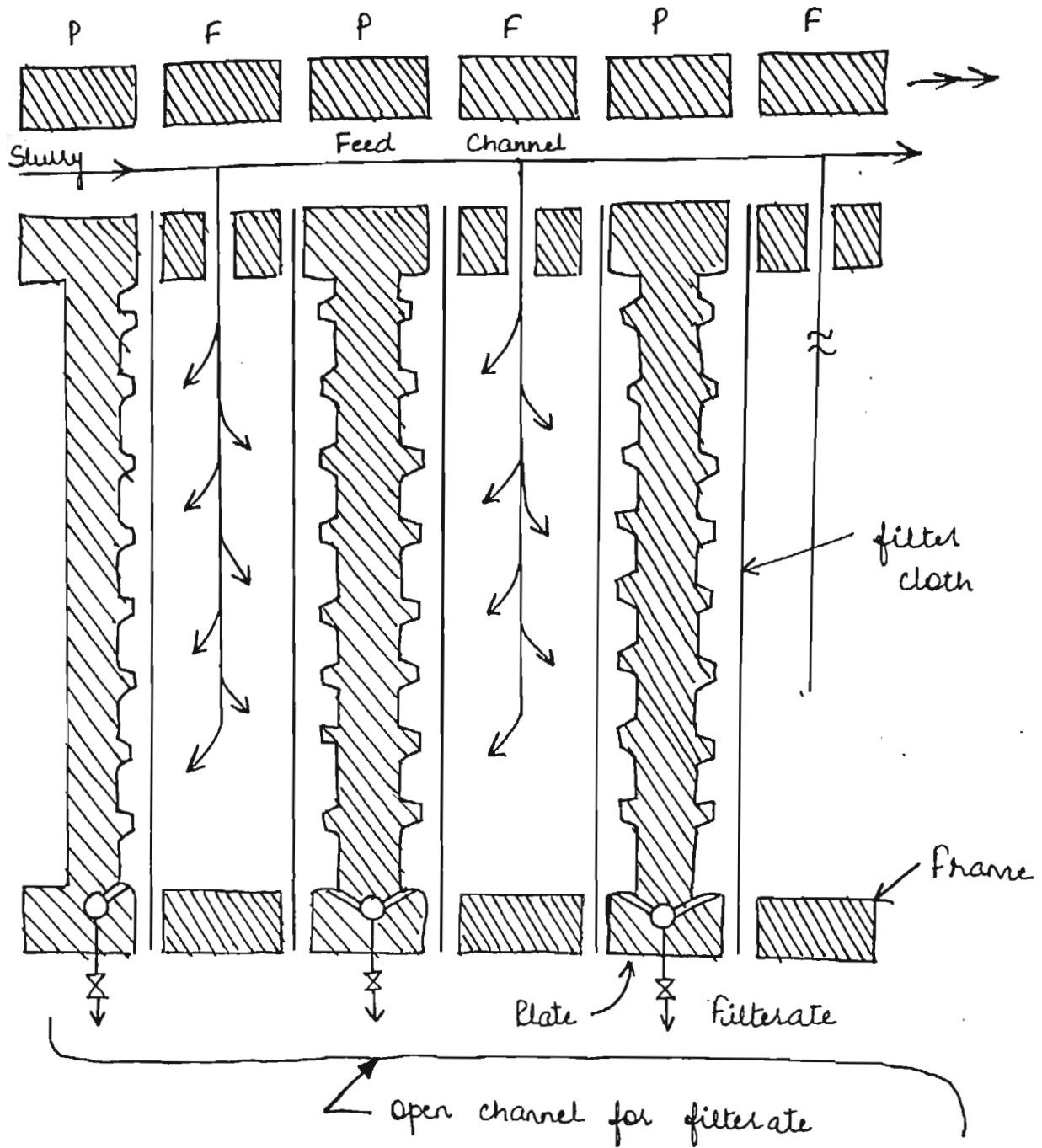


PRESS AND FRAME FILTER PRESS...



