filtration
chemap®

filtration chemap® by Infolabel AG Grossrietstrasse 7 CH-8606 Nänikon/Uster

EN

Chemap-Filter – multi-purpose applications of a process filter

The closed self-cleaning Chemap-Filter for the separation of solids from liquids can be used fully automatic in batch, as well as continuous processes. For use in continuous processes, two filters are required which alternately filtrate and regenerate. In the following applications the Chemap-Filter has been chosen because of one or several of its particular benefits. These applications only show a small abstract of the vast possibilities of the Chemap-Filter and where it has been used successfully thousands of times over the past decades.

Chemical

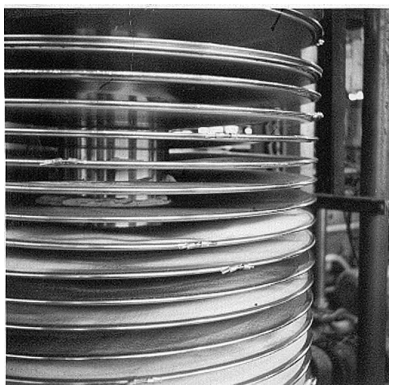
In chemical processes in which expensive catalysts such as palladium, ruthenium, etc. are used, the lossless separation of solids and fluids in a closed system is crucial. The Chemap-Filter makes everything possible, from recirculation back to the reactor to the final discharge of a dried filter cake for further use or recycling.

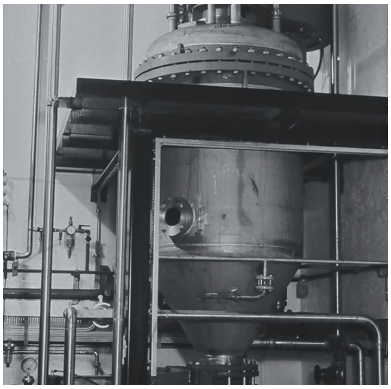
Pharmaceutical

The Chemap-Filter is used in the pharmaceutical industry, where solids are separated from liquids, washed, dried and then completely discharged in a closed system under sterile conditions. Filters supplied to this industry undergo a special surface treatment.

Food

To a considerable extent, the closed Chemap-Filter meets the growing requirements on filtration by the food industry, where higher and higher standards are placed on product quality and the cleanliness of the filter system.





Environment

People today are becoming more environmentally aware, and therefore ecologically friendly technologies and the use of renewable resources are becoming increasingly significant.

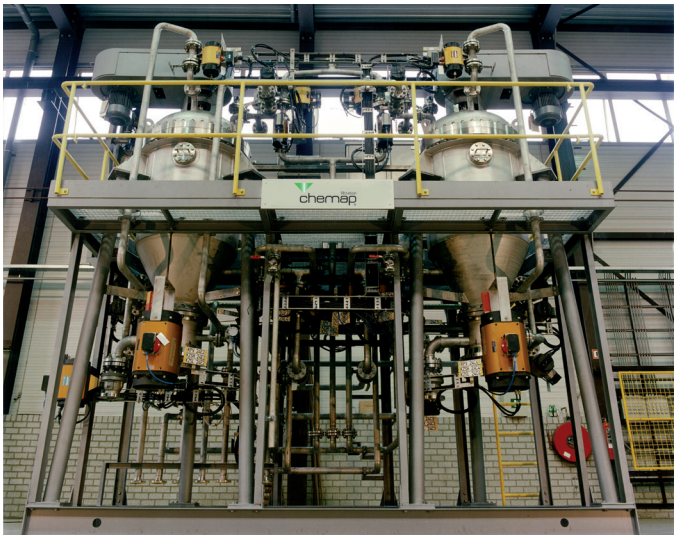
Chemap-Filters practically operate without additional input of energy. Because of its versatile range of applications, the filter is also suitable for recycling tasks, for example in the area of environmental protection and in the processing of contaminated materials. The filters can therefore also be found in nuclear power plants, where they are used for the filtration of different waters and to ensure that no radioactive particles can harm people or the environment.

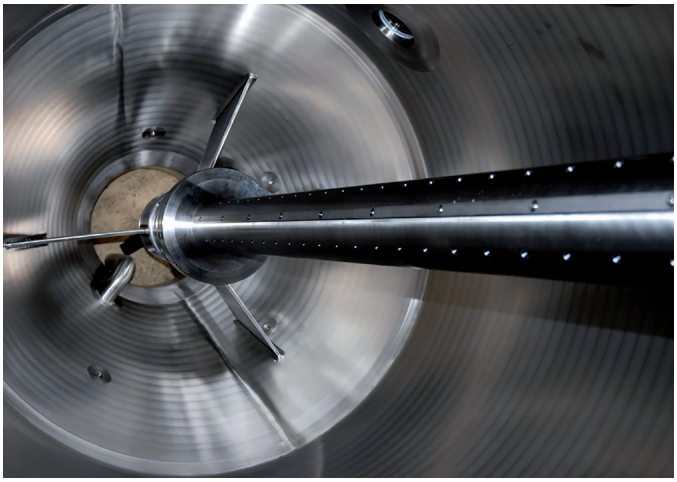
Textiles

Special processes have been developed for the filtration of basic products for the manufacturing of fibers. The typical construction of the Chemap-Filter allows cost-effective cleaning of the filtration surface with minimal use of washing fluid. Because of the cascade washing process, it is no longer necessary to fill the filter vessel completely.

