closed, gas-tight system. This enables a BHS Pressure Plate Filter to be implemented even where strict safety or hygiene regulations apply. It is also possible for products to be processed in an inerted or sterile environment. Sealing between the filter vessel and the vibrating plate stack is carried out using a static sealing collar made of elastomer or PTFE.

Fully automatic operation

The Pressure Plate Filter operates fully automatically. Once a process cycle has been completed, the filter cake is discharged by vibrating the plate stack. Following cake discharge, the next cycle begins.

GMP and ATEX

For applications in the pharmaceutical, food and bioprocess industries, we make specially equipped, GMP-compliant filter plants incorporating CIP equipment if necessary. We are also ATEX certified.

Modular, turnkey filtration skids

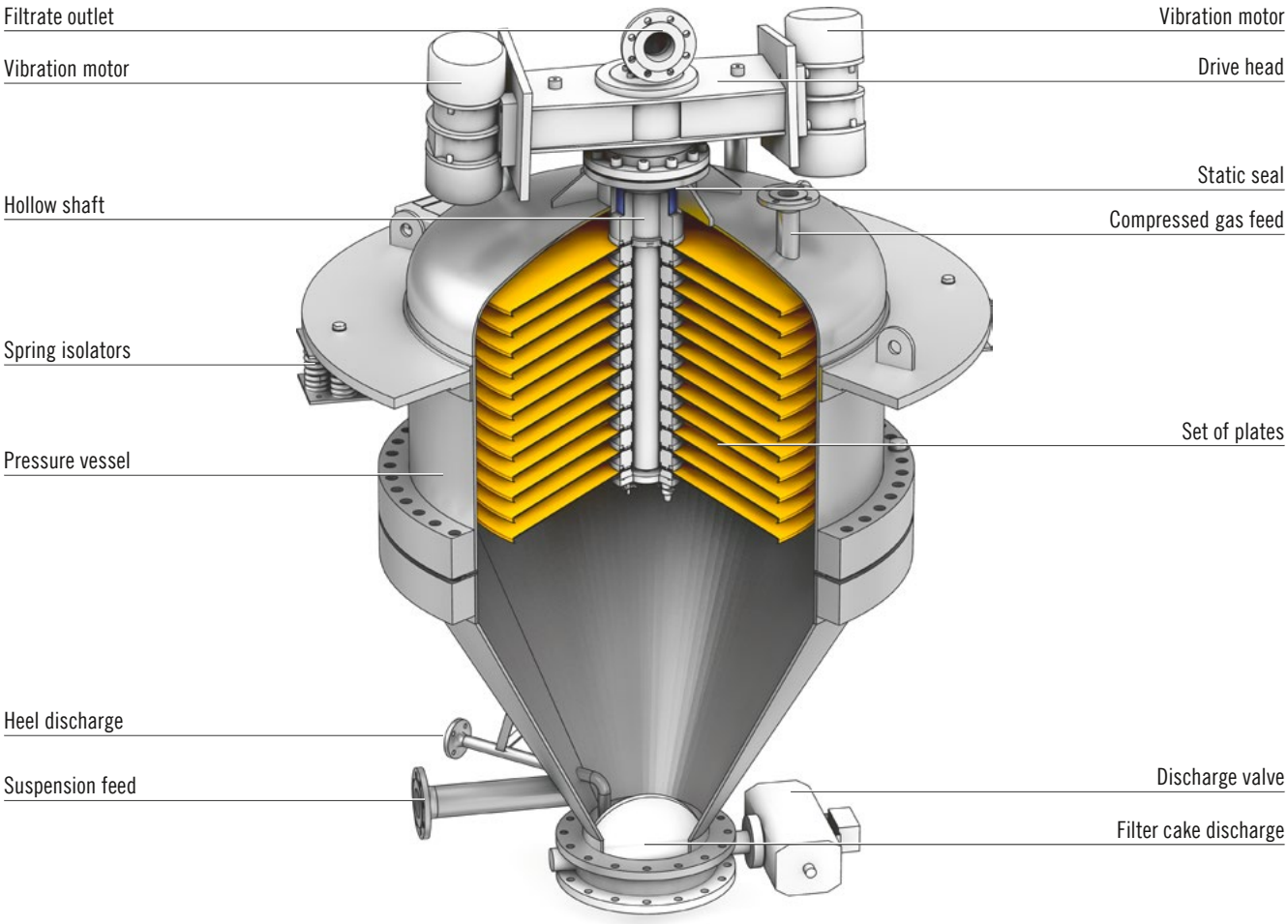
On the basis of the Pressure Plate Filters, BHS has developed a modular system of turnkey filtration skids. The advantages of these tried-and-tested system solutions are their short delivery times and low installation requirements on site. The modules are designed to allow cost-effective transport to the construction site in ISO containers.