Construction :-

It consists of plates and frames arranged alternately and supported on a pair of rails. The plates are solid pieces having ribbed surface. The frame is hollow and provides the space for filter cake. The alternate arrangement of plates & frame results into formation of chambers. The plates and frames are square or rectangular in shape and can be made of cast iron,

stainless steel, nickel, aluminium, monel, wood, hard rubber or plastics. Coated material are also used.

Filter cloths are placed over each plate surface on both sides so that hollow frame is separated from the plate by the filter cloth. The plates & frames have circular holes on the corner for discharge and feed. Filter cloths are also having holes that match the holes on the plates & frames. Filter cloth themselves acts as gaskets.

When the press is closed by means of a hand screw or hydraulically, a continuous channel is formed along the whole length of the press out of the corner hole in the plates, cloths & frames. The frames have openings in the interior from the corner holes so that slurry channel opens into the interior of frame (i.e. in the chamber formed between each pair of successive plates). At the bottom of the plates, holes are bored which connect the faces of the plates to the outlet cocks.

Working :-

The slurry to be filtered is pumped through the feed channel. It runs into the chambers formed and fills the chamber completely. As the feed pumps continues to supply slurry to be filtered, the pressure goes on increasing. Because of this, the filtrate passes through the cloth, runs down the faces of plates and finally leaves the filter through discharge cocks. The solids are deposited on the filter cloth. Two cakes are formed simultaneously in each chamber and these join when the chamber is full, and the press is said to be jammed. Wash liquid may be introduced in the press to remove soluble impurities from solids and the cake is then blowed with air to remove the residual liquid from cake. The press is then dismantled, and the cake of solids scrapped off from each plate.

Advantages of plate and frame press :-

1. Simple in construction
2. Low first cost
3. Very low maintenance and hence, maintenance cost is low.
4. It provides large filtering area per unit for floor space occupied.
5. High operating pressures are easily obtained.
6. It is possible to alter the capacity.
7. Most joints are external, so leakage is easily detected.
8. Flexibility

Disadvantages of filter press frame press :-

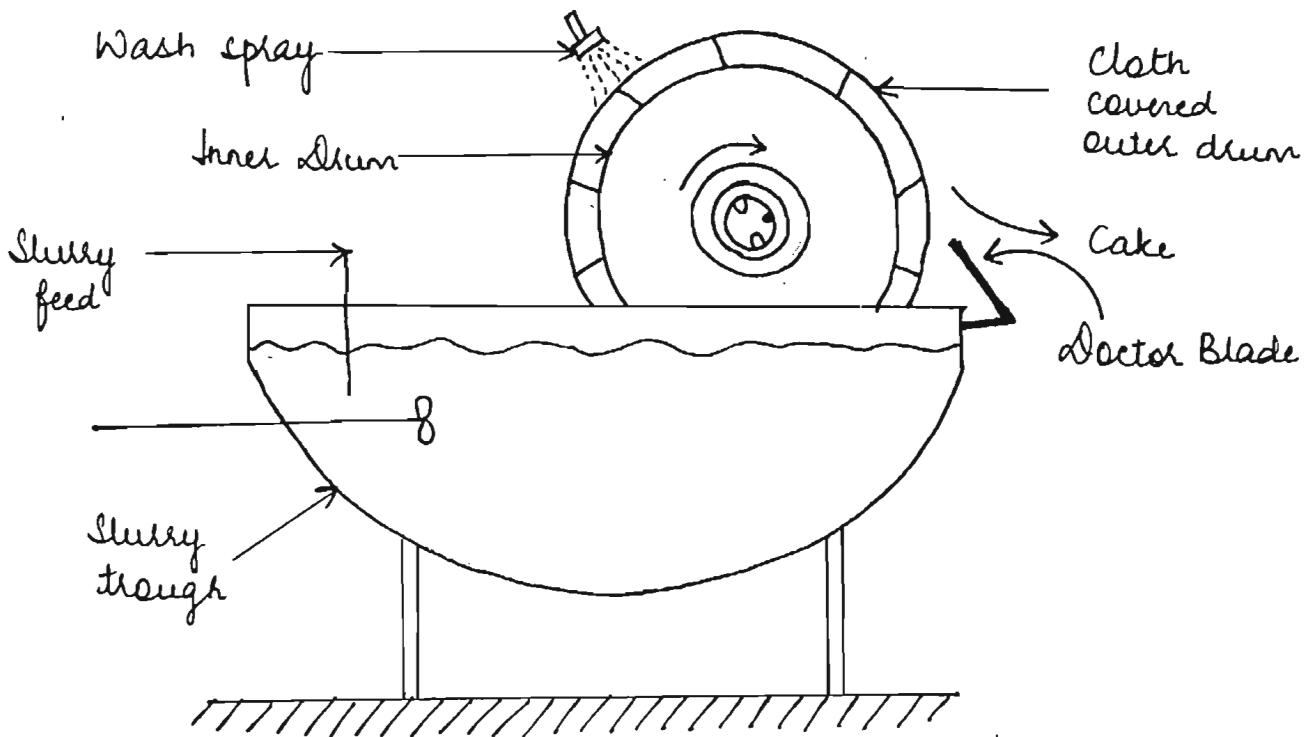
1. Labour requirement is very high.
2. Not suitable for high throughputs.
3. Cake washing is likely to be imperfect.
4. Presses frequently dip and leak, making housekeeping in the area a problem.
5. Intermittent in operation and periodic manual dismantling tend to cause high wear on the cloths. So, filter cloth life is relatively short.

