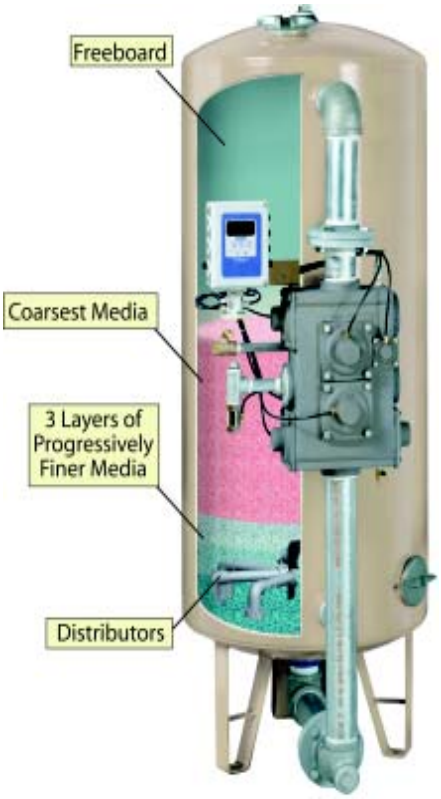
Fundamentals of Depth Filtration

"Why filtration"

Muddy, turbid water is the first and most visible sign that some type of filtration is needed. Even ancient Egyptians used filtration techniques of boiling and filtration through charcoal to improve their water supply. Today, municipalities, home-owners, and businesses all benefit from water filtration to improve their drinking or working water.

Many types of filters exist. This piece, however, concentrates on the process of depth filtration, considered to be one of the leading and most efficient types of filtration for pre-treating ground water to the quality required for different business applications.



"How filtration works"

Older, conventional slow sand filtration exploits the mechanical actions of straining and interception of dirt particles. Unfortunately this only occurs in a narrow surface layer of the media. Fast direct filtration relies on contact-coagulation mechanisms which occur on the surface of the filtering media leaving gaps for the "filtered" water to flow through.

Contact-coagulation consists of three primary forces:

1. "Transport" forces cause the dispersed particles to get close to the media granules (physical and physico-chemical in nature).

2. "Attachment" forces induce the dirt particles to stick to the media granules through an action which is mainly electrical in nature.

3. "Release or detachment" forces play a determining role in dirt break-through and in the important step of filter backwash.

"Depth filtration"

The underlying principle behind depth filtration is that just as dirt particles have varying sizes, shapes and chemical compositions, the use of different sized media, with varying chemical properties, allows for more efficient contact coagulation.

A depth filter usually has three to five layers of filtration media, each of different size and density in a pressurized vessel. Light, coarse material lies at the top of the filter bed. The media become progressively finer and denser in the lower layers. A depth filter also has an underbedding of relatively large-sized media with a distribution system designed to provide uniform collection of filtered water during service.

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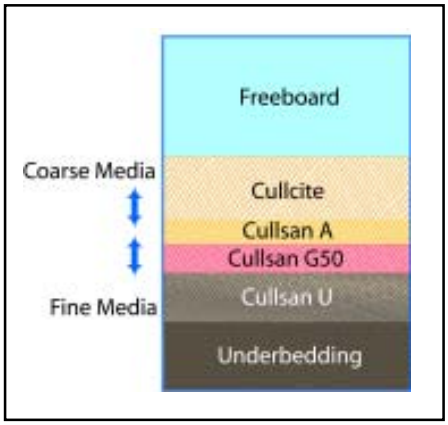
Upper layers remove larger particles and lower layers remove smaller particles of suspended solids, sand, silt and oxidized iron. Particles are trapped throughout the bed, not in just the top few inches. The use of graduated media also provides a higher filtration velocity with less pressure drop allowing for a longer service cycle.

The pressure drop through the filter will increase as the suspended particles accumulate on the media. When the pressure difference between filter inlet and outlet increases by 5-10 psi the filter should be reconditioned.



A typical reconditioning cycle consists of a backwash followed by a downflow rinse. The backwash cycle, generally flowing in the opposite direction from the service cycle, runs at about 14 gpm per square foot (34 m/hr) of the filter bed area. As the media particles scour one another, the trapped dirt particles are released from the media and rinsed out of the tank to the drain by the backwash water. A downflow rinse settles the bed before the filter returns to service. Depending on incoming water conditions additional backwash and rinse cycles may be necessary. A typical backwash cycle will last from 20 to 30 minutes.

“Filtered water quality”

Depth filtration provides for a more efficient filtering process to provide quality water to businesses. Proper selection of any combination of depth filtration, softening, or any other water treatment methods are dependent on the incoming water conditions.

“Typical uses for filtration”

Reduction/removal* of particulate matter including: suspended solids, sand, silt and oxidized iron for: boiler and cooling tower pretreatment, laundry operations, food and beverage services, drinking water; manufacturing processes, vehicle wash, and pretreatment for other water treatment processes such as reverse osmosis and deionization.

Untreated water can cause: poor tasting food and beverages, increased utility bills, higher operating costs, decreased equipment efficiency and life; increased usage of detergents and chemicals, reduction in linen life, and increased boiler blow-downs and downtime.

*Not all substances removed or reduced by filtration are necessarily in your water. Filtration systems should not be used with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.

Culligan International has been in the water treatment business since 1936. Headquartered in Northbrook, Illinois, Culligan has over 800 company-owned and franchise dealers in North America. Culligan offers a wide range of water treatment services for consumers and businesses. From softening and filtering to reverse osmosis and bottled water, Culligan is the leading water expert in the field of water treatment. This educational piece is provided by Culligan as a service to clients and companies in the commercial and industrial arena. Please contact us at 1-800-CULLIGAN for more information or visit us at www.culligan.com/commercial.

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