

# TECHNICAL BRIEF

## Cleaning BevASSURE® II Membrane Filters with Hydrogen Peroxide/Peracetic Acid Based Sanitizing Agents

### Introduction

In many food and beverage applications, the final membrane filters tend to plug by the gradual constriction of the pores with colloidal materials, not by the collection of fine particulate or microorganisms on the membrane surface. These colloidal substances are composed of various naturally occurring organic substances in the malt or fruit based beverage. These organic substances include beta-glucans, proteins, tannins and carbohydrates. These materials are either inherent in the malt or fruit or are generated in upstream processes such as fermentation and the enzymatic breakdown of carbohydrates and other components.

Regular flushing of the filter with warm water can reduce this build up and remove the layer of materials on the membrane surface. Many beverage manufacturers have found that including a daily warm water flush of the membrane in their daily filtration cycle reduces the level of build-up on the membrane surface and decreases the rate of differential pressure increase across the membrane with time (CUNO Technical Brief LITTDCO2). However, flushing with warm water alone is not 100% effective at cleaning the pores in the membrane.

Warm water will dissolve the colloidal materials, removing them from the membrane surface which results in longer filter service life and lowers operating costs. Longer service life and larger operating cost savings can be achieved if the warm water cleaning step is followed by the addition of a chemical cleaning/sanitization step to the daily filtration cycle. The most commonly used cleaning/sanitizing agents are hydrogen peroxide/peracetic acid based sanitizing agents. Peracetic acid and hydrogen peroxide are strong oxidizing agents that are very effective in oxidizing organic substances and also has a beneficial biocidal effect. The agents also contain hydrogen peroxide at a significantly higher concentration than the peracetic acid.

The recommended conditions for chemical cleaning of used membranes are a warm water flush using filtered water at 131°F (55°C) followed by a static soak of the cartridges for 30 minutes in 0.5% v/v aqueous/hydrogen peroxide/peracetic acid based cleaning agent solution at ambient temperature.

Laboratory tests indicate that the CUNO BevASSURE membrane is compatible with dilute solution (up to 1.5% v/v) of hydrogen peroxide/peracetic acid based cleaning/sanitizing agents for up to 192 continuous hours at room temperature. Measurement of the membrane bubble point during the tests indicated the bubble points remained constant as a function of time of exposure to the sanitizing agent and remained above the minimum bubble point specification. No deterioration in the membrane flow characteristics as a function of the time of exposure were found.

Chemical cleaning is only effective when the hydrogen peroxide and peracetic acid can penetrate the pores to oxidize colloidal materials within the pores. Therefore, a warm water flush is employed prior to use of the chemical cleaning agents to remove excess colloidal material from the membrane surface to expose the pores in the membrane. Warm water can only work on those pores the warm water can flow through. Once a pore is plugged, neither the chemical cleaning agent nor warm water will be completely effective in removing the colloidal materials. Therefore, warm water flushing and chemical cleaning should be practiced **BEFORE** the differential pressure across the membrane begins to build. Once the differential pressure rises, the pores are effectively lost and can be considered as permanently plugged.

The warm water flushing or regeneration of the membrane, followed by chemical cleaning is ideal for removing water soluble materials and oxidation by-products. These cleaning steps are usually followed by a hot water sanitation step. The typical temperature during the sanitation is 80° to 90°C. At these elevated temperatures, the colloidal materials tend to “bake” in the pores and on the membrane surface causing permanent plugging of the membrane. Therefore, maximum benefit is achieved by conducting the warm flush and chemical cleaning **PRIOR** to the hot water sanitation step.

## Procedure

**WARNING: Exercise caution when working with caustic solutions. Wear and use appropriate safety equipment (clothing, gloves, face/eye protection) at all times.**

1. At the end of the daily filtration run, push residual product out of the housing and cartridges with ambient temperature filtered water or CO2.
2. Flow 131°F (55°C) filtered water through the filters to drain for 15 minutes at the same flowrate used to filter the product.
3. If filters are in series, it is recommended that the first filter be flushed to drain with warm water for 15 minutes before diverting the flow through the second filter.
4. Allow the housing to return to ambient temperature. (Flowing cold filtered water through the filters will shorten the time required to cool the housing and filters.)
5. Slowly add the 0.5% v/v hydrogen peroxide/peracetic acid sanitizing solution and fill the housing.
6. Allow the hydrogen peroxide/peracetic acid solution to remain in contact with the filters for 30 minutes.
7. Flush the cleaning solution from the housing by flowing ambient temperature filtered water to drain for 15 minutes at a flow rate of up to 2 gpm per 10” element not to exceed 35 psid.
8. Flow 176°F (80°C) filtered water through the filters to drain for 30 minutes at the same flow rate as used to filter the product.
9. Allow the housing to cool to ambient temperature. (Flowing cold filtered water through the filters will shorten the time required to cool the housing and filters.)
10. Integrity test the filters before the next production run.

The five most common cleaning/sanitizing agents (the manufacturer) used in this application are:

Cleaning/Sanitizing Agents	Active Components		
Oxygal NEP (CFPI)	15% hydrogen peroxide	2.5% peracetic acid	
Oxonia (Henkel)	27.5% hydrogen peroxide	5.8% peracetic acid	
Divosan Mezzo (Diversey)	22% hydrogen peroxide	2.5% peracetic acid	8% nitric acid
Divosan Plus (Diversey)	15% hydrogen peroxide	5% peracetic acid	
Divosan Forte (Diversey)	26% hydrogen peroxide	15% peracetic acid	



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