Pusher centrifuge SHS

Efficient separation of solids and liquids
Our administration building at Raffelbergpark in Mülheim an der Ruhr

The factory located in the industrial area of Mülheim on Weseler Strasse

View of the Technical Center on Weseler Strasse
The SIEBTECHNIK pusher centrifuge fulfils its separation task reliably and efficiently in numerous applications for the chemical, pharmaceutical and food industries. Its strengths are most evident for special process requirements: long retention times, low solids loss in the filtrate, low crystal breakage and abrasion, intensive solids wash and minimum wear. These features make it an outstanding machine for most crystalline products, e.g. sodium or potassium chloride, sodium, ammonium and ferrous sulfate, but also as a solution to dewater “exotic” products like granulate, seeds, fibers, and crushed animal-bones (or your product?).

While a trend to standardization is generally observed, SIEBTECHNIK continues to focus on details. Our specialists design and construct this machine for standard products, but also in cooperation with customers for special or difficult applications. In this manner, optimum efficiency can be achieved and individual requirements met.

We are your partners!
The pusher centrifuge belongs to the group of continuously working filtration centrifuges. The solids are retained as a cake on the wedge wire basket and transported by an oscillating step-by-step movement of the inner basket axially in the direction of the solids discharge. With the pusher centrifuge, the transport speed of the solids on the wedge wire basket is slower than with a worm/screen centrifuge. This results in a longer retention time of the material allowing increased wash efficiency and lower discharge moistures.

The size of the separated solid particles is preferably greater than 80 µm. The thick, dense filter cake ensures a good yield of even very fine particles.

Both factors – long retention time and dense filter cake – allow additional dewatering of solids with high fines content coming from other types of filters, e.g. filter press or belt filters.

A diverse range of pusher centrifuges has been designed and supplied by SIEBTECHNIK for a wide variety of products. These proven designs can be used for similar applications or as a basis for a new process or product.

Currently we manufacture 13 sizes with internal basket diameters from 250 mm to 1,200 mm. SIEBTECHNIK pusher centrifuges are designed with one, two or three stage rotating parts depending on the application and filtration rate of the product concerned.

Which design is correct for your use is dependent on operational factors:

- Type of product
- Capacity
- Particle size
- Solids concentration
- Product washing
The outer basket is a cylindrical-conical (ZK) for many products. Our “ZK” design increases the release of the trapped liquid inside the filter cake. The conical section of the “ZK” machine also reduces the energy required to transport the solids to discharge.

The patented filling system with acceleration cone and ring pocket ensures extremely gentle acceleration and uniform distribution of the solids. Even with unfavorable feed conditions, this results in reduced abrasion in the feed zone of the centrifuge. This same ring pocket can be equipped with a screening element to predewater the slurry before it reaches the screen basket. This optimizes cake formation in the feed zone of the machine and allows lower feed concentrations to be successfully handled by this machine design.

Separate mother liquor and wash liquid discharges can be supplied via internal partitions within the filtrate area of the product housing.

Advantages from SIEBTECHNIK pusher centrifuges due to product requirements:

- a long retention time for solids is required
- the loss of solids in the filtrate must be low
- crystal breakage and abrasion must be low
- intensive washing of the filter cake is required
- high abrasion from product expected
- slow solids transport speed
- thick, dense filter cake (inherent filtration)
- no mechanical stress by transport elements, patented filling system
- direct spray of the washing medium onto the cake
- low transport speed, wedge wire screen in direction of transport, wear resistant materials of construction, patented filling system
Available sizes - Type SHS

<table>
<thead>
<tr>
<th>Nominal basket diameter</th>
<th>250-300</th>
<th>350-400</th>
<th>450-500</th>
<th>600-700</th>
<th>800-900</th>
<th>1000-1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length app. mm</td>
<td>1,500</td>
<td>1,750</td>
<td>1,900</td>
<td>2,600</td>
<td>2,750</td>
<td>3,600</td>
</tr>
<tr>
<td>Width app. mm</td>
<td>850</td>
<td>950</td>
<td>1,100</td>
<td>1,800</td>
<td>2,000</td>
<td>2,500</td>
</tr>
<tr>
<td>Height app. mm</td>
<td>950</td>
<td>1,020</td>
<td>1,100</td>
<td>1,700</td>
<td>2,000</td>
<td>2,200</td>
</tr>
<tr>
<td>Operating weight app. kg</td>
<td>850</td>
<td>1,100</td>
<td>2,100</td>
<td>5,500</td>
<td>9,500</td>
<td>15,000</td>
</tr>
</tbody>
</table>

We reserve the right to make alterations necessitated by technical progress or process requirements.