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ROTARY DRUM FILTER

It is the most common type of continuous vacuum filter in which filtration, washing, partial drying & discharge of cake take place automatically.

Construction :-



It consists essentially of cylindrical sheet metal drum mounted horizontally. It may be from 50 to 400 cm in diameter and 50 to 800 cm long. Outer surface of the drum is formed of perforated plate. A filter medium such as canvas covers the outer surface of the drum which turns at 0.1 to 2 r/min in an agitated slurry trough. Inside outer drum, there is a solid drum called inner drum. The annular space between the two is divided into no. of compartments by radial partitions and separate connection is made between the compartments and a special type of rotary valve. As the drum rotates, vacuum & air are alternately applied to each compartment.

apart from cast iron, other materials include stainless steel, titanium etc. Construction from these materials give much improved corrosion resistance for many slurries.

Working :-

The drum is immersed to the desired depth in the slurry which is gently agitated to prevent the settling of solids. The vacuum is applied to the portion of drum which is submerged in the slurry through a rotary valve. Because of this, the liquid (filtrate) is sucked into the compartment and solid gets deposited on the cloth to form a cake of desired thickness which can be regulated by adjusting the drum speed. With higher speed, thinner cake will be formed & consequently, high rate of filtration will be achieved. The filtrate then goes to filtrate collecting tank through internal pipe & rotary valve.

As the portion of the drum on which the cake is formed comes out of slurry, the cake is washed and enters into drying zone as drum rotates where cake is partially dried by sucking air through the cake of solids. After this, vacuum is cut off and the cake is removed by scrapping it off. A little air is blown in under the cloth to aid the removal of the cake. Once the cake is dislodged from the sector of a drum, it re-enters the slurry, and the cycle is repeated.

Commonly, one-third of cycle is used for filtration, one-half for washing, drying and one-sixth for removal of cake.

Advantages of Rotary drum filter :-

1. The filter is entirely automatic in action and thus the man-power requirement is very low.
2. It is possible to remove most of the liquid from cake before discharging.
3. It has large capacity for its size, widely used in filtration of

