

A Practical Solution

for Real Time Organic Monitoring

***M**onitoring organics continuously provides instantaneous water quality data that is vital for several of the most common water and wastewater treatment applications.*

By Jodi Glover

Online organic water quality testing ensures that immediate action can be taken to establish proper treatment. Real-time organic monitoring is invaluable for optimizing and controlling coagulant dosing; monitoring performance and condition of activated carbon filters; determining UV dose; indicating potential formation of disinfection byproducts (DBPs) for chlorination applications; indicating biofilm formation potential in distribution systems; determining plant efficiency and effectiveness; monitoring pollution; and more.

Common parameters

Several water quality parameters are used to measure organics, including: total organic carbon (TOC), dissolved organic carbon (DOC), biological oxygen demand (BOD), chemical oxygen demand (COD) and UV 254 nm.

Each of these organic test parameters provides slightly different characterization of the organic content of a water sample. For instance, UV 254 nm is more indicative of the aromatic organic content, which combines more readily with chlorine to form DBPs.

***New technology offers
real solutions for online
organic monitoring***

Despite the slight biases that the different organic test parameters have, site-specific correlations can generally be formed between two organic test parameters. For example, excellent correlations can be easily produced between DOC tests and UV 254 nm tests for most sites, as indicated in Figure 1.

Because testing TOC, DOC, BOD and COD is complicated, time-consuming and expensive, real-time monitoring of these organic parameters is often not feasible. This has resulted in the increasing use of the UV 254 nm test as the most practical organic water quality parameter.

The UV 254 nm parameter

The UV 254 nm water quality parameter is measured in units of UV transmittance (UVT) or UV absorbance (UVA). UVT is a measure of how much UV light at the 254 nm wavelength is able to transmit through a water sample. UVA is a measure of how much UV light can be absorbed by a water sample.

Both units of measure for the UV 254 nm test require that the test water sample be compared to a reference water sample, which is preferably 100% deionized (DI) water. Without using a reference sample of DI water for comparison, the UV 254 nm test would not be meaningful.

Conventional monitoring problems

In a perfect world, calibrating or zeroing to the reference sample could be performed once at the factory. In the real world, however, several factors interfere with this process.

The two main interferences are UV lamp fluctuations over time and fouling of the quartz flow cell. If the UV lamp changes its output or the flow cell becomes fouled between the time that the system is calibrated and the time that the UV 254 nm test is performed, then the test will be incorrect. This is a common occurrence for conventional UV 254 nm online monitors.

To reduce these interferences, the monitors try to employ three methods: calibrate to DI water inside the sample chamber as frequently as possible; clean the flow cell as frequently as possible; and use an expensive UV light source in an attempt to minimize output fluctuations.

The awkwardness of conventional online UV 254 nm instrumentation calibration methods puts practical limits on the frequency of calibration, which leaves these monitors open to errors due to lamp drift/fluctuations and quartz fouling. Calibration also makes them susceptible to errors due to calibration water contamination.

Some conventional online monitors try to improve the situation by using expensive cleaning systems such as wipers or ultrasonics to clean the quartz as well as expensive light sources to improve output stability. But these methods are far from perfect solutions, and they drive up the cost of online UV 254 nm instrumentation.

Due to the inherent problems with conventional online UV 254 nm instrumentation—which cause not only inaccurate test results but also increased maintenance and expense—there is a clear need for a real online organic monitoring solution.

