

Silver Eagle Refinery

STM-Aerotor™ Biological Nutrient Removal System



CASE STUDY

Location: Woods Cross, Utah
Owner: Silver Eagle Refinery

Background

Woods Cross and West Bountiful, Utah, are home to a handful large oil refineries. These large plants have several smoke stacks, open burning flares, and round storage tanks. Speeding by on the highway, drivers might imagine that these industrial companies are shamelessly polluting our environment. To the contrary, Silver Eagle Refinery proactively worked with the South Davis Sewer District and WesTech Engineering, to find a treatment solution for the environmental pollutants that are generated at their facility.

BTEX

During the production of gasoline products, oil refineries generate a waste stream that contains petroleum byproducts such as BTEX (Benzene, Toluene, Ethylbenzene, and Xylenes). These volatile, monoaromatic hydrocarbons can be toxic to receiving streams with different populations of organisms. Silver Eagle had discharged these harmful compounds to the South Davis Sewer District North Plant. At this wastewater plant, a trickling filter treatment process had been degrading these compounds biologically. But high levels of BTEX would upset the biological process

and cause problems for any wastewater treatment plant. Silver Eagle Refinery and the South Davis Sewer District wanted to explore different methods of treating the BTEX before the wastewater plant would receive it.

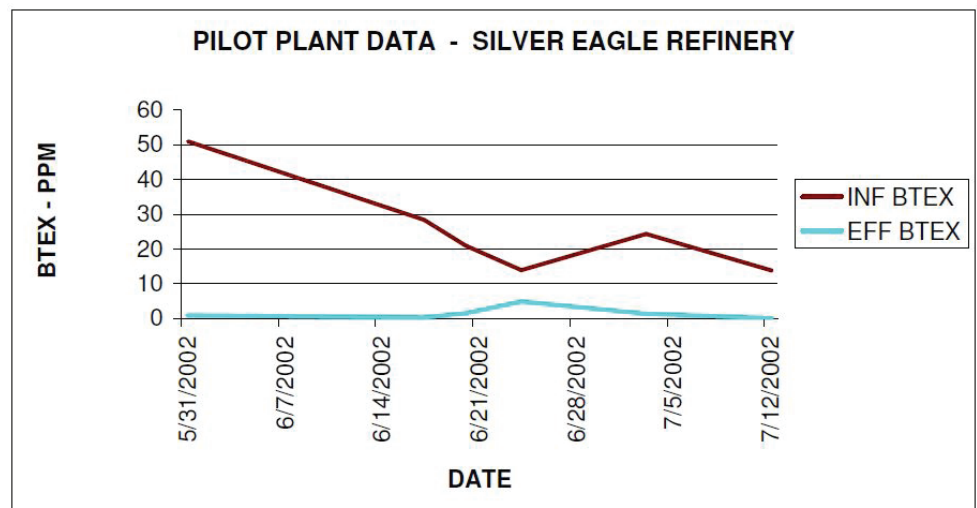
Pretreatment

To prevent any upsets at the wastewater plant, the South Davis Sewer District needed to limit the Silver Eagle Refinery discharge of BTEX to 5 ppm. As the treatment plant had proved, specific organisms could be employed to biologically remove BTEX. With these tighter restrictions, this refinery started to evaluate a pretreatment program for their

waste. Silver Eagle joined with WesTech Engineering to conduct a pilot study. The goal was to find an efficient biological system that would significantly reduce their BTEX discharge in order to meet the limits required by South Davis.

Pilot Plant Equipment

WesTech recommended their compact STM-Aerotor™ pilot unit. It consists of a 10-foot-long, 6-foot-wide, and 8-foot-tall container unit including a biological stage and an integral settling clarifier. The two-stage tank has an inlet feed into the biological stage, an effluent pipe in the clarification stage, and a drain used for wasting sludge.



The STM-Aerotor wheel contains several rows of unique plastic media, a strong structural cage, center shaft, roller chain, and a low HP drive unit.

The plastic media has two main functions. First, the plastic media has a hollow interior, which captures atmospheric air, draws it down into the mixed liquor, and releases it for aeration. Second, the media provides a large surface area for the growth of fixed-film organisms. The steel cage supports the rows of plastic media. Submerged up to 80%, the STM-Aerotor wheel relies on a buoyant force to support a portion of its weight. The drive rotates the wheel with a single 1 HP motor via a steel roller chain. These components make the STM-Aerotor a compact treatment unit.

Process Objective

The Silver Eagle Refinery needed to meet the 5 ppm BTEX limit on their discharge without building a large treatment facility that would require extensive operations and maintenance. Currently, the refinery has a holding tank that discharges a BTEX waste stream that varies from 60 to 15 ppm. WesTech provided the STM-Aerotor pilot plant to receive a small portion of this waste stream to determine if this technology would effectively treat the BTEX.

Results

The effluent data shows that the STM-Aerotor successfully met the 5 ppm limit. The organisms in the pilot plant tank successfully oxidized the influent BTEX. Throughout this study, the influent BTEX varied considerably, but the effluent BTEX remained around 1 ppm. During a stress test, the pilot unit received flow rates well above its design. Even during these high flows, the pilot plant removed the BTEX below the 5 ppm limit.



The STM-Aerotor® biological nutrient removal system uses integrated fixed film and activated sludge technology to provide biological nutrient removal for industrial wastewater treatment.

Current Status

After this pilot test, the Silver Eagle Refinery decided to install a full-scale STM-Aerotor system to treat their effluent. The full-scale plant has been operational since January 31, 2003. Currently, Silver Eagle has operated the STM-Aerotor plant without a secondary clarifier. Therefore, the treatment mainly comes from the fixed-film organisms instead of a suspended growth population of organisms. In the future, Silver Eagle plans to add a settling clarifier so that a portion of the suspended growth organisms can be recycled from the clarifier back to the STM-Aerotor basin.

The South Davis Sewer District has been sampling the effluent of the new pretreatment plant. So far, Lyndon Tan of South Davis reports that the Silver Eagle Refinery has met the 5 ppm limit during every test. The Silver Eagle Refinery Operations Manager, Gil Higham, enjoys the ease of operation and lack of extensive maintenance. When asked about the routine maintenance, Gil reported that they clean the dissolved oxygen probe once per week because of the biological growth in the basin.