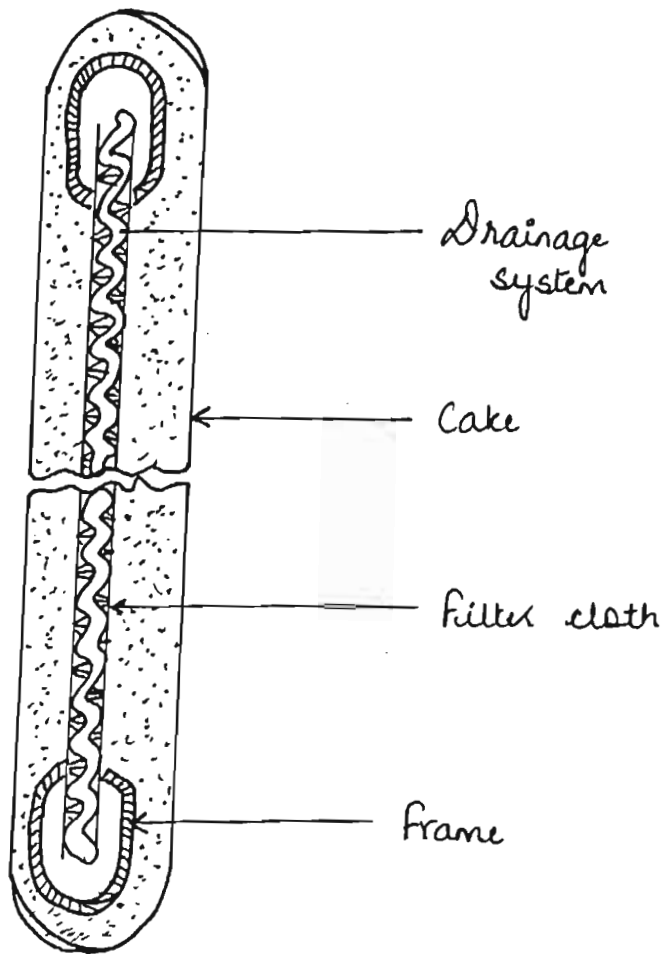
4. By altering the speed, it is possible to build up the cakes of varying thickness. With fine solids, thickness is small and large with coarse solids.

Disadvantages of Rotary drum filter :-

1. The maximum available pressure difference is limited as it being a vacuum filter.
2. Being vacuum filter, a difficulty is encountered in the filtration of hot liquids because of their tendency to boil.
3. The filter cannot be employed for materials forming relatively impermeable cakes or that cannot be easily removed from cloth.
4. Initial cost of vacuum filter equipment is high.

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LEAF FILTERS



These filters provide large surface area by using varieties of filter leaves and do not require complete disassembly for cleaning.