Machine industry

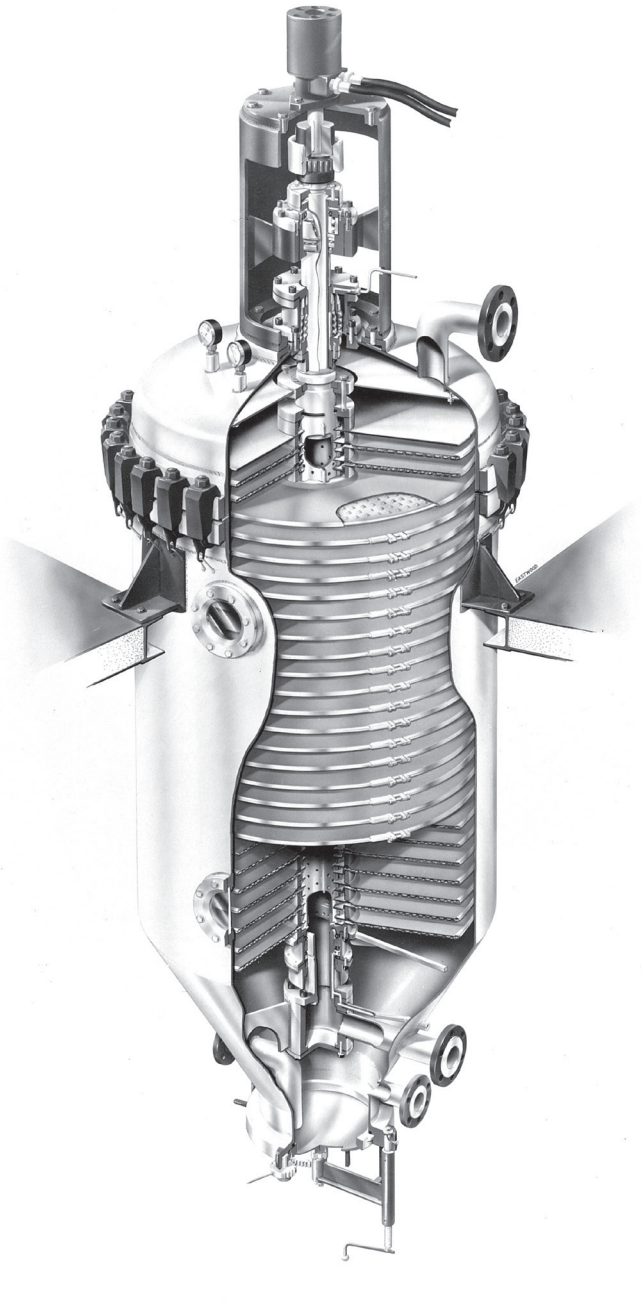
Cutting, grinding and honing oils, which are commonly used in large quantities in automotive and machine factories, are regenerated with a high purification level on the Chemap-Filter.





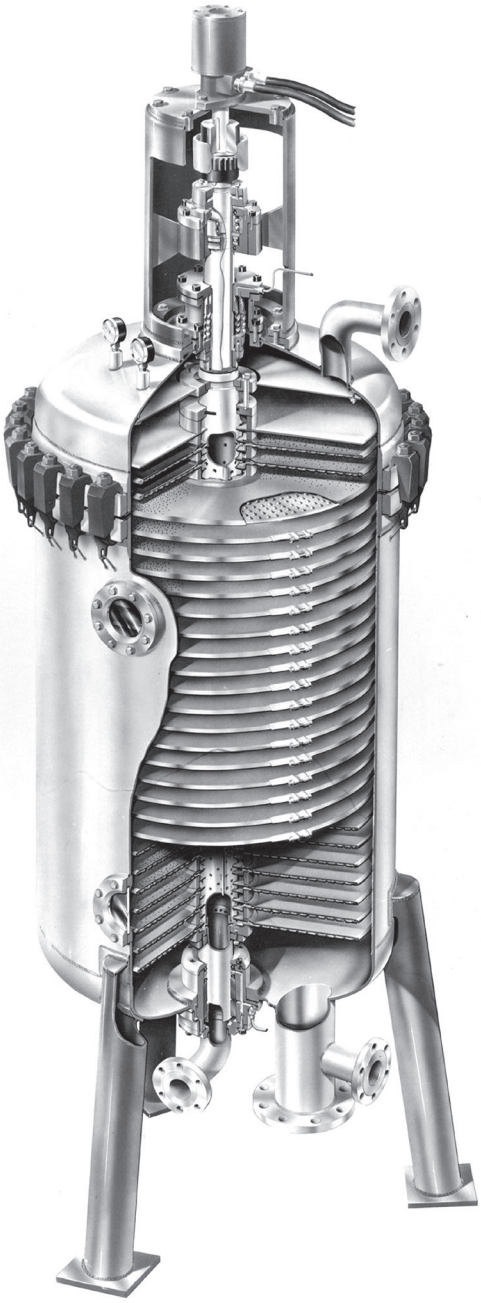
Chemap-Filter type R

For the output of the filter cake in dry form



Chemap-Filter type A

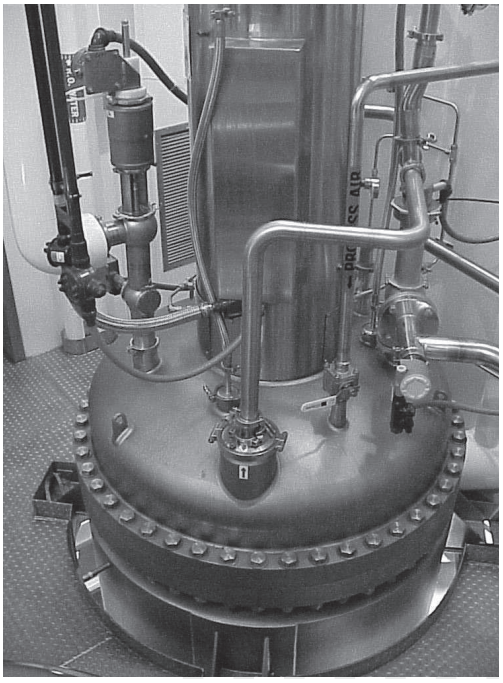
For the output of the filter cake in wet form

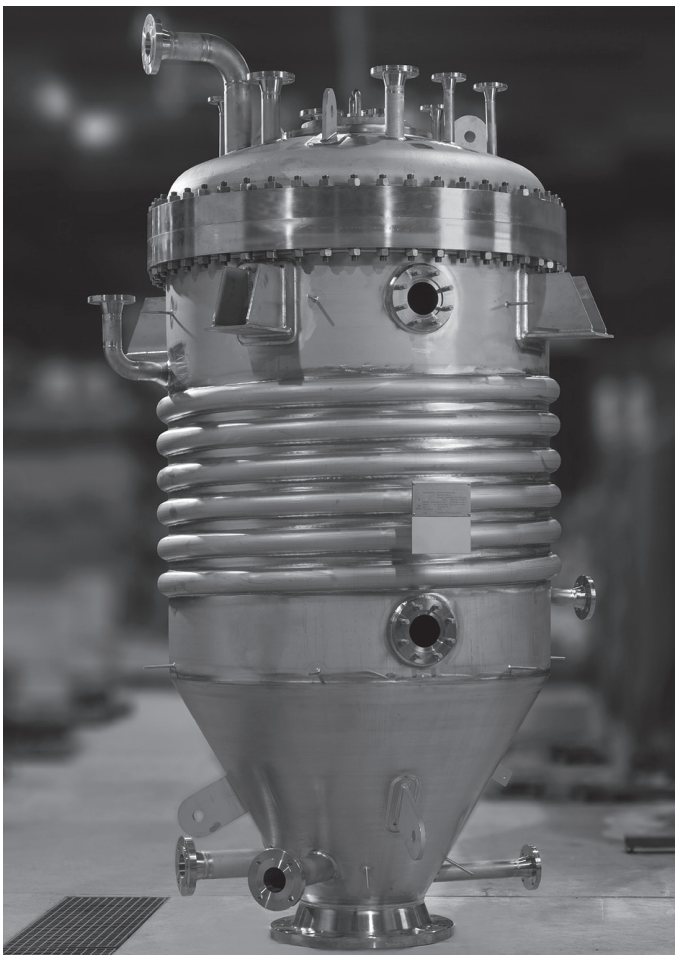


Round, slightly conical filter plates, which are covered with the filter screen or cloth, are stacked horizontally over each other on a rotatable hollow shaft to a plate stack, which can be put into rotation using the drive sitting on top of the filter.

