

Confidential Client, Eastern U.S.

Challenge

A beverage company implemented a corporate-wide program to capture at least 70 percent of its discharged biochemical oxygen demand (BOD) using waste stream segregation techniques, and to reduce the BOD of the captured wastewater by at least 90 percent. As part of this program, the company investigated several high-strength wastewater treatment options and chose to test an aerobic membrane biological reactor (MBR) process as one option.

The chemical oxygen demand (COD) of the segregated wastewater was anticipated to be between 40,000 and 60,000 milligrams per liter (mg/L); therefore, the MBR would need to be designed to operate at high temperatures due to the high levels of heat that would be generated through biological oxidation. A heat and mass balance around the MBR showed that the system could be designed to remove heat through evaporative cooling of the reactor water to maintain a reactor temperature between 50°C and 60°C, the thermophilic temperature range of microorganisms.

Solution

Envirogen Technologies, Inc. (Envirogen) conducted a laboratory pilot test to determine treatment effectiveness and process design parameters. Representative samples of wastewater produced from can-crushing operations were sent to the laboratory every week to obtain actual waste stream variability. Greater than 96 percent COD removal and 99 percent carbonaceous five-day BOD (CBOD₅) removal were observed based on measurements of feed and membrane permeate samples. The yield of biosolids was very low [0.040 mg total suspended solids (TSS) per mg COD removed; typical of thermophilic processes], and the average CBOD₅ to TSS ratio of the solids was determined to be 0.23 mg CBOD₅ per mg TSS.

Based on the laboratory test, it was concluded that the beverage manufacturer's high-strength segregated wastewater could be effectively treated by an MBR system operated within the thermophilic temperature range. Greater than 95 percent BOD reduction could be expected even with excess biological solids from the reactor routed directly to the effluent.

Installation of the full-scale system, including 20-ft. diameter bioreactor and external, tubular ultrafiltration membranes, was completed and is currently operating successfully at the client's site.

