Shubham™
transformative ideas

A Brief about Media Filtration !!

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Shubham is in the business of making this planet water secure…….

Shubham Inc. is the leading EPC contractor of Water and Sewage Water Treatment Plants. We use the best-in-class technology and cutting-edge tools to foster high-quality, sustainable, community-level water supply projects.

We design, engineer, and deliver the most innovative, cost-effective solutions for managing your most challenging water woes!

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Product Portfolio

Membrane and separation

- Reverse Osmosis Plant
- UF Plants

Media Filters

- Activated Carbon Filters
- Dual Media Filters
- Multigrade Filters
- Pressure Sand Filters
- Side Stream Filters

ION exchange

- DM Plants
- Softening Plants
- Mixed Bed units

Waste Water Treatment

- Septic Tanks
- Sewage Treatment Plants [Civil & Modular]
- Bio Accelerator 360°™
- Electra Rapid™
- Bio Memclean™
- Bio Synthesis
- Effluent Treatment Plant (ETP)
- Grey Water Treatment (GWT)
- Laundry Water treatment

- Swimming Pool
- Operation & Maintenance

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Filtration

The process of passing water through a bed of material to remove suspended impurities from water and treated waste water. Variety of media are been used for water purification and recognized by different names.

Depending upon the application and requirements, media filter use variety of media to remove contaminants. Flirtation system can be classified according to .....

- Direction of Flow
- Types of Filter media or bed
- Driving Force

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- Intend to remove of TSS & Turbidity from Water.
- A polishing solid / liquid separation step.
- Other Impact
- Bio Degradation.
- Organic adsorption (especially to GAC)
- Mn and Fe adsorption.

Applications	Advantages
River Water Treatment	•Enhance appearance of water •Adhere to drinking water norms
Swimming pool	Improve appearance and clarity of Water
Cooling Water Filtration	Improve efficiency & life of cooling tower leads to Low OPEX.
Waste Water Treatment	▪Removal of TSS and Turbidity make water suitable for recycling application. ▪Particulate BOD and COD also removed by filtration. ▪Carbon adsorption can reduce dissolved BOD and COD up to 40%.
RO pre treatment	▪SDI reduction enhance life span of RO membrane. ▪Biological adsorption prevent bio-fouling of membranes ▪Adsorption of free chlorine by Carbon prevent membranes from chemical fouling.
Process Water Treatment	▪Improve efficiency of water base applications. ▪Reduce frequency of Shut down which lead to high production at lower operating cost.

Media Filters	Flow	Force
• Pressure sand Filter • Dual Media Filter • Multi Media Filter • Carbon Filter	• Up Flow • Down Flow	• Gravity Filter • Pressure Filter

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Activated Carbon Filters

Media Filters

- Activated Carbon Filters
- Dual Media Filters
- Multigrade Filters
- Pressure Sand & Side Stream Filters

Pressure Sand Filter

Dual Media Filters

Multigrade Filters

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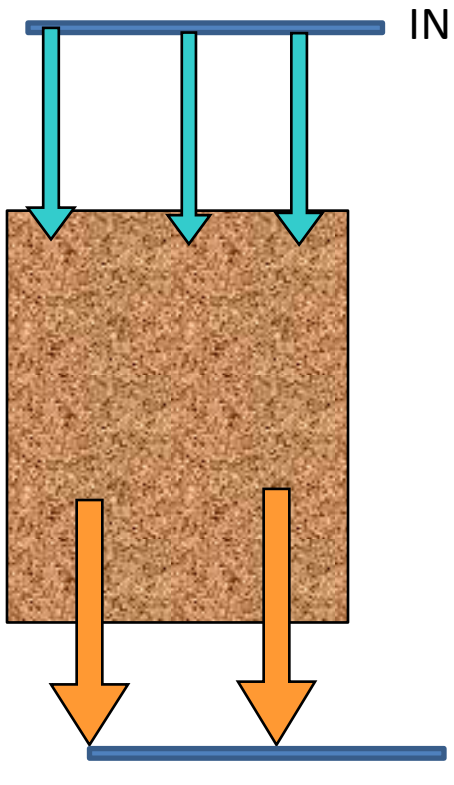
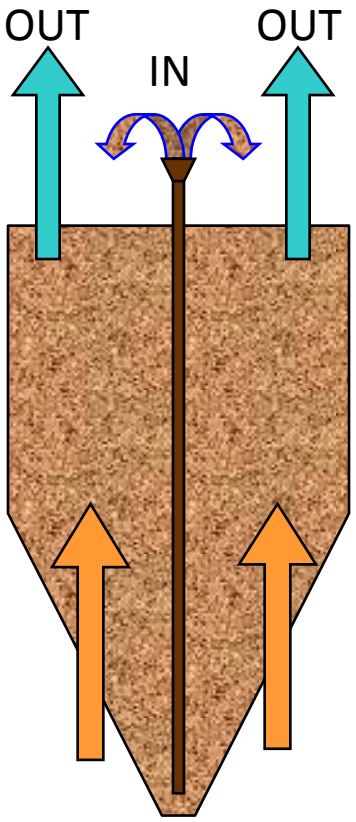