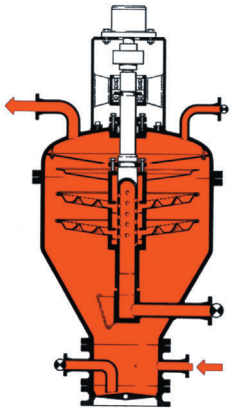
The liquid to be filtered fills the filter vessel with the stationary filter stack, passes through the filter plates into the hollow shaft and leaves the filter as a clear liquid through the filtrate nozzle connected to the shaft. The solids remain on the filter screens or cloth as a filter cake.

At the end of a filtration the filter vessel is emptied and the cake is spun from the plates, through the rotation of the filter stack. It falls down through the space between the stack and the vessel shell and exits through the outlet nozzle in dry or wet form. This procedure is precisely coordinated for every filtration, and depending on the type of process it is supported and supplemented with other different procedures.



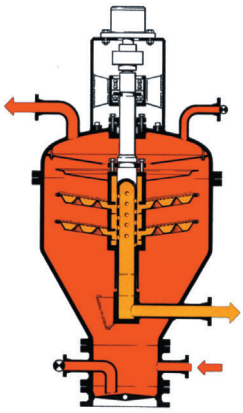


The different phases of the Chemap-Filter in the closed system



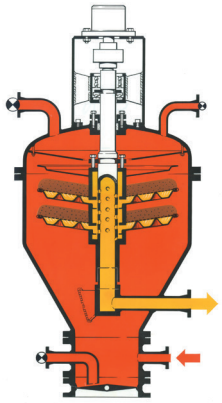
1 Filling and homogenizing

The vessel is filled with unfiltered product or pre-coat, and circulated through the overflow nozzle for an even suspension.



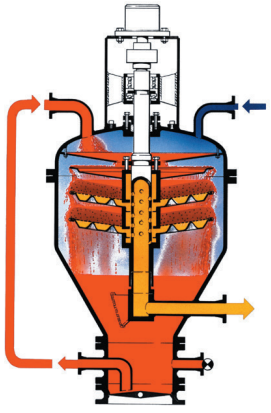
2 Pre-coating / pre-filtration

The suspension is circulated through the filter elements to produce a porous pre-coat layer. For solids with quick sedimentation, a partial flow is recirculated via the overflow nozzle.



3 Filtration

The filtrate passes through the building filter cake, filter plate and spacer ring area to the hollow shaft and filtrate outlet.

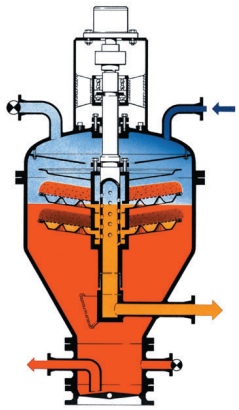


4 Heel volume filtration

After filtration and / or washing, the heel liquid is recycled by pump into the vessel head from the bottom outlet, with filtration pressure created by compressed gas. Product recovery is maximized by this process, which is faster and more efficient than systems utilizing scavenger plates.

Via the distribution and overflow plates, the medium flows as a cascade over the filter stack and fills the conical area above the filter cake with fluid and flows out through the hollow shaft.

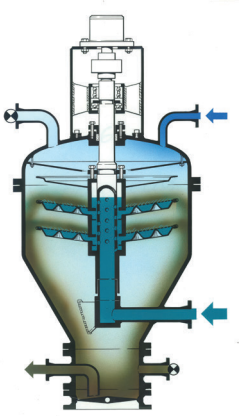
This procedure goes on until the vessel is emptied. If no more liquid is being pumped to the top, any fluid remaining on the cake is pressed out by the gas pressure. At the following gas breach the heel volume is filtered.



5 Drainage

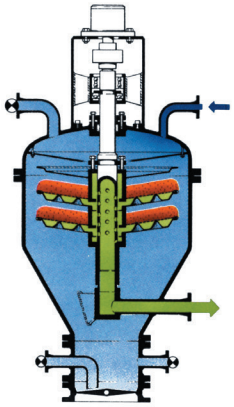
At the end of filtration, if no heel volume filtra-

tion is required, the remaining filter volume can be drained back to the product tank using gas pressure. There, the clear filtrate line must remain open, so that it is simultaneously possible for a flow to pass through the cake into the filter plates. This prevents flooding of the cake.



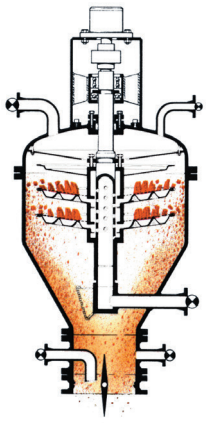
6 Discharge of the wet filter cake

After draining, the wet filter cake is spun by rotating the filter stack and leaves the filter through the cake outlet nozzle.
This process can be supported through the addition of a clean rinsing fluid (water, filtrate, etc.) against the filtration direction. If the slurry cannot flow away using gravity, it has to be discharged by using gas pressure.



