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.

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.

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
- Reduction 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 Filter Elements
worldwide successful in operation

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Mechanical and Thermal
Cake Drying with
JVK Filter Elements

RELY ON JVK – THE EXPERTS IN FILTRATION
Example of Sludge Dewatering with JVK TCM/TCC Plates

Example of an effective aqueous dewatering process for continuous sludge dewatering with a high organic content.

The process step covers aaron sludge with additional biological treatment (prepurification or anaerobic process), but with a operating pressure of up to 40 bar followed by a vacuum dewatering line of 130 cm. The finished dewatering process with the same dewater, a high used content and an treatment at all is illustrated.

ADVANTAGES OF CAKE DRYING
-• Fibre and dewatering in one item of equipment
-• Higher product quality
-• Low maintenance costs
-• No additional dryer
-• Reduction of transport and disposal costs
-• Higher heat value of the cake [mechanical filtration]
-• Savings of energy costs by using existing hot water
-• Cake washing and air blowing before the drying
-• Fibre of different batch sizes
-• 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

ADVANTAGES OF TCM/TCC SYSTEM
-• Special designed feed nozzle with self-cleaning avoidance
-• Bleach
-• Equal feed and filling of the chambers
-• Long life time of membranes without any perforations
-• No mechanical overmattedness of membranes
-• Full automatic filtration cycles
-• Use of low expensive drape-over filter cloths on the plates

MECHANICAL AND THERMAL CAKE-DRYING

Within solid liquid separation with filter processes 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 material content is required.

Different efficient processes in filter press are available to increase the dry solid output.

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

This process uses membranes and combination plates, separating the filter cloth 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 65% dry solids content.

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

This process can be performed according to item 1. above but with low pressure. The additional application of temperature and vacuum evaporates the remaining liquid from the heated cake. In many cases also a very low residual moisture content.

3. TCM/TCI SYSTEM

In the case of a special designed combination plate concerning the operation as: similar to a membrane plate. The membranes are replaced by a special liquid sealable attachment of the stainless steel sheet.

This allows the most efficient and fastest cake drying.
MECHANICAL AND THERMAL CAKE-DRIYING

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 high cake concentration is required.

Different efficient processes in filter presses are available to increase the dry solid 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 60% dry solid 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 heat 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 (steam generation)
• Savings of energy by using existing heating water
• Cake washing and air blowing before the drying

The process steps come from a membrane squeezing with additional logistics transport (jacket/membrane) and for a separating pressure of up to 40 bar followed by a vacuum drying low of 130 mbar.

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

ADVANTAGES OF CAKE DRYING WITH HIGH PRESSURE SQUEEZE FCP/CCP SYSTEM

FCP/CCP SYSTEM

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 together by a special plate.

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 collective pipe and rubber hose 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-clearing avoidance
• Blocking
• Equal feed and filling of the chambers
• Long life time of membranes without any perforations
• No mechanical overstressed membrane areas
• Simple mounting and dismounting of membranes because no additional fixing elements are required
• Fully automatic filtration cycles
• Use of less expensive drape over filter cloth on the plates

MECHANICAL CAKE DRYING WITH HIGH PRESSURE SQUEEZE FCP/CCP SYSTEM

FCP/CCP SYSTEM

Example of an effective vacuum drying process.

The use of Polyacrylamide (PAM) or Polyaluminiumchlorid (PACI) both will lead to a significant increase of the filter cakes. The increasing of the cake concentration means an increase of the heat conductivity of the cake. The cooling of the cake and the condensation of the cake 

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 the combination channels. The operating corresponds basically to item 3.

ADVANTAGES OF DHV-PROCESS

• Most efficient and fastest drying
• Low noise levels
• Low energy costs
• Significant reduction of cycle-time
• All filtration steps are possible

ADVANTAGES OF DHV-PROCESS

JVK Intensive filter plates which are excellent in operation for more than 40 years have become more efficient in combination with special developed, more heat conductive associated feed and discharge media for cake drying up to 150 °C.

The space between the body plate with low thermal conductivity and membrane plate with higher thermal conductivity is constantly filled by hot water or steam. A flow reduction or a complete out of the filter cake from the necessary pressure for the operating of the filter cake. At the same time the applied pressure in the cake decreases the vaporization and condensation of the liquid in the cake. The exsudate is extracted by the vacuum residue system and conditioned in a separate vessel.

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

JVK filter elements world-wide successful in operation

www.jvk.de

Patent DE 102 21 041
Patent DE 1 990 5674
Patent DE 37 13 419 C2
Patent DE 199 05674
Patent DE 102 21 041
Patent DE 199 05674
Patent DE 102 21 041
Patent DE 102 21 041
JVK pressure filter plates are designed for operation in a temperature range of 0-150 °C. The membranes developed for use at temperatures up to 150 °C.