Filter by Flow

- Up flow
- Down Flow



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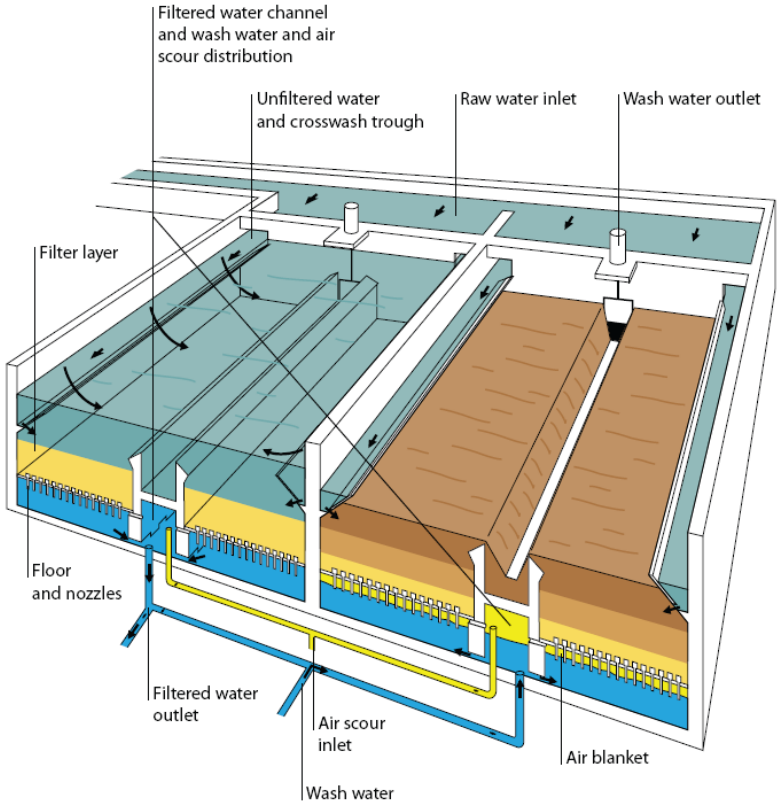

Filter by Force

- Gravity Filter
- Pressure Filter

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Pressure Sand Filters

Consist of Single media / Mono Media

- Silica Quartz Fine Sand used for efficient filtration
- Quality Sand media - as per IS code.
- Supporting Layers of gravels and pebbles.
- Bed depth 700 MM to 1200 MM
- Maximum Inlet Total Suspended Solid - < 50 Mg/L
- Filter Water outlet – 1 – 5 Mg/L
- Service Velocity – 8 - 12M/Hr. Maximum
- Backwash velocity 20 - 36 M/Hr. Maximum
- Air scouring available for high flow pressure vessel
- Filtration rating up to 20 – 40 Microns

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Dual Media Filter

Consist of Dual media (Silica Sand + Anthracite)

- Combination of Sand and Anthracite provide more area & efficient filtration.
- Supported by of gravels and pebbles at bottom.
- Sand Depth 400 to 700 MM and Anthracite 200 to 500 MM
- Maximum Inlet Total Suspended Solid - < 50 Mg/L
- Filter Water outlet – 1 – 5 Mg/L
- Service Velocity – 15 – 20 M/Hr Maximum.
- Backwash Velocity – 25 – 36 M/Hr.
- Filtration Up to 20 - 40 Micron

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Multi Media Filter

Consist of Multi media (Sand + Anthracite + Fine Sand + Garnet)

