

# Texas refinery identifies the source of contamination and restores production using Sievers\* InnovOx On-Line TOC Analyzer

CASE STUDY | Oil & Gas

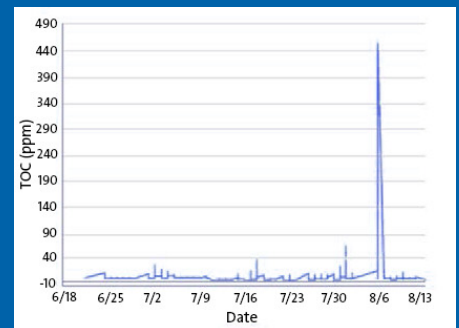
## | Challenge

A major refinery in Texas, USA, recently experienced steam condensate contamination and major fouling of a boiler, resulting in an unplanned shutdown. The financial impact of the damaged boiler, unscheduled maintenance, and loss of production led the refinery to review its condensate monitoring program and techniques. The review panel concluded that current methods of measuring organic contamination resulted in under-reported values and were inadequate for detection of contamination events.

The panel identified two aspects of the hot condensate monitoring program that could be improved to better protect capital assets and increase production up time:

- Frequent and/or continuous, real-time organics monitoring to immediately alert operators of a condensate contamination event
- Improved sample collection and handling methods to deliver representative samples of oil contaminated condensate

Historically, steam condensate in the facility was monitored by collecting grab samples and transporting them to the onsite laboratory for organic carbon analysis. Laboratory measurements typically reported carbon levels of less than 1 ppm. However, the investigation revealed that the grab sample process was not providing representative samples for analysis. While being transported to the lab and waiting for analysis, samples would cool, allowing the major constituent of the fouling—hydrocarbons—to be lost through volatilization and phase separation.



**Figure 1. Organics data collected over a two-month period using the Sievers InnovOx On-Line**

## | Solution

The refinery team investigated ways to capture and analyze samples at elevated temperatures to ensure hydrocarbon contamination was adequately represented in the carbon analysis. They also investigated the use of an online analyzer to provide continuous process monitoring. While it is common practice for manufacturers of online instruments to cool incoming samples to protect analyzer components, Sievers InnovOx Total Organic Carbon (TOC) Analyzers feature a high-temperature sampler, capable of handling condensate samples up to 85 °C (185 °F), and used for multiple industries, including refineries.

The refinery team implemented a Sievers InnovOx On-Line TOC Analyzer for continuous, online analysis of organics. Data collected on site (**Figure 1**) indicate typical organic carbon levels around 2 ppm, with periodic contamination events reaching 20–40 ppm. Continuous monitoring alerts operators to major organic contamination events, which results when carbon levels spike above 400 ppm. It is unlikely these contamination events would have been detected with laboratory analysis, due to the intermittent occurrence of the events in combination with the sample matrix changes that take place as grab samples cool.

The refinery's maintenance crew used the data to locate the source of major leaks. They also relied on TOC measurements to confirm successful repairs and restoration of low levels of organics (<2 ppm TOC).

Ongoing monitoring identified occasional organic excursions from unknown sources. The refinery team decided to eliminate these smaller excursions by passing the condensate over granular active carbon (GAC) beds. Utilizing the dual stream feature of the Sievers InnovOx On-Line, the refinery team analyzed both the condensate entering and exiting the GAC beds. The team evaluated continuous data and monitored the effectiveness of the GAC via TOC percent removal calculation.

## | Conclusion

Reusing condensate from industrial processes has an associated risk of organics contamination. This risk and the financial implications of boiler system fouling can be mitigated with the addition of online organics monitoring to measure the quality of returned condensate. Accurate assessment of condensate quality not only provides users with the opportunity to detect leaks and prevent fouling, but the information also impacts operational decisions—enabling maximum reuse and reducing costs associated with the production of additional make-up water and wastewater treatment.

The Sievers InnovOx On-Line enabled the refinery to obtain reliable, continuous measurements of a challenging, two-phase sample containing a wide range of hydrocarbon contamination. The improved steam condensate monitoring program provides real-time notification of contamination events, thus protecting capital equipment and enhancing uptime of production processes.