



JVK Filter Elements

worldwide successful in operation

RELY ON JVK – THE EXPERTS IN FILTRATION



Filtration Systems

**Mechanical and Thermal
Cake Drying with
JVK Filter Elements**

JVK Filtration Systems

MECHANICAL AND THERMAL CAKE-DRYING

Within solid-liquid separation with filter presses there is quite often a special task to gain a certain purity of the filtrate and the cake. In many cases also a very low residual moisture content is required.

With the existing filtration methods often an additional dryer has to be used to achieve solid concentrations above 40%.

Different efficient processes in a filter press are available to increase the dry solids content.

1. Mechanical High Pressure Drying in a Filter Press (DHC-Process)

This process works with membrane and combination plates, squeezing the filter cake with high pressure and displacing liquid from the filter cake. The limitation of this process is the compressibility of the cake to a maximum of 40-50% dry solids content.

2. Thermal Vacuum Drying in a Filter Press (DHV-Process)

This process uses the mechanical drying according to item 1. above, but with low pressure.

The additional application of temperature and vacuum evaporates the remaining liquid in the heated cake. The limitation mentioned above does not exist anymore and a dry solid content close to 100% can be achieved.

ADVANTAGES OF CAKE DRYING

- Filtration and drying in one item of equipment
- Higher product quality
- Low equipment costs
- No additional dryer
- Reduction of transport and disposal costs
- Higher heat value of the cake (wastewater filtration)
- Saving of energy costs by using existing hot process water
- Cake washing and air blowing before the drying stage
- Filtration of different batch sizes
- Best possible cake release from the filter cloth which improves automatic discharge
- Sterilization of the cake (DHV)
- Abrasion and corrosion protection not required
- Oil and water separation at the same time
- Space saving
- Simple handling

JVK PLATE SYSTEMS

CCP	Compression Chamber Plate
FCP	Feed Chamber Plate
TCM	Temp. Controlled Membrane Plate
TCI	Temperature Controlled Chamber Plate with internal heating
TCC	Temperature Controlled Chamber Plate with external heating

JVK PROCESS SYSTEMS

DHC	Mechanical Cake Drying with High Pressure Squeeze
DHV	Thermal Cake Drying with Heat and Vacuum

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Retrofitting of existing filter presses to JVK Cake Drying System is easily possible. JVK provides support with all the necessary technical information.

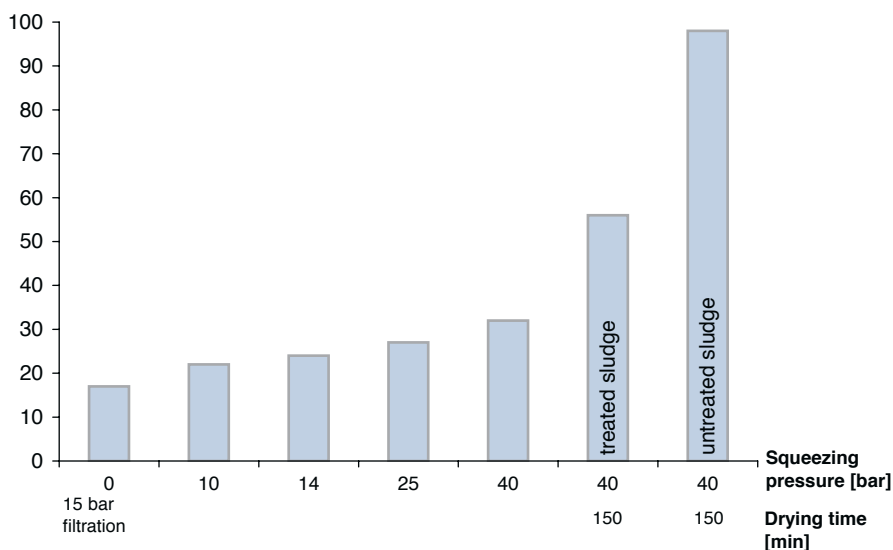
EXAMPLE OF SLUDGE DEWATERING WITH JVK TCM /TCC PLATES

Example of an effective vacuum drying process for communal sewage sludge with a high organic content.