- Combination of Sand, Anthracite, fine Sand and garnet provide more area & efficient multi level filtration at high velocity.
- More and very efficient filtration area
- Bed Depth equally distributed filter media in multiple layers.
- Maximum Inlet Total Suspended Solid - < 75 Mg/L
- Filter Water outlet – 1 – 5 Mg/L
- Velocity across the Filter – 15 – 25 M/Hr Maximum.
- Filtration Up to 20 Micron

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Activated Carbon Filters

Consist of activated carbon

- Single layer of activated carbon supported by gravels and pebbles at bottom
- Coconut shell carbon and coal based carbon used for multiple application.
- Adsorption efficiency – Up to 90%
- Chlorine, Color and Odor removal – 85 to 90%
- EBCT – 2 to 30 Minute
- Bed depth – varies from 400 to 1200 MM

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Removal Processes

- Sedimentation on media.
- Adsorption – The collection of a gas, liquid or dissolved substance on the surface and interface zone of another material.
- Biological action.
- Absorption – The taking in or soaking up of one substance into the body of another by molecular or chemical action
- Straining – The removal of particulates by trapping in the open spaces between the grains of the media.

Filtration Mechanisms

Physical and Chemical Process

Based upon

- Chemical characteristics of the water
- Nature of suspended material
- Types and degree of pretreatment
- Filter type and operation

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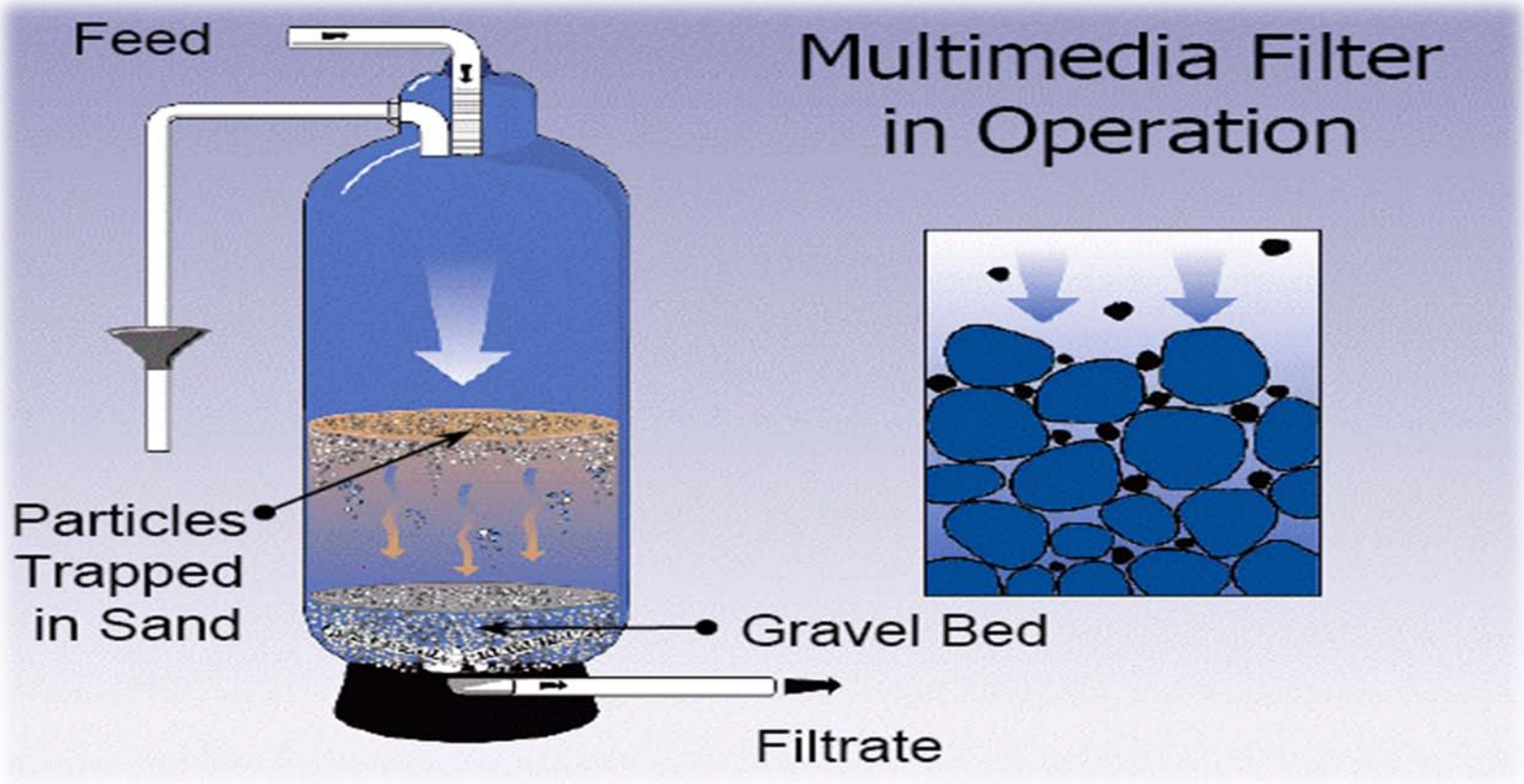
Filters In Operation



