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Section: Food. Application: Heat exchangers no 2.

Report of experiments on the prevention and removal of scale by using "Scalewatcher™".

The Company

SweetRipe Drinks Ltd, a major Canadian juice manufacturer, produces 20 million cases of fruit beverages annually. They are distributed throughout Canada, the USA, Europe and the Middle East. (Picture 1)



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The Process

The heat exchanger is used on the glass bottle rinsers to heat up the circulating water which is sprayed on the outside of the bottles to prevent thermal shock when the bottles are filled with hot pasteurised juice which can reach temperatures of 203 °F (Picture 2). Failure to preheat the bottles could cause them to shatter when filled with the hot juice.

The table below shows information derived from a water analysis:

Water Analysis:

Alkalinity	92 - 95	PPM
pH	7.8 - 8.2 -	
Hardness	120 - 134	PPM
Iron Contents	3 - 14	PPM

Plate Heat Exchanger Specifications:

Heat Exchanger	Alfa Laval Type SWEPEG 50.46	Dimension
T upstream	126	°F
T downstream	180	°F
P upstream	1.4	bar
P downstream	2.1	bar
OM flow	35 - 40	gpm
D pipe	2	Inch

The problem

A build up of Calcium Carbonate (CaCO_3) on the plates of the heat exchanger resulted in the loss of heat transfer coefficient and necessitated the shutting down of the unit to clean the plates. Without cleaning, the standard temperature of the circulating water would not be achieved and increased the probability of thermal shock at the filler. The cleaning of the plate heat exchanger had required the use of two mechanics for up to three hours every two to three weeks. The plates had been difficult to separate and, once apart, the scale had to be chiselled off and the plates soaked in an acid bath. In addition, the scale was acting like abrasive sandpaper and causing wear and tear on the EMT wear strips on which the rubber bottle grip holders run. The acid also attacked the gaskets, which had to be regularly replaced. Finally, the sprinklers had to be cleaned every day as they were also choking up with CaCO_3 .

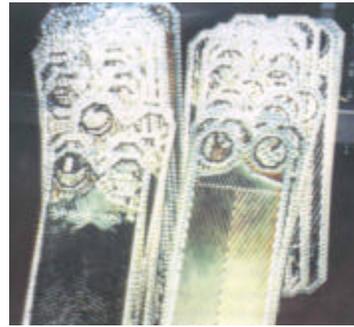
The solution

The company was looking for an environmentally friendly and cost-effective way of cleaning its plate heat exchanger. In August 1996, Sweet Ripe Drinks Ltd purchased a **Scalewatcher™** system to overcome its scale problem. A **Scalewatcher™** Electronic Hard Water Treatment System was installed on to a 45 foot, 2 inch brass water outlet pipe feeding the Alfa Laval plate heat exchanger. The **Scalewatcher™** treated a water flow rate of between 35 and 40 gpm with an upstream temperature of 180 °F and pressure of 20 psi and a downstream temperature of 126 °F and pressure of 30 psi.

In September, during a planned shutdown, and just 2 weeks after installation, the circulating pump was pulled out and the inside of the volute and impeller were examined for scale build up. Normally, excessive scale resulted in Sweet Ripe replacing the pump every 18 months. Much to their surprise, the inspection team found the pump to be relatively clean from scale, and the small amount of scale present was soft and easily removed with a brush. It was also found that the pump and the inlet pipe were totally free of any scale build-up. The plates of the heat exchanger were also checked and were found to be fairly clean. (Picture 3) Scale remaining was soft and could easily be removed by hand.



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On November 1st when the heat exchanger plates were pulled apart, so that the gasket could be replaced, it was noted that 100% more of the previous existing scale build-up had been dissolved (Picture 4) and passed through the system to drain. Further inspections on December 1st showed the plates to be completely scale free and were in fact cleaner than the steam side of the heat exchanger.

The efficiency of the heat exchanger was also radically increased, with the steam pressure being reduced from 120 psi to 12 psi.

5. Conclusion

Sweet Ripe Drinks Ltd calculated the savings over a five-year period being around \$100,000. The major benefits are:

- **Chemicals are no longer necessary**
- **The life cycle of the equipment increased**
- **Reduction in maintenance costs**
- ◆ **The equipment is working more efficiently**

6. Source

DSI Canada LTD.