

4.4 Dewatering and pumping equipment

- Dewatering equipment are used to perform dewatering on construction sites, which is defined as the process of separating water from another material like saturated soil or sludge.
- The separation of water is performed by using a force generated by vacuum or centrifugal motion. Dewatering equipment saves money by reducing solids handling and disposal expenses. It is an alternative and economical option compared with heat drying systems for water removal.
- The selection of dewatering equipment depends on the corrosion potential of the material removed and the contaminants present in the liquid. As the reactivity of the liquid increases, the equipment is constructed with more durable materials.

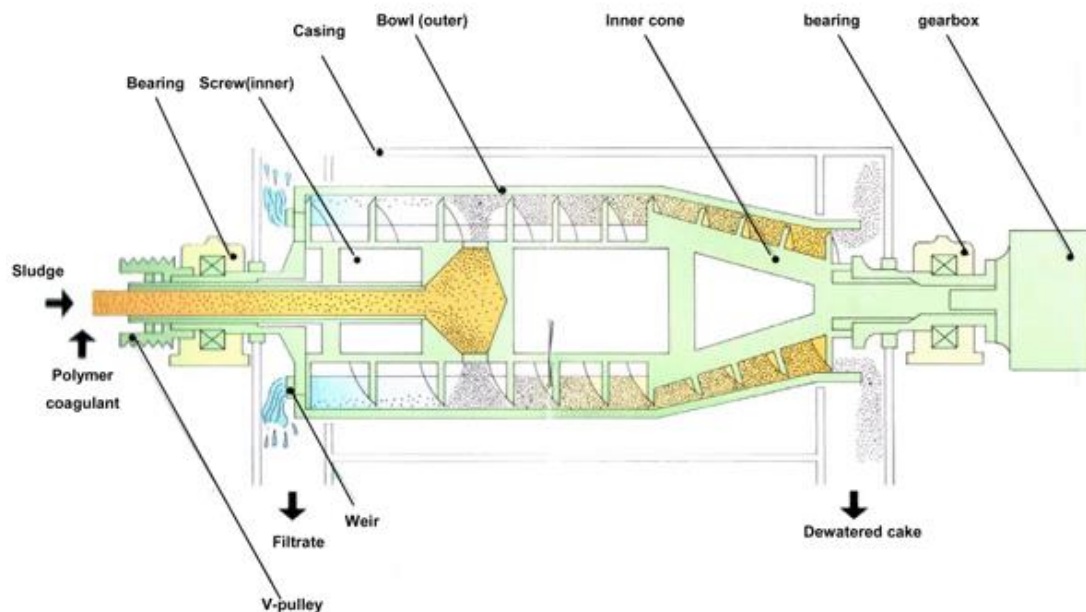
Types of Dewatering Equipment

The common types of dewatering equipment are:

1. Centrifuges
2. Drying beds
3. Vacuum filters
4. Filter presses
5. Sludge lagoons
6. Gravity and low-pressure devices

1. Centrifuges

Centrifuges remove solids from liquids through the process of sedimentation and centrifugal force. The solids or sludge are fed through the stationary feed tube. The sludge moves with an acceleration through the ports in the conveyor shaft, which is then distributed to the periphery of the bowl.



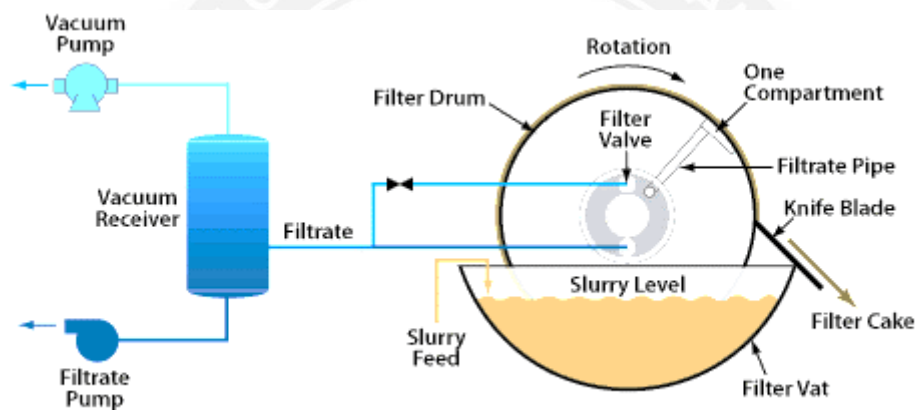
The bowl spins at high speed which simultaneously separates water from the solids. The separated solids are compacted against the bowl wall, as shown in the figure. The solids are then conveyed to the centrifuges drying stage and the liquid separated is discharged continuously over the weir arrangements around the sides of the bowl.

