

# Metso in filtration



Mechanical  
dewatering  
by pressure



# Mechanical dewatering by pressure

As particles get finer the resistance against removing water increases. Gravity dewatering can no longer be used, pressure has to be used.

By creating a differential pressure  $D_p$  across a cake of solids, liquid can be removed by:

### Compression:

“Dewatering by compression means removing the liquid in a cake by compacting the cake structure”.

### Through blow

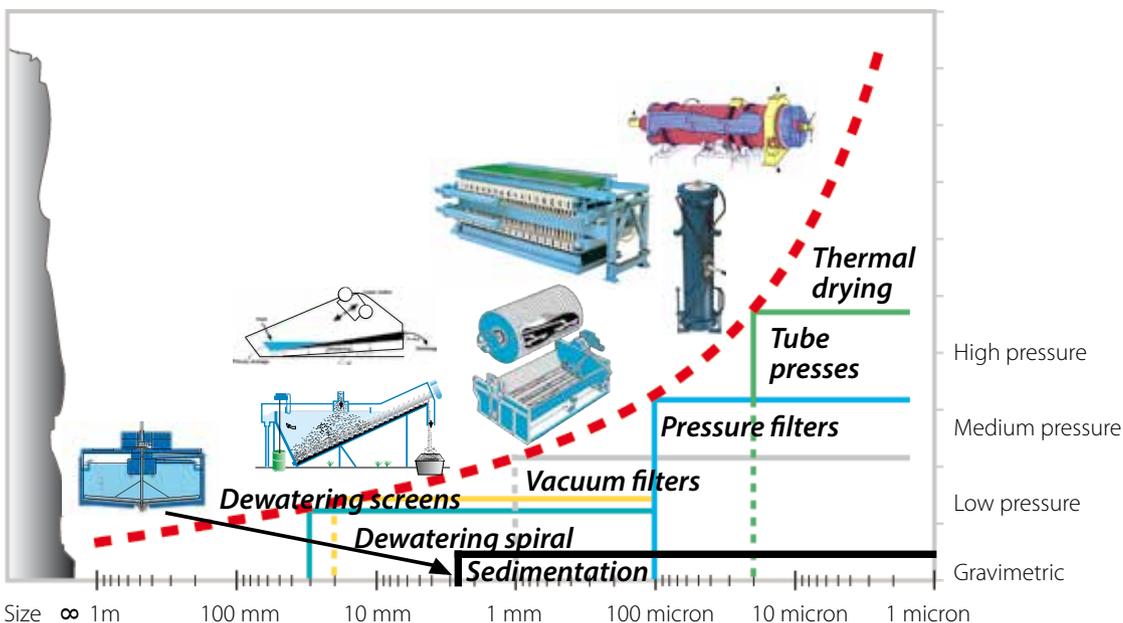
“Dewatering by through blow means replacing the water in a cake with air”.

For **tube presses** either compression or a combination of compression and air purge is used. Similarly by the same method, cake

washing is possible on the Tube Press. This is known as displacement washing where liquid is forced through the filter cake by hydraulic pressure causing the remaining natural liquid to be displaced by the incoming wash liquid.

For **vertical plate pressure filters** either compression or a combination of compression and air through blow is used.

For **vacuum filters** air through blow is used.





## Tube press

The tube press is a membrane type filter press designed in cylindrical format and capable of operating at high filtration pressures up to 100 bar.

The use of these high pressures enables a higher degree of separation of the liquid and solid phases.

### The tube press is suitable for the following applications:

- Where the process requires very low cake moisture eg. smelters
- Where cake handle ability is critical. e.g. underground slimes
- Where filtrate is a valued product
- Where cake transport costs are significant
- Where cake is to be disposed of to landfill

### Principle of operation

Filtration takes place between two concentric cylinders. The outer cylinder is the casing, and the inner, the candle.

The process slurry is pumped into the annular space between the filter media and the bladder. Hydraulic fluid, water, is then pumped between the bladder and the casing putting the slurry under pressure and

causing filtration to take place. When filtration is complete the hydraulic fluid is withdrawn from the Tube unit using vacuum until the bladder is dilated against the casing.

The candle is then lowered to the discharge position and a pulse of air is blown between the candle and the filter media. This causes the filter cloth to expand, fracturing the cake which is discharged under gravity. When complete the candle closes to the slurry fill position to repeat the cycle.

