PALL

Food and Beverage

Application Bulletin

CIP Recovery: More than 80% environmental impact reduction with 2 years payback.

Overview

The Food & Beverage industry requires frequent cleaning in place (CIP) of its equipment, tanks and pipes to ensure product safety during processing. The cleaning typically includes:

- Caustic solution between 1 to 3% at high temperatures up to 80 to 85 °C
- Acid solutions between 1 to 2% at temperature < 70 °C
- Hot and cold water rinses
- Other special chemicals (surfactants, wetting agents, complexing agents, etc.)

In the F&B industry the hygienic standard, including installation cleanability, is getting more and more stringent. At the same time, the environmental considerations are creating huge pressure on the industry to reduce water consumption and waste-water disposal, including salt rejection. On the other hand, the market competitive situation keeps pressure on operation cost.

The Challenge

A Dairy producer and processor, located in South America, looked at reducing CIP process costs.

The annual consumption and associated costs are detailed hereafter:

- 500 metric tons of 50% caustic soda for a total purchase cost of $350 K/year
- 12.5 million liters of water generating effluent at high pH
- 1,700 tons of steam consumed for CIP solution heat up

These costs together represent $420 K, which has potential for significant change as caustics prices fluctuate. A major part of the costs are from caustic itself (more than 80%) with steam and water as secondary costs.

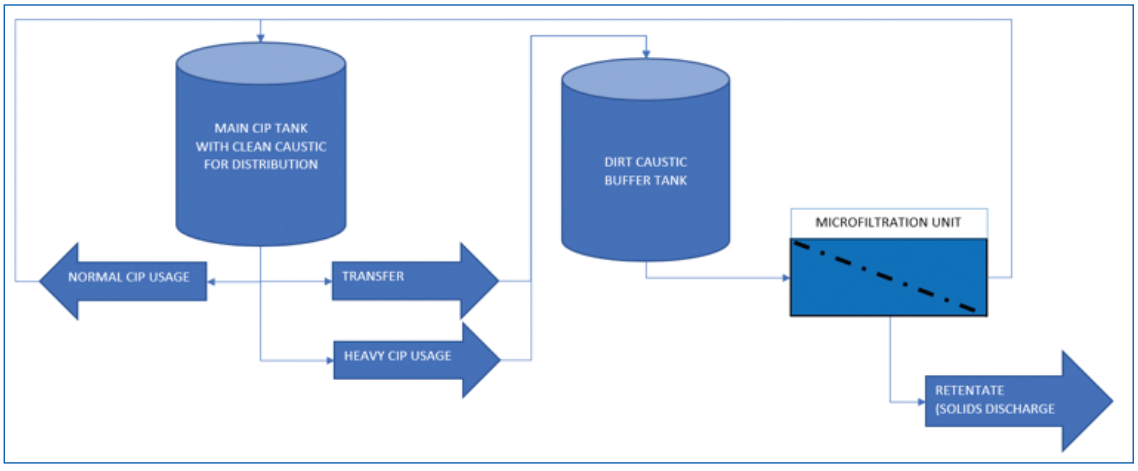
Additionally, the customer knows that the disposed effluent from CIP still contains a significant amount of caustic (up to 1.0%), while its process required 2.0% caustic.

The Solution

Based on previous experience in a similar application, Pall promoted the use of Membralox® ceramic membranes (with 50 nm pore size) to filter the used caustic solution. This crossflow filter demonstrated efficient removal of suspended solids (including denatured proteins and fat) from the CIP solution, making it re-usable again, just by adjusting its caustic concentration.

The existing customer plant is designed with a central CIP tank to distribute CIP solutions to evaporators and pasteurizers throughout the facility. It also includes an old tank to receive dirty caustic solution to be further neutralized before disposal. For the installation of the Pall Membralox TFF Microfiltration unit, together Pall and the customer came up with the following design.

Figure 1: Conceptual process



*Filtration. Separation. Solution.*SM

Pall Membralox TFF Microfiltration Unit

The unit is able to deliver highly clean, very low turbidity reclaimed caustic solution, from several different and heavy-duty equipment cleanings (*e.g.* whole milk and cheese whey evaporators). In very rare cases, the customer detects some minor residual soap in the microfiltration permeate, which is shown to be beneficial for the CIP solution (acting like an additive).

The microfiltration system requires electrical energy consumption for pumps (0.8 to 1.2 kW per 1,000 liters of filtered solution), a low volume of water for membrane regeneration and also some nitric acid (20 kg of nitric acid and 5 m^3 of water for more than 80,000 liters of recovered solution). Advantageously, this residual nitric acid contributes to the neutralization of the discharged concentrate from the membrane system.

The recovered caustic solution achieves turbidity values (@ filtration temperature) below 10 NTU.