Energy-efficient and low-maintenance

Unbalance motors are required for cake discharge with only low drive power (0.3 to max 2.0 kW depending on size). This is an advantage over alternative design principles, which require a higher energy to generate a rotation of the set of plates. In addition, there is no need for a rotating shaft feedthrough including sealing against the pressure vessel. The uncomplicated design leads to savings in energy and maintenance costs.

Pressure Plate Filter of type PF 1019 with 14.9 m² filter area

Structure of a Pressure Plate Filter



Functional description

Set of plates and cake formation

The individual filter plates consist of slightly conical stainless steel plates. On the surface is a coarse-mesh backing screen that supports the actual filter cloth. The filter cake builds up on the filter cloth. The prevailing pressure differential causes the clear filtrate to flow into the backing screen area and from there to the central collecting pipe. The filter plates are connected to each other via hubs with special toothing and tie rods to produce a form fitting connection. The filter cloth is fastened to the shaft side by means of the hub seal and to the plate rim by a clamping ring.

Shaft seal

Sealing between the hollow shaft and the filter vessel is carried out in the BHS Pressure Plate Filter using a radially acting static sealing collar. Compared with dynamic solutions, this static sealing of the process space offers very high system reliability, even in challenging operating conditions.

Heel filtration

After a filtration cycle, the heel volume in the lower part of the vessel is forced out through the vessel discharge pipe by means of compressed gas. Additional filter plates with a reduced diameter can be used to reduce the heel volume in the vessel cone. For further, virtually complete heel filtration, an additional filter cylinder can be flange-mounted at the bottom of the vessel.

Typical process steps

Cake formation

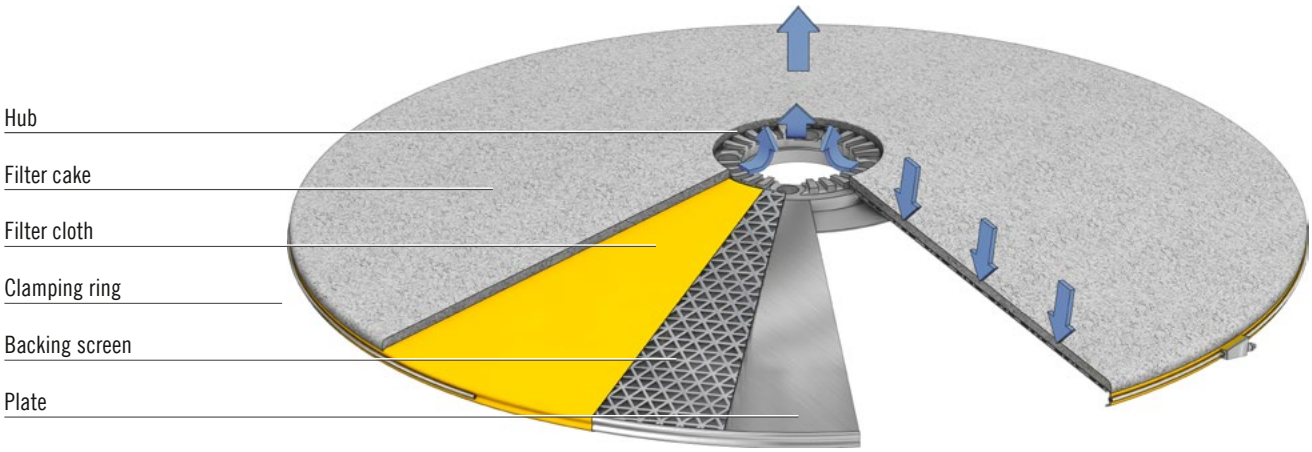
During the filtration cycle, the solid particles are deposited as a filter cake on the surface of the slightly conical plates due to the applied pressure differential. The filtrate is discharged through the backing screen, the plate hub and the hollow shaft (blue arrow).