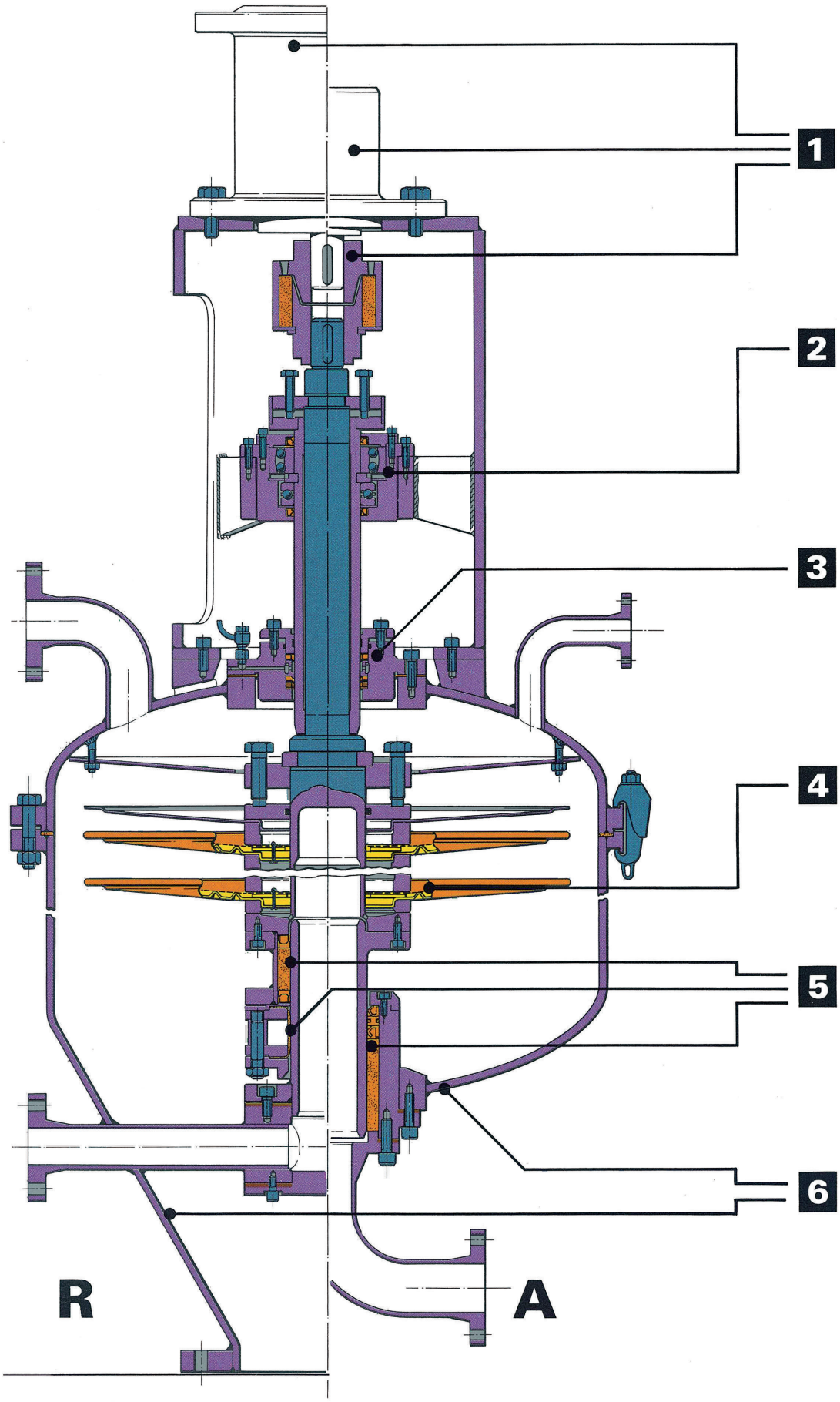
7 Heating, drying

If the cake has to be discharged in dry form, it is heated with steam and then dried by blowing air or nitrogen.
Heating and drying can also occur through the direct use of hot gas.
Advantageously in this process, the filter vessel is loaded not continuously, but rather several times and then released via the clear filtrate line.



8 Discharge of the dry filter cake

Here the filter stack rotates with an opened cake outlet nozzle. The dried cake is spun with centrifugal force off the plates and then falls down into a container in bulk form or a less rough grain.
In many cases, only some of the described steps are required.
The additional cylindrical part on the cake outlet nozzle shows the RA model, which is required for an optional discharge of dry or wet filter cake, e.g. during catalyst filtration.


1
2
3
4
5
6
R
A

The features of the Chemap-Filter

1 Filter drive

The filter drive, hydraulic or electric, is connected to the filter shaft via an elastic coupling; the hydraulic one directly, and the electric drive via a gearbox for a vertical layout and via a V-belt reduction for a horizontal layout. The torque from the electric motor to the gearbox is transferred via a hydraulic start-up coupling.

2 Upper bearing

A radial ball-bearing takes up part of the radial forces during rotation. An axial bearing underneath carries the entire weight of the filter stack. The upper bearing is arranged separately from the upper seal and cannot be reached by the medium in the event of leakage.

3 Upper seal

The sealing surface of the upper seal is located on a corrosion-resistant bearing sleeve on to which the filter stack is suspended. The sealing options available are lip seals with or without flushing, mechanical seals and hydraulic bellow seals. The bellow seal is closed during filtration and is open during rotation.

4 Filter plate

The filter plates with the spacer rings and gaskets piled up to a filter stack on the hollow shaft are tightly tensioned against the filter shaft support under the lowest plate, whereas the top plate is a non-filtering flow protection plate. The cross-section on page 10 shows the arrangement of the individual elements such as the filter screen, support screen, clamp ring, dimpled plate, passage ring and gaskets. Due to the slightly conical shape of the plate, the complete draining of liquid is ensured.

5 Lower bearing and seal

In the R-filter, the rotating bearing and seal is connected to the filter shaft while the spigot is mounted on to the lower bearing support in the filter vessel.
This arrangement can also be supplied for the A-filter. In the arrangement of the A-filter shown, the spigot is connected to the filter shaft while the seal is mounted from the bottom to the filter vessel. The lower bearing consists of a bearing sleeve whose materials are made of teflon, carbon, etc. with a lip seal on both sides. In the R-type under the bearing the so-called teflon sleeve guarantees the highest filtrate purity.