The process steps come from a sewage sludge with additional biologic treatment (polymerconditioning), first with a squeezing pressure of up to 40 bar followed by a vacuum drying time of 150 min.

The finished drying process with the same sludge, a high sand content and no treatment at all is also illustrated.

Solid concentration [%]



JVK filter elements world-wide success

MECHANICAL CAKE DRYING WITH HIGH PRESSURE SQUEEZE FCP/CCP SYSTEM

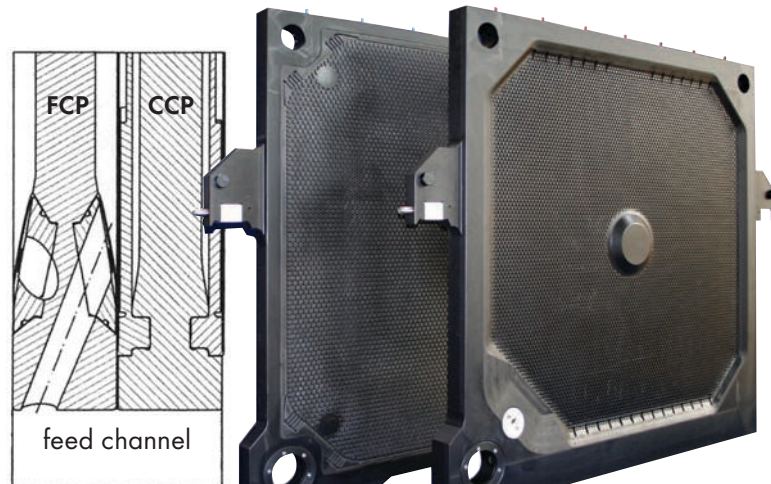
(DHC-PROCESS)

FCP/CCP SYSTEM

PATENT DE 102 21 061

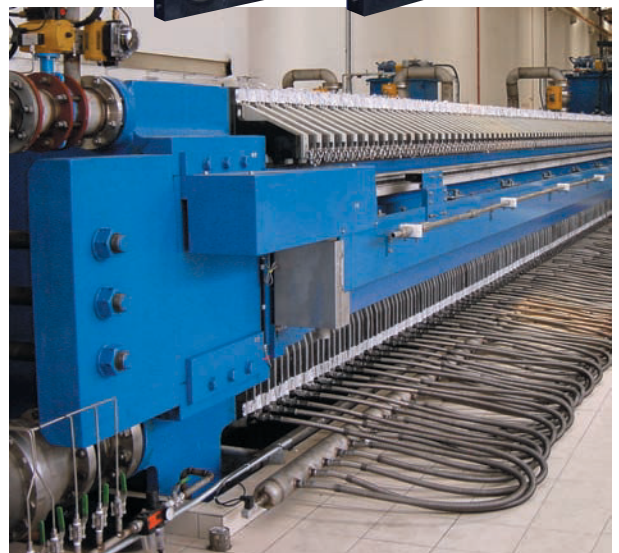
The system consists of special developed membrane and combination plates. The chamber is filled through the combination plate FCP only. The filter cloth is clamped leakage-free by a feed nozzle.

There are various feed positions around the sealing area possible, especially at the plate corners. Although individual feed of each FCP plates with an external collector pipe and rubber hoses can also be provided. In this case, cake deposits on the sealing area can be avoided. The compression plate CCP can squeeze the cake with a maximum pressure of 6 MPa. The achievable dry solid content depends on the compressibility of the cake. In certain applications the compression of the cake is more efficient with several pressure venting stages during the squeezing step.