Cake drying

Mechanical cake drying is realized by blowing gas or steam through the filter cake. The exhaust gas flows through the hollow shaft and upwards through the filtrate pipe. Alternatively, the cake can be discharged as slurry.

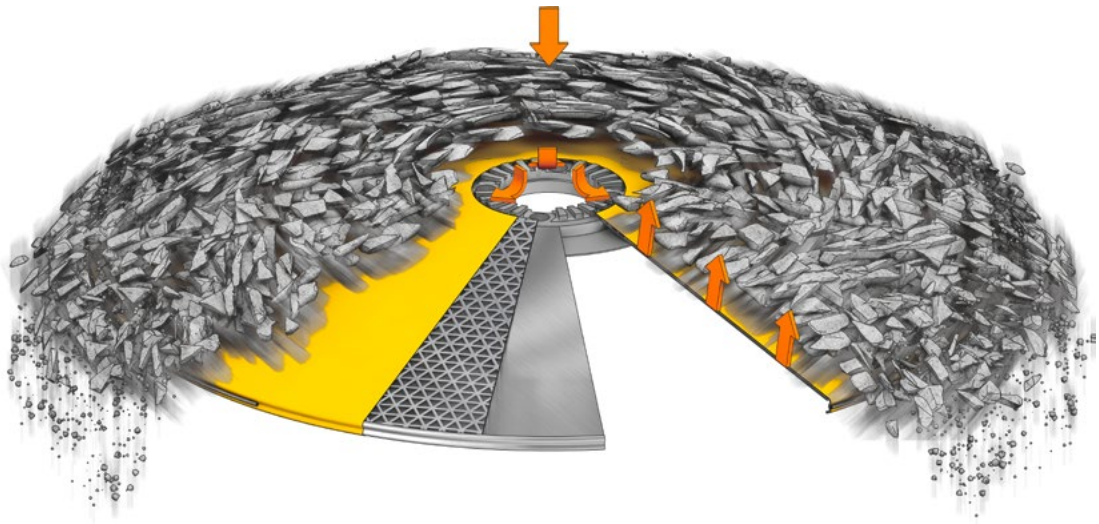
Cake washing

Displacement washing or recirculation washing in filtration direction can be supplied.



Cake discharge

After the end of the process cycle, the discharge valve opens. The filter cake is located on the filter plates. The set of plates is subjected to defined vertical and horizontal vibrations by unbalance motors. Spring isolators on the vessel prevent the vibrations from being transferred to the foundation. Additionally, gas is blown back from the filtrate side under a slight overpressure (orange arrow). The cake begins to crack and the solids are moving outward over the rim of the plates. From here the filter cake falls into the vessel cone and is discharged through the discharge valve.



BHS manufactures Pressure Plate Filters and corresponding skids for diverse applications. These are based on a range of standardized modules for skids from 0.33 m² to 45 m² filter area. BHS also makes individually engineered filter skids to customer specifications.

The BHS plate filter skid consists of the following four main components:

» Pressure Plate Filter
» Piping with fittings and measuring instruments
» Steel structure
» PLC Controls

The skid can be supplemented and expanded with further accessories.

Process solution

Besides the machinery itself, BHS also offers complete process solutions in the area of solid-liquid separation. Upstream and downstream process steps can be planned and integrated in addition to the actual filtration.

Modularization

All BHS plate filter skids are of modular design which reduces the planning effort and allows preassembly at the factory as well as comprehensive testing prior to shipment (FAT). On-site installation time is thus reduced and short overall delivery periods are possible. The modules can be combined to meet the individual process requirements.

