

A black wellhead is positioned in a grassy field. It features a red-handled valve at the top and a corrugated hose extending from it. The wellhead has the handwritten text "Gw 3" on its side. The background shows a wide, open landscape with rolling hills under a blue sky with scattered clouds. A semi-transparent grey box is overlaid on the right side of the image, containing the title text.

Landfill Condensate Treatment Case Study

Using Anaerobic + OxyShark® High-Purity Oxygen, Fixed-Film Bioreactor

OxyShark® Water Reclamation Solutions was commissioned to accomplish two goals for a landfill gas production client:

- Treat the landfill condensate to <1,000 mg/l BOD₅ for discharge to the sanitary sewer system
- Explore the treatability of the wastewater to reach state regulation standards required to reclaim and reuse it onsite, possibly in the cooling tower system at the landfill.

Since landfill condensate water can vary in chemical characteristics, it was recommended to perform a series of lab tests and treatability studies to confirm the effectiveness of the biological process for achieving the goals enumerated above. Our team retained Andrew J. Englande, PhD., P.E., internationally acclaimed expert in industrial water quality and aerobic wastewater systems, as a consultant and resource for evaluating industrial wastewater and he was utilized in developing the scope of work for the studies and as an overall project consultant. Dr. Englande has been an ongoing advisor on the design of the OxyShark system since 2014.

The initial test performed was a respirometer test that is used to determine the biodegradability of the water. This test showed the landfill water was biodegradable where a biological treatment process should work to meet the first project goal of BOD₅ reduction. The next series of tests incorporated OxyShark's high-purity oxygen process to perform a treatability pilot study to further verify that biological treatment was appropriate. The result of the initial phase of the treatability study indicated a larger than expected hydraulic retention time would be necessary for an aerobic-only process to meet the project goals.

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As a result, the project team recommended a second phase treatability study to pre-treat the water before using the aerobic OxyShark process to reduce the operation and maintenance (O&M) costs and overall efficiency of the system. After three months of developing an anaerobic reactor for the treatability study, and using it as pre-treatment ahead of OxyShark, it was found to be very effective in both BOD₅ and COD reduction when used in conjunction with OxyShark (see Figure 1). Other potential pre-treatment processes that were evaluated (i.e., ozone and electrocoagulation) proved to be too expensive in capital and/or O&M costs or were not as effective in removing the organic contaminants as anaerobic plus OxyShark.

The results from the treatability study showed a reduction in BOD₅ from 18,000 to <100 mg/l and COD reduction from 26,000 to <1,000 mg/l. The last week or two of the study showed a stabilized effluent BOD₅ and COD with pH being maintained as well.

From the five months of testing and treatability studies, it was concluded the most reliable and economical method of treating the landfill water was anaerobic plus OxyShark high-purity oxygen process. This method would allow some or all the condensate water to be used for discharge to sewer and/or reuse for supply water to the cooling tower(s).

Figure 1 - OxyShark Effluent BOD and COD