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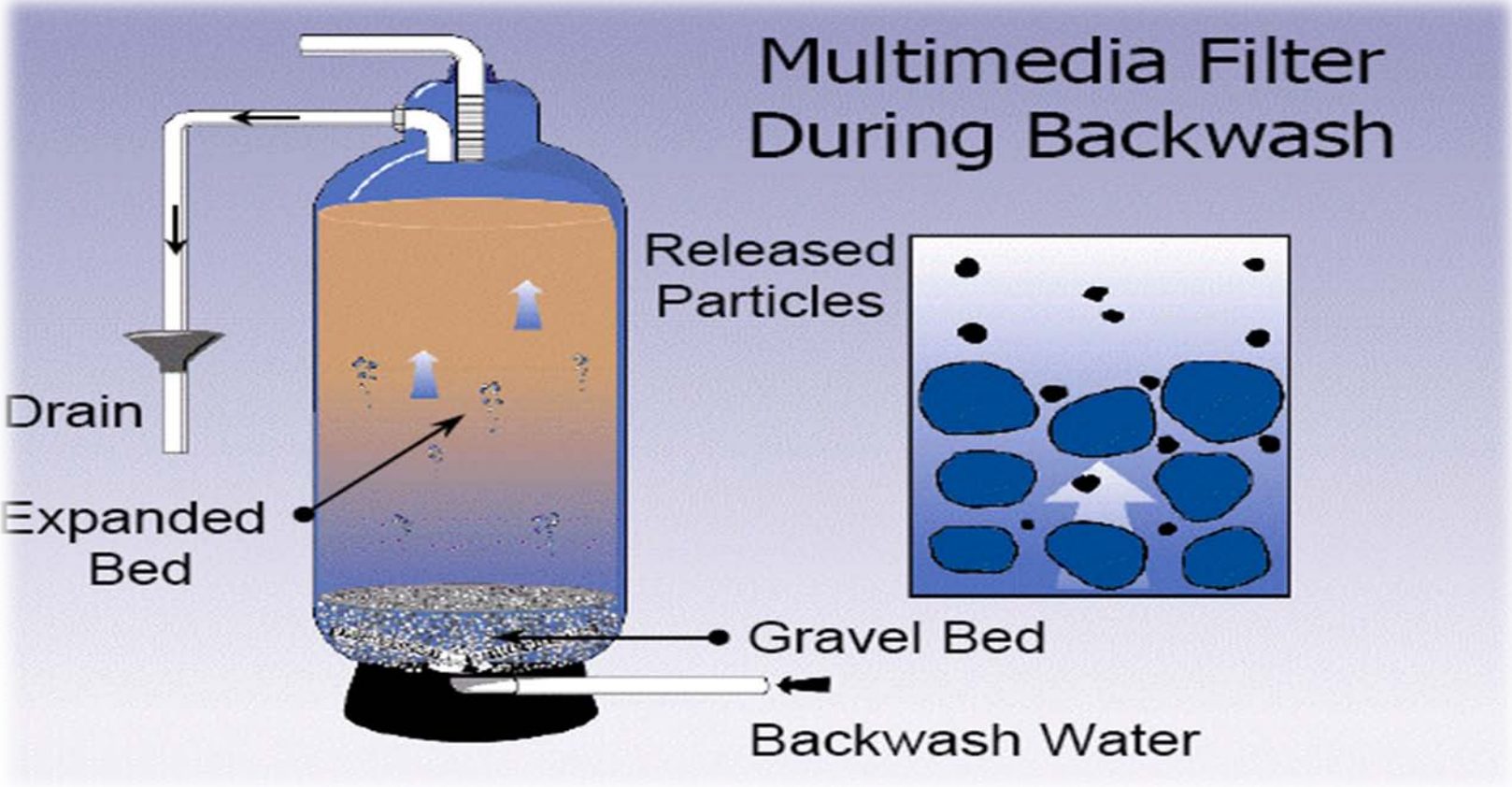
Filters In Backwash



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Filtration is the physical trapping of an impurity by any media.

