Water Technologies & Solutions
case study

food manufacturer uses Total Organic Carbon (TOC) to understand and control wastewater strength

challenge

A food manufacturing facility utilizes a publicly owned wastewater treatment facility to process their wastewater after pretreatment. Facility wastewater discharges are combined from production units into three different equalization tanks (East EQ, West EQ and Monitoring Tank). Two of the tanks are adjusted for pH and the third is untreated. Effluent from all tanks then enter aeration and biological treatment before being discharged.

24-hour composite samples from each outfall are collected daily to determine the wastewater strength. The samples are then analyzed with Biochemical Oxygen Demand (BOD). The BOD and flow data are used to calculate the total organic load discharged from the plant. In the event the permitted daily organics load is exceeded, the plant pays a surcharge.

The five-day wait time for BOD analysis was impractical for process optimization. The facility sought a solution that would provide information faster to ensure they were meeting quality standards and avoiding costly fines.

solution

As an alternative, two Sievers* InnovOx Laboratory TOC Analyzers were selected, providing data in seven minutes. This short analysis time allows for near real-time data-driven decisions. The plant implemented sampling at key points (**Table 1**) to identify upsets and make required process changes to ensure discharge limits were met.

This approach can be applied to process water streams where product loss from mechanical failure of process equipment such as valves, improper cleaning, maintenance activities or human error contaminates water and adds to the wastewater load.

Table 1: Monitoring Points

Sample Point	Process Actions
Wastewater sample points	
East EQ	pH set point = 4.2 if below automatic adjustment with soda ash
West EQ	Process waste from starch; no pH control
Monitoring Tank	Manual pH control with soda ash; if pH < 6 valve shuts
Co-Gen Effluent	Sewer monitoring
A Basin (Biological)	Biological treatment, Floc Analysis is completed on the sampling schedule for TOC
B Basin (Biological)	Biological treatment, Floc Analysis is completed on the sampling schedule for TOC
C Basin (Biological)	Biological treatment, Floc Analysis is completed on the sampling schedule for TOC
West Main Outfall	If pH drops < 6 discharge to city shuts off. If pH >10 shuts off discharge.
East Outfall	If pH drops < 6 discharge to city shuts off. If pH >10 shuts off discharge.
South Outfall	No pH control
Leak detection sample points	
Feed house	Monitor condensate hot well – condensate from feed house & starch; no control
68 Cooling Towers	Cooling water
69 Cooling Towers	Cooling water

A complete sampling plan, including a mitigation strategy, was created for each point (**Table 2**). This allowed for monitoring of key process points as far up stream as possible, thus ensuring the most effective decisions and actions for the operator to take. Sampling of the equalization tanks (East and West Monitoring) three times per shift emphasizes the importance of effluent monitoring.

This sampling approach recognizes the value of early identification and resolution of an upset in the process. Extending the sampling plan for leak detection in condensate or cooling water allows other opportunities to identify events in the processes that may require discharging cooling water and condensate. These additional sample points add protection from errant discharge issues.

Any time the concentrations are below established limits, the operator has no additional requirements. However, when concentrations exceed the control points, follow up actions are required to identify the source of the excess and mitigate the issue.

Table 2: TOC Test Plan

Sample Point	Normal Range	Corrective Action
Wastewater sample points		
East EQ*	<2300	If over range Audit process "A" determine source of excess
West EQ*	<2900	If over range Audit process "B" determine source of excess
Monitoring Tank	<900	Run again; start troubleshooting
Co-Gen Effluent	<150	Run again; start troubleshooting
A Basin (Biological)	<150	Run again; start troubleshooting
B Basin (Biological)	<150	Run again; start troubleshooting
C Basin (Biological)	<150	Run again; start troubleshooting
West Main Outfall	<400	Limit to city is 48000 #/day; if it gets high contact city
East Outfall	<300	Limit to city is 48000 #/day; if it gets high contact city
West2 Outfall	<100	Limit to city is 48000 #/day; if it gets high contact city
Leak detection sample points		
Feed house Hot Well	<1700	Run again; start troubleshooting
68 Cooling Tower	<150	Run again; start troubleshooting
69 Cooling Tower	<150	Run again; start troubleshooting

*3/shift for these points, 1/shift for remaining points

conclusion

When issues arise, data obtained with the Sievers InnovOx Lab empower operators to help determine root cause, minimize unintended product loss to the waste stream, and minimize the organic load of the wastewater. The ability to quickly identify a change in the expected process parameters triggers predefined troubleshooting and mitigation efforts. By adding TOC analysis to its wastewater treatment process, the food manufacturer is now more prepared to meet effluent quality standards and avoid regulatory fines.