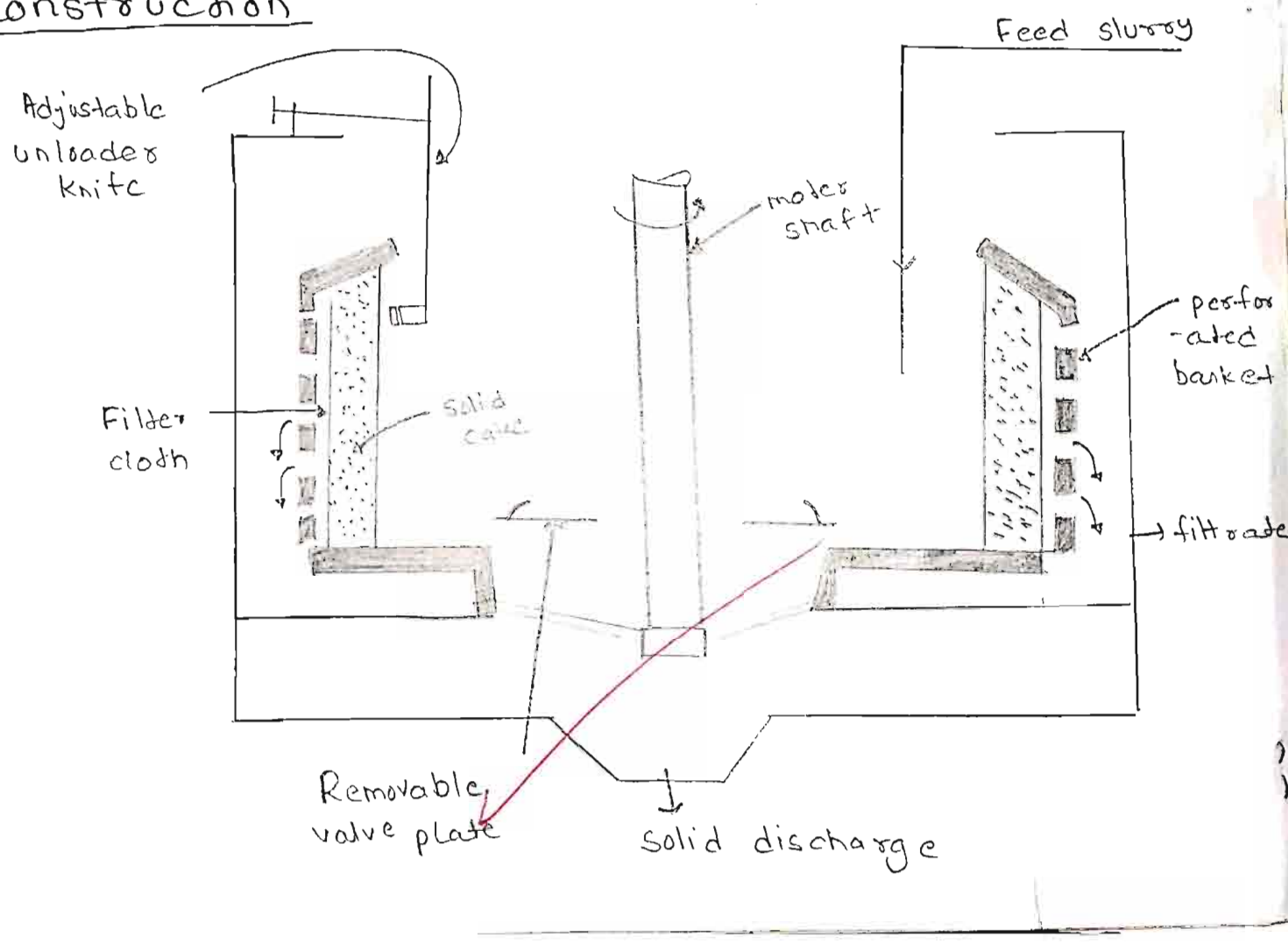
The leaf filter consist of a heavy wire drainage screen mounted in a tubular frame which acts as support and filtrate conduit. The slurry to be filtered fills the space around the leaf and is forced to flow through the leaf by applying pressure on the slurry or vacuum within the leaf. In either case, the filter cake builds upon the outside of leaf (on cloth) & filtrate passes from within the leaf to the filtrate discharge system.

Leaf filters may be grouped into vacuum leaf filters & pressure leaf filters.

④ Centrifugal filter

Principle ⇒ The peeler centrifuge is a device that perform by rotating filtration basket in an axis. A centrifuge follows on the principle of centrifugal force to separate solids from liquids by density difference.

Construction



Construction ⇒ The top suspended centrifugal is a common type of batch centrifugal in industrial processing. It consists of a basket with perforated sides. The diameter of the basket ranges from 750 to 1200 mm and depth from 450 to 750 mm. The basket rotates at speeds b/w 600 to 1800 rpm. The basket is held at the lower end of a free swinging vertical shaft. The shaft is driven from above by an electric motor. A filter medium is placed around the inside surface of the basket sides. Surrounding the basket is the casing provided with a filtrate discharge connection at the bottom.

Working ⇒ Slurry to be filtered is fed to the rotating basket through an inlet pipe or chute. It is forced against the basket sides by centrifugal force. The liquid passes the filter medium into the casing and out a discharge pipe. The solid phase forms a filter cake against the filter medium. The cake thickness usually varies from 50 to 150 mm. The cake is washed by spraying wash liquid to remove the soluble material. It leaves the centrifuge through the discharge pipe. After washing the charging and washing steps. The motor is then shut off and the basket speed is reduced by application of a brake. At the basket speed 30-50 rpm. The cake discharge by cutting it out with an unloader knife. The knife peels the cake off the filter medium and drop it through an opening in the basket floor.

Advantages

- ① Centrifuge have a clean appearance and how little to no odour problem
- ② Not only is device easy to install and fast at starting up and shutting down, but also only require a small area of operation
- ③ They can be selected for different operation

Disadvantages

- ① The machine can be very noisy and can cause vibration
- ② The device has high-energy consumption due to high gravitational force.
- ③ High initial capital cost.