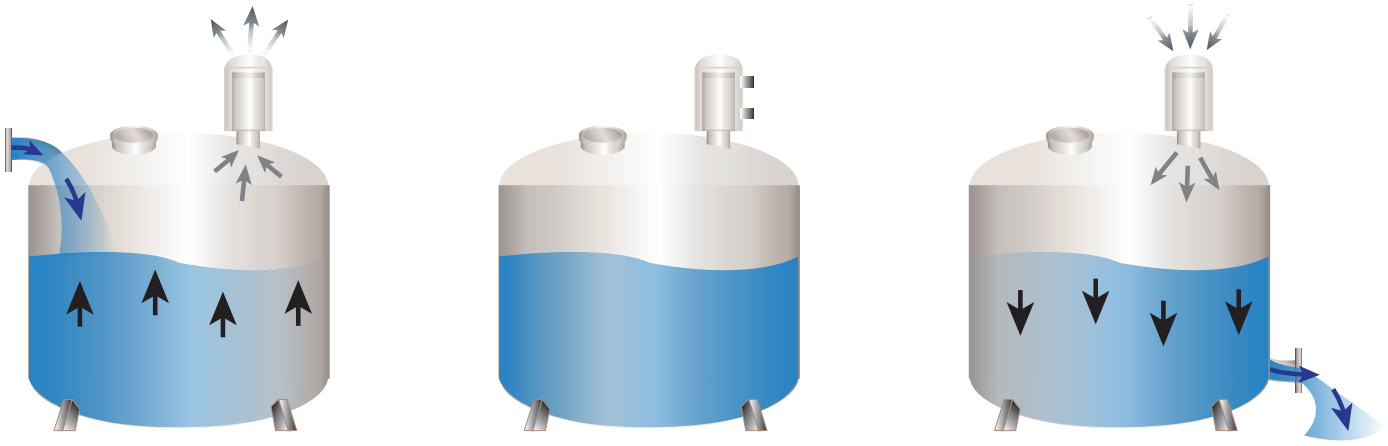
Sterile Vent Filtration on Hot and Ozonated Water Tanks

Hot and Ozonated Water Tanks

Many Food and Beverage processes require large volumes of water. It is critical that the water used is protected from particulate or microorganism contamination to ensure that the process operations do not become inadvertently contaminated. There are several approaches that can be used to ensure that the water remains free from contamination. One of them is to add ozone, which acts as an antimicrobial and oxidizing agent, to ambient as well as to hot water storage and distribution systems. Usually, the water is stored in tanks fitted with a sterilizing grade vent filter to ensure that the tank can be properly vented for filling and emptying without the risk of a secondary contamination from the tank environment. This document will discuss considerations for selecting a vent filter for a hot or ambient water tank that is subjected to ozonation.

Either ozone evaporating from the ozonated water into the gas phase or the elevated temperature of the gas phase could cause oxidation effects to the polypropylene hardware used in many vent filters. Oxidation can result in brittleness and loss of plasticity of sterilizing grade vent filters. In addition to the polypropylene hardware, the most vulnerable parts of many vent filters are the support and drainage layers made from polypropylene fibers. The other components in the filter such as PTFE membrane, silicone O-rings and the 316 stainless steel used in the filter housings have excellent resistance to ozone.



A tank vent filter protects product from airborne contamination during filling, storage and emptying, and the environment from aerosols coming from the tank.

Sterile Venting of Hot and Ozonated Water Tanks

From experience it is known that standard vent filter cartridges such as **Emflon® PFRW** (with hydrophobic PTFE membrane) filters can show evidence of oxidative degradation from exposure to ozone after three to six months in hot and ozonated water tank applications. Several investigations have demonstrated that Emflon PFRW filters passed the filter integrity tests after exposure to ozone. However, the polypropylene drainage layers became brittle and powdery due to oxidative attacks from the ozone or the hot air above the water. This type of degradation can lead to particle release or even failed integrity after longer exposure times. For this reason, the use of standard vent filter cartridges such as Emflon PFRW filters under oxidative conditions requires a frequent changeout of filter cartridges in order to avoid degradation of the filter materials that could lead to:

- Material and particle input into water storage tanks
- Passage of microorganisms through damaged cartridge components
- Failure of cartridge integrity and integrity test procedy

Pall developed **Emflon HTPFRW** filters to provide a longer vent filter service life in applications that involve a highly oxidative environment. Emflon HTPFRW PTFE membrane filters have been developed with a special support and drainage material made of polyphenylene sulfide (PPS) polymer which is more robust in oxidative environment. In addition, the

polypropylene hardware used for the Emflon HTPFRW filters has been optimized to have greater resistance to oxidation. To confirm the suitability, compatibility and resistance of Emflon HTPFRW filter cartridges on ozonated water tanks, several on-site investigations have been conducted with Emflon HTPFRW filters as the sterile vent filter on different water system tanks and with ozone as disinfectant.

Water Tank with Ambient Temperature and 100 ppb Ozone

In the first study an Emflon HTPFRW filter was used as asterile vent filter on an ambient temperature water tank system with 100 ppb ozone as disinfectant. After 3 months, the Emflon HTPFRW filter passed the Forward Flow integrity test and showed no deterioration in the condition of the hardware, support, drainage and media layers after the dissection of the filters.

Water Tank with 85°C (185°F) and 50-89 ppb Ozone

In a further study, an Emflon HTPFRW filter was used for the sterile venting of an 85° C (185° F) water system with 50-89 ppb ozone used as a disinfectant. After 6 months in use, the Emflon HTPFRW filter passed both Water Intrusion and Forward Flow integrity tests and showed no deterioration in the condition of the hardware, support, drainage and media layers.

Results and Recommendations

The results demonstrate that Emflon HTPFRW filters have a higher degree of resistance against oxidation than Emflon PFRW filters in vent filter systems on hot and / or ozonated water tanks. Emflon HTPFRW filters are therefore the first choice sterilizing vent filter in water systems operated with

- 50-89 ppb ozone at 85° C (185° F) for a minimum 6 month usage period or
- 100 ppb ozone at ambient temperatures for a minimum 3 month usage period

In addition to temperature and ozone concentration in the water, it is important to consider that specific installation and plant properties, as well as other operating parameters (filling and drainage rate, head volumes and steaming cycles) in a water plant and tank may have further influence on the service life of the sterile vent filters.

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