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Selecting Industrial Water Filters, Liquid-Solid Separators, and Dewatering Equipment

Selecting an industrial filter can be challenging. This page discusses, in plain English, available technologies (for example: Coanda effect wedge-wire screens) and criteria that may be used in characterizing and selecting industrial filtration, separation, and dewatering equipment in liquid processes. For purposes of simplicity, this treatment refers largely to inorganic, insoluble particles, yet this presumption is not absolutely necessary as many organic solids may also be physically treated by filters, separators, and dewatering equipment.

Filter is a word that comes from the root word “felt”, where the felt material was generally used to arrest particles in a liquid stream while allowing the liquid to pass through the felt with particles removed. The term filter is used fairly loosely in industry to generally refer to particle-removal equipment; strictly speaking though, there are essentially three general categories of particle-removal equipment:

1. Filters
2. Separators
3. Dewatering Equipment

These three categories are differentiated based on your process and what you are attempting to achieve in applying the equipment. Often, all three types of equipment, or at least two of them, may be used in complimentary ways to achieve the intended result.

1. Filters

Generally, liquid filters are used to remove relatively small amounts of particles from liquid process streams. Flowrates through filters may be large or small, depending on the relative amount of particulate material in the process stream.

2. Separators

Liquid-solid separators are used to remove relatively large quantities of particles from liquid process streams. Flowrates through separators may be large or small, yet typically, flow through separators are relatively large.

3. Dewatering Equipment

Dewatering equipment is used to remove the final amount of entrained water that remains in solids that have been separated from liquid. Therefore, liquid flowrate is typically small with respect to amount of solid.

Water Filters, Separators, and Dewatering Equipment

There are several types of filters that vary according to: 1) the type of filter elements, and 2) whether the filter unit is automatically cleaned or requires human intervention in operation and

maintenance. Types of filters/separators include:

Bag Filters -- usually good for relatively small-sized particles, low percent solid loading, and relatively low flows; best used as a polishing filter that can have a wide range of removal sizes by simply inserting/exchanging media. Incurs considerable expense replacing consumed bag filters. Easy to install and operate. Requires excessive maintenance in exchanging bags. Initial capital expense is medium and incremental cost may be excessively high. Often left unattended with bags obstructing with excess solid, since does not self-clean.

Strainers -- usually good for relatively coarse-sized particles, low percent solid loading, and medium flows; may be used as a polishing filter that can have a wide range of removal sizes by simply inserting/exchanging strainer baskets. Incurs less expense since typically not replacing consumable media. Easy to install and operate. Requires excessive maintenance in removing and cleaning internal baskets; depending on character of solids, baskets may be difficult to clean, leaving degraded hydraulic capacity. Initial capital expense is medium and incremental cost is low. Again, often left unattended with baskets obstructing with excess solid, since does not self-clean.

Automatic Filters -- similar to a strainer, except that the basket/filter element is cleaned automatically. Good for relatively coarse-sized particles, low percent solid loading, and medium to high flows; may be used as a polishing filter that can have a wide range of removal sizes by simply inserting/exchanging strainer baskets. Limited to low solids loading rates and goes into frequent backflush in medium to high solids applications, which consumes significant quantities of water. Incurs less expense since typically not replacing consumable media. Requires considerable effort to install. Operation may be temperamental requiring distinct particle sizes; not good for particles having high cohesion. Initial capital expense is medium to high and incremental cost is medium. Again, often left unattended with frequent backwashing. Parts replacement is low to high, depending on the application. Work well when properly applied; may be easily misapplied.

Centrifugal Separators -- usually good for relatively coarse-sized particles having specific gravity greater than one (SG>1), good for medium to relatively high percent solid loading and medium to large flows; limited as particles must be heavier than water for removal. Even when particles are heavier than water, significant carryover may occur, so absolute filtration is not always achieved. No consumable media. Easy to install and operate. Maintenance required is minimal. A discharge valve may be manually-operated or automatically actuated. Considerable water loss occurs in removing solids through the discharge valve. Initial capital expense is medium to high and incremental cost is low. Overall performance may be less than desired. Systems usually installed without adequate analysis of the flow stream, often leaving unsatisfactory outcomes.

Coanda Effect Wedge-Wire Screens -- uses static screens, so no moving parts and no replacement parts. Easy to install in retrofit and original equipment applications. Essentially no operation procedures and virtually maintenance-free with gravity removal of solids. Open to atmosphere; open design allows easy access. Zero-discharge, since no backwashing; instead, uses efficient screen rinse. Good for wide range of particle sizes from relatively small to coarse particles. Works with low to very high percent solid loading and low to high flows; works great as a prefilter. Made especially for heavy solids loading rates. Incurs less expense since there is no consumable media. Character of

particles may range from very cohesive to non-cohesive. No strict physical property requirements of particles in specific gravity, shape, or character. Initial capital investment is low with no incremental cost. High capacity to footprint ratio. May be left unattended. Low overall cost since relies principally on gravity; automatic self-cleaning of screens under influence of gravity makes these screens very cost-effective.