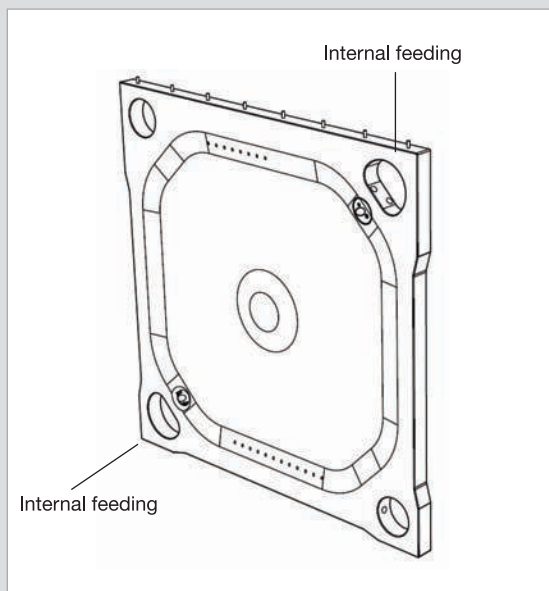
ADVANTAGES

- Special designed feed nozzle with self-cleaning avoids blockage
- Equal feed and filling of the chambers
- Long life time of membranes without any perforations
- No mechanical overstressed membrane areas
- Simple mounting and de-mounting of membrane because no additional fixing elements are required
- Fully automatic filtration cycles
- Use of less expensive drape-over filter cloths on the plates



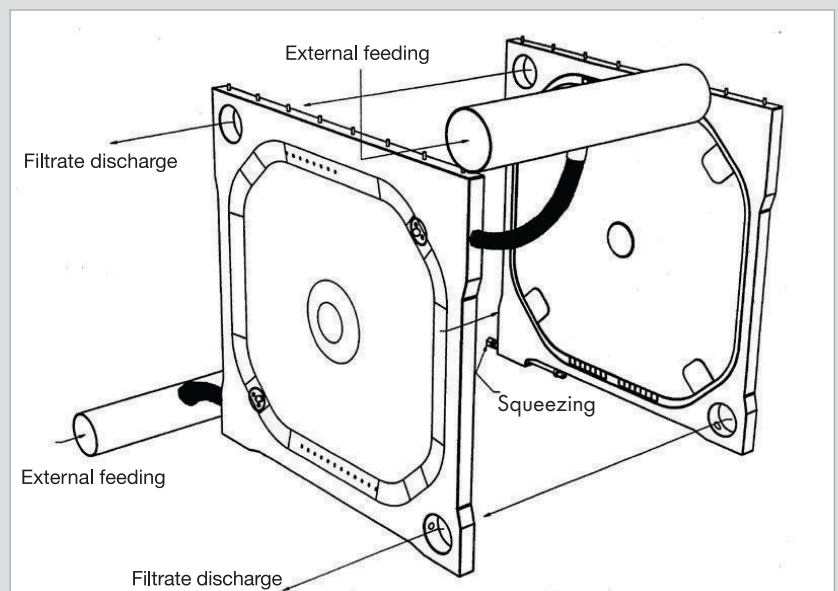
Filter press with high performance membrane plates 1500 x 1500 mm, up to 6,0 MPa (60 bar)

FCP



FCP

CCP



THERMAL CAKE DRYING WITH HEAT AND VACUUM (DHV-PROCESS)

The use of Polypropylene (PP) or Polyvinylidenfluoride (PVDF), both with low thermal conductivity for the filter plates, guarantees low heat loss during the drying process.

The cycle time depends on the thermal conductivity of the used materials. For normal applications an existing source of process water with temperatures between 60-80° C as a heating and compression media is sufficient. During the drying process each membrane remains in contact with the surface of the shrinking cake. A permanent heat transition from the membrane to the surface of the cake is always guaranteed. In addition cracks in the cake are eliminated and a decrease of the drying efficiency is avoided.

Washing and blowing of the cake before the drying process is possible.

1. TCM/TCM SYSTEM

PATENT DE 3713419C2

JVK Membrane filter plates which are successful in operation for more than 40 years have now become more efficient in combination with special developed, more heat conductive elastomer membranes for cake drying up to 130° C. The space between the body plate with low thermal conductivity and the membrane with higher thermal conductivity is permanently floated by hot water or steam. A flow reduction or a complete cut of the outlet flow creates the necessary pressure for the squeezing of the filter cake. At the same time the applied vacuum in the chamber decreases the vapour pressure of the liquid in the cake. The vapour is extracted by the vapour vacuum system and condensed in a separate vessel.

