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SELF-CLEANING FILTERS

TECHNICAL INFORMATION 1

COMPARISON OF SELF-CLEANING FILTERS AND SAND FILTERS

SELF-CLEANING FILTERS

A self-cleaning filter is a type of filter designed to remove suspended solids present in surface water (rivers, lakes, sea), well water and spring water. Self-cleaning filters are constructed in such a way that they can operate for long periods of time without the need for external maintenance. During normal operation they operate similarly to other systems, with the fluid passing through a filter media. When a certain degree of clogging is reached, with a relative pressure drop between inlet and outlet, a cleaning system comes into operation to restore the functionality of the filter media.
These filters are used to remove particles with diameters between 500 and 50 micron µm in quantities not exceeding 100 ppm TSS (Total Suspended Solids). For some special applications and with adequate pre-treatment, filter screens up to 20 µm and 5 µm are available.
The different types of self-cleaning filters, constructed in various shapes, sizes and materials, differ essentially in the type of cleaning system. The most common self-cleaning filters are:

- Backwashable filters
  - backwashable basket filters;
  - disc backwashable filters;
- automatic filters
  - brush-type filters;
  - spray nozzle filters;
  - suction nozzle filters;
  - Bernoulli filters.

Example of self-cleaning suction nozzle filters

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SAND FILTERS

Sand filtration is a process of removing suspended solids by passing the fluid through a filter bed. Sand filters can work either at atmospheric pressure or under pressure. In its most common version, the pressurised sand filter, one can imagine this filter as a large vessel with a cylindrical body and two convex pseudo-elliptical bottoms, containing sand (quartzite, anthracite, pyrolusite or recently active glass powder) that acts as a filter medium. The water slowly passes through the filter bed from top to bottom and is gradually purified. These filters are used to remove particles with a diameter between 3000 and 40 micron µm in quantities not exceeding 300 ppm TSS (Total Suspended Solids). For some special applications, with dosage of specific flocculants/coagulants and with adequate pre-treatment, they can remove particles even smaller than 1µm.

There are main types of sand filters:

- gravity sand filters

- floating-bad sand filters (DYNASAND)

- pressurized sand filters

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COMPARISON OF SELF-CLEANING FILTERS AND SAND FILTERS

Increasingly, self-cleaning filters are being used in place of sand filters because they provide undisputed technical and economic advantages as summarised in the table below

FILTRATION TECHNIQUE

	SELF-CLAEANING FILTERS		SAND FILTERS
+	PHYSICAL Self-cleaning filters guarantee the precise and constant removal of particles that are equal to or larger than the mesh size of the filter meshes installed inside the filters. Minimum filtration degree: 5 microns. Type of filtration: two-dimensional surface on mesh.	-	STATISTICAL Sand filters do not guarantee the precise and constant removal of particles of a defined size. Minimum filtration degree: 40 microns (without flocculants/coaugulants). Type of filtration: three-dimensional depth on the filter bed.

FILTRATION EFFICIENCY OF INORGANIC PARTICLES LARGER THAN 5 MICRONS

	SELF-CLAEANING FILTERS		SAND FILTERS
+	GUARANTEED (physical removal) The filter meshes installed inside the selfcleaning filters have calibrated dimensions that guarantee precise and constant filtration efficiency of inorganic, nondeformable particles regardless of filtration speed and pressure.	-	NOT GUARANTEED (statistical removal) The filter bed inside sand filters does not guarantee a constant filtration efficiency of inorganic particles that cannot be deformed at varying filtration speed and pressure.

FILTRATION EFFICIENCY OF INORGANIC PARTICLES SMALLER THAN 5 MICRONS

	SELF-CLAEANING FILTERS		SAND FILTERS
-	NOT GUARANTEED (physical removal) The filter nets installed inside the selfcleaning filters have a calibrated size of no ess than 5 microns and therefore cannot remove particles smaller than 5 microns. The filtering nets installed inside the selfcleaning filters also do not allow the filtration of flocs formed by flocculants/coagulants (used to agglomerate fine particles) because once the flocs settle on the filtering net, due to the pressure, they could break up into particles smaller than the mesh of the filtering nets and thus pass through them.	+	NOT GUARANTEED (statistical removal) The filter bed placed inside sand filters does not remove particles smaller than 5 microns. However, the filter bed placed inside sand filters, working slowly by accumulation through layers of filter material, does not allow the flocs formed by flocculants/coagulants (used to agglomerate fine particles) to break up, thus also allowing a significant removal efficiency of fine particles.

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FILTRATION EFFICIENCY OF ORGANIC PARTICLES

	SELF-CLAEANING FILTERS		SAND FILTERS
-	NOT GUARANTEED (physical removal) The filtering nets installed inside the selfcleaning filters, although having calibrated dimensions, do not guarantee a precise and constant filtration efficiency of particles of an organic nature since, by their nature, these particles, once deposited on the filtering net, due to pressure, could break up into particles smaller than the mesh of the nets themselves and thus pass through them.	+	NOT GUARANTEED (statistical removal) The filter bed placed inside sand filters does not guarantee a constant filtration efficiency of organic particles at varying filtration speed and pressure. However, the filter bed placed inside sand filters, operating slowly by accumulation through layers of filter material, does not allow particles of organic nature to break up, thus also allowing a significant removal efficiency of organic particles.

FOOTPRINT

	SELF-CLAEANING FILTERS		SAND FILTERS
+	REDUCED Self-cleaning filters ensure high flow rates with reduced installation space requirements.	-	HIGH Sand filters require high filter surface areas, which translates into high installation space requirements.