Air purge and/or cake wash can be incorporated into the cycle. At the completion of the filtration element, air or wash fluid is pumped between the cake and the bladder which is then forced through the cake by a further application of hydraulic pressure to be incorporated into the cycle.

### Benefits

- Driest possible cake solids
- Maximum volume reduction
- Exceptionally clear filtrate

### Advantages of on-site tube press trials

Tests will be undertaken on production slurry and will encounter any variability of production feed that occurs during the trial. The client will see the performance and in particular will be able to handle the cake and observe the filtrate clarity.

The client has opportunity to operate the plant. Contact your Metso representative for further information on these available services.

### Reliable support

Metso specialists are experts in a wide range of industrial processes. Our policy is to provide a thorough knowledge of our customers' applications.

### After sales service

Our after sales service provides you with fully detailed operating and maintenance instructions, training, professional start-up services and technical assistance.

### Opportunities

In many industries a liquid phase in the process creates the need for liquid/solid separation so that the solids and/or filtrates so produced can be handled or disposed of.

"Traditional" mechanical dewatering often leaves the cake too wet or too sticky to handle effectively and usually demands further treatment such as thermal drying.

The Tube Press, because of its unique design, will automatically and economically dewater most slurries to produce a clear filtrate and, without any form of thermal drying, a hard, surface dry cake that is convenient to handle as a product for immediate storage or for disposal.



## Vertical plate pressure filter VPA

The pressure filter model VPA is of “medium pressure” type operating in the pressure range of 6-10 bar. The machine mainly is based on the “air through blow” dewatering concept, whereby water is displaced by air as it passes through a filter cake.

### Simple mechanical construction

The Metso pressure filter is a heavy duty machine, developed for filtration of metallic minerals, industrial minerals, coal and tailings.

The filter has simple mechanical construction and design, with few moving parts. By using a pulling hydraulic cylinder system for closing and sealing the filter plate pack, we can provide a compact layout and a light weight support frame design.

Polypropylene filter plates are used for good chemical resistance and the light weight.

### Smart fully automatic control system

The pressure filter is controlled by a system consisting of a PLC connected to a PC screen, built in a well sealed and well insulated cabinet.

All control logics are implemented in the PLC. On the PC monitor the filter operator can follow and control the filter operation and information such as settings, statistics and alarms.

### High unit capacity

By installing the Metso pressure filter on load cells connected to the PLC a multitude of data become available.

The weighing system provides accurate production information, and can be used to optimize the filtration and drying steps in the filter cycle.

### Low dewatering cost with the membrane technology

The pressure filters use a rubber membrane in each filter chamber. The membrane technology eliminates cracks in the cakes and also compensates for the shrinking in the cake during the compressed air drying. The result means lower compressed air consumption and lower total dewatering cost.

### Low maintenance cost

Because of the simple mechanical design with few moving parts as well as the filter cloth design and system, with extremely short downtime for cloth changing, the Metso pressure filters have very low maintenance costs.

### VPA =

### Vertical Pressure filter Air through blow

- Lightweight polypropylene filter plates are mounted on a bolted steel frame and are moved by hydraulic cylinders
- Adjacent “filter and compression” plates form a filtration chamber. The filter cloths hang between each pair of plates. Rubber membranes are protected by the filter cloth thereby reducing wear.
- By mounting the filter on a load cell system the filtration cycle is monitored and controlled.
- Chambers are top fed for optimum filling. Two sided filtration speeds up the “filling” cycle.
- Openings for pulp, water and air are generously dimensioned to reduce energy losses and wear
- Service and maintenance requirements are low. The VPA design facilitates easy cloth changing.
- Air blow pressure 5-8 bar (73-116 psi). Membrane pressure 6-9 bar (87-131 psi)





# Drum vacuum filters

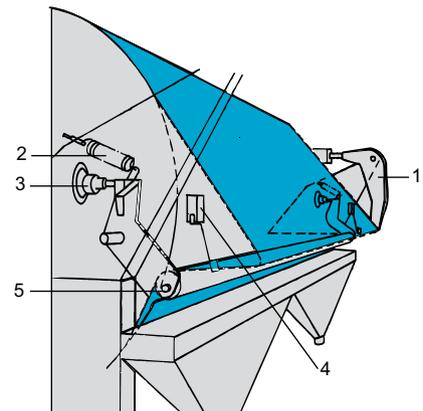
Vacuum filtration is a well established technique used in industrial dewatering. Metso has successfully delivered and installed many hundreds of rotary vacuum filters covering a wide field of applications.

