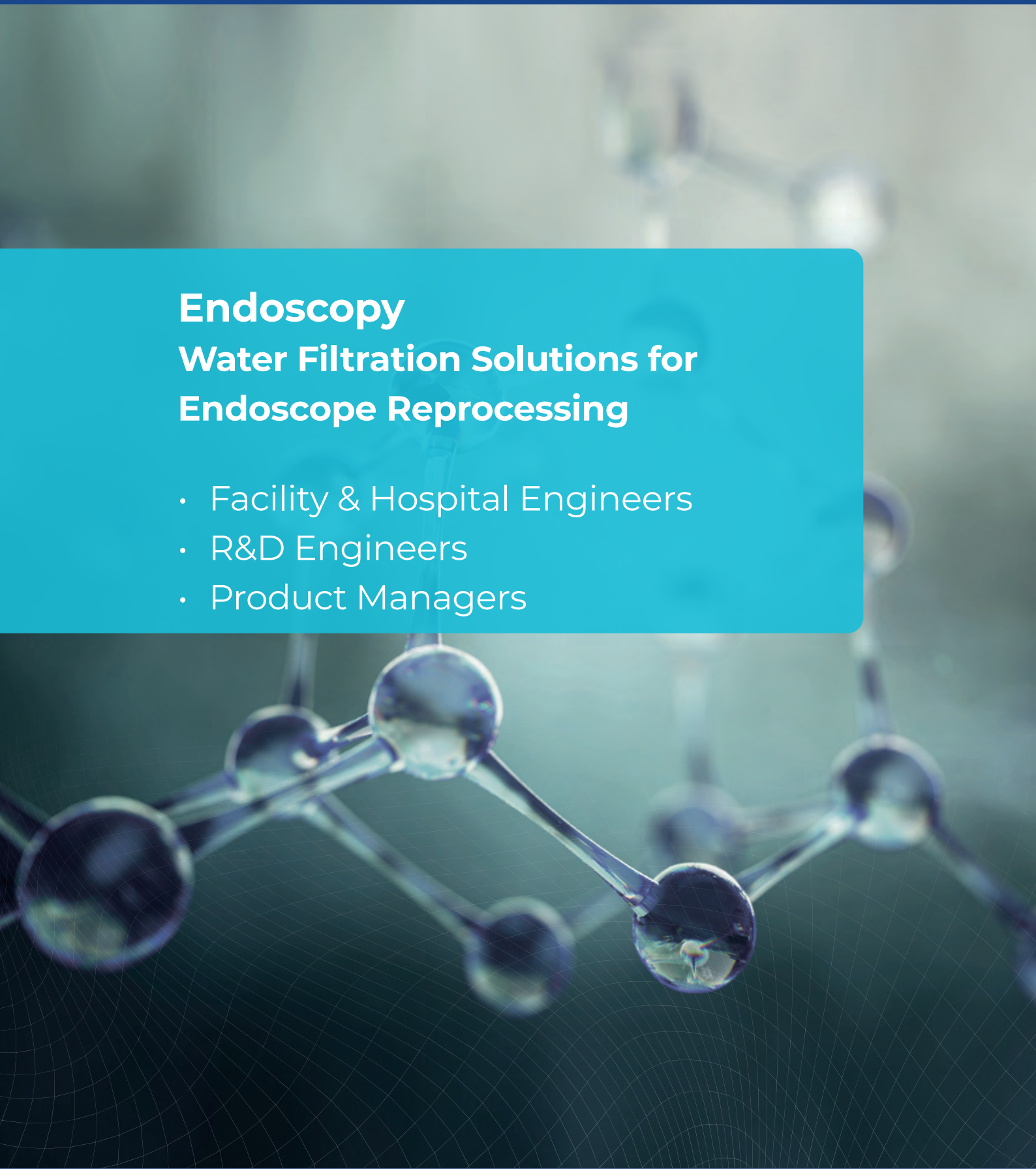
PALL CORPORATION



Endoscopy

Water Filtration Solutions for Endoscope Reprocessing

- Facility & Hospital Engineers
- R&D Engineers
- Product Managers

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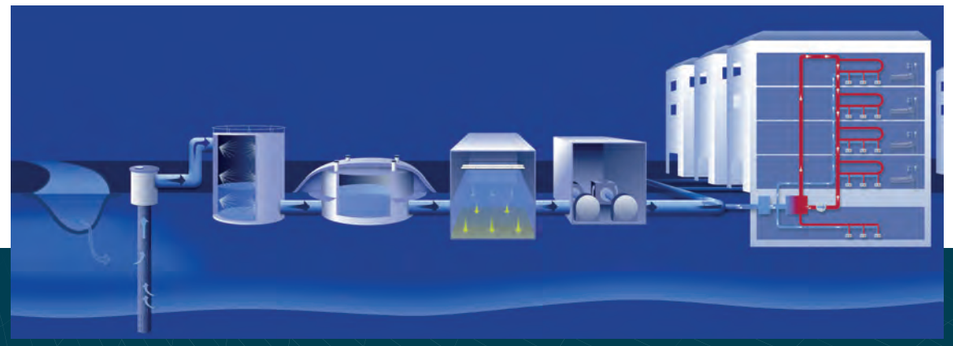
Introduction - Water Delivery to your Facility

Every building has a unique water system and therefore a unique mix of requirements regarding contamination control. Filtration removes and retains contaminants from the water system that may adversely affect users and equipment. Pall Medical offers a broad range of filter systems from Point-of-Entry (POE) to Point-of-Use (POU) and for specialised water systems, such as feed water for automated endoscope reprocessing.

According to the application parameters and performance needs, we are able to provide tailored filtration solutions for our customers. This catalogue provides a general overview of a selection of Pall water filters for particle, bacterial, chemical and endotoxin removal. Our Scientific and Laboratory Services (SLS) team can provide on-site and laboratory technical support to help you find the best filtration solutions for your specific needs.



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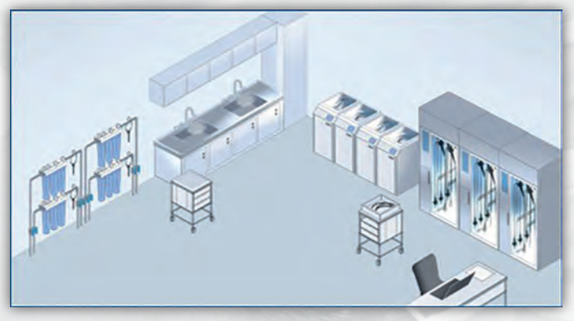
Endoscopy

Pall's Endoscopy Portfolio for Clean Water



Endoscope Reprocessing

Water quality for use in reprocessing of endoscopes is required to be of a high standard set-out within national and international guidelines. Endoscope Washer Disinfector (EWD) machines are final stage cleaning equipment used to decontaminate scopes before re-use on patients. Therefore, it is imperative that final rinse and residual water is free from microorganisms and pathogens that maybe present in a water distribution system.