Various type of filtration

- Surface Filtration - Occlusion
- Depth Filtration - Occlusion
- Adsorption Filtration e.g. Organics removal by Activated Carbon.

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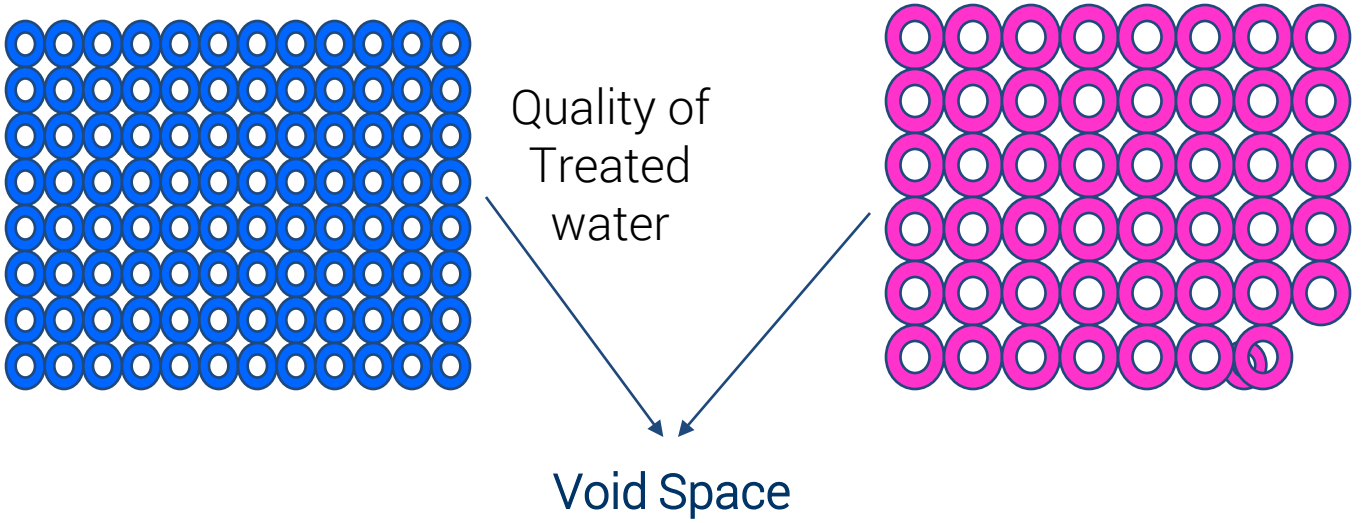
Filtration Fundamentals

For Big Void Space the Pore Size is large and therefore poor Filtration.



For small Void Space the Pore Size is small and therefore good Filtration.

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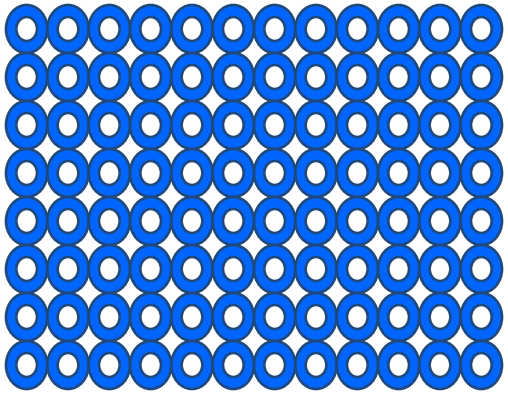
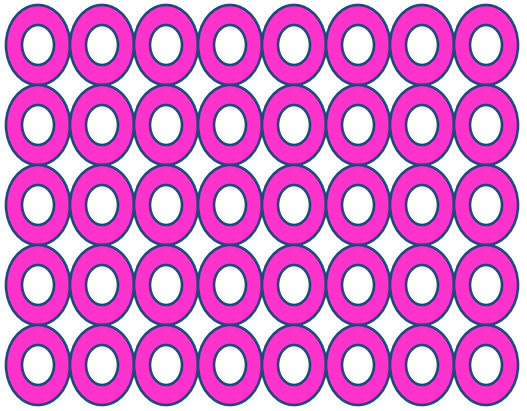
The Pressure Drop across the Coarse Media shall be lower in comparison to the fine media.



