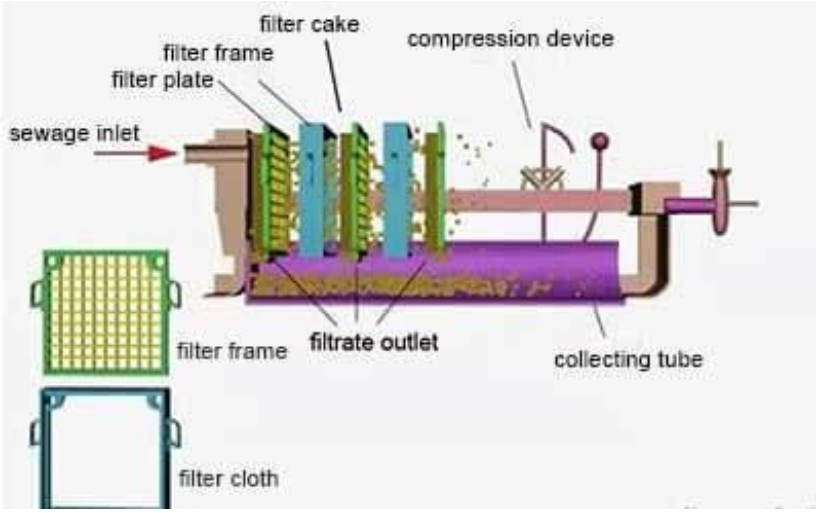
Filter Press [Definitation, Components & Types]

What is a Filter Press

Filter Press is a kind of mechanical equipment which uses a special filter medium to exert certain pressure on the object to make the liquid filtering out. It is a commonly used solid-liquid separation equipment.

Filter Press has been used in chemical industry since the beginning of the 18th century, and is still widely used in chemical industry, pharmacy, metallurgy, dyestuff, food, brewing, ceramics and environmental protection.

Filter Press Components



Frame

The frame is the basic component of the filter press. The thrust plate and the pressure strip are at both ends. The beams on both sides connect the two parts. The beams are used to support the filter plate, filter frame and the compression plate.

(i). Thrust plate

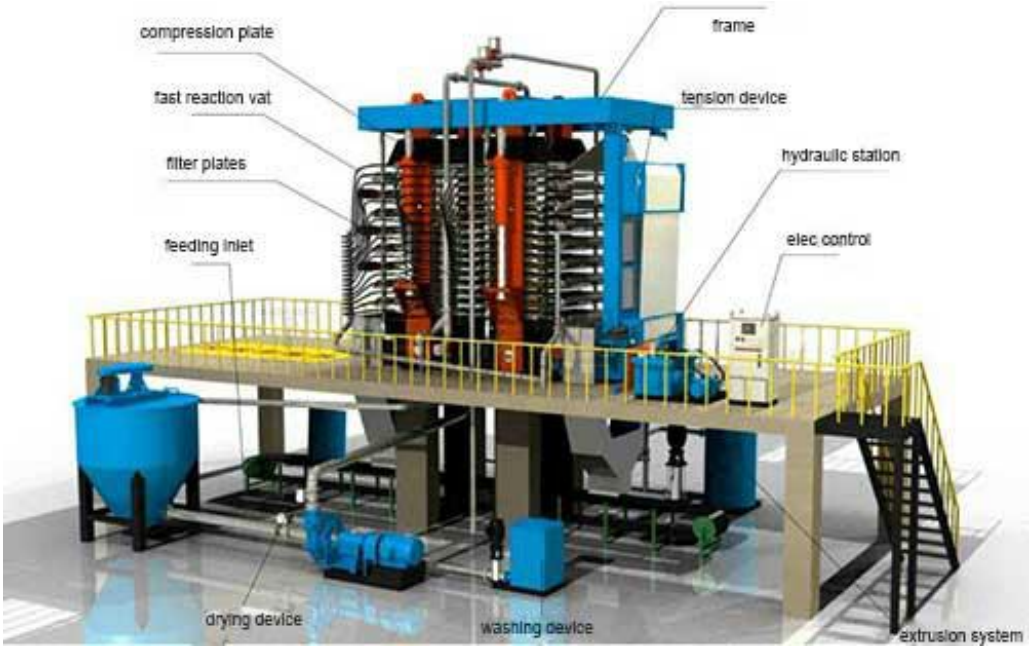
Thrust plate is connected with the support to place one end of the filter press on the foundation. In the middle of the thrust plate of the box filter press, there are feed holes, four holes in the four corners. The holes in the upper two corners are the inlet of washing liquid or pressing gas, and the outlet in the lower two corners (undercurrent structure or filter outlet).

