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## **A NEW ECONOMICAL APPROACH TO PULP WASHING**

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### **Abstract :**

Belt Filter Presses are being inducted now for Pulp Washing. Belt Filter Presses use 1/10th of the energy as compared to rotary vacuum filters, and do not need elaborate civil construction. History of development of Belt Filter Press is traced, with emphasis on current design, and trends.

The filterbelt press was first conceived as a sludge dewatering machine by Klien KG of West Germany some 25 years ago. Early work was limited to the dewatering of industrial sludges. Encouraging results were obtained, and soon the work was extended to sewage sludges. Now more than 20,000 belt filter presses are working worldwide, out of which largest number has been sold by Klien; & the rest by 30 other manufacturers.

It has been seen that no two sludges are same. A certain time has to be devoted initially when starting a new belt filter press, to get optimum performance.

### Development of Belt Filter Press:

Initially Belt Filter Press had a configuration shown in Fig. 1. It comprised a continuous belt of filter fabric travelling horizontally over a bed of rollers, pressure being applied to the sludge gradually increasing by an opposing belt of impervious material, moving in the same direction. Its major limitation was its inability to deal adequately with very thin sludges, or those of gelatinous nature.

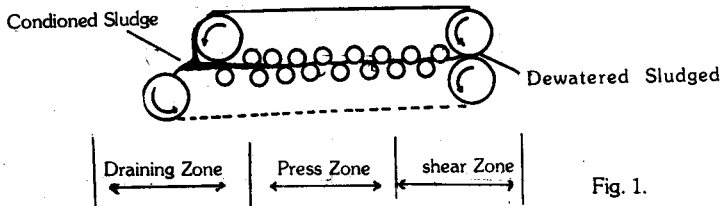


Fig. 1.

This led to the development of Belt Filter Press as shown in Fig. 2. In this free drainage was considerably increased by substituting a belt of filter fabric for the previously impervious press belt. The sludge was introduced at the top of this press belt. This modification gave much more satisfactory results with slow draining sludges, and also with very thin sludges in which the ratio of hydraulic to solid loading was very high.

Better results were also obtained with gelatinous sludges, as it was found that once the gravity dewatered sludge entered the pressing zone there was much less tendency for sludge to squeeze out at the sides of the belt, thus permitting much higher loadings.

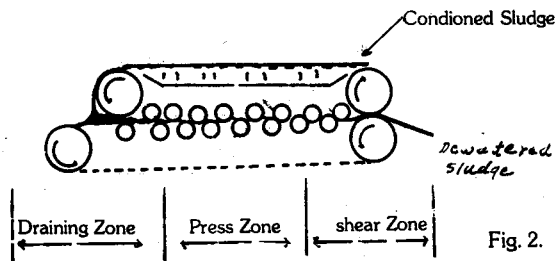


Fig. 2.

Demand for still drier filter cakes led to the development of so called Meander Press, as shown in Fig.3. In this machine a greater degree of sheer was obtained, and a higher pressure achieved.

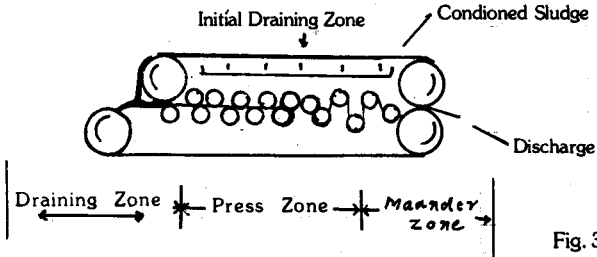
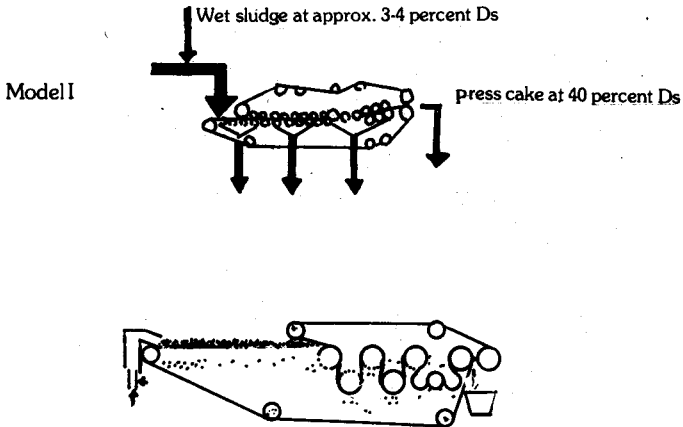


Fig. 3.