A Closer Look at Particulate

The following contaminants found in water can cause problems:

Contaminant Examples	**Particulate** Dirt, sediment	**Disinfectant** Chlorine, chloramine	**Organics** Leaves, mould, animal waste	**Bacteria** Endotoxins, *Legionella* spp., *Pseudomonas* spp.	**Scale** Calcium, Magnesium
Effects	Blocks pipework, equipment damage and bacterial growth	Poor taste, attacks RO membranes	Biofilm growth, poor taste	Risk of illnesses, including Legionnaires' disease	Blocked pipes, higher energy costs
Treatment	Bag Filter Spun-Bonded Cartridge Pleated Cartridge	Carbon Cartridge	Carbon Cartridge Nominal Particulate Filter	Ultraviolet Disinfection System Sterilizing-Grade or Microbial Filter Charged Filter for Endotoxin Removal	Ion Exchange Resin (Softening)

Contaminants Examples	**Parasites** *Cryptosporidium, Giardia*	**Pesticides** Nitrates, phosphates	**Color** Iron, tannins, algae	**High Salts (Alkali)** Potassium, sodium, chlorides	**Low Salts (Acidic)** Purified water
Effects	Diarrhea and vomiting	Gastric issues, blue baby syndrome	Staining, dehydration	Mineral build-up, high blood pressure	Dissolves metal pipes and valves
Treatment	Absolute Particulate Prefilter	Reverse Osmosis	Carbon Cartridge Ion Removal Resin Nominate Particulate Filtration	Ion Removal Resin	pH Correction

A Closer Look at Microorganisms in Water

A large variety of Microorganisms can be detected within water systems:

- *Pseudomonas* spp.
- *Legionella* spp.
- Nontuberculous mycobacteria
- *Acinetobacter* spp.
- *Cryptosporidium* spp.
- *Klebsiella* spp.
- *Escherichia coli*
- *Aspergillus* spp.

