

INDION

Automatic Valveless Gravity Filter

Introduction

As the name suggests Automatic Valveless Gravity Filter (AVGF) operates automatically, on the loss of head principle. This is generally accepted as being the most accurate control besides the constant analysis of the filtered water turbidity, which is seldom practical on a continuous basis. The head loss at which AVGF initiates backwashing is determined by the height of the inverted U-turn at the top of the backwash pipe. The level of water in this pipe is proportional to the head loss across the filter bed.

Product Description

AVGF consists of a tank divided into three functional compartments, a backwash storage space, a filter bed compartment and a collection chamber under a false bottom. The backwash storage space is designed to hold the adequate amount of backwash water. The filter bed compartment normally contains standard fine filter sand supported on a collection system of disc type plastic strainers, which provide uniform collection of filtered water and uniform distribution of backwash water without the use of gravel. Standard filter sand or dual media (sand and anthracite) is generally used as the filter media. The AVGF can be built in cylindrical construction of steel or rectangular of concrete. The standard models are available in steel.

Working Principle

Filtration

Unfiltered water from the constant head box

(which is used to provide a free fall at all times for water entering the filter and to prevent a pressure line from feeding directly into the filter) passes down the inlet pipe and enters the filter through an inlet wier box. Any air trapped in the unfiltered water is released through the small vent pipe. The unfiltered water flows downward through the filter media and the strainers into the collection chamber. As the unfiltered water passes through the bed of filter media, the dirt suspended impurities are trapped in the bed. The clean water from the collection chamber flows upward through the effluent duct, and when the backwash storage compartment has been filled, it flows through the effluent pipe to service.

As the filter bed collects dirt during the filter run, the head loss increases gradually, and the water level slowly rises in the inlet pipe and in the backwash pipe. Just before the water passes over into the downward section of the latter one, a self-actuated primer system evacuates air from the pipe. This pulls water rapidly over so that a large volume of water flows down the backwash pipe and initiates the siphon action that backwashes the filter.

Backwashing

Once the siphon has been established between the filter and the sump, the pressure immediately above the filter bed is lower than the pressure in the backwash storage compartment. This causes water from the backwash compartment to flow down the through the effluent duct, into the collection chamber and upwards through the strainers, expanding the bed and cleaning it. The backwash water with the dirt it has removed from

the filter bed then passes up the backwash pipe, over the U-Bend and out through the sump to waste. The backwash rate actually starts at a very high rate (around 2.62 – 2.68 ft/min) and gradually slows down to around 0.82 ft/min at the end. The performance of the various installed units has indicated that diminishing backwash rate satisfactorily cleans the filter bed. The high initial flow rate provides greater initial turbulence to wash the sand. The lower flow at the end of wash permits the bed to settle evenly and smoothly.

The backwash action continues until the level of the water in the backwash storage compartment drops below the end of the siphon breaker. When it does, air is admitted to the top of the backwash pipe and backwashing stops.

Rinsing

The inlet water automatically resumes its downward gravity flow through the filter bed as soon as the siphon is broken. The first water to be filtered rinses the bed and then flows up into the backwash storage compartment where it is stored for the next backwash. When this compartment is filled to the level of effluent pipe connection, it goes no higher, and all water filtered after this flows directly to service.

When more than one filter is used, the flow is divided equally among all the filters by means of a flow splitting box. In addition, an interlock between filters is provided to prevent more than one unit backwashing at any time.

Features

- Automatic backwash, hence reliable
- No need of manpower - as the filter operates automatically

- No need of expensive valves, instrumentation, and backwash pumps and hence cost competitive.
- No moving parts, hence less maintenance
- Uniform high quality treated water
- No need of expensive power, hence low operating cost
- Compact and modular design, hence low expansion and installation cost
- Even though AVGF is automatic, the backwash can be initiated manually, however, external water source at 20 – 30 psi has to be provided
- Space saving

Applications

Ideal for side stream filtration

In side stream filtration the suspended solids will be very high in the beginning of operation, but with time (several days typically) it will drop significantly (usually below 20 ppm). The AVGF is widely used to reduce turbidity of cooling tower waters. This improves cooling tower efficiency and reduces maintenance and cleaning costs.