All rotary vacuum filters operate on a similar principle. A pressure differential between the surface and inside of the drum is applied by means of vacuum.

This pressure differential causes transport of liquid through the filtration surface while the filter medium arrests solid particles and a cake is formed. As the drum rotates, the cake rises above the slurry level in the filter tank and air is drawn through the cake, forcing out liquid. The liquid (filtrate) exits the filter through the internal piping and the vacuum head.

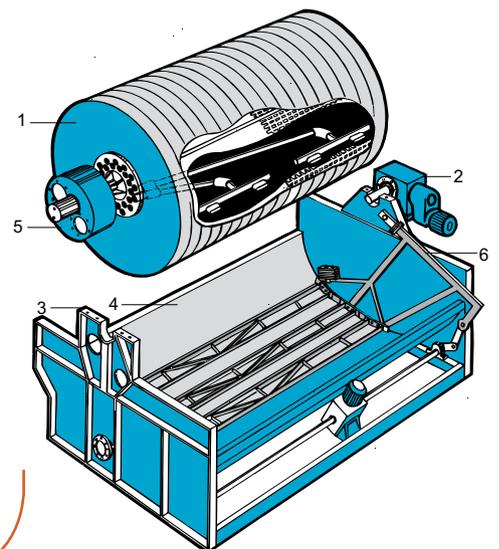
## Principal components of the drum filter model BTF

1. Cake discharge system counter weight and lever arms
2. Pneumatic diaphragm cylinder
3. Cylinder tensioning spring
4. Optical or pneumatic cloth edge sensor
5. Guide pulley



## Drum filter model BTF

1. Drum
2. Drum drive
3. Support Frame
4. Tank
5. Vacuum Head
6. Agitator



Contact you local Metso office for further information about vacuum filters.



**The range of rotary vacuum filters incorporates two basic design principles:**

Metso's filters are specially designed for high vacuum operation allowing very high air flow rates.

This results in:

- Higher capacities
- Lower cake moisture
- Extended application range

**Modularized components and equipment results in:**

- Flexibility in machine configuration
- Features may be added or altered to accommodate process changes
- Construction from proven, standard components
- Simplified maintenance and parts replacement
- Lower equipment and operating costs

**Belt drum filter model BTF**

Belt drum filters, model BTF, are identical in all respects to the TF range with one fundamental exception: cake discharge. With the belt drum filter the cloth is removed from the drum after the dewatering zone and passes over the cake discharge system before washing and return to the drum prior to the cake pick-up zone.

The three key system features of the belt drum filter are thus:

- Cake discharge
- Cloth washing
- Cloth tracking

**Cloth washing system**

Cloth washing increases the capacity of the filter and extends the cloth service life by preventing blinding. After passing the cake discharge system the cloth is washed over its full width by two high pressure sprays, one above and one below the cloth. Wash water is confined by a soft rubber curtain and collected for separate discharge through a launder.

**Cloth tracking system**

Cloth tracking is achieved by means of a single hinged guide pulley mounted in spherical roller bearings after the cloth passes from the washing system. The guide pulley is positioned by pneumatic diaphragm cylinders activated by optical or pneumatic sensors at each side of the cloth. Correct cloth tension is maintained by adjustable counterweights acting via levers to the cake discharge system.

The cloth tracking system

- Maintains cloth position within a few mm
- Eliminates need for special cloth edgings
- Provides self-adjusting cloth tensioning

**Top feed drum filters model TFF**

The top feed drum filter, model TFF, is especially suited for dewatering slurries containing coarser solid fractions. The top feed principle promotes segregation of the coarser particles in the feed box forming a "pre coat" which results in a high filtration rate cake.

Our capability to incorporate very high capacity vacuum heads and internal drum drainage systems into the TFF design results in high machine capacities and lower moisture cake.

**Standard features include:**

- Special seal between feed box and drum prevents leakage of feed and reduces mechanical wear of filter cloth
- Snap-blow cake discharge

**Optional features:**

- High pressure water, air or water/air mixture cloth cleaning between cake discharge and feed point.

Contact you local Metso office for further information about vacuum filters.

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