TYPES OF FILTRATION
GRAVITY OR PRESSURE

A **Gravity Filtration –** Roll media laid in a tray or placed on a movable belt employs only gravity to push the liquid through the media. It can be made of paper or other cellu-lose material or synthetic, to withstand or

be compatible with the liquid being separated from the presence of solids.

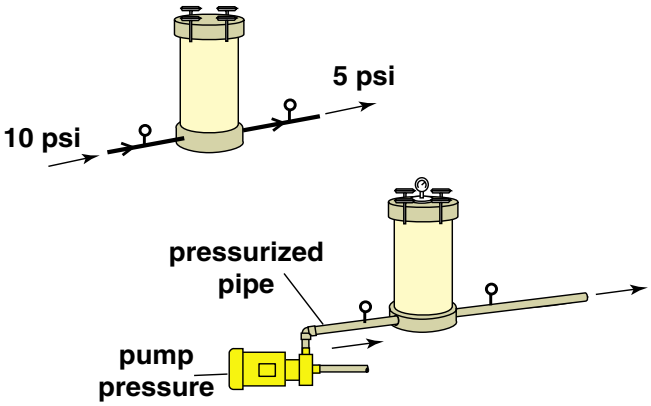
Perhaps the largest user of this type of filter is in the machine tool cutting, grinding or honing application where a clean solution will keep a tool sharper, cut more accurately or reduce the redressing of a grinding wheel.

Other applications could be in cleaning or wash systems, cooling towers, picking up skins from fruit and vegetable processing, potato chips and other hot fat cooking.

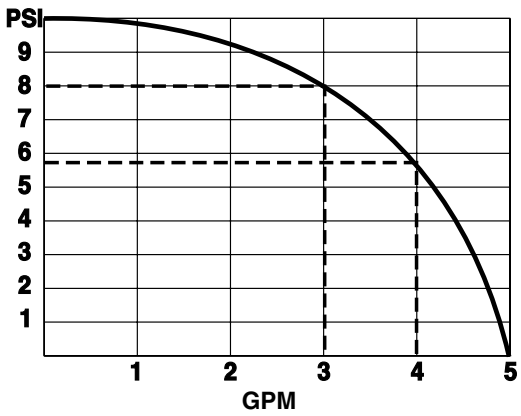
B **Pressure Filtration –** Pumps assist in the flow of liquid through the filter media. Pressure can be provided by an outside source such as pipelines of oil, gas and water, or in house with a pump as part of the system.

Differential pressure across the media may be below one psi to one hundred, with most systems designed for use with centrifugal pumps of 30 to 50 psi max, but pumps as low as 7 psi are usable and practical on light applications, gear positive displacement pump provide and conduct follow as ..... psi is.....

OUTSIDE SOURCE OF PRESSURE



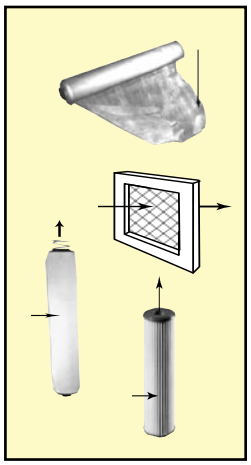
TYPICAL FLOW / PRESSURE CURVE —
As pressure is increased, flow is decreased.



Chambers are available in different sizes and materials of construction and pressure to hold a variety of filter media.

TYPES OF FILTER MEDIA – SURFACE OR DEPTH

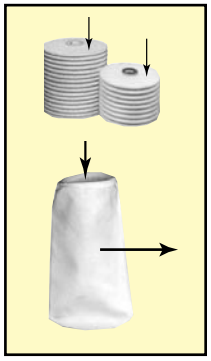
Surface area is the controlling factor to solids holding capacity, and as solids are picked up, pressure drop across the media follows a straight line.



The roll type media like paper used in the gravity filters is of the surface type, referring to the fact that the solids do not penetrate the thickness or depth of the media (e.g. using a phone book, what isn't stopped on the top page will go through all pages of equal density), whereas a depth media continues to pick up solids page after page as density increases.

Screens are surface type, whether they are flat or pleated or shaped with a screen type mesh, or used with paper or cloth on top of the support frame. Filter presses, bags or sleeves are also surface type – only different in application when the bag surface is pressurized pushing out, whereas sleeves or some bags employ an outside in, which causes the pores of the media to contract.