ISO containerization

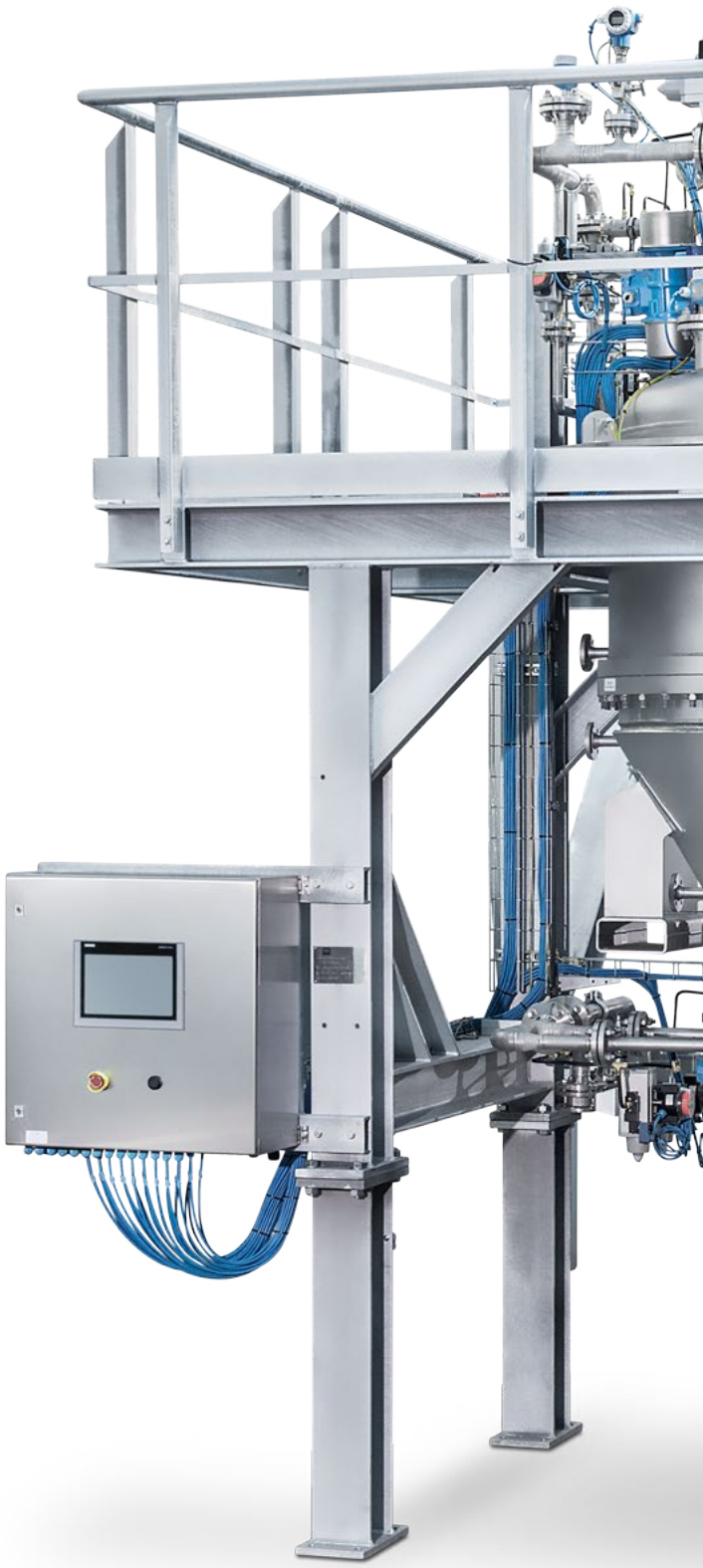
The modules installed in the skid can be shipped in ISO containers. This permits cost-effective and uncomplicated transport worldwide.

