FILTRATION

Notes about principles and plants

SEDIMENT FILTERS

Sediment filters are used to take all the suspended substances off the water.
The working of this kind of filter is similar to water flowing through a sifter; different size of the mesh are available, according to the utilization of filtered water.

The most common sediment filters consist of an housing, containing a filtering element (cartridge). The element usually has a cylindrical shape, with a large quantity of holes along the external surface. The housing consists of a head with thread ends, which have to be connected to the water line, and a bowl fixed to it.

The water is forced to flow from the external of the filtering element to the internal side, and the solids larger than the hole size are trapped along the surface of the cartridge itself.

The size of the holes (filtration rate) is usually 50 µm (1 µm=0.001 mm) for drinkable water, larger or smaller for other uses. The most common cartridge is made in nylon or stainless steel (the cleaning of both of them is allowed) or of polypropylene wound on a bracket of the same material (disposable cartridge). The housing are usually made of plastic materials, such as polypropylene, ABS, Trogamid T, and the bowl is colourless to allow to check the cartridge and replace or clean it.

Some filters are equipped with a device which allows the self-cleaning of the cartridge , by a simple operation, without opening of the filter.

The range of filters manufactured by NOBEL includes filters with the head of the housing in polypropylene, or brass, for high pressure. The bowls are made of Trogamid T, polypropylene, AS, coloured or colourless.

The range of NOBEL filters includes also self cleaning filters.

The range of available cartridges includes nylon, stainless steel, wound polypropylene. All the filters are made of fibers and materials suitable to get in touch with food, and fit to treat drinkable water.

Local laws can state special prescriptions concerning materials, filtration, type.
For example Italian Health Ministry Regulations DM 25/2012 concerning sediment filters for drinking water allows only washable cartridges and with filtration not lower than 50 µm.

FILTRATION BY SAND (DUAL MEDIA) FILTERS

This is the process that allows to take off the water all suspended solids which cause the turbidity of the water, like sludge, mud; this process is used to filter water from wells water or from surfaces sources.
The process simply consists of the flowing of the water through several layers of selected quartz sand (or others inert materials), with different grain-sizes, and a layer of anthracite (dual media or multi-media filter). The media filter is contained in vessels normally made in fiberglass or coated steel, or stainless steel.
Usually the water flows from the top to the bottom of the filter and the solids retained by the first layer of sand improves the action of the following ones.
As above briefly described, this process repeats the natural filtering action of the layers of the ground when the rain water flows through it to reach the underground creek.

Regeneration

Naturally the pressure drops across the media filter increases continuously, according to the proceeding of the filtration action and increasing of the trapped quantities of solids.
When the pressure drops reaches the max allowable value, usually not over than 0.9 bar (90 kPa), the cleaning (regeneration) of the media filter is required.
The regeneration process consists in backwashing the filtering bed, by the flowing of water (or water and air for large capacity filters) from the bottom to the top of the bed; the filtered substances are carried away to drain.
The backwashing phase is often followed by a co-flow rinse phase (water flows across the media from the top to the bottom of the bed and then to drain), to clean the lower layer of the bed. Usually this co-flow rinse phase is not required when filtered water is used for backwashing.
The regeneration can be hand-driven controlled, or fully automatic, by timer or by differential pressure switch control.
The better results in filtration are obtained when the suspended solids are in a flocculated form; in many cases, the addiction of a flocculating agent to the water is required upstream of the filtration through the bed of sand.
The good filtration mainly depends on the linear flow of the water through the bed of media (the slowest is the flow, the best is the filtration), it also depends on the depth of the bed.
The most appropriate linear flow must be selected case by case, according to the utilization and the quality of the water to be filtered.
However, for common application, it is recommended not to select a linear flow higher than 20 $m^3/m^2/h$, where m^3/h is the flow rate and m^2 is the surface of the vessel.

Swimming pool: special application

The recirculating water of swimming pool are also filtered through similar media; in this application the linear flow can be very fast (up to 50 m³/m²/h), and also the bed depth is lower than usual for sand filter.

Nobel range of sand (dual media) filters

All sand filters included in NOBEL range are automatically controlled; they are also equipped with auxiliary semi-automatic command of the regeneration. The standard range of Nobel sand filters (dual media) is designed according to a 20 m³/m²/h of linear flow, at the normal flow rate.
See technical leaflet of Nobel automatic sand filters, series FCV/T and FC/D for more detailed informations.

DIRECTIONS OF SELECTION

The operating features to be considered for a correct selection are:

- best linear flow < 20 m³/m²/h
- max linear flow: 40 m³/m²/h
- max allowable pressure drop across the filter: 0.9 bar (90 kPa)
- backwashing flow rate at a linear flow of approx: 30 m³/m²/h

This bullettin is provide only as general directions about the principles and applications of the process.

Apply Nobel Service or Technical Centers for further informations or about special application.