Pseudomonas aeruginosa and *Legionella pneumophila* are among those which are particular concern for immunocompromised patients

Water Quality for Endoscope Reprocessing

Water Treatment for Endoscope Reprocessing

1. **Pre-filtration 1**
   Large particulate & organic debris

2. **Ion Exchange & Brine Tank**
   Ion-exchange devices reduce the hardness by replacing magnesium and calcium (Mg^{2+} and Ca^{2+}) with sodium ions

3. **Pre-filtration 2**
   Particulate & debris removal

4. **Carbon Filtration**
   Adsorption of systemic disinfectant chemicals

5. **Absolute filtration**
   Fine (<1 micron absolute) filtration for fine particulate removal for protection of RO

6. **Reverse Osmosis (RO) System**
   Removing dissolved contaminates (sodium ions), bacteria, fine particulate

What is this process doing step by step?

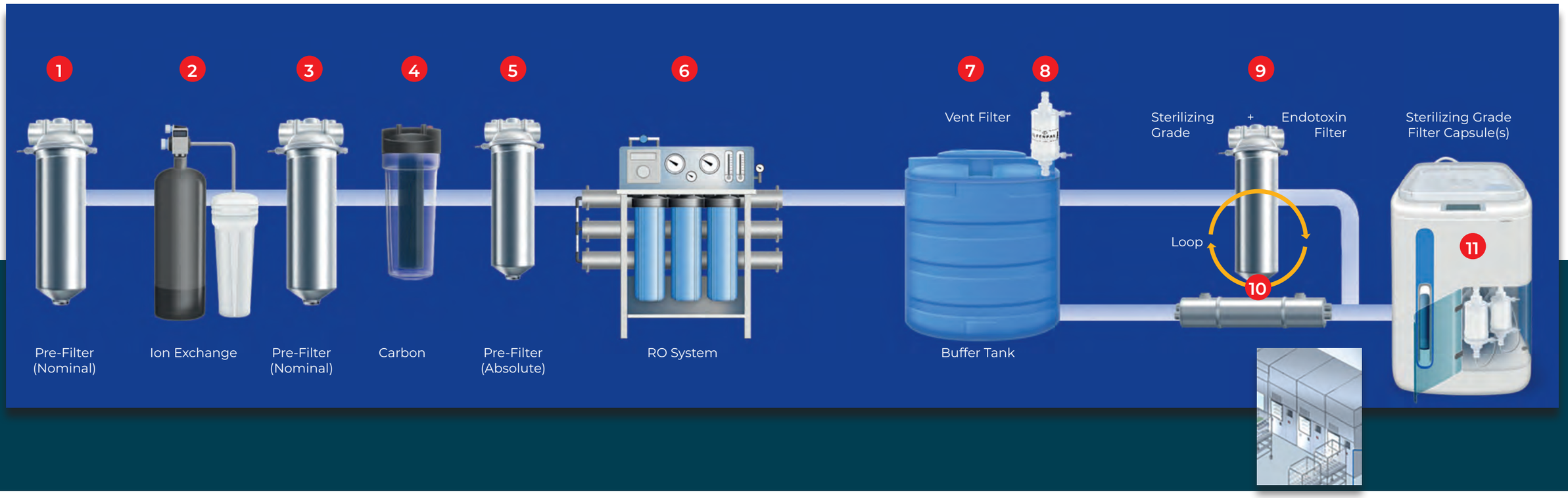
7. **Storage Vessel**
   Large sealed water tank to act as buffer, often as RO may not be able to keep up with peak demand

8. **Tank Vent Filter**
   Sterilizing grade vent filtration to protect tank water from bacteria and airborne particles

