

Immobilized cell bioreactor technology aids in juice wastewater treatment

Problem: A beverage manufacturer sought an advanced treatment capable of handling swings in wastewater loads.

Solution: The company found a solution by installing an aerobic-polishing bioreactor technology that offers low-energy operation and low-solids production.

A juice manufacturer faced stricter government regulations and corporate sustainability and environmental stewardship standards at three different juice production facilities. The facilities' wastewater had to be processed through a central wastewater treatment system and had to meet discharge standards set by the local water resource recovery facility. The manufacturer also had to ensure that no solid wastes passed through the system to enter landfills. The process to accomplish these outcomes also had to consume minimal energy.

Because of large fluctuations among the three production facilities, wastewater loading varied greatly. When looking to upgrade its wastewater treatment technology, the manufacturer had to find a robust and flexible process capable of handling load swings and to meet discharge standards consistently.

Bioreactor technology lowers energy use

The manufacturer decided to install a multistage wastewater treatment system consisting of

- 1136-m³ (300,000-gal) equalization tank,
- 568-m³ (150,000-gal) upflow anaerobic sludge blanket reactor (UASB) for bulk processing of biochemical oxygen demand (BOD)



As the beverage manufacturer's wastewater flows through the treatment system, it goes through (from left) the equalization tank, upflow anaerobic sludge blanket reactor (UASB), and immobilized cell bioreactor. Honeywell UOP

- aerobic polishing to remove BOD to discharge standards, and
- a multi-float dissolved air floatation (DAF) clarifier.

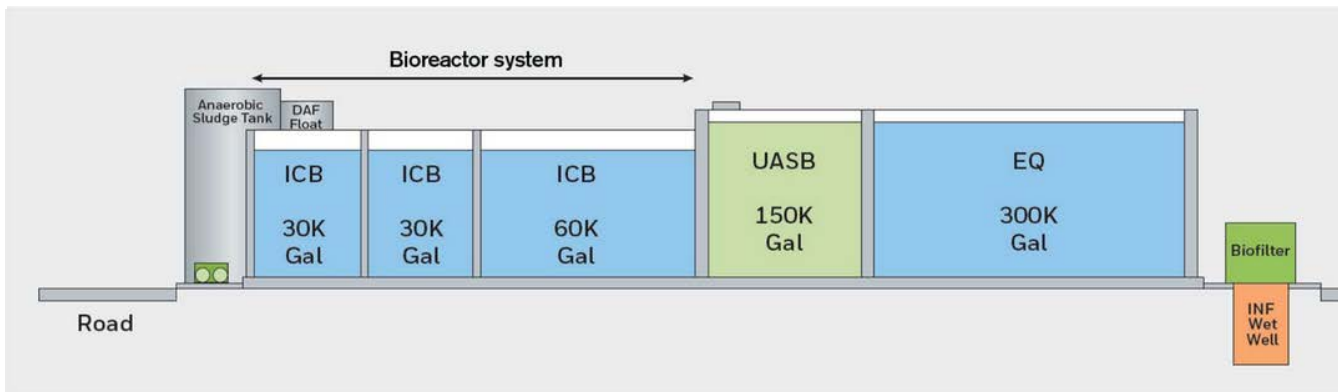
As part of the aerobic polishing stage, the manufacturer installed the Honeywell UOP (Des Plaines, Ill.) Xceed™ immobilized cell bioreactor (ICB). The Xceed system contains a 230-m³ (60,000-gal) ICB, followed by two 115-m³ (30,000-gal) ICBs.

The bioreactor technology uses a fixed multimedia packed bed that provides a high surface area for biofilm colonization and promotes flow. The system's compartmentalized, quasi-plug-flow design provides an effective aerobic process that requires up to 80% less energy than other comparable technologies.

The entire system requires minimal operator oversight and adjustments, even while handling robust swings in loading. This flexibility lowers operational, maintenance, and component replacement costs. The system also has a compact design. After installation, the facilities still had room left to expand juice production.

The treatment system's fixed media provides a stable environment for a sophisticated biological population and leads to efficient wastewater treatment with low solids generation. It is designed to produce 70% to 80% fewer solids for disposal than alternative systems.

The modular technology removes organic and inorganic contaminants to help the facility meet all its regulatory and customer requirements.



Honeywell UOP is providing an XCEED™ bioreactor system to a wastewater treatment facility at a beverage company in Florida. Honeywell UOP

“Honeywell UOP is delivering this project as a modular turnkey solution, which is delivered quickly and is less expensive and more reliable than field-constructed units,” said Ken Stacherski, vice president and general manager of Honeywell UOP’s Catalysts, Adsorbents, and Specialties business.

Years of operation confirms performance

The wastewater treatment system began operating in the summer of 2007.

During its 9-years of service, the system has handled a typical flow of 114 to 151 m³/d (30,000 to 40,000 gal/d) with typical BOD loads of 15,000 to 30,000 mg/L. The facilities face target discharge limits of less than 5300 mg/L BOD and less than 5275 mg/L total suspended solids.

The typical discharge results have been about 800 to 1100 mg/L BOD – that’s a reduction of 93% to 96% and 100% permit compliance.

The system produces only minimal solid wastes, which are managed and sent to

a nearby incinerator. This led to zero solid waste sent to the landfill, meeting the corporation’s goal. In addition, methane gas generated by the anaerobic process is recovered and converted into energy in process boilers.

During a facility upgrade in early 2017, the beverage manufacturer had Honeywell UOP revamp the XCEED ICB system. This is projected to provide an additional 10 to 15 years of service for the technology. ■