CHAMBER-MEMBRANE FILTER PRESS

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The EKOTON Industrial Group is a leading manufacturer of specialized filtering equipment in Eastern Europe and the CIS.

The EKOTON Industrial Group is focused on the development, production and implementation of modern high quality technological equipment for wastewater treatment at treatment plants and various industrial enterprises dealing with food, cement, chemicals, coal and metals, as well as municipal services.

Our company produces more than 35 different types of equipment for industrial waste and sewage treatment. A wide range of products under the brand name EKOTON allows us to offer customers complete solutions based on the equipment of its own production.

Our company’s plants are located in Poland, Ukraine and Russia, with more than 300 highly qualified specialists working there.

EKOTON equipment is in successful operation throughout 15 countries around the world: Belarus, Bulgaria, China, Hungary, Israel, Kazakhstan, Lithuania, Moldova, Netherlands, Poland, Russia, Turkmenistan, Ukraine, United Arab Emirates, and Uzbekistan.
Chamber-Membrane Filter Press EKOTON is applied for different types sludges and slurries filtration

**A FILTER PRESS** is a piece of equipment that operates intermittently for the pressure filtration of slurries.

**APPLICATION**

FILTER PRESSES are used in the following applications:

- When maximum phase separation is required
- When high filtrate purity is required
- When minimum filter cake humidity is required
- When cost-effective cake washing is required
- When high excess pressure is required to separate a slurry.
Typical Industries where Filter Presses are used

Metallurgy
- Nonferrous metal ore concentrate slurries (zinc, lead, copper);
- Iron-ore concentrate slurries;
- Slurries for the wet gas purification of furnaces (basic oxygen furnaces, blast furnaces, electric furnaces);
- Neutralized wastes of pickling sections;
- Galvanic sludge.

Food Industry
- Slurry and juice of the 1st saturation stage during sugar beet production;
- Raw sugar clarification slurry;
- Sunflower oil;
- Kvass wort;
- Wines;
- Juices.

Kaolin, Ceramics, Porcelain Production
- Clay and kaolin slurries.

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Coal Industry
- Coal culm.

Cement Industry
- Raw pulp for the wet method of cement production.

Chemical Industry
- Titanium dioxide slurry;
- Zeolite slurry;
- Catalyst production slurries;
- Silicon dioxide slurry (precipitated silica);
- Liquid glass;
- Various technical slurries.

Industrial Wastewaters
- Industrial and storm water sewers;
- Blowdown water from clarifiers used in thermal and electric power plants;
- Wastewater from the washing of regenerative-type air heaters;
- Wet ash removal wastewater;
- Washing wastewater;
- Graphite-containing slurries;
- Neutralized wastewater of various origins.

Municipal Wastewater

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Design

The main technological element of the filter press is a pack of filter plates with filter cloth. The plates can be suspended on an upper beam using special hangers (a filter press with the over head suspension of plates) or supported with special handles against the side beams (a filter-press with the side suspension of plates). Support beams are attached between the front and back supports. The pack of filter plates is bound at the back support by the push plate, which is a part of the clamping plate's mechanism. The push plate is connected to the clamping drive - in most cases it is a hydraulic cylinder with its cup being fixed on the back support. Valve-collector piping for the feeding and discharging of the processing medium is mounted on the front support. The tray for covering the opening used for the removal of cake is mounted under the filter press. The filter press is additionally equipped with device for regeneration of filter cloth by pressurized water, control cabinet, control and measuring devices.

Additionally filter press can be equipped by mechanisms for cake removal. It can be eccentric shaft for small filter presses or complex systems for plate or cloth jog or even special scrapers for most adhesive cake.
Principle of Operation

The operation cycle of the filter press begins with the filter plates being clamped. The internal recesses of plates are joined in a single chamber space. Upon reaching a pressure value which ensures that the chamber space is sealed, the external pump starts feeding the slurry into the filter press. The slurry gradually fills the inner space of the filter press, and the liquid phase infiltrates through the filter cloth and flows out of the filter press through the internal canal system. The cloth accumulates a layer of cake, and its thickness increases as the slurry is fed through it. This process continues until the chamber space is completely filled with the cake. Then, the slurry feeding shuts down.