9. **Sterilizing & Endotoxin Filtration**
   Removing any bacteria and endotoxin within recirculating loop

10. **Ultra Violet (UV) Light System**
    Virus reduction

11. **Final Rinse Water Filter (within Endoscope Washer Disinfector EWD)**
    Final stage sterilizing grade filtration step to remove bacteria & particulate (typically forms part of AER system)



Water Quality for Endoscope Reprocessing Problem: Large Particulate & Debris

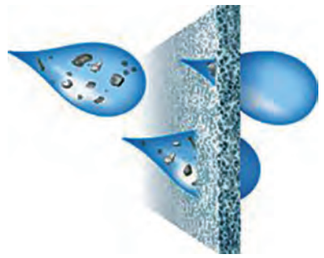
Problem

Large particulate & organic debris coming in from municipal or private water sources, together with that of a building's inherent water system contamination can foul softeners and give rise to bacterial growth or seeding inside the system.

Solution

Coarse particle filtration to remove bulk contaminate from influent water.

1 3 **Claris®** is an example of an economical melt blown filter that can help protect high value water system components such as softeners and RO systems. A nominal filter will have a certain efficiency wherein it will retain that percentage of particles at the specified micron size.



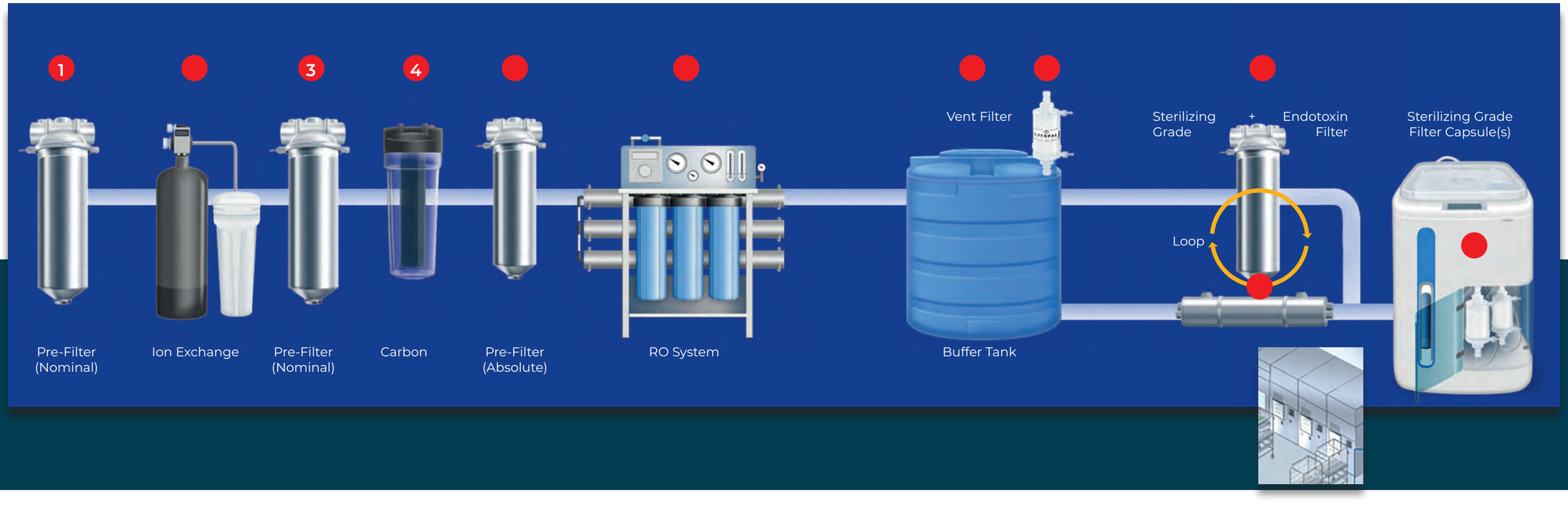
Water Quality for Endoscope Reprocessing Problem: Disinfection Chemicals

Problem

Systemic disinfectants used within healthcare water systems including chlorine, chlorine dioxide and monochloromine can cause an increase in degradation and shortening of usable life of RO membranes.