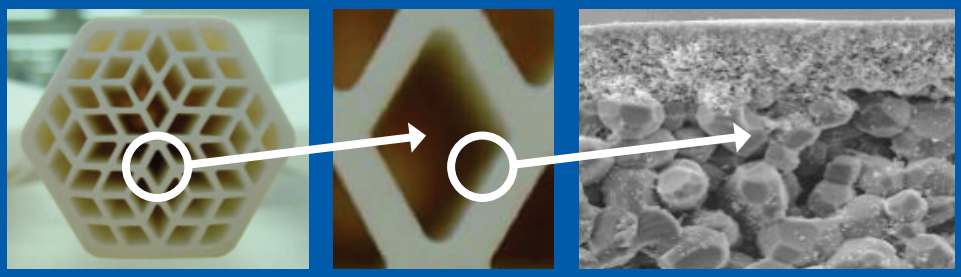
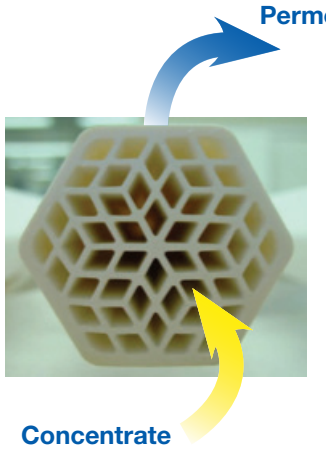
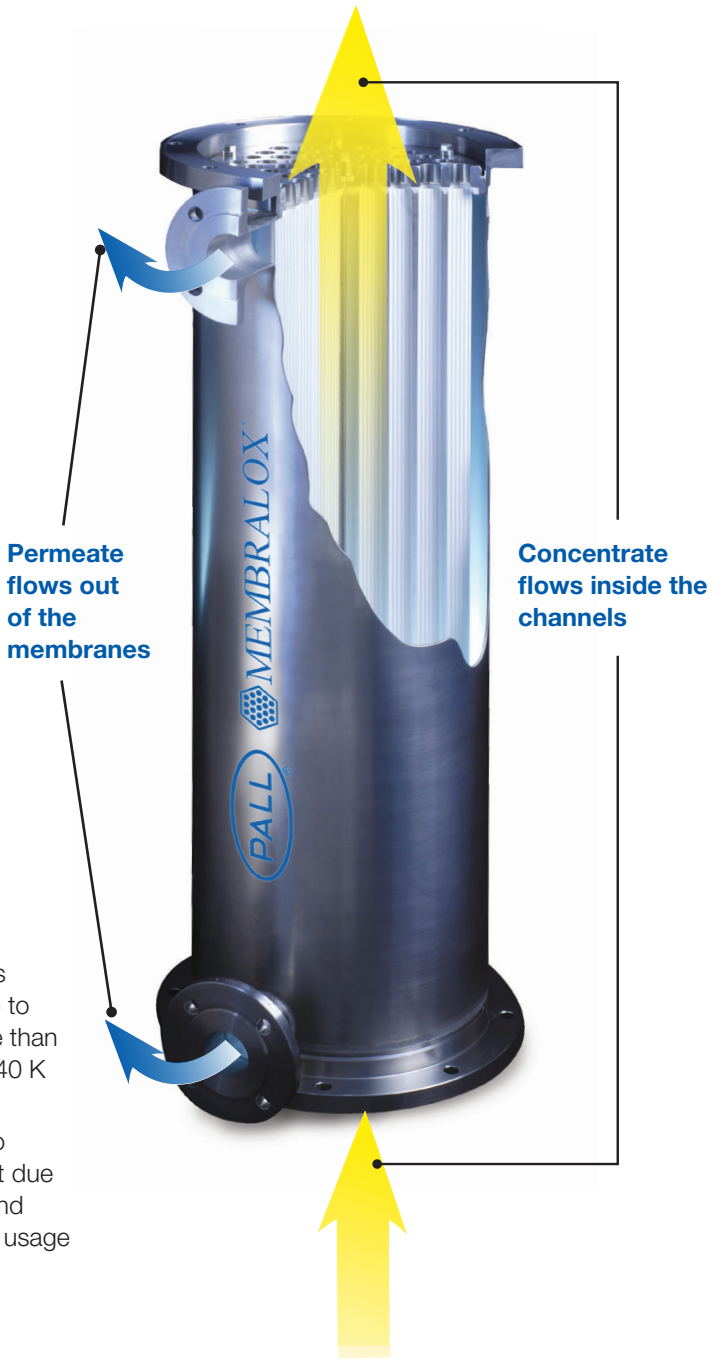


Figure 2: Membralox ceramic membranes type EP4840





Benefits

The Pall Membralox TFF Microfitration unit is able to reduce CIP solution discharge by up to 85% thus reducing operating costs by more than 40% (reducing from $420 K to less than $240 K per year).

Moreover, this solution greatly contributes to reducing the factory environmental foot print due to lower water consumption, waste water and greenhouse emission reduction (due to less usage of steam).

Pall Corporation

Better Lives. Better Planet.SM

Pall Food and Beverage

25 Harbor Park Drive
Port Washington NY 11050
+1 516 484 3600 telephone
+1 866 905 7255 toll free US

foodandbeverage@pall.com

Visit us on the Web at www.pall.com/foodandbev

Pall Corporation has offices and plants throughout the world. For Pall representatives in your area, please go to www.pall.com/contact

Please contact Pall Corporation to verify that the product conforms to your national legislation and/or regional regulatory requirements for water and food contact use.

Because of technological developments related to the products, systems, and/or services described herein, the data and procedures are subject to change without notice. Please consult your Pall representative or visit www.pall.com to verify that this information remains valid.

Filtration. Separation. Solution.SM

FBABCIPENEN June 2019