After filtering, the cake in the chamber is further processed - washed and dried - to obtain additional effects, if necessary. During washing, the washing fluid is fed to the filter press to remove the rest of the initial filtrate from the cake pores. Washing can be conducted in several stages with separation of the wash filtrate by concentration, and discharging the weakest portions for the first stages of the next cycle. It can also be conducted with several different fluids. The efficiency of washing in the filter press is achieved by the fact that the wash liquids are supplied via the discharge line from one side of the filter press. This ensures the even washing of the whole filtering area. Washing is highly effective when maximum phase separation is required. Multilevel washing ensures the achievement of good results with the minimum consumption of washing fluid.

During the drying process, compressed air passes through the cake inside the chambers of the filter press, thus decreasing the cake humidity. Like the wash liquids, air is supplied via the filtrate discharging line from one side of the filter press to ensure even drying. The cake drying is carried out to decrease the cake humidity for the reduction of subsequent heat treatment costs, to ensure the transportation of dried cake or for achieving maximum phase separation in cases when cake washing is unallowable.

After filtering and processing, the washed and dried cake is discharged from the filter press. In order to do this, the push plate is moved back to the end position at the back support. Gaps between the filter plates appear with a width greater than the cake thickness. Now unsupported, the weight of the cake makes it fall out through the opening into the reception bunker or onto a removal device.
Membrane Filter Press

Filter presses may be equipped with membrane filter plates. They are different from conventional chamber ones in the way the bottom of the filter chamber is equipped with a movable partition – a membrane. When air or water is fed under the membrane, it presses on the whole cake area. The use of membrane plates has a number of technological advantages:

- Increased performance by shutting down the filtration process when the filtering performance begins to sharply decline
- Possibility of cake discharging when the filtration properties of the slurry deteriorate
- Additional humidity reduction during the application of high pressure
- Reduced consumption of wash liquid and dry air compared to a chamber version.

The standard version is a mixed set of plates where each even plate is a membrane type, and each odd one is a chamber type. Thus, each chamber has one membrane wall. A completely membrane plate pack is unnecessarily expensive and not advisable with rare exceptions.

Range of EKOTON Filter Press Designs

Specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filter Area</td>
<td>1 – 1000 m²</td>
</tr>
<tr>
<td>Cake Thickness</td>
<td>15 – 60 mm</td>
</tr>
<tr>
<td>Plate Dimensions</td>
<td>200 x 200 – 2000 x 2000 mm x mm</td>
</tr>
<tr>
<td>Plate material</td>
<td>PPC/PPH</td>
</tr>
<tr>
<td>Operating Pressure</td>
<td>up to 16 bar</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>+10 to +85 °C (0 to +105)</td>
</tr>
<tr>
<td>Operation time</td>
<td>24 hrs per day</td>
</tr>
</tbody>
</table>
Design Variants:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate pack</td>
<td>chamber type, mixed, completely membrane</td>
</tr>
<tr>
<td>Plate suspension</td>
<td>over-head, side-bar</td>
</tr>
<tr>
<td>Plate clamping</td>
<td>hydraulic, electro-mechanical, mechanical</td>
</tr>
<tr>
<td>Plate separation by</td>
<td>by sections, one-by-one, manual</td>
</tr>
<tr>
<td>Manifold</td>
<td>stainless steel, molybdenum steel, polypropylene</td>
</tr>
<tr>
<td>Regeneration</td>
<td>portable high-pressure wash, automatic unit, chemical</td>
</tr>
<tr>
<td>Valves</td>
<td>with pneumatic drive, with electric drive, manual</td>
</tr>
<tr>
<td>Valve system</td>
<td>for all operations</td>
</tr>
</tbody>
</table>

Level of Automation

EKOTON filter presses are equipped with a variety of control and measurement instruments and a control system with an industrial controller. When in operation, the control system monitors the mechanical movements of the different filter press components and process operations, including equipment related to them.