Pressure Drop



Further, Fine Media will arrest most impurities at the surface, but the Coarse Media will allow to get some in it's depth.

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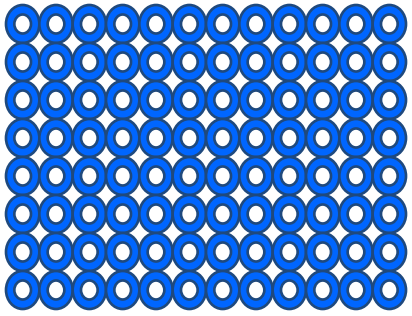
Comparison



Fine

Higher Pressure Drop

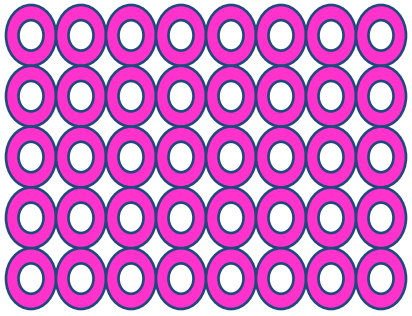
Low Rate of Filtration

Fine Quality

Surface Filtration

Small Bed Depth

- 16 + 32 Mesh BS



Coarse

Lower Pressure Drop

High Rate of Filtration

Poor Quality

Depth Filtration

Higher Bed Depth

24 m3/h.m2

9 m3/h.m2

Rate of Filtration

9 – 30 m3/h.m2

Backwash

24 m3/h.m2 with Air Blower (Only for Surface filtration)

40 m3/h.m2 otherwise

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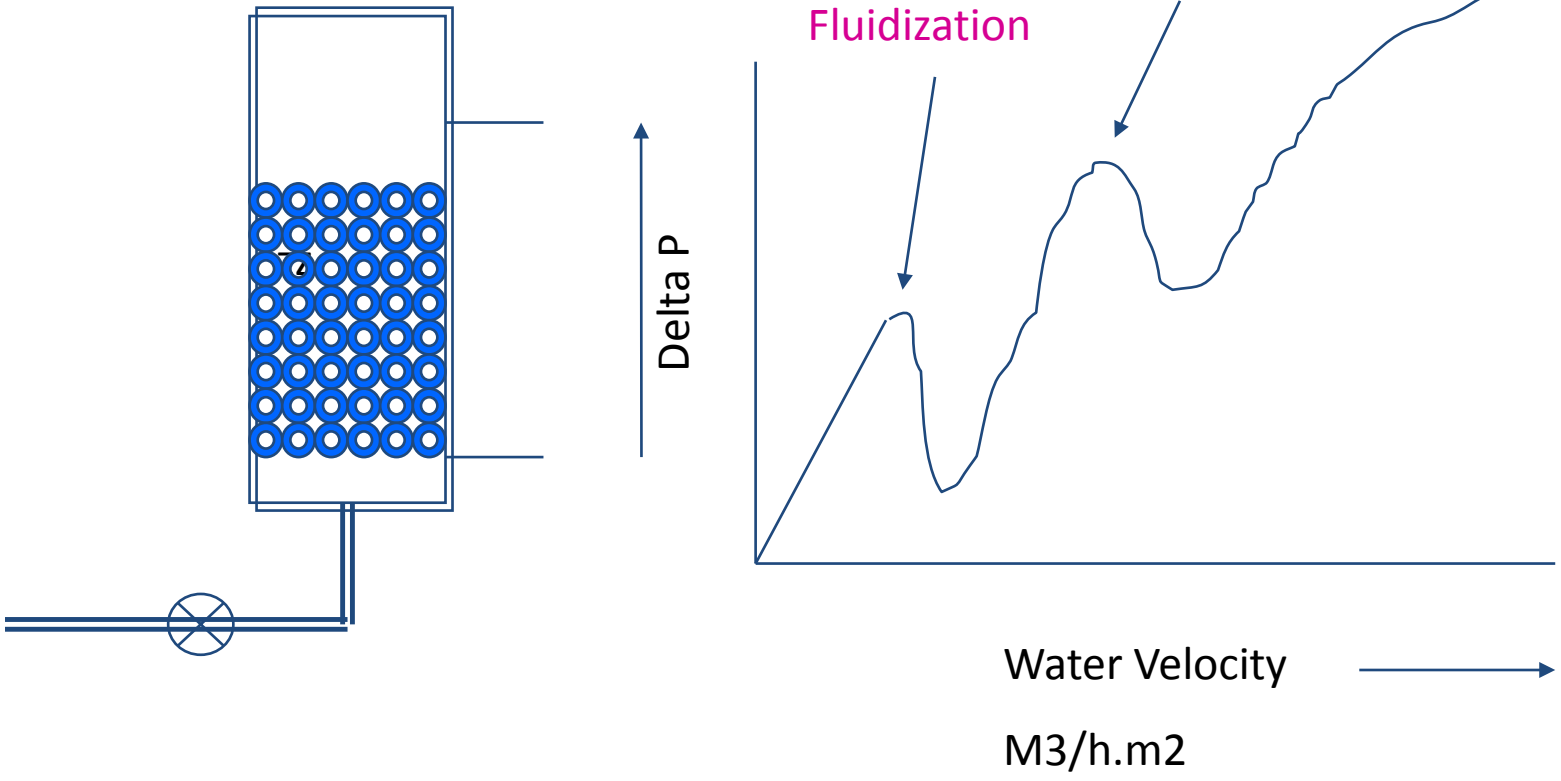
Let' Play a bit ..an Experiment



