Case Study - CMSA

Location: San Rafael, California

Client: Central Marin Sanitation Agency (CMSA), Partner: Black and Veatch

Type of Plant: Anaerobic Co-Digestion Facility

Location of Sensors: Feed line and recirculation.

Problem Statement: Identify loading that can cause digester failure earlier than VFA analysis. Utilize SENTRY™ data to optimize loading for increased biogas production.

Outcome: During a pilot study, SENTRY™ initially flagged overloading events 3 days before traditional metrics in pilot digesters and provided detailed insight into digester health throughout several feedstock changes. With the pilot study findings, installing SENTRY™ in the full-scale digesters can help protect CMSA $45,000 - $90,000 in daily costs of digester downtime due to imbalance. The potential to generate revenue for CMSA through increased biogas production is the next step.

Problem Statement and Facility Overview:

Central Marin Sanitation Agency (CMSA) operates two parallel mesophilic co-digestion anaerobic digesters. In addition to wastewater biosolids, CMSA is adding 20-30% additional FOG and food waste (solids food waste and engineered slurry) to reduce the amount of food waste sent to landfills and produce electrical power. The biogas from their two digesters typically produces more than 100% of the facility's electrical needs, allowing them to sell the excess for additional revenue (this is even more important with the price of natural gas doubling in the past 3 years).

Initial Findings and Deployment:

- The facility deployed SENTRY™ sensors into the recirculation lines of two pilot-scale reactors (580 Gallons each). This was part of their initial trial of bringing in variable feedstock from municipal sludge, municipal compost collection, as well as commercial F.O.G. from restaurants in the area and running the digester to failure (souring due to organic overload).
- The SENTRY™ sensors were able to flag problematic digester conditions over TWO DAYS before the VFA concentrations in manual samples indicated that there was a souring event beginning.

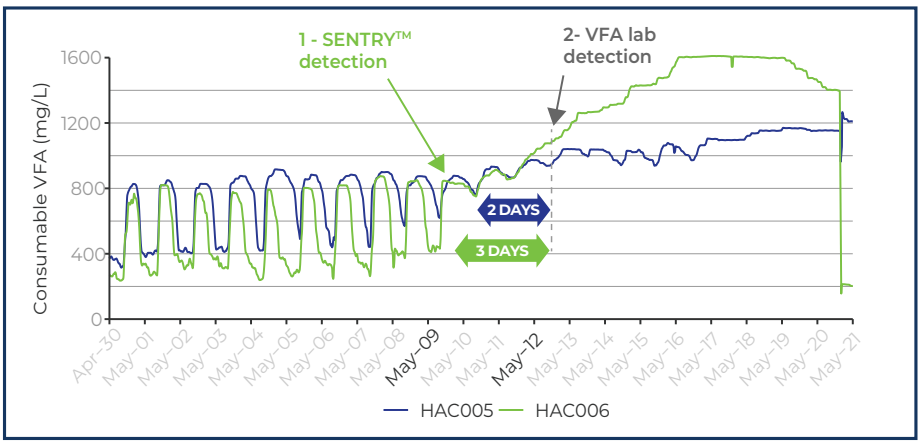

Figure 1: SENTRY™ detacted problems over two days sooner than VFA manual samples.

• Due to this success, the sensors were installed in the full-scale reactors – once again on the feed line and the recirculation lines. The sensors were able to monitor the digester health with very little maintenance. They even provided detailed, real-time insight into the different conditions inside the reactors when both food waste and F.O.G. food sources were stopped, and then re-introduced gradually after an equipment malfunction in one of the digesters.

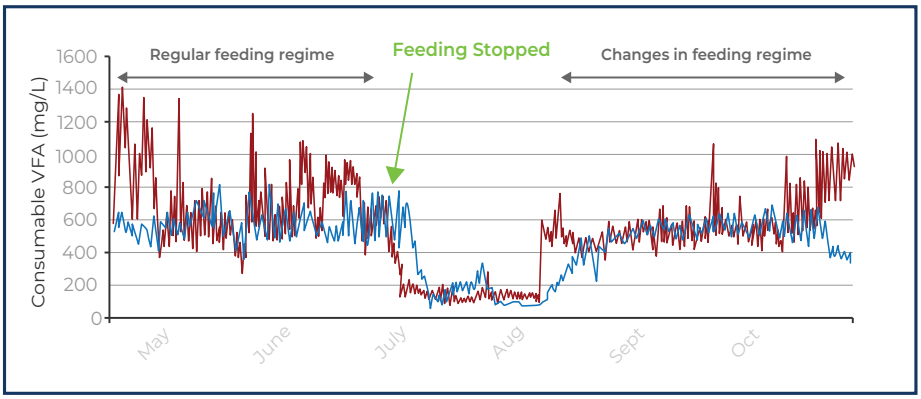

Figure 2: SENTRY™ measured biological activity events in the reactors.

Results and Values:

• Cost of downtime / imbalance = $45,000 – $90,000 per event.

• With the SENTRY™ sensors installed, the operators can reduce risk by closely monitoring the digester health and performance when feed stock changes. This allows them to reduce F.O.G. loading or change the feed blend when the SENTRY™ is indicating that VFA concentrations have started to rise – taking action even before a manual VFA test result comes back from the lab.

• With the minute-by-minute data the SENTRY™ provides, long-term analysis of feed blends, reactor controls, biomass behaviour (from the SENTRY™ data), biogas volume, and biogas quality assessments can help optimize blend concentrations and feed rates for optimal biogas production.

• Real-time, feed-forward data on reactor health can lay the foundation for automated control of the feed blends and digester controls with less risk of an upset.