The automation level of EKOTON filter presses is selected depending on the filter press type and size, its purpose, operating frequency, and can be changed from completely manual to fully automated systems.
Filter Press Basic Configuration

1. Metal skeleton
   - Front support
   - Rear support
   - Press plate
   - Bridge + lower trusses (for over head suspension)
   - Plate suspension (for over head suspension)
   - Side trusses (for side suspension)
   - Support rests

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2. Filter plates
- Polypropylene chamber plates
- Polypropylene membrane plates (for membrane filter presses)

3. Plate clamping mechanism
- Hydraulic

4. Tray
- In the opening on the rests
- Stainless steel
- 2 wings
- Hydraulic drive
- With troughs for leakage removing
- PP or AISI 304

5. Manifold system
- Stainless steel

6. Valves
- Filtering
- Cake drying
- Cake squeezing (for membrane filter presses)
- Collector blowing

7. Valve drive
- Pneumatic

8. Control cabinet
- Controller
- Interface module

9. Filter pads PA or PP

10. Regeneration by water device
- Automatic
- Cartridge filter for water treatment.
- “Plate washing” design
- Nozzles “flat fan”

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Filtering Scheme with a Filter Press

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Set of Equipment on Each Line

Slurry feeding – initial filtrate discharge
- Container for slurry with a stirring device and a level gauge
- Containers for the production of chemical reagents with stirring devices
- Container for the initial filtrate collection
- Slurry feed pump
- Chemical reagents feed pump
- Fittings
- Frequency converter for slurry feed pump motor
- Frequency converter for stirring device motor in the slurry container
- Control desk

Wash liquids feeding – wash filtrate discharge
- Containers for wash liquids with a level gauge
- Wash liquids feed pump
- Fittings
- Frequency converter for wash liquids feed pump motor
- Control desk

Water supply for regeneration
- Water container for cloth regeneration
- High-pressure water pump
- Frequency converter for water feed pump motor for regeneration
- Fittings
- Control and measuring instruments
- Control desk

Air supply for drying and squeezing (for pressure up to 8 bars)
- Air compressor to operate pneumatic actuators and control membranes
- Air receiver to operate and control membranes
- Process air compressor
- Process air receiver
- Fittings

Cake removal
- Cake collection bunker
- Screw conveyor
- Band conveyor

Water feeding for membrane operation (for a squeezing pressure over 8 bar) - recovery
- Water container for membrane operation with a level gauge
- Pump feeding water on the membranes
- Fittings
- Control and measuring instruments
- Control desk

Acid feed for regeneration by dissolution
- Acids container for regeneration
- Acids feed pump
- Fittings
- Control and measuring instruments
- Control desk

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## Type and Size Range of EKOTON Filter Presses

<table>
<thead>
<tr>
<th></th>
<th>Plate dimensions</th>
<th>Area min, m²</th>
<th>Area max, m²</th>
<th>Standard surface area, m² / number of plates</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>250 x 250</td>
<td>0.5</td>
<td>2.6</td>
<td>0.5 1 1.5 2 2.5</td>
</tr>
<tr>
<td>B</td>
<td>470 x 470</td>
<td>2.7</td>
<td>17.3</td>
<td>11 17 23 31 43 55</td>
</tr>
<tr>
<td>C</td>
<td>630 x 630</td>
<td>18.2</td>
<td>37.3</td>
<td>15 20 25 30 35</td>
</tr>
<tr>
<td>D</td>
<td>800 x 800</td>
<td>37</td>
<td>67</td>
<td>40 45 50 55 60 65</td>
</tr>
<tr>
<td>E</td>
<td>1000 x 1000</td>
<td>67</td>
<td>121</td>
<td>70 80 90 100 110 120</td>
</tr>
<tr>
<td>F</td>
<td>1200 x 1200</td>
<td>121</td>
<td>213</td>
<td>130 150 170 190 210</td>
</tr>
<tr>
<td>G</td>
<td>1500 x 1500</td>
<td>213</td>
<td>428</td>
<td>250 300 350 400</td>
</tr>
<tr>
<td>H</td>
<td>1500 x 2000</td>
<td>425</td>
<td>750</td>
<td>450 500 550 600 650 700 750</td>
</tr>
<tr>
<td>I</td>
<td>2000 x 2000</td>
<td>740</td>
<td>1008</td>
<td>800 900 1000</td>
</tr>
</tbody>
</table>