Treatment for portable water

Internationally AVGF is approved and used by majority of Municipal corporations for treatment of potable water.

Polishing filter for domestic sewage as well as industrial effluent

AVGF (Municipal type) can be incorporated as a polishing filter after secondary clarifier of the sewage/effluent treatment plant where usually load of less than 40ppm can be anticipated.

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Continuous Sand Filter

Product Description

The continuous sand filter is a continuous upflow deep bed granular media filter. The backwash is also continuous. The filter media is moving in downflow direction and also continuously cleaned by recycling the sand internally.

Working Principle

The feed is introduced into the lower part of the filter bed through riser tubes which discharge under a distribution hood. Filtration takes place upwards through the sand bed which is moving downwards. Most of the suspended solids in the feed will be separated near the feed level, which means that the dirtiest sand will be found in the lower part of the filter. The sand bed is kept in a slow downward motion by an airlift pump taking out dirty sand from close to the bottom of the filter tank. In the air-lift pump the sand is subjected to a thorough mechanical agitation by the action of air bubbles and the dirt is separated from the grains of sand. The filter bed is continuously cleaned while the filter is in operation. The dirtiest sand is continuously taken out of the filter bed, washed and returned to the clean part of the sand bed. This means that the filter does not have to be taken out of operation

for backwashing. The dirt is finally rinsed away from the sand in the sand washer, which is placed concentrically around the upper part of the air-lift pump. The clean sand is returned to the top of the filter bed. Reject water is continuously taken out from the sand washer. The filtrate leaves the filter as an overflow.

Features

- Continuous backwash operation
- Handles suspended solids load upto 150 ppm
- Operates at atmospheric pressure
- Simple modular construction with minimum moving parts

Applications

- Raw water filtration for potable use
- Raw water filtration for industrial process water
- Cooling tower side stream filtration and make up
- Recycling of white water in pulp and paper industry
- Tertiary treatment of sewage, treatment of industrial waste water
- Filtration of water to remove mill scale

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Pressure Sand Filter

Product Description

A typical pressure sand filter consists of a pressure vessel - this could be either vertical or horizontal-fitted with a set of frontal pipe work and valves, graded sand supported by layers of graded under bed consisting of pebbles and silex, a top distributor to distribute the incoming water uniformly throughout the cross section of the filter, and an under drain system to collect filtered water. Fig 1 shows the arrangement of a vertical pressure sand filter.

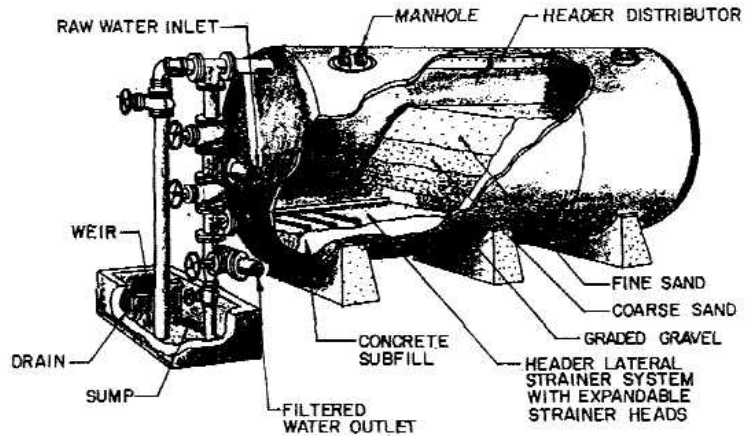


Fig-2: Vertical Pressure Sand Filter

Working Principle

In pressure sand filter raw water flows downwards through the filter bed and as the suspended matter- which has usually been treated by addition of a coagulant like alum- is retained on the sand surface and between the sand grains immediately below the surface. There is steady rise in the loss of head as the filtration process continues and the flow reduces once the pressure drop across the filter is excessive.