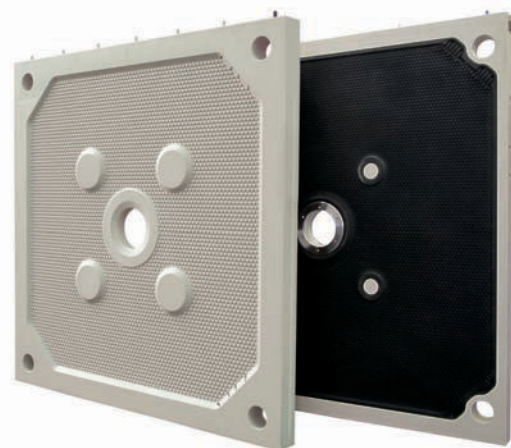


ADVANTAGES OF DHV-PROCESS

- Most efficient and fast drying
- Low heating temperature
- Low energy costs
- Significant reduction of cycle-time
- All filtration steps are possible

2. TCM/TCI SYSTEM

With this process each second membrane plate is replaced by a combination plate without a membrane. The thermal conductivity of the combination plate can be increased by using special additives. The plate is heated by internal heating channels. The operation corresponds basically to item 1.



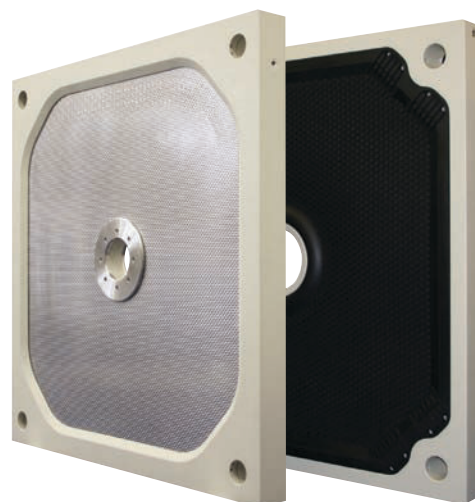
TCI/TCM SYSTEM

3. TCM/TCC SYSTEM

PATENT DE 19905674

In this case the design of the combination plate concerning the operation is similar to a membrane plate. The membrane is replaced by a very good heat conductive stainless steel sheet with a drainage grid.