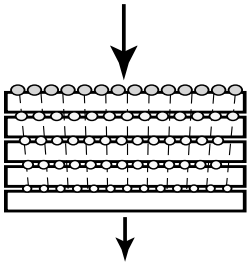
Surface media is available with pleats formed into a type of cartridge. The closer the pleats are together the more surface area, until the pleats are so close that solids can't be retained on the inner surfaces. Therefore, the media is limited to the outer edge.



Discs may also be stacked with very little space between the media. This is alright for light solids retention, but if too close together the volume of solids would be limited. Thus if an inside out bag is used, the nature of the solid would be best handled if it is gritty sand-like, creating a build-up of a porous cake, which allows the flow rate to be retained without the restriction causing a pressure drop across the media.

Therefore, if the solids are slimy like gels or of a kind which will not create a porous cake, surface media will only work if the amount of surface is extended to meet the amount of solids to be retained. Such a filter would then be sized according to the time desired to be achieved between servicing.

Depth can be best explained as a filter media consisting of layers which are progressively denser – sorting out the largest particles first (like a coin changer, from dollars to halves to quarters, etc. Thus, it's possible to pack more solids into a given volume of media.



Depth media could be the yarn wound type which is available in coarse to dense variations. Thus, a 100µ particle retention may be suitable for quench oil to pick up scales or 50µ might be suitable on a cooling tower. Then denser media would be preferred on liquid filling applications of a single pass.

This type of media benefits most because of its ability to increase its solids holding capacity through the employment of the recirculation technique.

Example: a typical 10" x 2.5" dia. cartridge is said to have the equivalent solids holding capacity of 3½ sq. ft., or has been known to pick up 8 oz. of solids from 50,000 gallons of city water.

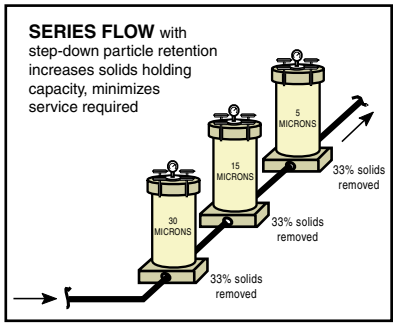
Automatic Cleanable Media – The idea of a filter media which was cleanable was always desired, but having the right type of solids along with a capacity to accept a more costly piece of equipment, was not always available.

Screen type media can handle a sand-like solid, reverse the flow for backwash and after cleaning, be ready for filtration. Bag type media, along with a filter aid, may also be backwashed with some success.

Therefore with sufficient area or depth, any media can accomplish the task. Choice would be determined by experience or testing.

INLINE FILTRATION OR RECIRCULATORY FILTRATION

Inline Filtration
Any time a filter chamber is placed between a source of liquid and the finished product, it is considered inline or single pass. This is often used after preliminary clarification techniques have been employed. For instance, fuel on a jet engine is filtered ahead of a final filter installed just ahead of the injector nozzle. Some-times critical solenoid valves in a hydraulic system may be protected in the same way. Liquids to be sprayed from an aerosol can or decorative fountains may employ individual filters to prevent the nozzles from becoming clogged and impairing the desired affect of the spray pattern.



Series Filtration
– Now let's consider applications where the solids are varied in size. Two or three filter chambers could increase the time between service, assuming that each retained 1/3 of the solids.

In a way, this is how a depth type filter media works, and it works best on a diversified solids mix to achieve the maximum benefit of the principle.

Depth type media has another advantage in that the density for particle retention can vary over a wide range, whereas cloth, paper and screens are limited to a closer range of denser media.

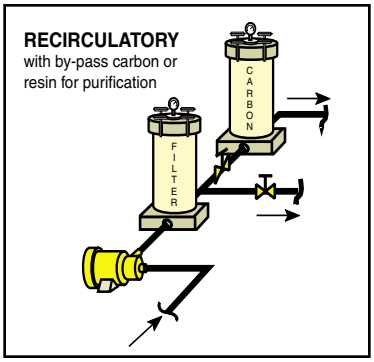
Therefore, depth media of 30, 50, 100, even 200 micron has the distinct advantage of increased solids holding capacity.