(ii). Compression plate

Compression plate is used to compress the filter plate frame, and the rollers on both sides are used to support the rolling of the compaction plate on the track of the beam.

(iii). Beam

It is a bearing component. According to the requirements of environmental protection, rigid polyvinyl chloride, polypropylene, stainless steel or new anti-corrosion coatings can be selected.



Compression Devices

Manual compression, mechanical compression, hydraulic compression.

(i). Manual Compression

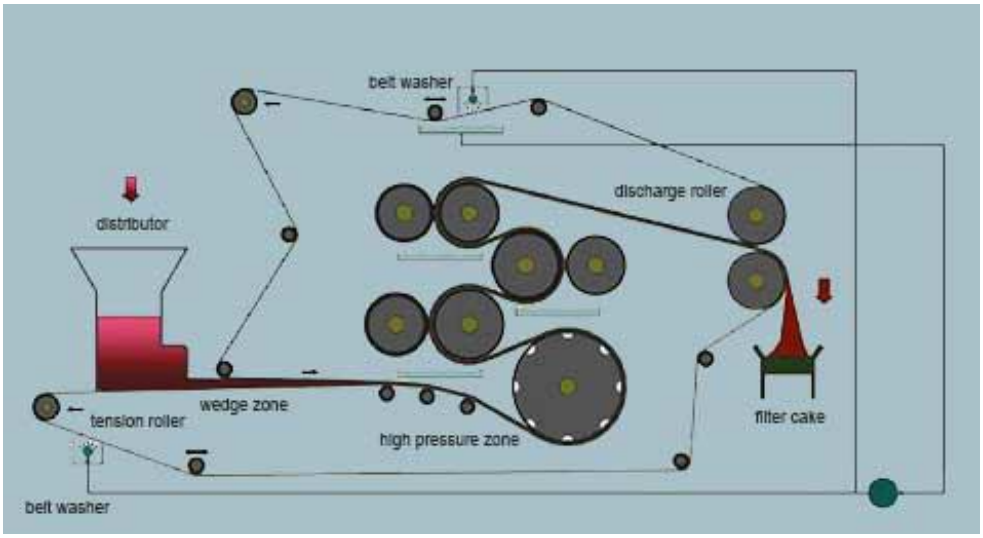
Screw type mechanical jack is used to push the compaction plate to press the filter plate.

(ii). Mechanical Compression

Mechanism compression devices consists of motor (equipped with advanced overload protector) reducer, gear pair, screw and fixed nut. When pressing, the motor rotates forward to drive the reducer and gear pair, so that the screw rod rotates in the fixed screw mother, and pushes the pressing plate to press the filter plate and the filter frame tightly.

(iii). Hydraulic Compression

Hydraulic compression devices consists of hydraulic station, cylinder, piston and piston rod. When the hydraulic pressure is pressed mechanically, the high pressure oil is supplied by the hydraulic station, and the component chamber composed of cylinder and piston is filled with oil. When the pressure is greater than the friction resistance of the pressure plate, the pressure plate slowly compresses the filter plate.



Filtration Devices

The filteration devices consists of filter plates, filter frames, filter clothes and filter press diaphragms. The two sides of the filter plate are covered by filter clothes. When a filter press diaphragm is needed, a set of filter plates are composed of a diaphragm plate and a side plate.

(i). Filtering Type

The types of filtrating is divided into open-flow filtrating and underflow filtrating.

A. **Open-flow filtrating**: The outlet hole under each filter plate is equipped with a water nozzle, and the filtrate flows intuitively from the water nozzle.

B. **Underflow filtrating**: There are outlet holes under each filter plate. The outlet holes of several filter plates are connected to form an outlet channel, which is discharged by the pipeline connected with the outlet holes under the thrust plate.

(ii). Washing Method

When cake needs washing, there are Open-flow one-way washing and two-way washing, Undercurrent-flow one-way washing and two-way washing.

A. Open-flow one-way washing is that the washing liquid enters from the wash hole of the thrust plate in turn, passes through the filter cloth and then passes through the filter cake, and flows out from the non-porous filter plate. At this time, the outlet nozzle of the orifice plate is closed, and the outlet nozzle of the non-orifice plate is open.

B. Open-flow two-way washing is that the wash liquid enters the holes on both sides of the thrust plate twice, that is, the wash liquid first washes from one side and then washes from the other side. The outlet of the wash liquid is diagonal to the import, so it is also called two-way cross washing.