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MEDIUM	DENSITY kg/m3	EFFECTIVE SIZE mm	UNIFORMITY COEFFICIENT	PRIMARY FUNCTION
Silica sand	1600 - 1700	16 – 32 Mesh	1.5 – 1.7	Suspended solids removal/ multi-media filtration
Manganese greensand	2250	0.6 to 1.2 mm	1.6	Iron, manganese, hydrogen sulfide reduction
Calcite (calcium carbonate)	1600	0.8 – 1.1	-	Acid neutralization
Magnesia	1440	1.3	1.5	Acid neutralization
Granular activated carbon	500 - 700	0.8 to 1.6 mm	1.6 – 1.8	Adsorption of chlorine, other taste and odor, some organic reduction & hydrocarbons
Anthracite	880	0.6 – 1.2	1.4 – 1.7	Multi-media filtration/ suspended solids removal, oil removal

TSS/Turbidity, Iron, Oil, Arsenic, Fluoride	Preferable units	Filtration velocity m/h
< 15 ppm	Pressure Sand Filters	16.0
< 25 ppm	PSF or MGF	12 for PSF 24 for MGF
< 50 ppm	MGF or DMF	16 for MGF 24 for DMF
< 75 ppm	DMF	16.0
> 75 ppm	Sedimentation/Clarification followed by filtration system	

MEDIUM	DENSITY kg/m3	EFFECTIVE SIZE mm	UNIFORMITY COEFFICIENT	PRIMARY FUNCTION
Manganese dioxide	1800	0.5 – 0.8	1.7 – 2.1	Iron, manganese reduction
Green Sand (coated sand)	1960	0.6 – 1.2	1.6 – 2.0	Iron & Manganese removal
BIRM media	800	9 TO 35 Mesh	1.96	Iron & Manganese removal
Activated alumina	750	4 to 6 mm	-	Fluoride, Arsenic reduction

- BIRM Media flow rate recommended is 8-9m3/h/m2 area
- Oil, Hydrogen Sulfide – Not present
- Organic matter – Maximum 5 ppm
- Chlorine reduces BIRM activity

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As filter removes more particles the area that will allow flow of water becomes smaller. A smaller cross sectional area means the velocity must increase to allow the same amount of water to pass. This results in higher head losses.

As velocity increases, the likelihood of scouring particles off the filter media becomes higher. This results in an increase in particles in the effluent. Called filter beak through.

If the head loss gets too high or the particle count in the treated water gets too high (measured by turbidity or particle count), the filter must be cleaned. The cleaning process is called filter Backwash.

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