Solution

Creating a separate water supply line without disinfection or using a carbon filtration to adsorb chemicals to levels permitted for use with RO membranes will help preserve their life as per manufacturers claims. 4 **CB-Micro Carbon II** is a carbon filter housed within standard filter cartridge design for ease of use and ease of disposal.



Water Quality for Endoscope Reprocessing Problem: Fine Particulate & Debris

Problem

Fine particulate debris such as silt and silica still poses an issue downstream for coarser filters and carbon. Protecting RO membranes is the prime objective here to ensure efficiency is maintained and life preserved

Solution

Absolute filtration will efficiently reduce 99.98% of particles at its stated micron size. 5 **Ultipor® GF+** is a 1 micron filter with a positive charge on the media giving it enhanced capability to remove negatively charged contaminants such as silica much smaller than the its 1 micron pore size

Water Quality for Endoscope Reprocessing Problem: Airborne Contaminants

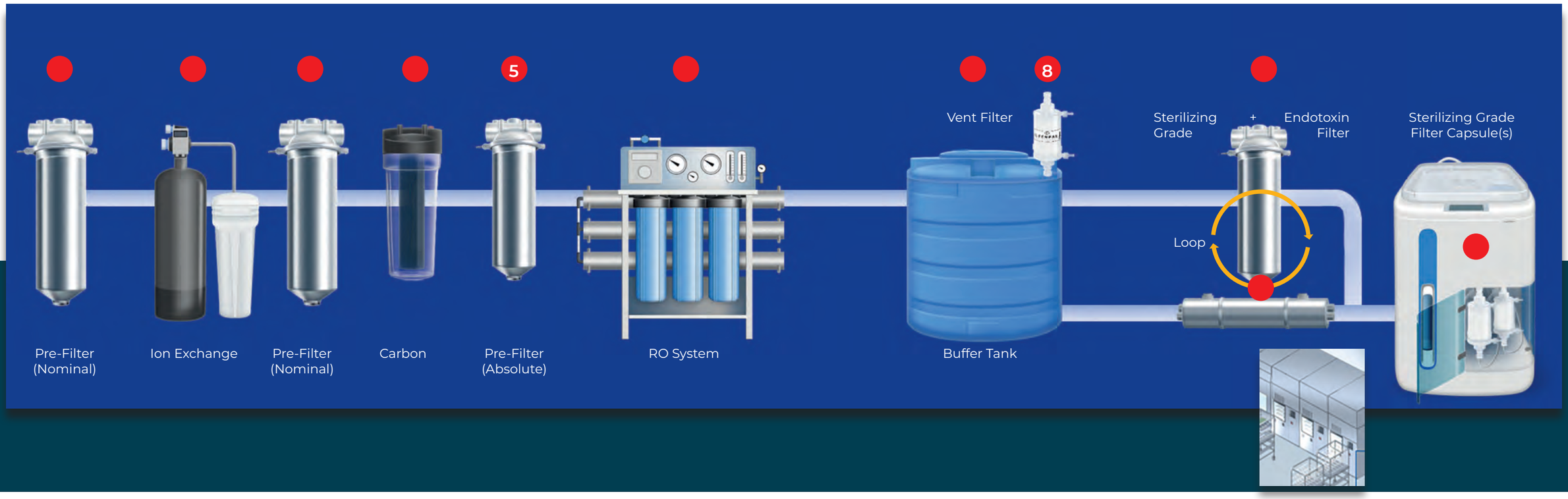
Problem

As a tank fills and empties a displacement of air occurs. Having a tank exposed to atmosphere at this stage in the process risks recontamination with airborne particular and microorganisms.

Solution

A sterilizing grade hydrophobic vent filter (0.2 micron in liquid and 0.003 micron in dry gas) will allow passage of air into the tank as required and remove risk of exposure to contamination.

