Buckman

WATER TECHNOLOGIES

CASE HISTORY

Assisting an ice cream manufacturer in Canada to drastically reduce effluent and recycle water

Background

The customer needed to reduce their discharge of effluent to the town's treatment plant and at the same time generate suitable quality water to serve as make-up to their multiple refrigeration systems. Since this is a food processing plant, control of all systems (including utilities such as cooling towers, etc.) need to be extremely well maintained; consequently, water treatment needs to meet a higher standard than for an industrial plant.

Action

Buckman already supplied the coagulant and polymer to the customer's effluent treatment plant. This system is designed to reduce the BOD and FOG loading in the effluent sent to the town's treatment facility. Having prior involvement with this application provided Buckman with a good understanding of the effluent quality and the requirements for the various cooling systems located throughout the plant site.

In order to manage the risks of the project, the evaluation process involved three stages:

I. Sampling effluent from the plant's internal effluent treatment system (which Buckman treats) was conducted to determine the typical water quality with respect to organic loading (FOG, BOD, COD, TSS) as well as inorganic constituents (phosphate, chloride, sodium, hardness, etc.). One finding that was highlighted was the presence of significant amounts of orthophosphate (range 1–10 ppm that came from process cleaners) that could have a significant impact on membrane fouling. Also, the amount of chloride (from sanitation chemicals) varied but tended to be much higher than seen in potable water. These water analyses served as the basis for modeling, to look at what could be tolerated in the cooling system and what treatment program would provide acceptable results. This was presented to the plant management and served as a basis for our recommendations in terms of what mechanical and chemical treatment options could be considered.

II. Ultimately the decision was made to go with UF and RO to bring the water to the quality needed. Since the plant could not risk problems with their systems and did not want to invest the $300K for the treatment system without confirmation that it would produce the required water quality, a pilot system was obtained for trial purposes. During the trial period a number of parameters were evaluated, including permeate quality and the cleaning frequency of the membranes. Over the month long evaluation period it was found that the combination of UF/RO met all the requirements and that fouling of the UF was well within acceptable limits.

III. Once the pilot plant work was assessed, the decision was made by the plant to install a UF/RO to treat the effluent from their existing primary treatment system (DAF/SBR). The goal was to produce 245 M^3/day of permeate from each of the two RO trains with a target recovery rate of 70%. The recovery rate was set at this to minimize the potential for fouling by calcium phosphate.

Results

The UF/RO plant has been commissioned and the two trains (45 US gpm/train or 10.2 M^3/hr each) are now in operation. The trains are being treated with Bulab® 8818, a high performance anti-scalant for severe service conditions.

Operating at 70% recovery, the units are showing no signs of fouling in spite of modulating levels of phosphate in the feed water.

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Benefits

The plant is located in a town with a limited potable water supply, and also its effluent treatment plant is approaching its maximum capacity. By using plant effluent as make-up to the cooling systems, the load on the town systems will be reduced, allowing the plant to continue to expand and freeing up capacity in the town for further residential construction. This plant is a large ice cream manufacturer in Canada and is planning further expansions that will raise the load on their refrigeration systems and hence their water consumption.

Also, by allowing further residential construction, with no increase in the town's water treatment plant, the town will be able to increase its tax revenue and credit will go to the customer for being both environmentally sustainable and helping the community. The town had proposed to reduce the amount of effluent that could be discharged or that the discharge fees would increase by $400K/annum to offset the cost of upgrading their waste treatment plant. By reusing plant effluent, the discharge to the town was reduced by over 80% (eliminating any surcharges) and at the same time reduced the need for potable quality water from the town.

ROI:

With capital costs of $300K and the avoidance of discharge surcharges of $400K, the payback on the system was 9 months. In addition, this change will allow the plant to increase production without the need to take additional water from the municipal supply. In other words the plant can expand production while concurrently taking less water from the town supply.

ROE:

There are a number of gains that the plant will accrue due to this project:

I. In excess of 65% of the plant effluent is now diverted from discharge to the town and instead is used as make-up to the multiple cooling systems in the plant. This in turn lowered their water costs since this displaced an equivalent amount of water that was used for the cooling system.

II. By lowering the amount of water required for the plant and the discharge volume, it allowed the town to permit further residential expansion without the need to spend any capital to increase their water treatment plants. The reduction in water consumption/discharge equates to:
   - 324 residential units (family of 4) based on typical potable water demand.
   - 169 residential units (family of 4) based on typical sewage discharge flows.

III. This was promoted by the plant as evidence of their commitment to the community and the sustainable nature of their business model.