6 The filter vessel / pressure vessel

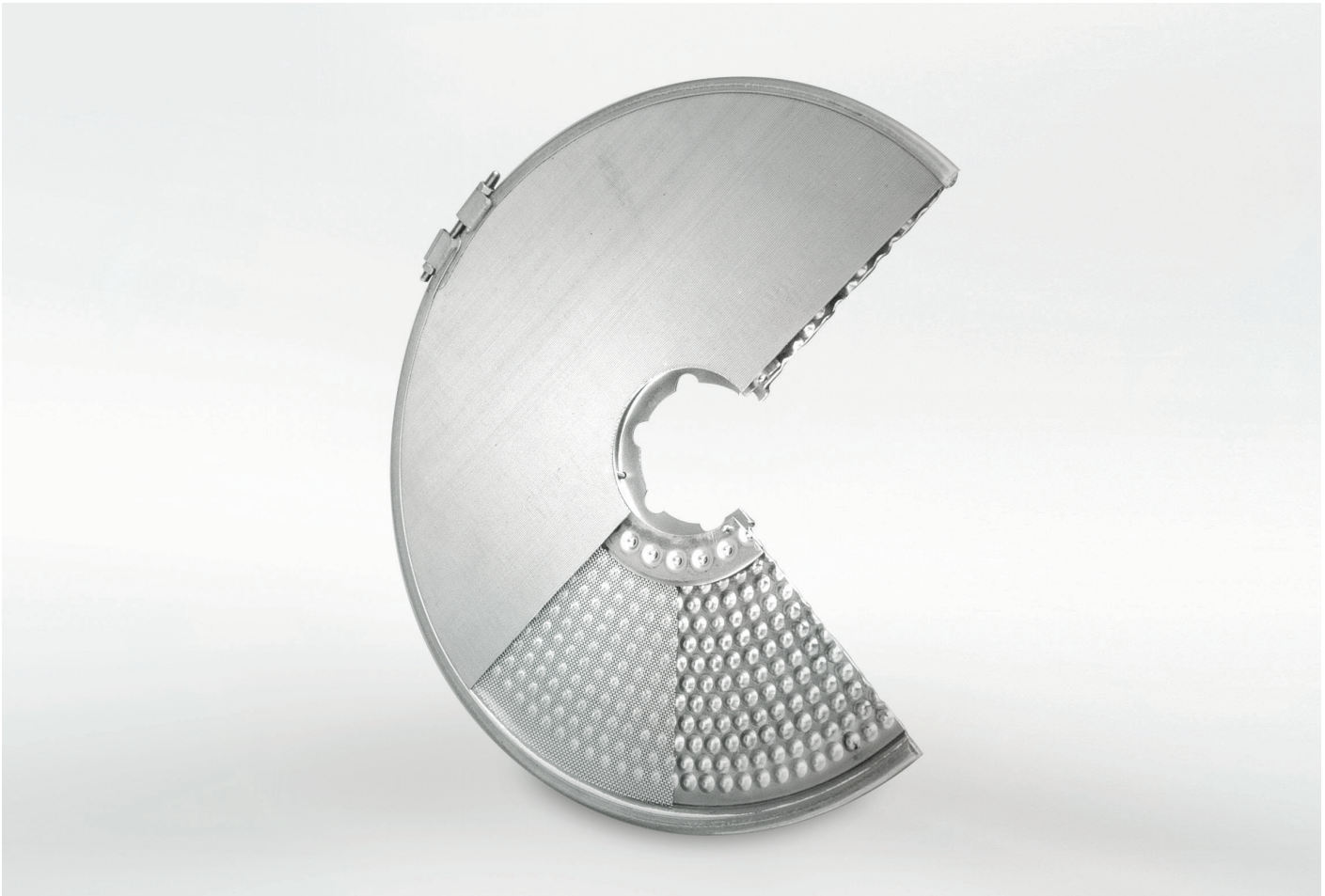
In the filter cover the distribution plate is mounted, which is particularly required for heel volume filtration. For the R-filter with its conical bottom, the clear filtrate nozzle is welded horizontally to the lower bearing support into the cone. For the A-filter with a torospherical bottom, it is attached with a vertical output to the lower gasket housing. The filter vessel might be supplied with a heating or cooling jacket, brackets or legs being provided for erection.
The pressure vessels are constructed according to the respective acceptance regulations such as TUEV, PED, ASME, China Stamp, GOST, SVTI, etc. Depending on the corrosion resistance, the materials extend from HII to stainless steel, Hastelloy and titanium; rubber lined constructions are also available.

Components, filter skids, plants

Single components are provided with a mechanical guarantee and a filter-related operating manual. Filtration guarantees must be explicitly defined.

Filter pallets, which are equipped with a pre-coat, dosing station and automation are provided as filter skids with a warranty for the individual process steps. The delivery limits are the product input and filtrate output.

To supply entire filtration systems we also take over the engineering to integrate entire processes with all components needed and also the corresponding process guarantee.