Model I and Model II of Dewan Belt Filter press are built similarly. Either of them can be with a fourth stage, which is a press, in which rollers squeeze the sludge. Model I is equipped with a triple press. These are illustrated in Fig.4.



Dewan Belt Filter Press

Fig. 4.

So far as the press section of a unit is concerned, the drier a sludge is the more pressure it can take without lateral movement. If too much pressure is applied too soon, the sludge will tend to squeeze out from the edges of the belts, as no mechanical restraint is provided and, indeed, none is necessary in normal practice. For this reason, modern presses are arranged so that the filter belts come together initially in the form of an elongated wedge.

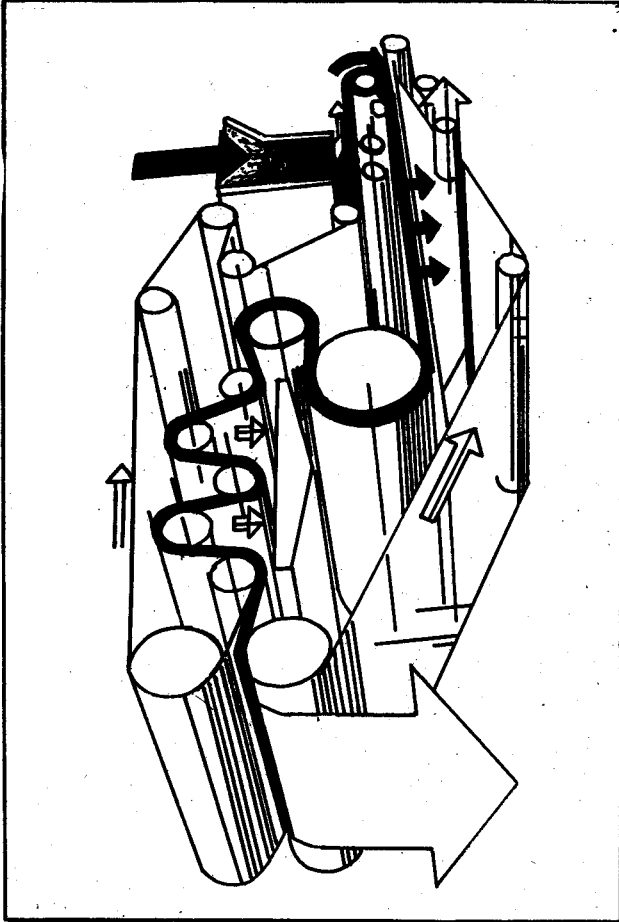


Fig. 5. Dewan Belt Filter Press

MODEL 3

This modern machine is illustrated in Fig.5. This machine differs from its predecessors whilst still applying the same basic principle of mechanically squeezing the sludge/pulp between two belts of filter fabric. The major difference is that Model III includes a pre-thickening stage. The elongated wedge is considerably longer and is provided with foils. In the shear zone the belts roll around rollers of decreasing diameter, considerably lengthening belt path. This provides a much longer pressing time.

The material and construction of the filterbelts themselves is of fundamental importance. Filterbelt presses do not generally use the belt fabric as a filter medium, it is important to note. Rather they use filterbelt as a support for a self-filtering solid/liquid system. Most belts are woven from polyester monofilament and a wide range of weaving patterns is available. Jointing is generally done by stainless staples set into each of the free ends of the belt, and joined in use by a pin passing through the eye of the staples. Such joints have a strength atleast 90 % that of the belt itself, and are designed to present a low profile to avoid interference with the doctor knife, removing sludge from the belts at the discharge point.

### **Pulp Washing By Rotary Vacuum Filters**

Rotary vacuum filters consist of a rotating drum, partly immersed in pulp, having several segments which are alternately under atmospheric pressure and vacuum extraction. A sheet of pulp is formed on the drum surface and vacuum applied which removes much strong black liquor. Weak liquor sprayed on top surface displaces more strong liquor; fresh water sprays then displace the weak liquor, and air finally displaces much of water.

### **Pulp Washing By Belt Filter Press**

Model III Belt Filter Press (Fig.5) can do much the same thing. The pulp is dewatered before washing, expelling strong black liquor, in the wedge zone. Washing is done at the first roller, which is perforated, and water is fed in by a rotameter on the inner side of the roller. Subsequently the pulp is squeezed to remove the weak black liquor, by the shear zone of the press. Pulp at 20 % Cy is obtained. Higher Cy can be obtained if required.

## **Conclusion**

There are many positive factors favouring the use of Belt Filter Press.

- (a) simple operation
- (b) low energy & space requirements
- (c) low maintenance
- (d) lesser capital investment
- (e) ease of installation
- (f) low operator time
- (g) versatility of operation
- (h) no two-storey building and heavy foundation required.