FIGURE 1: Correlations Between DOC and UV 254 nm Tests

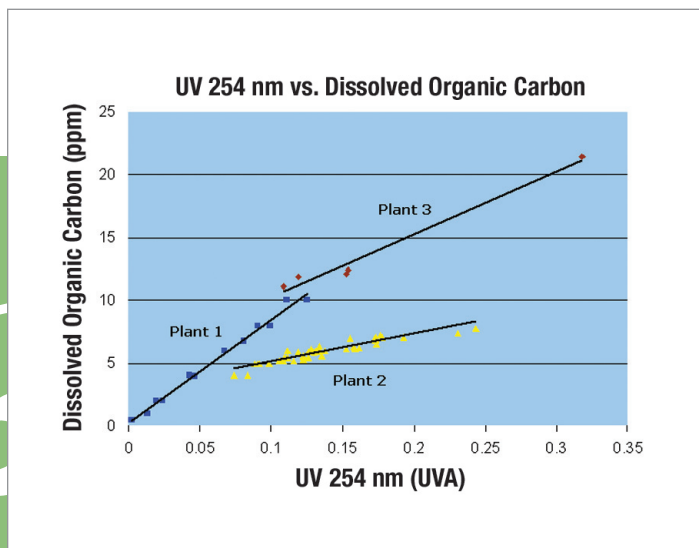


FIGURE 2: UVT of Two Technologies

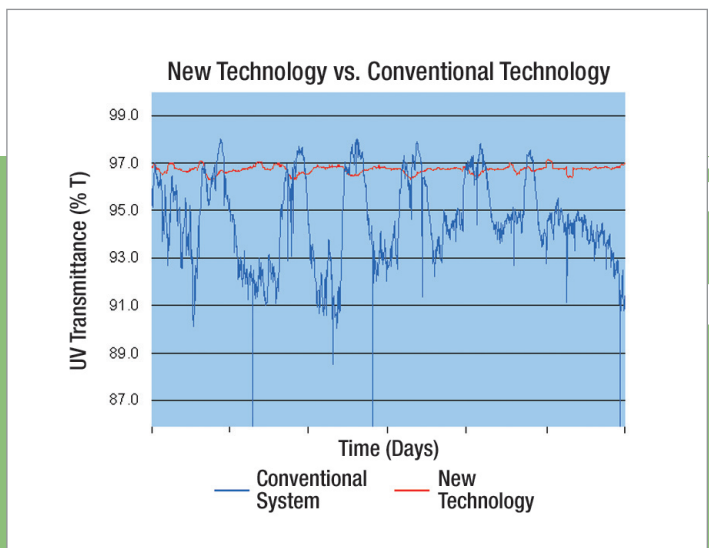
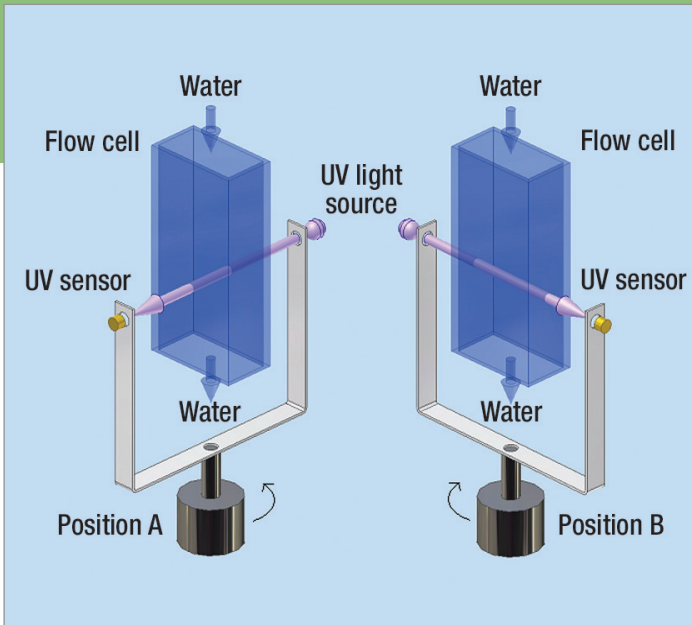


FIGURE 3: Ortho-Beam Technology Process



A new solution

Real Tech's new Ortho-Beam technology allows for the design of an online UV 254 nm monitor that can overcome the problems associated with conventional online UV 254 nm instrumentation.

This new technology is designed to take two UV 254 nm measurements at 90-degree angles to each other through a rectangular quartz flow cell. The technology uses only one UV light source and UV sensor which are fixed relative to each other. The two measurements are taken by rotating the lamp/sensor fixture back and forth between the two measurement positions. An illustration of this new technology can be seen in Figure 3.

The two UV 254 nm readings give the amount of light able to transmit/absorb through two different path lengths

of the test water. From these two measurements alone, the water quality parameter is calculated without the need for calibration with DI water.

Because the effects of quartz fouling and lamp fluctuations are the same in each direction through the flow cell, these error-causing components are cancelled during the calculation. Therefore, quartz fouling and lamp fluctuations are intrinsically compensated for by the measurement process. By alternately taking readings in each direction through the flow cell every few seconds, calibration is effectively performed automatically every time a UV 254 nm measurement is made.

The true benefit of this new technology is illustrated in Figure 2, which compares the accuracy provided by the new technology with that of conventional online UV 254 nm monitors.

Not only does the Ortho-Beam technology greatly improve the accuracy of online UV 254 nm monitoring instrumentation, it also reduces maintenance and increases affordability. This new technology finally provides a practical solution for real-time organic monitoring. **WWD**

Jodi Glover is business development manager for Real Tech, Inc. She can be reached at 905/579-2888, x112 or by e-mail at jodi@realtech.ca.