### Solutions for Specific Filtering Problems

- Experimental determination of a customer's slurry filtration properties
- Selection of the optimal filter cloth
- Determination of the most productive filter press mode of operation
- Taking into account the parameters of a customer's existing equipment
- Taking into account the worktime duration and working peculiarities
- Calculation according to the current capacity
- Manufacturing of individual filter presses
- Selection of the structure and parameters of associated equipment
- Shipment of associated equipment.
## Technological Features of EKOTON Filter Presses

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Method to achieve it</th>
</tr>
</thead>
<tbody>
<tr>
<td>High purity of filtrate</td>
<td>Dense filter cloth</td>
</tr>
<tr>
<td></td>
<td>Separation of the first impure filtrate portions</td>
</tr>
<tr>
<td>Low cake humidity</td>
<td>High pressure filtration</td>
</tr>
<tr>
<td></td>
<td>Cake squeezing</td>
</tr>
<tr>
<td></td>
<td>Cake drying</td>
</tr>
<tr>
<td></td>
<td>Cake drying simultaneously with squeezing</td>
</tr>
<tr>
<td>Low amount of initial filtrate in the cake</td>
<td>Cake washing</td>
</tr>
<tr>
<td></td>
<td>Cake drying</td>
</tr>
<tr>
<td>Minimum filtrate dilution with the washing filtrate</td>
<td>Multi-stage washing</td>
</tr>
<tr>
<td></td>
<td>Separate discharge of the washing filtrate</td>
</tr>
<tr>
<td>Low air consumption for drying</td>
<td>Even drying across the whole cake area</td>
</tr>
<tr>
<td></td>
<td>Cake drying simultaneously with squeezing</td>
</tr>
<tr>
<td>Low consumption of wash liquids</td>
<td>Even washing across the whole cake area</td>
</tr>
<tr>
<td></td>
<td>Cake washing simultaneously with squeezing</td>
</tr>
<tr>
<td>Capacity</td>
<td>High pressure filtration</td>
</tr>
<tr>
<td></td>
<td>Filtering surface selection</td>
</tr>
<tr>
<td>Low power consumption</td>
<td>Filter press does not consume energy most of the time</td>
</tr>
<tr>
<td>Easy maintenance</td>
<td>Small amount of moving parts</td>
</tr>
<tr>
<td>Long service life of filter cloth</td>
<td>Filter cloth does not move during the operation process</td>
</tr>
<tr>
<td></td>
<td>Regeneration by pressurized water</td>
</tr>
<tr>
<td></td>
<td>Regeneration by dissolution</td>
</tr>
<tr>
<td>Simple cake discharging</td>
<td>Vertical position of filtering plates</td>
</tr>
<tr>
<td>Simple filtrate discharging</td>
<td>Filtrate is discharged by gravity into the collector system</td>
</tr>
<tr>
<td>Separation of working fluids</td>
<td>Modern system of valves and manifolds</td>
</tr>
<tr>
<td>Adaptive sequence diagram</td>
<td>Progressive control system</td>
</tr>
</tbody>
</table>
The EKOTON Industrial Group offers other in-house products:

- Sewage mechanized screens (rake-type, step-type, screw-type, drum-type, grinding screens, waste grinders)
- Screw conveyors and compacting presses
- Tangential, horizontal and combined grit chambers
- Sludge scrapers and sludge suckers, weirs, influent wells, reflectors, semi-submersible boards for primary and secondary clarifiers
- Slide gates
- Aeration and drainage systems
- Complexes for mechanical dewatering based on belt and chamber filter presses, thickeners, screw and multi-disk dehydrators;
- Flotation facilities.