CONSUMPTION

	SELF-CLAEANING FILTERS		SAND FILTERS
+	REDUCED Self-cleaning filters ensure reduced consumption: • water cleaning of the filter elements starts quickly with minimal water consumption relative to the volume of water treated • energetic cleaning the filter elements does not require the use of pumps with high flow rates	-	HIGH Sand filters have high consuption: • water the cleaning of the filter bed starts slowly with high water consumption • energetic the cleaning of the filter bed requires the use of high flow rate pumps with high energy consumption

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INSTALLATION

	SELF-CLAEANING FILTERS		SAND FILTERS
+	SIMPLE Self-cleaning filters are easy to install, move and position.	-	COMPLICATED Sand filters are complex to install because they require robust concrete beds, pipes and valves, large pumps for cleaning the filter bed (backwashing), and are difficult to move and position because they are heavy and bulky.

MAINTENANCE

	SELF-CLAEANING FILTERS		SAND FILTERS
+	SIMPLE Self-cleaning filters are easy to maintain as they consist of a few simple, easy-to-handle internal components.	-	COMPLICATED Sand filters are complex to maintain as they consist of heavy materials to handle (sand) and internal components that are difficult to remove and replace.

COSTS

	SELF-CLAEANING FILTERS		SAND FILTERS
+	REDUCED Self-cleaning filters, as they are massproduced, do not require major civil works for their installation, are easy to install and maintain, and always guarantee reduced purchase and installation costs.	-	HIGH Sand filters, being large in size, not being mass-produced, requiring major civil works for their installation, being complex to install and maintain, entail high purchase and installation costs.

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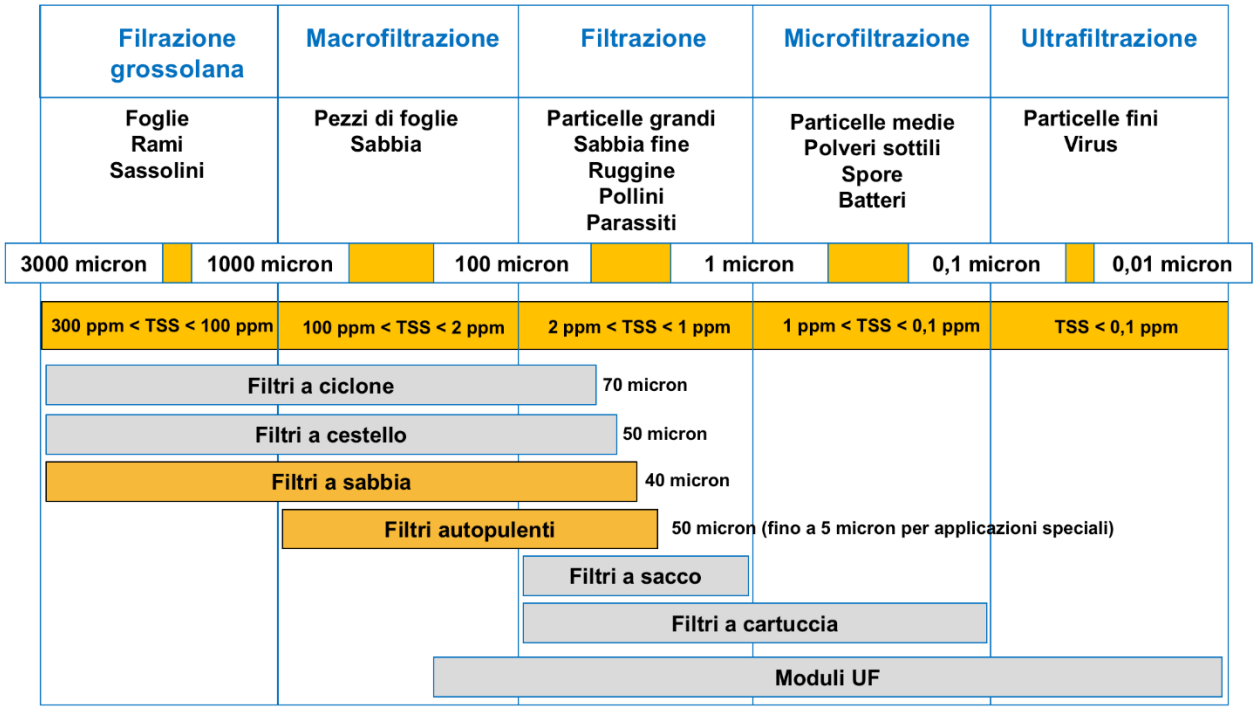
The table below summarises the operating limits for both self-cleaning filters and cartridge filters:
SIZE OF PARTICLES TO BE REMOVED
TOTAL QUANTITY OF PARTICLES TO BE REMOVED (TOTAL SUSPENDED SOLIDS - TSS)
MINIMUM DEGREE OF FILTRATION

The same table is obviously very useful to identify the type of filtering system to be used depending on the type of water to be treated.
In order to choose the correct type of filtering system to filter the water, the following data must first be known
TYPE OF WATER TO BE TREATED (WELL, RIVER, LAKE, SEA)
TOTAL QUANTITY OF SUSPENDED SOLIDS (TSS)
SIZE AND NATURE OF PARTICLES
REQUIRED DEGREE OF FILTRATION
INSTANTANEOUS FLOW RATE
DAILY CONSUMPTION



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It is also the responsibility of the manufacturer or user to verify the efficiency and result of the application also by means of pilot systems.