Interfaces

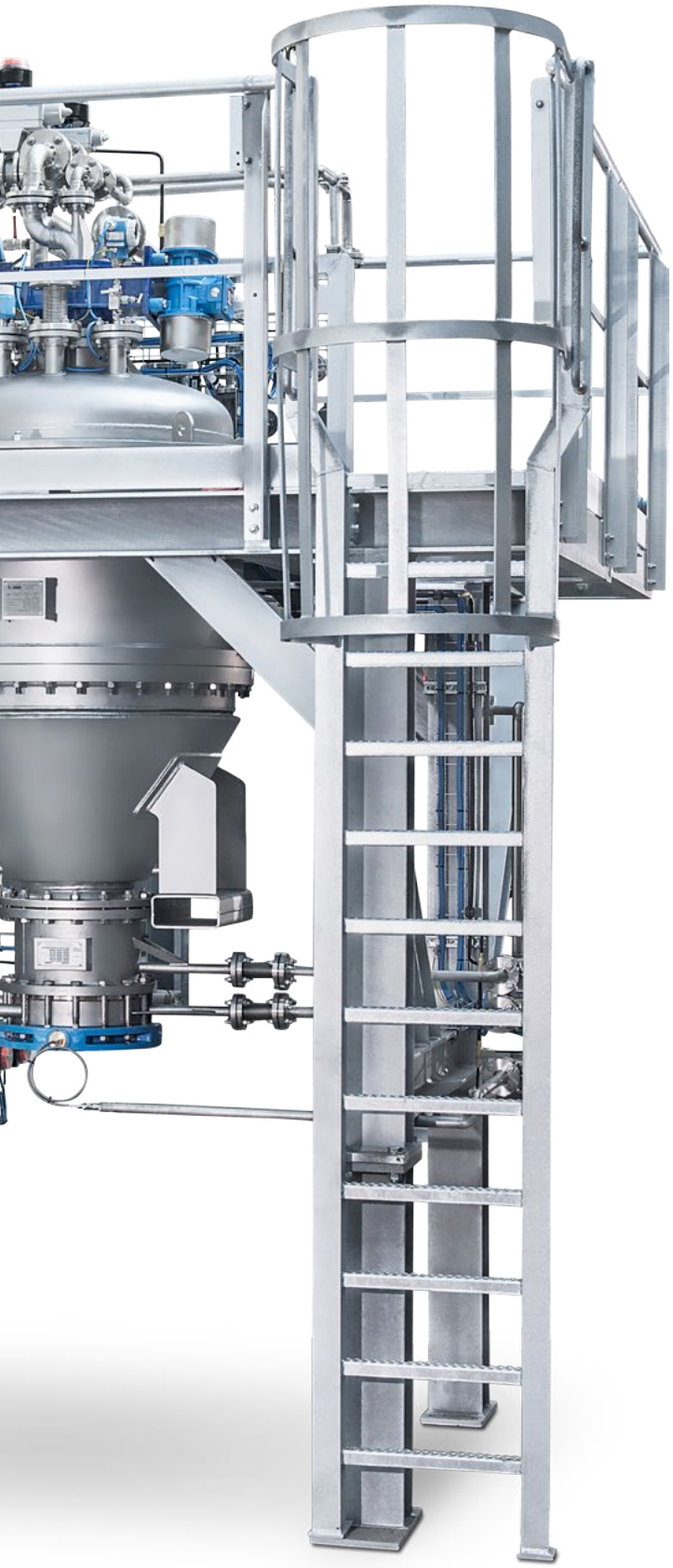
Timely and complete clarification of interfaces is an integral part of our project planning. We create foundation plans and detailed isometric drawings for the piping. All connection points are precisely defined.

Documentation

BHS has extensive experience in the production of engineering documentation conforming to international standards.



Pressure filter plant of type PF 0713 with 5.8 m² filter area



Heel filtration device

The heel filtration device enables the residual volume to be processed on completion of the filtration cycle by means of an internally filtering cylinder at the vessel cone. This ensures complete heel filtration with a minimum of compressed gas.

Precoat or body feed

In certain cases a precoat or body feed is required to help with filtration. They are used to suspend powdery filter aid. The precoat operates in batch mode, whereas the body feed runs continuously. BHS provides the precoat or body feed system including tanks, pumps, agitators, automated feeding etc. which is fully integrated with the filtration package.