2. Vacuum Filters

The main aim of the technique is to extract extra water from concrete surface using **vacuum dewatering**. As a result of dewatering, there is a marked reduction in effective water-cement ratio and the performance of concrete improves drastically. The improvement is more on the surface where it is required the most. Mainly, **four components are required in vacuum dewatering of concrete**, which are given below:

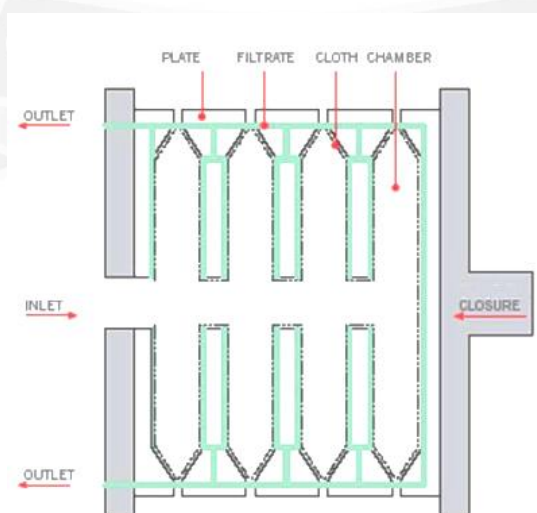
1. Vacuum pump
2. Water separator
3. Filtering pad
4. Screed board vibrator

Vacuum pump is a small but strong pump of 5 to 10 HP. Water is extracted by vacuum and stored in the water separator. The mats are placed over fine filter pads, which prevent the removal of cement with water. Proper control on the magnitude of the water removed is equal to the contraction in total volume of concrete. About 3% reduction in concrete layer depth takes place. Filtering pad consists of rigid backing sheet, expanded metal, wire gauze or muslin clothsheet.



3. Filter Presses

This equipment uses a filter medium to separate solids from the liquids. A filter press captures the solids in the pores between two or more porous plates. The solids captured are then pushed into the cavities by forcing water over them either through plate pressure or by build-up solid pressure.



4. Drying Beds

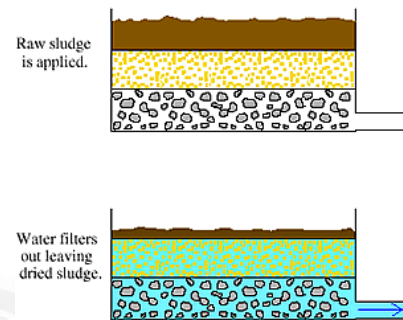
It consists of a perforated or open joint drainage pipe placed within a layer of gravel base, which is again covered with a layer of sand. The sludge collected is placed over this sand layer and allowed to

dry. The water from the sludge is removed by evaporation and by gravity movement to the underlying gravel base. This water is taken out through the drainage pipe placed in the gravel base.

With time, the sludge dries, and cracks develop on the surface. These cracks allow the evaporation of lower layers of the sludge.

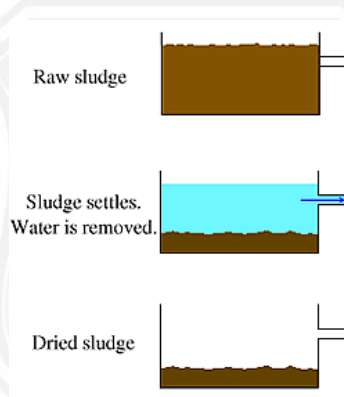
The design parameters of a drying bed includes:

- Depth of sludge
- Moisture content of sludge
- Availability of sand bed area



5. Sludge Lagoons

Sludge lagoons are excavated areas that are used to deposit and dry the sludge for several months to years. The depth of a sludge lagoon can vary from 2-6 feet.



Dewatering Equipment Selection Considerations

The selection of the most effective dewatering equipment for construction activities is dependent on:

- Drying requirements
- Cost
- Sludge characteristics
- Available area

The drying requirements and cost constraints are the primary factors governing the selection of the dewatering equipment. An engineer or industrial buyer must be aware of the sludge characteristics or corrosion potential of the water to be dewatered. The solids separated may possess hazardous contaminants or undesirable composition that may affect the performance of the equipment. For highly reactive sludge, the dewatering equipment like filter presses or gravity/low-pressure devices demand chemical conditioning prior to dewatering.