C. Undercurrent-flow one-way washing is that the wash liquid enters the orifice plate in turn from the wash liquid of the thrust plate into the orifice plate, passes through the filter cloth and then through the filter cake, and flows out from the non-orifice filter plate.

D. Undercurrent bidirectional washing is that the washing liquid enters two holes on both sides of the top of the stop plate and then washes twice. That is to say, the washing liquid first washes from one side and then washes from the other side. The outlet of the washing liquid is diagonal, so it is also called undercurrent bidirectional cross washing.

(iii). Filter Cloth

Filter cloth is a kind of main filter medium. The selection and use of filter cloth plays a decisive role in the filtering effect. When selecting, appropriate filter cloth material and aperture shall be selected according to the pH value of filter material, solid particle size and other factors to ensure low filtering cost and high filtering efficiency. When using, the filter cloth shall be smooth without discount and aperture unblocked.

Filter Press Types

Plate and Frame Filter Press

Plate and frame filter press consist of alternately arranged filter plates and frame to form a set of filter chambers. The surface of the filter plate is grooved, and the protruding part of the filter plate is used to support the filter cloth. The edge and corner of the filter frame and the filter plate have through holes, which form a complete channel after assembly, and can enter suspension, wash water and drain filtrate. Each side of the plate and the frame has a handle supported on the cross beam, and the plate and the frame are pressed by the compression device. The filter cloth between the plate and the frame acts as a sealing gasket.

When working, the suspension is pumped into the filter chamber by the feed pump to form filter cake on the filter cloth until the filter chamber is filled. The filtrate passes through the filter cloth and flows along the filter plate groove to the channel at the edge and corner of the plate and frame, and is discharged centrally. After filtration, the cake can be washed with clean water. After washing, compressed air is sometimes introduced to remove the remaining detergent. Then open the filter press to remove the filter cake, clean the filter cloth, re-press the plate and frame, and start the next filter cycle.

Plate and frame filter press is suitable for suspension with high compressibility or near incompressibility of filter residue. The suitable concentration of solid particles in suspension is < 10%, and the operating pressure is 0.3-0.6 MPa. The filter area can be increased or decreased with the number of filter plates used. The plate frame is usually square, the inner edge of the filter frame is 200-2000 mm long, the thickness of the frame is 16-80 mm, and the filtering area is 0.5-1200 square meters.

Chamber Filter Press

The structure and working principle of the chamber filter press are similar to that of the plate and frame filter press. The difference is that the two sides of the filter plate are concave. Each two plates are combined into a chamber-shaped filter chamber, omit the filter frame, There is a circular hole in the center of the filter plate from which the suspension flows into each filter chamber. Chamber filter press is suitable for suspensions that need to be filtered under high pressure without washing the cake.

Vertical Filter Press

The filter plate of vertical filter press is superposed horizontally and up and down to form a group of filter chambers, which occupies a small area. It adopts a continuous filter belt, after the completion of filtering, it moves the filter belt and unloads the cake and cleans the filter belt. The operation is automatic.

Vertical filter press has a wide range of applications and simple structure. Compression and opening of plate and frame, filter cake discharge and cleaning of filter cloth can be operated automatically, which is conducive to the large-scale development of filter press. After the elastic rubber diaphragm is added to the filter chamber of the filter press, the filter cake can be compressed with high pressure water or compressed air at the end of the filter by means of the rubber diaphragm, so that the filter cake can be further pressed and dehydrated.

Belt Filter Press

Belt filter press is widely used for sludge dewatering in municipal sewage treatment, chemical industry, oil refining, metallurgy, paper making, leather making, food, coal washing, printing and dyeing industries.

Belt filter press has 3 working zones, i.e. gravity dewatering zone, wedge compression dewatering zone and shear dewatering zone. Its compression type belongs to two-dimensional compression and is an ideal equipment for sludge dewatering. However, the dewatering effect of belt filter press depends on chemical agents, which results in high cost of sludge treatment.

Membrane Filter Press

Membrane filter press is an intermittent pressure filter equipment, which is used for solid-liquid separation of various suspensions. The filter press is equipped with a rubber press membrane to dewater the cake. The medium for expanding the membrane may be compressed air (used below 0.7 MPa) or water (used above 0.7 MPa).

> Filter Press has a long history, mainly as a solid-liquid separation equipment, has been widely used, especially in the coal industry. According to statistics, at least 60% of coal manufacturers choose filter press.
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> With the continuous changes of the market, the demands are becoming higher and higher for filter presses, especially in energy saving and environmental protection, so catering to the complex market demands is an important direction for the development of filter presses.