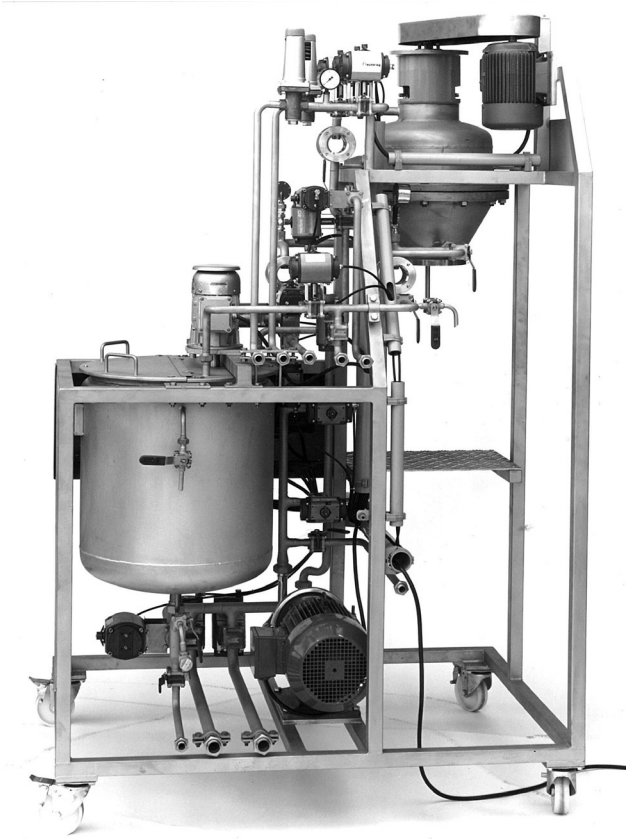
Automation of the Chemap-Filter

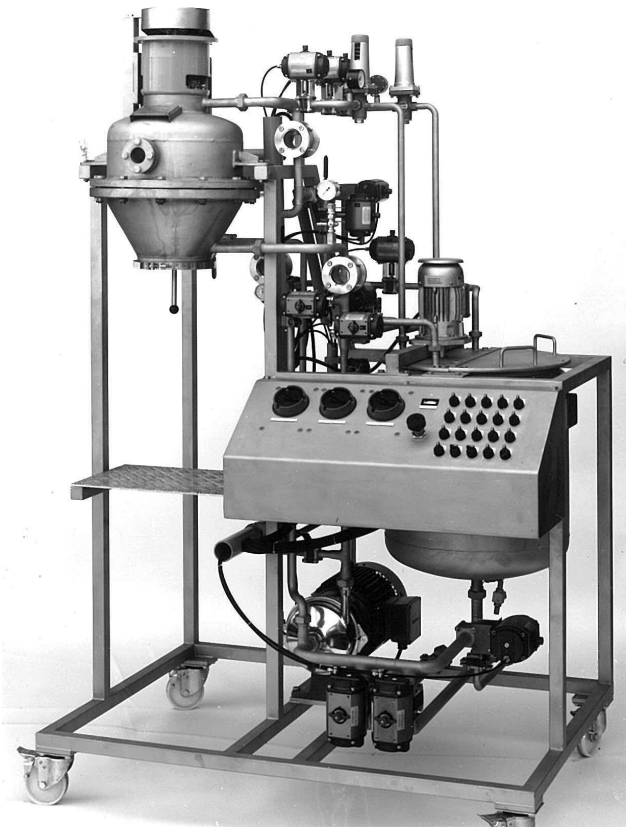
The filter is automated in collaboration with the customer. It can be operated manually, semi-automatically or automatically. All of the capabilities of modern control technology can be used until the point of integration into control systems with a link to the production control. Along with our partners, we support users when defining the functional specifications.

Of course, this also applies to the integration with existing control solutions. Subsequent adjustments to changing needs are possible at any time through the use of conventional components.

Freely programmable electronic controllers with position feedback, blind schematic with display of the respective process step, optional manual or automatic operation ensure a safe operation during all filtration steps.

Lab devices such as Nutsche filters and lab filters, to determine filtration data or with which we can perform tests for interested parties, are also part of our product range.





Cake controller

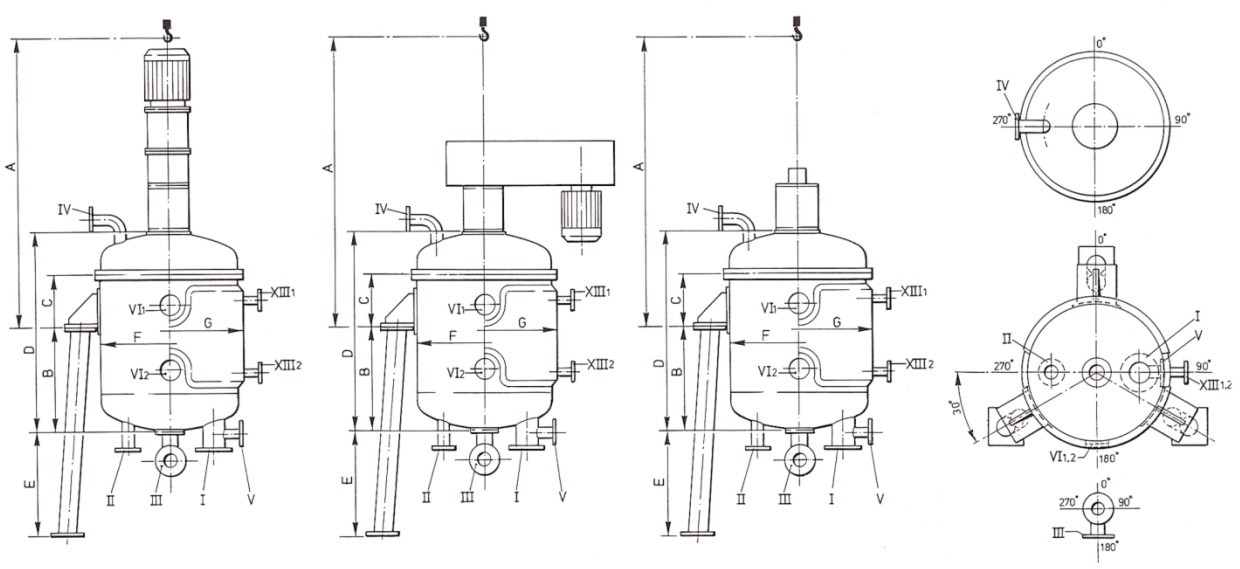
The cake controller, which can also be subsequently added to every pressure filter with a control opening, has provided a sought-after, fully automated system in even the most difficult filtration conditions.

The cake controller allows the seamless monitoring of the cake height on the filter plates. When the permitted thickness is achieved, it emits a signal. This activates the appropriate reaction in the system (alarm, washing, drying, output, and similar actions). A seamless and cost-effective fully automated system is therefore also guaranteed with this unit when the solid portion of the solution to be filtered has large fluctuations. In filtrations with an increased solid percentage, the benefits for monitoring the cake thickness are particularly impressive.

Function

The mounted cake controller is adjusted in such a way that the measuring spoon is located between two filter plates. The lift value and the alarm value are set for the maximum cake height. During filtration, a filter cake forms on the filter plate. The measuring spoon is sensed, as previously, from the top to the filter plate. If it then has impact with the filter cake, the measurement process is stopped and the measurement value is compared to the threshold value, and the measurement spoon moves back to the starting position. This occurs with a programmed cycle frequency and depends on filtration factors (solid component portion, filtration speed, solidness of the filter cake, etc). It is performed until the measured value corresponds to the maximum value or has exceeded it. This signal is then sent to the controller and as a result the next step, such as cake washing/drying or output, can be initiated. The measurement spoon has a rinsing device on the membrane so that defective measurements due to soiling can be precluded.