8 Pall's **Autoclave Vent Filter** is a cartridge that can fit directly on to a tank for ease of use.



Water Quality for Endoscope Reprocessing
Problem: Microorganisms & Endotoxin

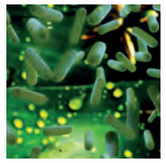
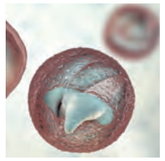
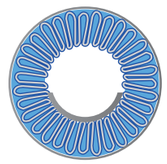
Problem

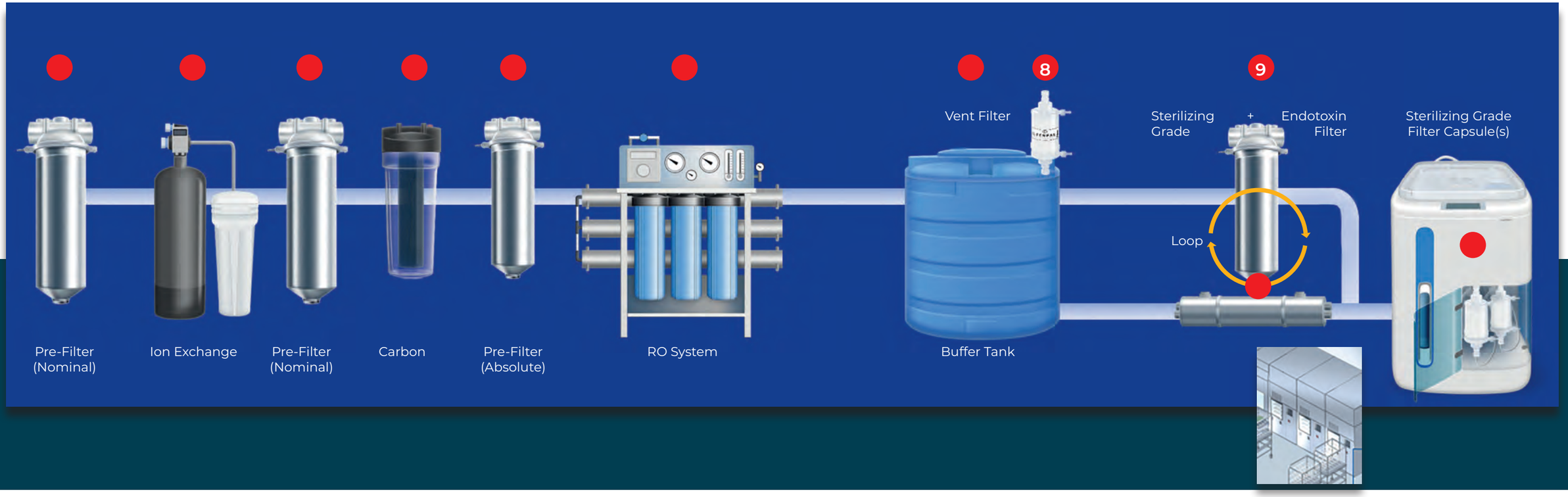
Water produced by RO should meet water hardness specifications but is no guarantee for microorganism or endotoxin control. RO modules are not absolute and may become colonised if not managed through pre-filtration and regular disinfection.

Solution

Keeping the water moving in a loop design after the buffer tank is a good way to minimise stagnation and biofilm proliferation. Installing sterilizing grade filtration within the loop capable of removing bacteria and capturing endotoxin is a way of control.
9 **Posidyne®** filters have a positive charge enabling enhanced endotoxin capture, together with a sterilizing grade (0.1, 0.2 micron) membrane.

Pall Filter Solutions

Contaminant Type	Bacteria	Parasites	Organic Material	Particulate	Chemical
					
Examples	***Legionella*** ***Pseudomonas*** Nontuberculous mycobacteria	***Cryptosporidium***	Leaves, straw, grass	Dirt, sediment	Chlorine, chlorine dioxide, monochloramine
Impacts					
Suitable Filter Type	Laid-Over Pleated	Pleated Depth	Depth Media	Depth Media	Carbon Media
					



PALL CORPORATION

Corporate Headquarters
Port Washington, NY, USA
+1-800-717-7255 toll free (USA)
+1-516-484-5400 phone
medical@pall.com

European Headquarters
Fribourg, Switzerland
+41 (0)26 350 53 00 phone
medical@pall.com

Asia-Pacific Headquarters
Singapore
+65 6389 6500 phone
medical_apac@pall.com

Visit us on the Web at www.pall.com/medical
Contact us at www.pall.com/contact

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