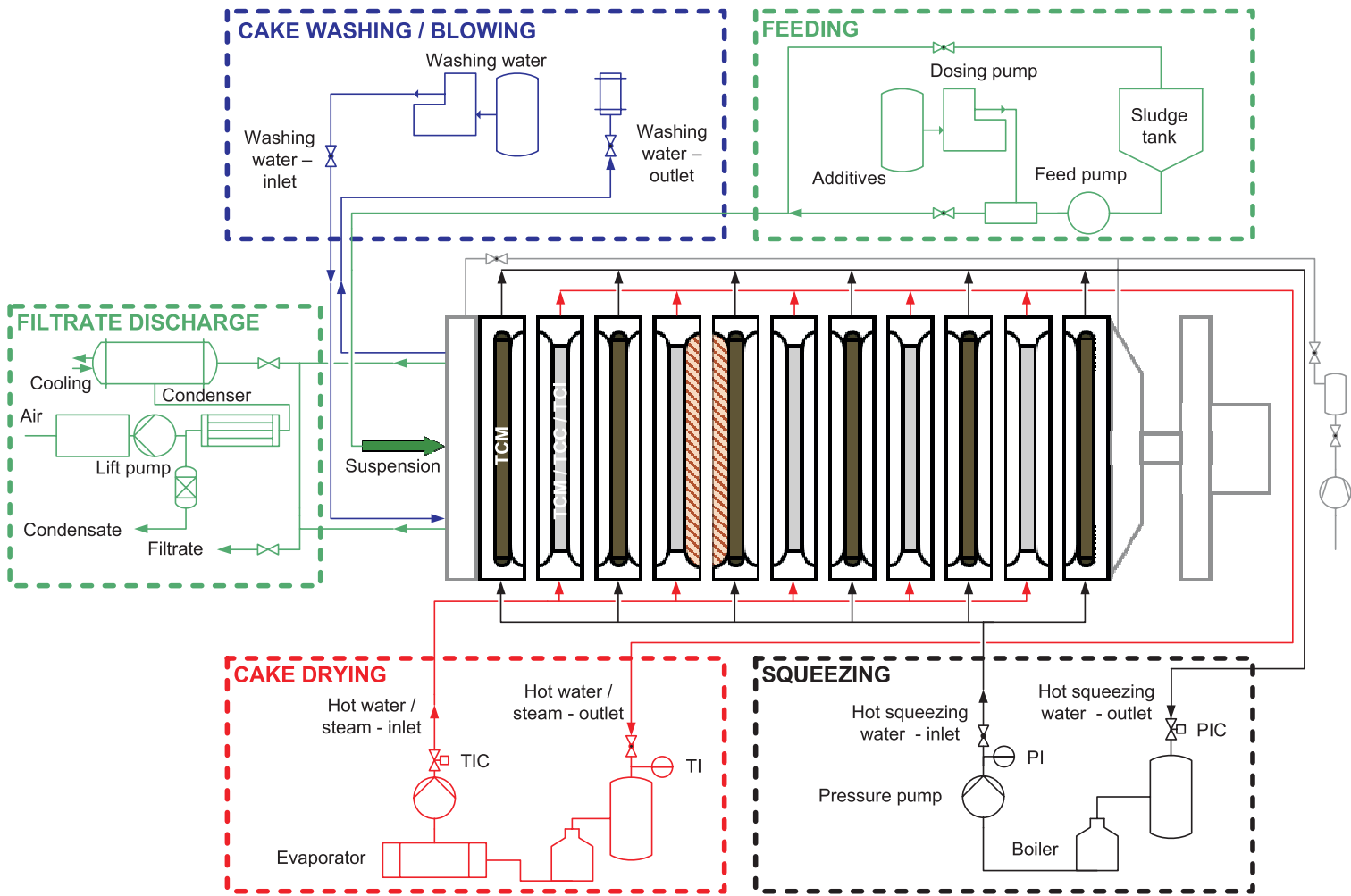
The heating media flows externally between the surface of the body plate and the steel sheet fixed on the top. The heat transition via the filter cloth to the cake is significantly improved. The very different heat expansion coefficients are compensated by a special liquid sealed attachment of the stainless steel sheet. This system allows the most efficient and fastest cake drying.