The filter is now taken out of service and cleaning of the filter is effected by flow reversal. To assist in cleaning the bed, the backwash operation is often preceded by air agitation through the under drain system. The process of air scouring agitates the sand with a scrubbing action, which loosens the intercepted particles. The filter is now ready to be put back into service.

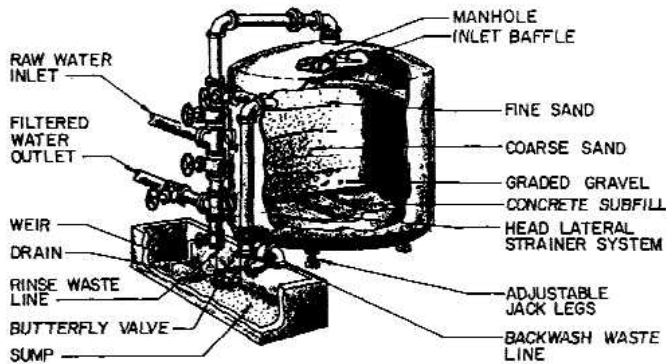


Fig-1: Vertical Pressure Sand Filter

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Multi Grade Filter

Product Description

Multigrade filter is a depth filter that makes use of coarse and fine media mixed together in a fixed proportion. This arrangement produces a filter bed with adequate pore dimensions for retaining both large and small suspended particles. This filter performs at a substantially higher specific flow rate than conventional filters. Specific flow rates of 0.82 – 1.64 ft/min have been successfully obtained for treating waters containing 25 – 50 ppm suspended solids respectively to produce filtrate with less than 5 ppm.

Features

- Higher specific velocity
- Raw water can be used for backwashing the filter

Applications

The INDION Multigrade filter is an ideal choice for all applications where a conventional sand filter is used. It is extensively used in side stream filtration of cooling water and in potable water treatment. It is ideal for filtration of clarified water. In addition it finds application in sea water filtration and in filtration of chemical solutions. For these types of filtration rubber lined or epoxy painted filters are used.

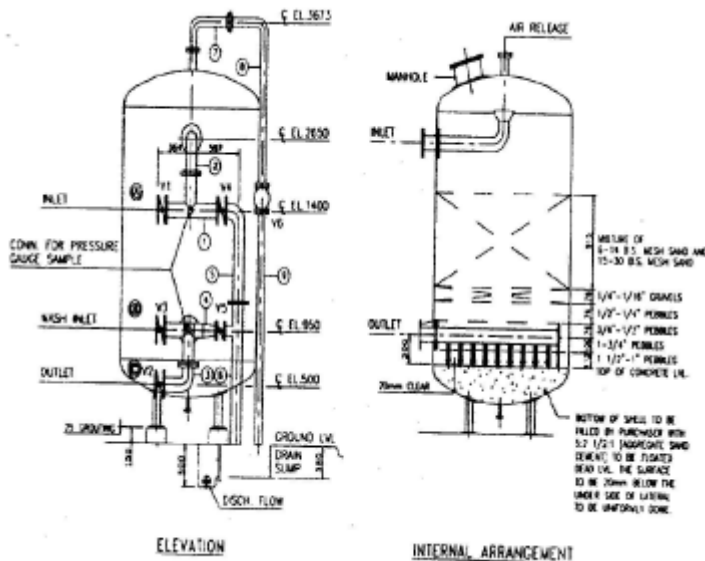


Fig-1 - Elevation and internal arrangement of the multigrade filter

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Metal Removal – Sulfex Process

Introduction

Hydroxide precipitation, which is conventional process for removal of heavy metals from wastewater has two drawbacks:

- Some metal hydroxides tend to re-dissolve upon increasing the pH value above a certain critical value. This is called "amphoterism". In case of a mixture of heavy metals, an operating pH ideally suited for efficient removal of one metal is unfavorable for the good removal of the other.
- In the presence of chelating agents such as EDTA, metal hydroxide precipitation is incomplete.