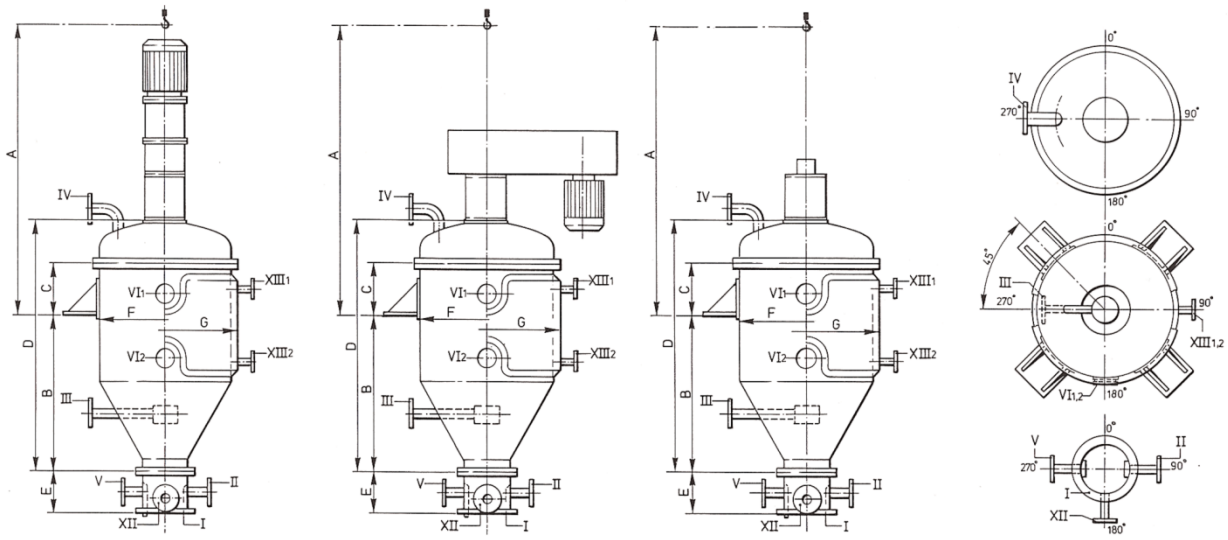
Layout of Chemap-Filter type A



Standard connections and dimensions type A

Filter-size		Product inlet	Filtrate outlet	Heel volume outlet	Collector nozzle	Cake outlet				In-spection port	Jacket nozzle			No. of filter discs	Plate diameter	Spacing of filter-plates	Approximate dimensions only (mm)							Filter weight empty	Filling volume
		II	III	V	IV	I				NO DN80 VI1+2	IN XIII1	OUT XIII2					A	B	C	D	E	F	G	approx. kg	approx. liters
1 m²		40	40	40	40	80				1	25	25		9	400	30	1540	235	250	730	400	500	540	700	120
2 m²		40	40	40	40	80				1	25	25		18	400	30	1870	555	250	1050	400	500	540	950	170
5 m²		50	50	50	50	100				2	25	25		20	600	30	2090	670	250	1205	400	700	750	1300	360
7 m²		50	50	50	50	100				2	25	25		16	800	30	2045	485	300	1070	500	900	950	1400	520
10 m²		65	65	65	65	150				2	25	25		22	800	30	2265	660	300	1290	500	900	950	1800	630
15 m²		80	80	80	80	150				2	25	25		33	800	30	2695	1090	300	1720	500	900	950	2000	860
20 m²		80	80	80	80	200				2	25	25		28	1000	30	2640	780	400	1540	600	1100	1150	2300	1100
25 m²		100	100	100	100	200				2	25	25		35	1000	30	2895	1040	400	1800	600	1100	1150	2500	1300
30 m²		100	100	100	100	250				2	25	25		43	1000	30	3195	1330	400	2090	600	1100	1150	3000	1550
35 m²		100	100	100	100	250				2	25	25		50	1000	30	3555	1490	500	2355	600	1100	1150	3300	1700
40 m²		150	150	150	150	300				2	25	25		57	1000	30	3810	1745	500	2605	600	1100	1150	4000	1900
45 m²		150	150	150	150	300				2	25	25		63	1000	30	4030	1875	500	2825	600	1200	1250	5000	2550
50 m²		150	150	150	150	300				2	25	25		45	1250	30	4375	1625	500	2625	600	1400	1450	6500	3100
60 m²		150	150	150	150	300				2	25	25		54	1250	30	4710	1960	500	2960	600	1400	1450	8500	3500
80 m²		150	150	150	150	300				2	25	25		72	1250	30	5480	2730	500	3730	600	1400	1450	12500	4300
100 m²		150	150	150	150	300				2	25	25		90	1250	30	6250	3500	500	4500	600	1400	1450	16500	5100

Layout of Chemap-Filters types R and RA



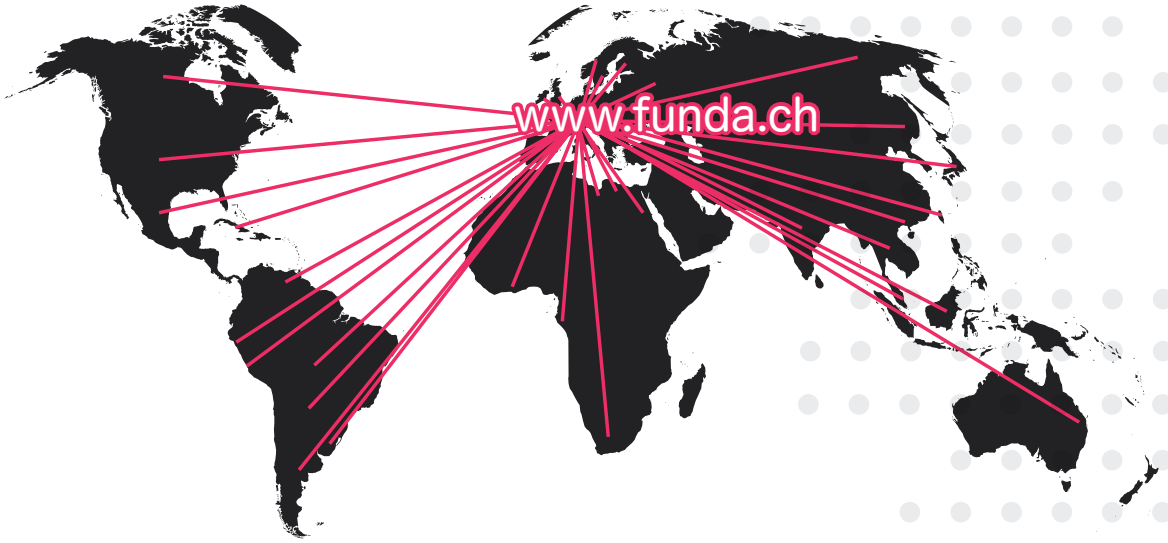
Standard connections and dimensions types R and RA