Further accessories

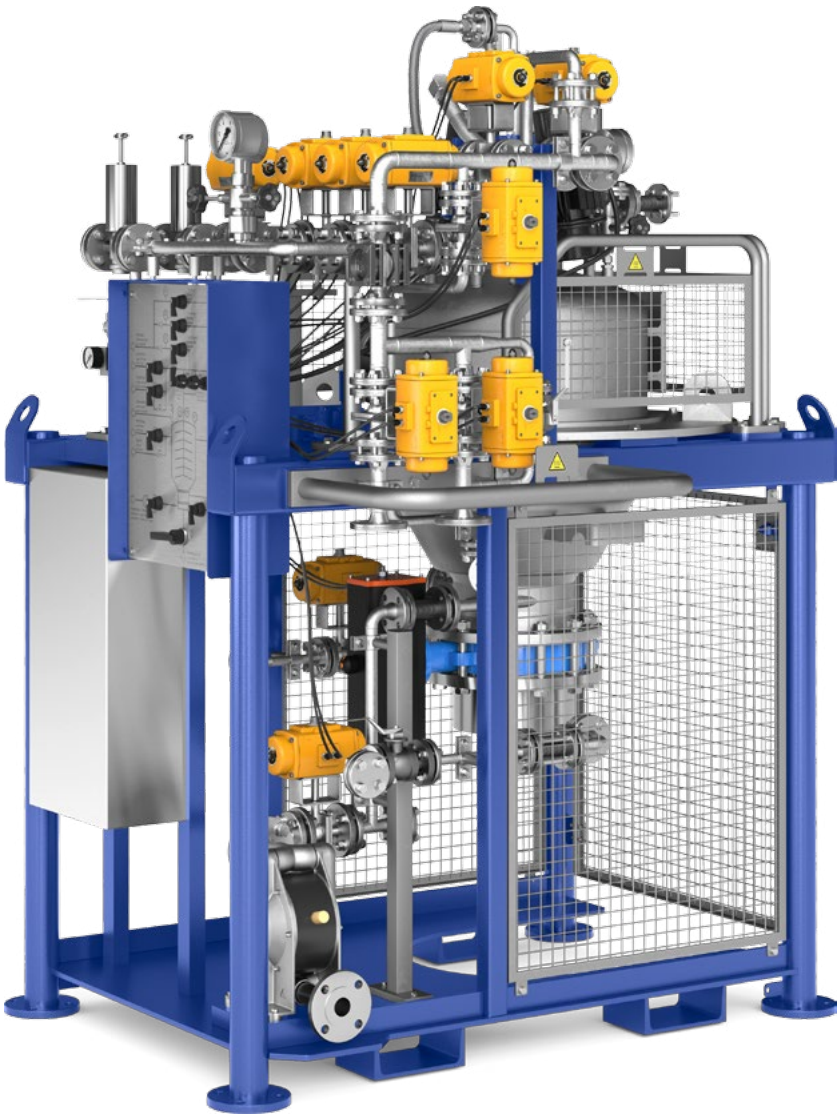
We can integrate additional accessories into the plate filter skids as required by the application, e.g. polishing filters or activated carbon filters.

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 any of BHS locations worldwide. Basic data can thus be obtained about the filterability of a suspension and the general design of a production filter.

For more extensive tests, even spanning several weeks, we can rent out pilot and lab filters for all BHS filter types. Filters made of different materials are also available. If necessary, the filters can be equipped to meet specific customer requirements.

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.



Pilot plate filter skid of type PF 0406 with 0.6 m² filter area for customer-specific testing on site

Performance data and dimensions

Type	Plate diameter	Filter area/plate	Number of plates	Active filter area	Vessel diameter
PF 04	400 mm	0.11 m²	3 - 6	0.33 - 0.67 m²	550 mm
PF 07	760 mm	0.42 m²	4 - 15	1.7 - 6.3 m²	1,000 mm
PF 10	1,010 mm	0.78 m²	7 - 30	5.5 - 23.4 m²	1,300 mm
PF 14	1,440 mm	1.5 m²	16 - 30	24 - 45 m²	1,800 mm