The membrane remains in contact with the surface of the shrinking compression media is sufficient. During the drying process each membrane remains in contact with the surface of the shrinking compression media is sufficient. During the drying process each

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

The use of Polyacrylamide (PAM) or Polyaluminiumchlorid (PACI) both will lead to a significant increase of the filter cakes. The increasing of the cake concentration means an increase of the heat conductivity of the cake. The cooling of the cake and the condensation of the cake

ADVANTAGES

• Significant blockage
• High energy costs
• Significant cycle-time

ADVANTAGES

• Simple mounting and de-mounting of membrane
• No mechanical overstressed membrane areas
• Long life time of membranes without any perforations
• Equal feed and filling of the chambers
• Special designed feed nozzle with self-cleaning avoids

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JVK PLATE 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 it also very high mechanical exhaustion is required.

Different efficient processes in filter presses are available to improve 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 60-70% dry solids content.

2. Thermal 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.

Economical and Efficient Sludge Dewatering

JVK Cake Drying System is easily possible.

JVK provides support with all the necessary technical information.

ADVANTAGES OF CAKE DRYING

- • Fibre-drying in one item of equipment
- • Higher protein quality
- • Low equipment costs
- • No additional dryer
- • Reduction of transport and disposal costs
- • Higher heat value of the cake (esterification methods)
- • Saving of energy costs by using existing hot process water
- • Cake washing and air blowing before the drying
- • Fibre of different batch sizes
- • 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 Compresiong Chamber Plate
- FCP Feed Chamber Plate
- TCM Temp. Controlled Membrane Plate
- TCC Temp. Controlled Chamber Plate with external heating
- DHC Mechanical Cake Drying with High Pressure squeezing
- DHV Thermal Cake Drying with Heat and Vacuum

ADVANTAGES

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

MECHANICAL CAKE DRYING WITH HIGH PRESSURE SQUEEZE FCP/CCP SYSTEM

FCP/CCP SYSTEM

PATENT DE 102 21 041

The system consists of special developed membrane and combination plates. The splitter is clamped between the feed chamber plate CCP and the filter cloth. The filter cloth is clamped together by clamped plate CCP.

There are various fixed passes around the sealing area possible, especially at the plate corners. Although individual length of each FCP plates with an external collector pipe and rubber hose can also be provided. In this case, cake release on the sealing area can be avoided. The compression plate CCP can squeeze the cake with a maximum pressure of 5 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 working stages during the operating step.

MECHANICAL AND THERMAL CAKE-DRYING

- • Simple handling
- • Space saving
- • Oil and water separation at the same time
- • Sterilization of the cake (DHV)

ADVANTAGES

- • Use of less expensive drape-over filter cloths on the plates

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

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

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

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

ADVANTAGES OF DHV-PROCESS

- • Most efficient and fast drying
- • 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 one side and vacuum is applied. The operational cycle corresponds basically to item 1.

3. TCM/TCI SYSTEM

In the case of the combination of the filtration plate concerning the operations similar to a membrane plate, the membrane works together with a drainage grid.

The heating media flows externally between the surface of the filter plate and the steel sheet fixed on the top. The heat transfer to the cake in the cake is significantly improved.

The very different heat exchange coefficients are compensated by a special fluid and heat management of the stainless-steel sheet.

This allows the most efficient and fastest cake drying.

Example of Sludge Denitrification with JVK TCM/TCI Plates

Example of an aerobic sewage disposal process for nitrated sewage sludge with a high organic content.

The process steps came from a sewage sludge with additional biological treatment (pesticide metabolism), but with a operating pressure of up to 60 bar followed by a mechanical drying by low 150 min.

The finished drying process with the same dewatering, high solid content and ex treatment at all in a visually illustrated.

Rely on JVK – The Experts in Filtration
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.

DIAGRAM OF A FILTERPRESS WITH JVK CAKE DRYING SYSTEM
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.

TYPICAL DRYING SOLID CONCENTRATION

<table>
<thead>
<tr>
<th>AREA</th>
<th>PRODUCT</th>
<th>SOLID CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewage treatment works</td>
<td>Digested sludge</td>
<td>60-95%</td>
</tr>
<tr>
<td>Purification of waste gases</td>
<td>Cement slurry</td>
<td>91-95%</td>
</tr>
<tr>
<td>Galvanic industry</td>
<td>Hydroxid slurry</td>
<td>65-78%</td>
</tr>
<tr>
<td>Metallurgical industry</td>
<td>Silver powder</td>
<td>96-100%</td>
</tr>
<tr>
<td>Paper industry</td>
<td>Production sludge</td>
<td>92-97%</td>
</tr>
<tr>
<td>Leather industry</td>
<td>Tannery sludge</td>
<td>90-94%</td>
</tr>
<tr>
<td>Food industry</td>
<td>Corn (Polenta)</td>
<td>92-97%</td>
</tr>
<tr>
<td></td>
<td>Protein</td>
<td>70-90%</td>
</tr>
<tr>
<td></td>
<td>Apple</td>
<td>91-93%</td>
</tr>
<tr>
<td></td>
<td>Water treatment</td>
<td>Contrasting sludge</td>
</tr>
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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)
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- Cake washing and air blowing before the drying stage
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<td>Tannery sludge</td>
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<tr>
<td>Metal industry</td>
<td>Coke (Rhein)</td>
<td>95-96%</td>
</tr>
<tr>
<td>Road industry</td>
<td>Frost (App)</td>
<td>91-95%</td>
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<tr>
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