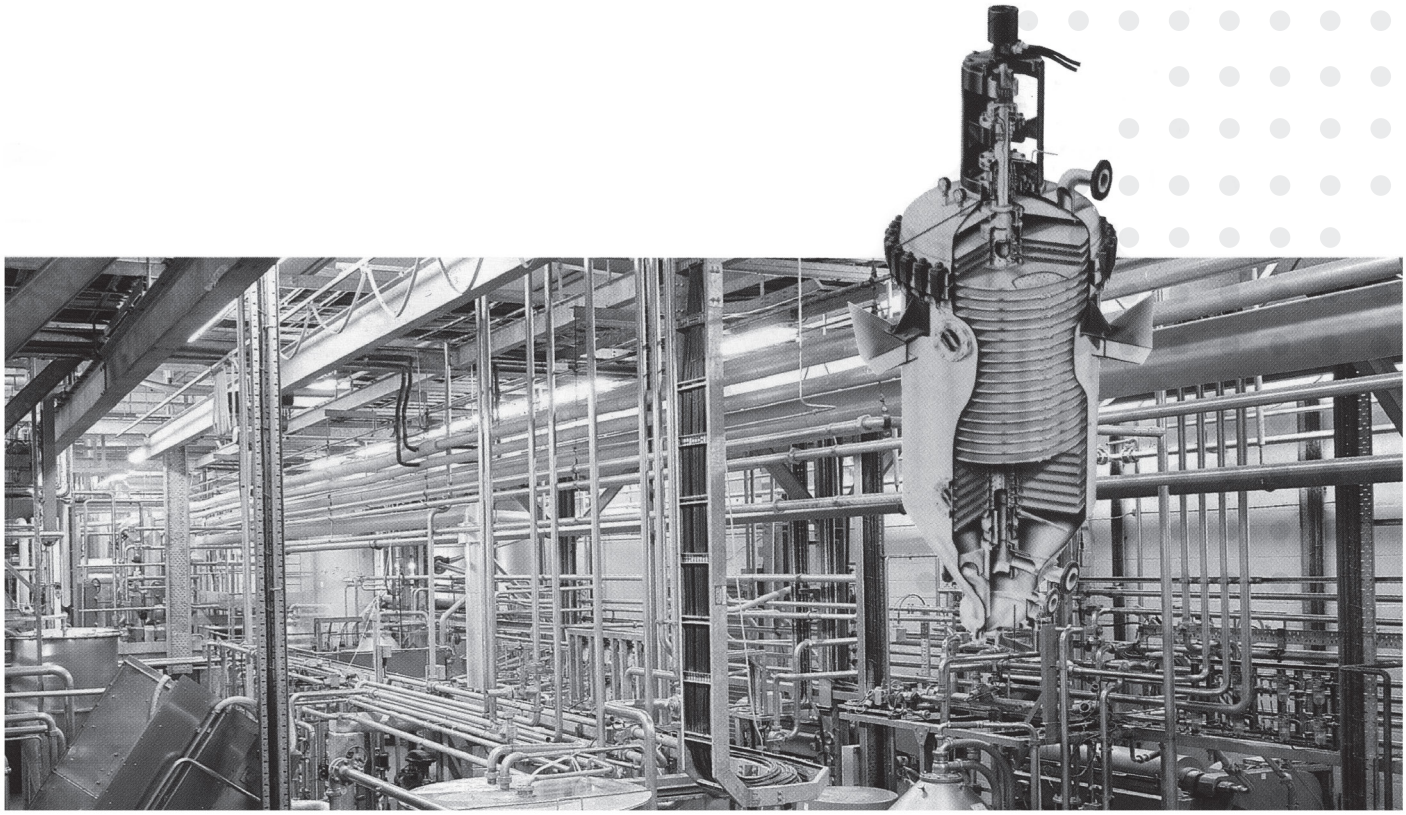
Filter-size		Product inlet	Filtrate outlet	Heel volume outlet	Collector nozzle	Cake outlet			RA-slurry outlet	In-spection port	Jacket nozzle			No. of filter discs	Plate diameter	Spacing of filter-plates	Approximate dimensions only (mm)							Filter-weight empty	Filling volume
		II	III	V	IV	I			XII	NO DN80 VI1+2	IN XIII1	OUT XIII2					A	B	C	D	E	F	G	approx. kg	approx. liters
1 m²		40	40	40	40	250			50	1	25	25		9	400	30	1646	731	250	1246	200	500	540	900	190
2 m²		40	40	40	40	250			50	1	25	25		18	400	30	1970	1055	250	1570	200	500	540	1100	250
5 m²		50	50	40	50	250			65	2	25	25		20	600	30	2220	1065	300	1680	300	700	750	1500	470
7 m²		50	50	40	50	250			65	2	25	25		16	800	30	2240	975	400	1740	300	900	950	2000	730
10 m²		65	80	50	65	300			80	2	25	25		22	800	30	2474	1209	400	1974	300	900	950	2400	880
15 m²		80	100	65	80	400			100	2	25	25		33	800	30	2900	1635	400	2400	350	1000	1050	3000	1410
20 m²		80	100	65	80	400			100	2	25	25		28	1000	30	2820	1420	500	2320	350	1150	1200	3100	1670
25 m²		100	100	65	100	400			100	2	25	25		35	1000	30	3080	1680	500	2580	350	1150	1200	3500	1890
30 m²		100	100	65	100	400			100	2	25	25		43	1000	30	3380	1972	500	2872	350	1150	1200	4000	2100
35 m²		100	2x100	65	100	400			100	2	25	25		50	1000	30	3740	2130	600	3130	350	1150	1200	5100	2350
40 m²		150	2x100	80	100	500			150	2	25	25		57	1000	30	4000	2385	600	3385	400	1150	1200	5900	2650
45 m²		150	2x100	80	100	500			150	2	25	25		63	1000	30	4210	2600	600	3600	400	1150	1200	6800	2830
50 m²		150	2x100	80	100	500			150	2	25	25		45	1250	30	4600	2490	600	3590	400	1400	1450	8000	4000
60 m²		150	2x100	80	100	500			150	2	25	25		54	1250	30	5140	2635	800	3930	400	1400	1450	10000	4400
80 m²		150	2x100	80	100	500			150	2	25	25		72	1250	30	5910	3405	800	4700	400	1400	1450	14000	5200
100 m²		150	2x100	80	100	500			150	2	25	25		90	1250	30	6680	4715	800	5470	400	1400	1450	18000	6000

Only the Chemap-Filter offers all of these benefits in a horizontal plate filter

Characteristics	Advantages	Benefits
Construction	• Closed system • Even cake structure • Fully automatic cake output through rotation	• Preclusion of hazards in toxic or explosive media • Sterile processes are possible • No product losses
Horizontal, conical	• Complete draining of fluid • Heel volume filtration or cake washing and extraction in a cascade process • Plates are selfsupporting and require no edge support, which would obstruct cake discharge	• No liquid residues impair cake drying • No loss of filtrate • No mixing of the media with subsequent washing • Minimal need for washing fluid or solvent
Top drive	• Main bearing cannot come into contact with the medium • Allows a conical vessel bottom for dry cake discharge	• Prevents malfunctions due to corrosions of the main bearing • Eliminates the need for additional equipment to transport dry filter cakes

Globally over 6000 Chemap process filter systems in industrial use





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