

## Aerojet Fine Chemicals, Rancho Cordova, California

### Challenge

Aerojet Fine Chemicals (Aerojet) in Rancho Cordova, California, operates a batch pharmaceutical manufacturing plant with a variable wastewater effluent. Since new effluent limitation guidelines went into effect for the pharmaceutical industry (40 CFR 439), Aerojet investigated treatment methods.

### Solution

Envirogen Technologies, Inc. (Envirogen) installed a process wastewater treatment system with membrane biological reactor (MBR) treatment. A pilot MBR system was tested at the plant site from mid-October 2000 through January 2001 to obtain design parameters and performance data for the full-scale MBR system.

The pilot MBR system consisted of the following basic process components: (1) biological reactor; (2) internal membrane separation unit; (3) influent pump; (4) permeate pump; (5) air addition system with compressor; (6) nutrient supply system with pump; (7) hypochlorite supply system with pump; and (8) pH control system with acid/base supply pump. The influent pump delivered the feed to the biological reactor in a continuous mode. Effluent was withdrawn from the biological reactor by the permeate pump.

The pilot MBR program consisted of two phases:

- Phase 1: Startup and baseline operation of the pilot MBR system
- Phase 2: MBR operation to assess performance and develop design information
  - Phase 2a: Operation at a moderate TOC loading
  - Phase 2b: Operation at a high TOC loading

During Phase 1, the reactor was inoculated with biological solids from the local wastewater treatment plant and fed a continuous supply of dilute wastewater from sources containing low concentrations of total organic carbon (TOC) (i.e., less than 1,000 mg/l of TOC). The objectives of Phase 1 were to initiate pilot MBR operation and to increase the biosolids concentration within the reactor using a feed that was representative of “non-process” wastewater (i.e., washdown water and laboratory wastewater).



During Phase 2, the “baseline” wastewater in the feed equalization tank was supplemented with process wastewater containing a high level of TOC (i.e., greater than 10,000 mg/l) and salt (based on measurement of conductivity). The objectives of Phase 2 were to assess MBR performance in response to higher TOC and salt concentrations and to develop design and bioprocess control information.

During all phases of the project, the system performance and the influent feed characteristics were monitored. In addition, the “health” of the biological solids within the reactor was periodically monitored during Phase 2 (more frequently during Phase 2b) by measuring the rate of oxygen consumed by the biosolids in the presence and absence of the wastewater feed (i.e., by measuring the specific oxygen uptake rate (SOUR) of the biosolids). SOUR measurements were shown to be a valuable tool for treating variable wastewater sources, and can be used to regulate (i.e., temporarily slow down) flow rate until the microbial population in a biological system fully acclimates to its new food supply (i.e., new wastewater concentration and/or composition).

Based on the results of the pilot study, a full-scale MBR system was installed with dimensions of 28 feet in diameter with 31 feet of liquid height to treat a portion of the wastewater generated at the plant. The system was designed and started up by Envirogen and installed with Envirogen oversight. System start-up occurred in October 2001. Envirogen is contracted to provide operation support services, and the unit continues to operate well.