

Production Process

Most chemical/petrochemical plants have a utilities section which supplies process water to the production areas. Water can be used as fluid for rinsing vessels (tanks, vials, bottles), as a dilution fluid, as quench/wash fluid for final product, heat exchanger fluid, and as a reaction medium. The quality of water depends upon its end use. Regardless of where the water is used, it is necessary to remove particles and bacteria. Unfiltered water can foul downstream equipment which leads to costly repair and downtime, and contaminate catalysts which in turn can lower conversion rates and process yields.

A typical D.I. water schematic is shown. Incoming water contains suspended solids or particulates, dissolved organics, dissolved inorganics, and bacteria. It is generally treated first, by sand or multimedia filters to remove bulk solids, followed by an activated carbon bed to

remove dissolved organics. In some cases, a Reverse Osmosis System (RO) is placed downstream of the carbon bed to reduce high salt contents and dissolved organics. The heart of the system is an ion exchange unit, the purpose of which is to remove dissolved inorganic salts.

The D.I. water is then sent to a storage tank before distribution to the various point-of-use areas. To prevent the growth of bacteria, unused water is continuously recirculated through the storage tanks, which use vent filters or a prefiltered nitrogen blanket to prevent airborne bacterial contamination.

When ultrapure water is required, it is subjected to additional purification such as ultraviolet light (UV) and ultrafiltration. Both the UV and ultrafiltration units remove microbial contaminants such as bacteria and other microorganisms to ensure ultra high purity of water. The UV units will also reduce dissolved organics.

Pall Product Recommendations

- 1 Since sand or multimedia filters are packed beds and therefore, not of a fixed pore structure, they are subjected to attrition and migration of fine particles downstream that can foul the carbon bed. Nexis® T Cartridge 20-40 micron (μm) are recommended for this service. Nexis filters have a higher voids volume than other conventional depth filters, which means higher dirt capacity and longer life. In addition, effective removal of contaminants prevents the adsorptive sites of the carbon bed from becoming fouled.

- 2 Nexis® T 5-10 µm filters or Ultipleat High Flow Filters are recommended downstream of carbon beds to remove migrating carbon fines. The Nexis filters protect the ion exchange resin bed from particulate contamination, thereby increasing the unit's efficiency.
- 3 Nexis A 5-10 µm filters or Ultipleat High Flow Filters upstream of RO modules, prevent fouling and avoid costly downtime associated with cleaning the modules. For enhanced protection and lower power consumption, a 0.1 µm Microza hollow fiber filter system is recommended.
- 4 Nexis A 5-10 µm filters or Ultipleat High Flow Filters are recommended as resin trap filters downstream of the ion exchange resin beds. These filters prevent the fragmented resin fines from fouling expensive downstream equipment such as tanks, valves, pumps, etc.
- 5 For ultra high purity water, such as water used as a reaction medium in the manufacture of specialty polymer resins or water used as a dilution agent for a high purity chemical (e.g. semiconductor grade), additional filtration steps are required to further purify the water. Pre-and final point-of-use filters are recommended.
- 6 Pall Ultipor® N₆₆® (NB) 0.45 µm prefilter (#5) and N₆₆® Posidyne® 0.2 µm (NAZ) final filters (#6) guard against particles generated by pumps, corrosion particles present in the piping, and bacteria. Pall Posidyne filters are constructed using Nylon 66 membrane containing cationic (positively charged) functional groups. Since most bacteria and colloidal silica particles have a negative charge in water, these filters remove contaminants much smaller than their rating at extremely high efficiencies. Removal of these contaminants ensures high yields and conversion rates in the chemical or polymerization reactor or high quality grades of the final chemical product.
- 7 Emflon® II (hydrophobic polyvinylidene fluoride) elements are recommended as vent filters on storage tanks to prevent airborne particulate and bacterial contamination from entering the tank. Emflon II filters have an absolute microbial rating of 0.2 µm in liquid service and a particulate rating of 0.01 µm in gas service.
- 8 Pall Microza ultrafiltration OLT modules with a molecular weight cutoff of 6,000 daltons are recommended for high purity water where the TOC level is less than 20 ppb.

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