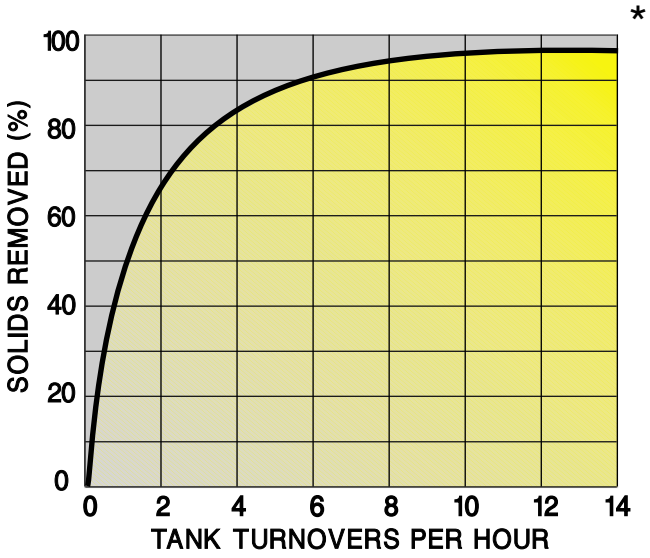
Now combine a flow rate with a selected depth media to recirculate until clarity is achieved. If time is available, a coarser media will achieve the desired results with the least media cost.

The choice of a prefilter could be that of a slightly coarser media to increase solids holding capacity, or of a recirculating type consisting of valves and piping to return the liquid back to the original reservoir for refiltration, probably by a coarser media which was only capable of removing the larger particles, and thus required the build-up of these particles to remove those that are smaller.

The goal of removing all of the solids down to a given requirement is, consequently, achieved at a cost of less labor for servicing and replacement or cleaning of the media. It is generally accepted that a depth type media performs this task well because of its ability to retain some solids until the finer particles are picked up.

Recirculation FIltration
A recirculatory system is rated or sized with a flow rate or turnover rate of the volume in the reservoir. However, velocity to keep the solids in sus-pension is also required. Therefore, the sug-gestion of 14 turnovers will cause all of the liquid to pass through the filter chamber once, may or may not be adequate for the purpose intended.





* Even as many as 30 to 50 turnovers per hour never result in 100% solids removal.

AUTOMATIC FILTRATION

Where then does the filter specialist begin?

Perhaps the volume of liquid is the most significant factor. It suggests the amount and
type of solids. Also, what is desired to be accomplished? Let's suggest a 25 gallon batch of perfume or cologne for filling in bottles. Very dense cartridges or paper media would likely be used.

Now, expand the volume to 500 or even 2,500 gallons. Would inline filters handle it? What
about two in series (15µ and 1 to 5µ), or should recirculation be considered?

Of course, materials of construction must also be considered, be it metallic or non-metallic. What about temperature and if inline, available pressure?

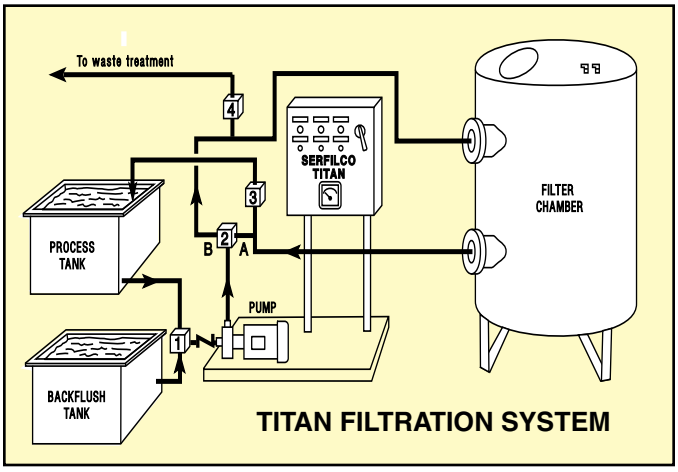
When it comes to solids holding capacity, most types of filter media are offered in chambers from small to large.

What if the liquid being filtered is valuable or must be saved, not to be disposed of during a cleaning backwashing cycle? This then requires additional valves to direct the liquid back to the source or to a holding tank. This is the type of application suitable for our Titan, which is given its name because of its size, strength and achievement.

Here is an example of the tanks necessary for backwashing, etc.

Quite a contrast from the simple pump and filter offered in our Labmaster, Space-Saver, Guardian and Sentinel Series, or the Admiral suitable for intank pump and filtering.

Each Series represents a size of filter chamber so that for quick reference, identification of size is readily available.



TITAN FILTRATION SYSTEM

COMPLETE SYSTEMS consist of a pump / motor and a filter chamber mounted on a reservoir for recirculation .

Special Systems could include accessories – pipe, hose, valve, priming chamber for pump; slurry / precoat tank which also acts as priming chamber.

Systems are assembled for placement next to a reservoir of liquid such as a swimming pool; hydraulic, quench or cutting oil; processes in metal finishing and chemical, food, pharmaceutical, photographic production. In other words, anywhere there is a liquid requiring solids removal. Systems are assembled for manual or automatic operation. Various types of filter media are employed.

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