TCC/TCM SYSTEM

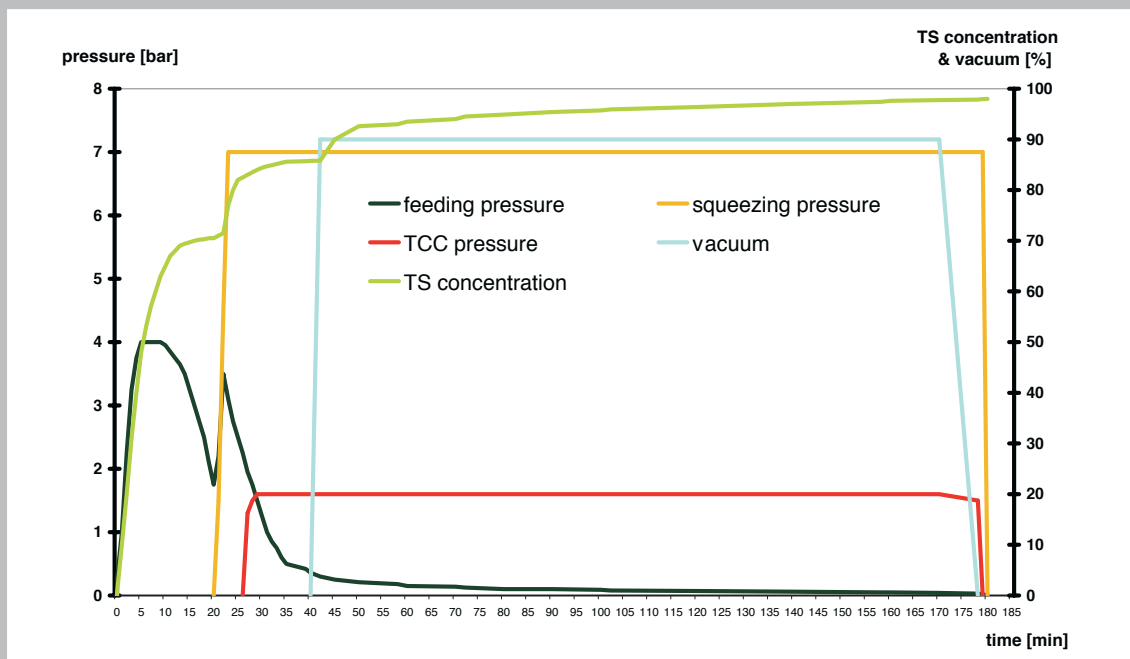
DIAGRAM OF A FILTERPRESS WITH JVK CAKE DRYING SYSTEMS

The principal connection of different TC plates is colored in red and black. Blue and green illustrates the washing water and the filtrate discharge by pressure and vacuum.



EXAMPLE OF A PROCESS DIAGRAM FROM A TCC/TCM DRYING SYSTEM

In this filter process a TCC plate was connected with steam of 110°C and the TCM plate was used with hot water of 75°C. A dry solid concentration (green) of almost 100% was reached using only a constant vacuum (blue). The squeezing pressure of the TCM plates was sequentially set up and the TCC pressure was also constant due to a permanent heating flow.

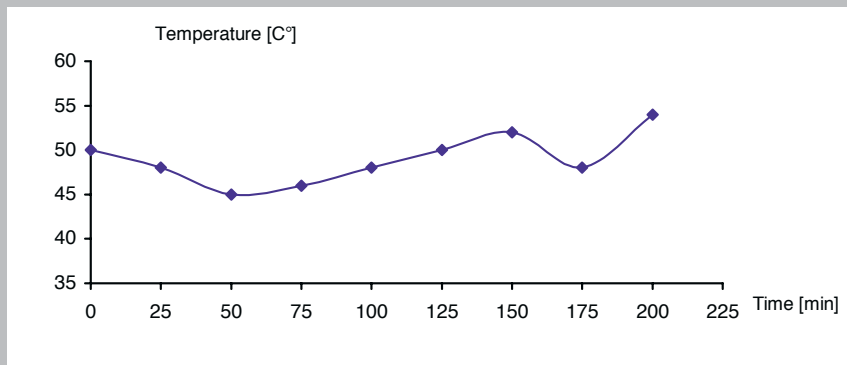


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EXAMPLE OF DRYING WITH HOT PROCESS WATER

The dry solid concentration of 93.1% is the result after drying with process cooling water from a block heating station for an iron-hydroxide application with JVK TCM/TCC System.

An average temperature of 45-55 °C was achieved with a heating temperature of only 70 °C.



TYPICAL DRYING SOLID CONCENTRATION

AREA	PRODUCT	SOLID CONTENT
Sewage treatment works	Digested sludge	60-95%
Purification of waste gases	Cement slurry Waste slurry	91-96% 90-95%
Galvanic industry	Hydroxid slurry	65-78%
Metallurgical industry	Silver powder Venturi sludge Electrolysis sludge	96-100% 98% 96-99%
Paper industry	Production sludge	92-97%
Leather industry	Tannery sludge	90-94%
Food industry	Corn (Polenta) Protein Apple	92-97% 70-90% 91-93%
Water treatment	Contrasting sludge	92%

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Potable Water Treatment



Filtration Systems GmbH

P. O. Box 60
Obere Lerch 2
D - 91166 Georgensgmünd (Germany)

Phone: +49 (0)9172 707 - 0
Fax: +49 (0)9172 707 - 77
E-mail: jvk@jvk.de
Internet: www.jvk.de