Its high degree of adaptability enables the SIEBTECHNIK pusher centrifuge to be successfully used in a wide product range, examples are:

- ABS polymerisate
- Adipic acid
- Ammonium chloride
- Ammonium hydrogen carbonate
- Ammonium molybdate
- Ammonium sulphate
- Animal bone
- Calcium nitrate
- Calcium propionate
- Chloride hydrate
- Copper sulphate
- Dicalcium phosphate
- Fibrous materials
- Flotation concentrate and residue from the potassium industry
- Foodstuffs applications
- Glauber salt
- Granulate
- Hexamine
- Ferrous sulphate
- Melamine
- Methacrylamide
- Milk sugar
- Nickel sulphate
- Pentaeritritol
- Phosphate
- Potassium chloride
- Potassium nitrate
- Potassium sulphate
- Rape coarse grain
- Seed grains
- Silicone fluoride
- Sodium acetate
- Sodium chlorate
- Sodium chloride
- Sodium formate
- Sodium carbonate
- Sodium nitrate
- Sodium perborate
- Sodium sulphate anhydride
- Sorbic acid
- Soya coarse grain
- Tartaric acid
- Various mixed salts
- Zinc sulphate

![Diagram of pusher centrifuge with dimensions](image_url)
Machine Design

The SIEBTECHNIK pusher centrifuge shows clear separation of the:

- Process area
- Bearing and drive assemblies
- Hydraulic mechanism

The rotating parts are in a horizontal position, ensuring easy access to the product side and drive. This centrifuge has a modular design to meet constructional and operational criteria. The basic element is the machine housing which includes:

- the bearing area
- the drive for the rotating and pushing movements
- the pump unit (including the electrical-hydraulic control system)

The basic machine housing is subdivided into two separate chambers:
- The 1st chamber serves as an oil reservoir for the hydraulic oil including the internal oil cooler.
- The 2nd chamber is designed to be filled with concrete, making any additional foundation requirements unnecessary.
The rotating parts are driven via V-belt transmission. The basket speed can be changed by installing different V-belt pulleys or the use of a frequency converter.

The pushing parts are operated by a modern electrical-hydraulic system. The oil volume and oil pressure is supplied by a motor-driven screw spindle pump. All hydraulic components are mounted on a common plate that bolts to the top of the machine housing over the oil sump. In addition to the pump, the valve unit, pressure gauge, thermometer or thermowell, return hydraulic line and vented fill port are mounted to this “hydraulic aggregate”. This allows quick and easy exchange if any maintenance or troubleshooting is required, greatly reducing downtime.

The pushing mechanism is monitored by an SPS control system which is included with supply of the machine.

**Construction characteristics and features**

- **Exact separation of the pusher hydraulics and bearing system with secure sealing - no high pressure oil near the product.**
- **The hydraulic multipath rotating unit is externally mounted and easily accessible.**
- **The hydraulic control unit is also externally mounted and contains an integrated safety valve.**
- **Stroke length is controlled via limit switches mounted at the rear of the machine and can be readily and easily adjusted; this is totally independent of pressure setting.**
- **Pump unit is submerged in the machine housing, but easily accessible, on the "hydraulic aggregate", - this mounting arrangement yields low noise level during operation.**
- **Automatic continuous lubrication of the main bearings via hydraulic oil drip feed.**
- **Due to vibration isolators no special foundation or support is required.**
Materials

Dependant on the application, all product contact parts are fabricated of stainless steel, austenitic steel, special bronze, Hastelloy, nickel, titanium, etc. For high wear abrasive products, we protect vulnerable areas with wear-resistant materials.

Special executions

- Filling system with pre-dewatering (DBP)
- Product feed via screw feeder
- Separate discharge and ventilation of mother-liquid and washing liquid with double-filtrate cyclone
- Gas-tight execution
- Explosion-proof execution in accordance with Directive 94/9/EC (ATEX 100a)
- Food-service execution
- Other special executions available on request
The product’s centrifuging factor and retention time are parameters affecting the capacity of the centrifuge both for screening as well as for decanting machines.

G-force calculation ($z$)

$$z = \frac{V^2}{r \cdot g} \approx \left( \frac{n}{30} \right)^2 \cdot r$$

Calculation of the peripheral speed

$$v = \frac{\pi r n}{30} \text{ [m/s]}$$

- **Speed**: $n = [\text{min}^{-1}]$
- **Diameter**: $D = [\text{m}]$
- **Radius**: $r = D/2[\text{m}]$