Process criteria

Mode of operation	batch
Operating pressure	up to 10 bar (g)
Operating temperature	up to 250 °C
Solids content (suspension)	up to 10% (weight)
Cake thickness	up to 60 mm
Particle size	starting from 0.5 µm
Filtration capacity – suspension	up to 4 m³/m² h
Filtration capacity – dry solid	–
Active filter area	0.35 - 45 m²

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

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MIXING TECHNOLOGY

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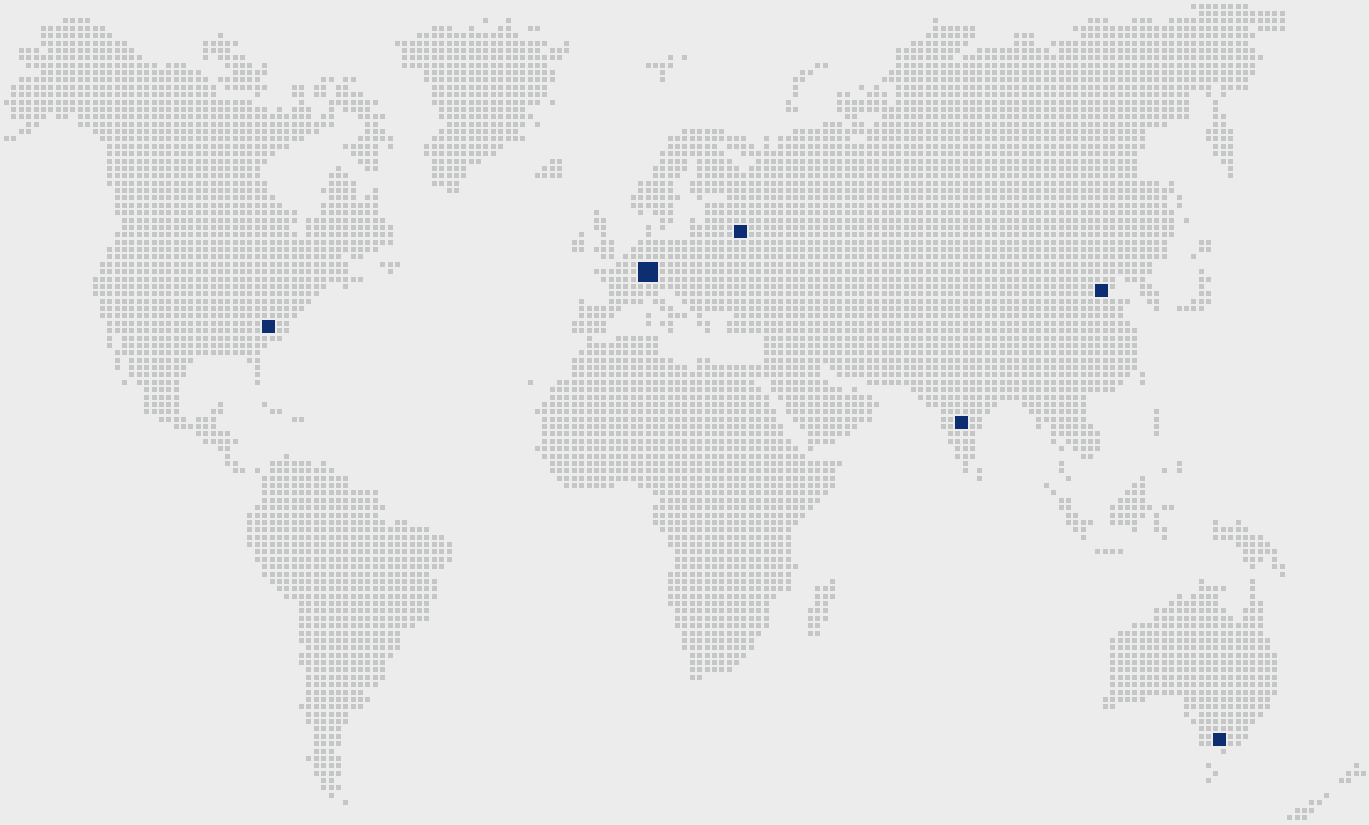

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