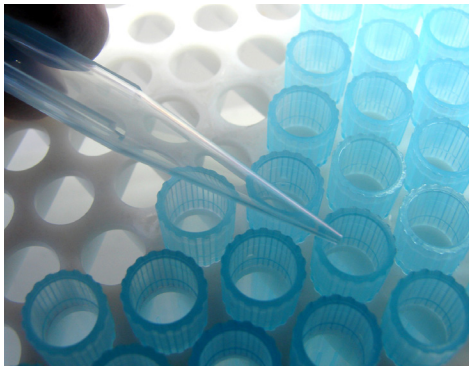
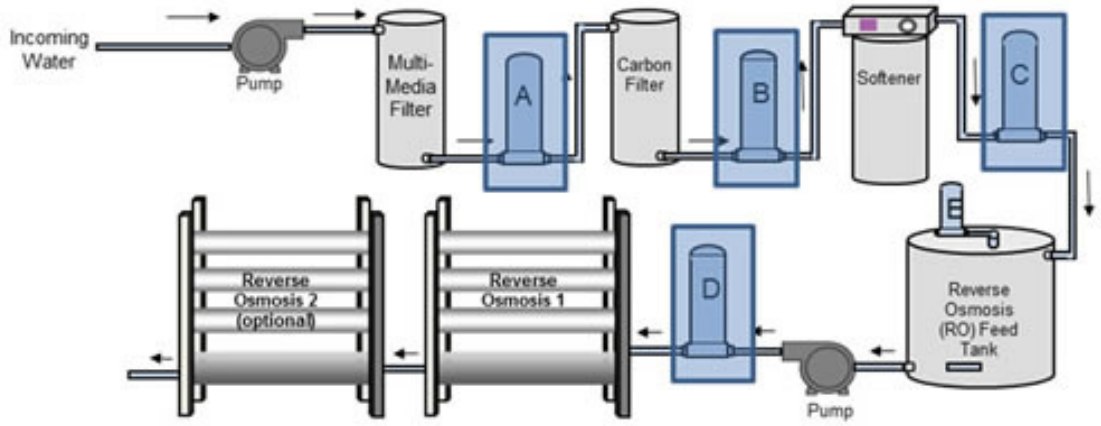
CRITICAL PROCESS FILTRATION, INC.

Particle Filtration in USP Water Systems



There are many reasons to remove larger particles 1 micron or larger in water systems. All are related to protecting processes from contamination by those particles. The particulate matter in water systems could enter with the feed water (municipal or well water). Other sources of particles may be some of the system components such as multi-media filters and resin-based treatment components like softeners or deionizers. This document explores the filtration options available to remove these particles and protect your treatment process.

Figure 1 - Prefilters in a Pharmaceutical Water System



A - Large Particle (>20µm) Trap Filter
B - Carbon Fines Trap Filter
C - Resin Trap Filter
D- RO Prefilter (1µm to 5µm)

Removing Particulates from Water

In most cases, the water entering a reverse osmosis (RO) system is filtered to remove larger particles, larger meaning bigger than 1 to 5 microns, depending on the system. Removing these particles prevents premature fouling of the reverse osmosis membranes, which are a critical and expensive component for water treatment.

The quality of the incoming water determines how much filtration is needed to protect the RO membranes. Figure 1 shows the most complete system. Many systems using municipal water will need few of these components. Below is a brief explanation of each particle filter and its function.

Particle Trap Filtration (Housing A)

Systems using well water or other raw, untreated water often use a multi-media filter (sand filter) before the water enters the treatment system. In most cases, water from municipalities does not require this step. The sand filter could release small particles that should be removed before they reach downstream components and clog them or otherwise interfere with their operation.

Carbon Fines Trap (Housing B)

The activated carbon filter shown in the diagram is typically a granular carbon filter that removes chlorine, chloramine, and other dissolved organic materials from the water supply. This protects downstream treatment components, particularly RO membranes, from oxidation. Unfortunately, all carbon filters produce carbon fines, so trap filters are needed protect downstream equipment.

Smaller systems utilize activated carbon block cartridge filters, such as Critical Process Filtration's ACB Activated Carbon Block filter cartridges instead of granular carbon beds. Due to their method of construction, carbon block filters do not shed carbon fines after a short initial rinse, making a downstream filter unnecessary.

Resin Trap (Housing C)

There are two resin-based treatment processes illustrated in the system diagram, water softening and deionization. Most pharmaceutical water systems will use these resin based processes. In both cases, the resin beads installed to treat the water will break down over time and introduce resin fines into the water supply. Filters are used to trap the fines and prevent them from harming the processes downstream.

RO Prefiltration (Housing D)

The most important particle filter is the RO prefilter. This filter protects the high pressure RO pump and keeps particles from the membranes. Reducing particle loads prevents membrane fouling and performance loss due to particles. Longer membrane life means reduced system cleaning and maintenance expenses as well as lower replacement costs over the life of the system.

Figure 2 – Critical Process Filtration's Melt-Blown and Nano-Spun Polyproplyene filters and pleated depth media filters are available in a wide variety of configurations to fit existing housings

Filter Options

Depth filtration products such as Critical Process Filtration Melt-Blown Polypropylene or Nano-Spun Polypropylene cartridges are commonly used for particulate removal. These products will hold a large quantity of silt or sediment before requiring replacement. Yarn wound filters are also utilized in this application, but wound filters often add 'extractable' surfactants to the water just after installation. Additionally, the superior construction of Critical Process Filtration's Melt-Blown or Nano-Spun filters ensures consistent particle removal unmatched by yarn wound filters.

Depending on the type of particles in your water supply, an economical alternative to standard depth filters may pleated media filters. Pleated filtration products, such as pleated polypropylene depth filters, have several times more surface area than melt-blown or nano-spun depth filters and will hold a much higher quantity of sediment or silt. Pleated filters do generally cost more, but the increased life in high-particle-load applications and labor savings from reduced filter change frequency may make pleated filters economically advantageous.

Contact Critical Process Filtration for assistance in determining the best filter options for your system. Visit our website at www.criticalprocess.com for more information and access to datasheets for all of our products.

Filter Media Options for Particle Filtration in USP Water Systems

Process Area	Filter Application	Filter Function	Critical Process Media*
Prefiltration	Particle Reduction	Reduce particulate load to protect performance of downstream water treatment processes	MB, NS, PD
	Carbon Fines Removal	Remove carbon fines to protect downstream processes	MB, NS (ACB in small systems)
	Resin Trap	Protect downstream processes from resin fragments that might foul media or membranes	MB, NS
	RO Prefiltration	Remove particulates that might prematurely foul membrane or interfere with membrane performance	MB, NS, PD

*Media Codes

MB = Melt-Blown Polypropylene Depth NS = Nano-Spun Polypropylene Depth PD = Pleated Polypropylene Depth

ACB = Activated Carbon Block

Visit our website or contact us for more information and to access datasheets on all of our products.

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