With ever increasing stringent limits for effluent disposal, hydroxide precipitation cannot meet the required permissible limits.

The development of Sulfex process eliminates both the above deficiencies and has been in commercial use for several years. This precipitation technique involves an exchange of sulphide ion between ferrous sulphide and the heavy metal ion present in the effluent as pollutant.

Sulfex Process Principle

In order to precipitate any of the heavy metals as sulphides, the sulphide source added to the solution of the metal must be more soluble than the metal sulphide to be precipitated. As the added sulphide dissolves, the dissociated sulphide ion then reacts readily with the heavy metal that has lower sulphide solubility. When equilibrium is reached, the metal of lower solubility will be precipitated and the one of higher solubility will remain dissolved.

In the Sulfex process FeS is used as the sulphide source. Starting with a soluble sulphide, such as Sodium Hydrogen Sulphide, (NaHS), this is reacted with an equivalent or excess amount of ferrous ion (Fe²⁺) so that there can be no excess sulphide

relative to the ferrous ion. Therefore, the only ionic sulphide that will be present is due to the solubility of FeS.

Features

- Since FeS is rather insoluble, only 3 x 10⁻² ppb of free sulphide is present in a natural aqueous solution. This concentration is too low to produce an odour of Hydrogen Sulphide, but it is high enough to react with the Heavy metals that are less soluble when combined with sulphide.
- $Fe^{2+} + S^{2-} + M^{2+} + SO_4^{2-} + Ca(OH)_2 = MS + Fe(OH)_2 + SO_4^{2-} + Ca^{2+}$ (Where symbols have usual meaning)
- The pH of the water is maintained in the range of 8.5 to 9.0 causing the iron to precipitate as ferrous hydroxide. Iron is relatively insoluble under these conditions, normally less than 0.5 mg/lit, such concentration of iron are considered nontoxic and acceptable in an ecological system.
- The addition of lime (or caustic) to elevate the pH and precipitate the excess iron also improves the removal of heavy metal sulphides because they too are less soluble at the higher pH values.
- The main advantage of the Sulfex process is its ability to remove hexavalent chromium in one step as opposed to the typical two-step process used with hydroxide precipitation. Possible reaction is as follows:
 $CrO_4^{2-} + 4H_2O + FeS = S + Fe(OH)_3 + Cr(OH)_3 + 20H^-$ Here Chromium is removed as hydroxide precipitate.

Applications

- Metal processing industry
- Metal refining
- Automobile industry

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Two Bed Portable Deioniser

Introduction

D.M. plants consists of cation unit and anion unit placed one after other in series. The cation unit is charged with strong acid cation resin & anion unit is charged with strong base unit.

D. M. plants remove all the anions & cations from the water. Conductivity of the treated water is in the range of 0 to 40 μ -cm. The cation resin is regenerated with Hydrochloric acid & anion resin with Caustic solution. Then the cation unit is rinsed with feed water and anion unit with deionised water till the acceptable water quality is achieved.

Product Description

INDION Two bed portable deionisers produce demineralised water at flow rates upto 2.65 gpm. They are easy to install and economical to operate. Their design is the outcome of many years of experience in manufacturing deionisers to meet the specific requirements of many industries. The units are made of corrosion resistant materials of construction - pressure vessel of FRP, plastic

tubes, moulded rubber components, plastic coated stands, FRP panels etc.

When the capacity of the ion exchanger is exhausted, it is regenerated: the cation exchanger with dilute hydrochloric acid and the anion exchanger with caustic soda solution. The units are pre-assembled and tested before despatch and easy to install.

Advantages

- Ready to use
- Portable, can be moved to points of use
- Complete with regeneration equipment and a multi-valve control block
- Continuous monitoring of treated water quality

Applications

- Battery top up
- Laboratory and research institutions
- Pharmaceuticals
- Chemicals
- Electroplating and mirror silvering

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