

New Integrated Panel Features Multiple Instrument Probes For Proactive Source Water Monitoring

by **Mike Feldman, Hach Company**

Replacing a cluttered wall of stand-alone instruments and associated piping and wiring with a compact panel outfitted with multiparameter, digitally-integrated probes finally brings confidence in continuous source water monitoring.

When source water travels over a long distance before reaching a treatment plant, having the right instrumentation in the right place can provide plant operators with a head start on the treatment process. Monitoring source water not only gives an early indication of potential problems, but also provides information to optimize treatment plant performance.

At the 6.0 MGD Clapper Road Water Treatment Plant in Bethlehem, New York, source water is delivered from 11 wells located about two miles from the facility. A new, integrated panel of monitoring instruments installed in a pump station midway between the wells and the plant allows operators plenty of reaction time.

The new monitoring panel is fitted with a suite of probes to monitor turbidity, dissolved oxygen (DO), conductivity, UV-Organics and pH.

From these continuous measurements operators know what constituent levels to expect hours before the water arrives, allowing them to modify the treatment process as needed to meet changes in source water conditions. This is especially important due to the water's high iron and manganese concentrations.



System Overview

The rapid growth of industry in the Bethlehem area put excessive pressure on the town's original water treatment plant. The Clapper Road Water Treatment Plant was built to handle the process water needs of Bethlehem's industrial customers, so that the town's original water treatment plant can be dedicated solely to public supply.

The Clapper Road facility, which went online in 1996, currently treats an average of 2.5 MGD. Because the wells take in water from the Hudson River through an infiltration gallery, the plant is classified as a "groundwater under direct influence" (GWUDI) facility, thereby requiring added treatment. The plant uses a four-filter Trident Modular Adsorption Clarifier Filtration System for water purification with chlorine as the primary disinfection agent and

ozone on standby, if needed. Chemical use includes coagulation with polyaluminum chloride (PACL) and a non-ionic polymer, potassium permanganate for taste and odor control and a corrosion inhibitor.

At the time the treatment plant was built, several independent monitoring instruments—including a UV organics sensor, pH and conductivity probes, and a turbidimeter—were installed at a raw water pumping station located approximately one mile from the plant, to monitor the source water prior to it entering the plant. Each probe and analyzer required its own plumbing and wiring. According to Paul Van Wely, deputy chief operator, all of these instruments and their associated plumbing and wiring encompassed nearly an entire 12-ft-wide by six-ft-tall wall inside the pumping station.

A "Rat's Nest" Of Instrumentation

"The equipment had been provided and installed by three different vendors," Van Wely says. "The idea was to have all the analyzers in one place at the pump station. It was a great idea, in theory, but in reality it turned out to be a maintenance nightmare. It was essentially a rat's nest of pipe, wires and instruments."

Van Wely says that nearly half an hour was required daily to clean and maintain each of the individual units. Plus, the complicated plumbing configurations made it difficult for operators to isolate and shut off sample flows to a single instrument.

"Our source water has very high iron and manganese, and the lines and probes would quickly become coated with iron. We had

widespread rust and severe fouling issues with the instruments. The readings were not reliable, and our operators had problems determining if abrupt changes in measurements were due to an excursion in our well water or contamination caused by the build-up of corrosion and scum in the instrument piping."

"We had a fair amount of equipment failure there," concurs Chief Operator Rich Sayward. "And instrument calibration was a story in itself. Some equipment could not even be calibrated by our staff and we had to contract with the vendor for that service. Also there was a lot of hands-on reagent making, which was time-consuming and just added to the operations and maintenance complications there."

Continued on next page.

Call 800-227-4224 or visit: www.hach.com



Be Right™

Integrated Multi-Probe Monitoring Panel

In 2007, the entire clutter of instruments, piping and wiring in the pump house was permanently removed and replaced with a Hach Source Water Monitoring Panel sc, a single panel of five instruments integrated by a single controller. The individual instrument probes are suspended in a single sampling trough, and the design of the panel and trough contribute to the functionality of the new monitoring system.

The sampling trough has one inlet and one outlet, and all the probes continuously sample a homogenous water stream. In addition, all sensors are easily accessed -- the entire bank of probes can be pulled out from the panel as needed for maintenance, whereas with the old system each probe had to be individually unscrewed from its mounting hardware.

"The monitoring panel's setup is very efficient," Van Wely says. "What used to take up a 12 foot by six foot space is now done in one spot about four feet square. Plus, with the sample trough, we're getting a homogenous point of reference."

The new smaller panel on the pump house wall provides continuous monitoring of pH, conductivity, DO, UV-Organics and turbidity in the source water heading to the treatment plant. The

individual probes are plugged into the panel's Hach sc1000 controller, which relays the data to the treatment plant's SCADA system. Because all data feeds into the single controller, one menu covers basically all the panel's monitoring parameters.



The self-contained panel features field-proven instruments. In addition to Hach's highly regarded pH and conductivity probes, these include: Hach LDO[®] Dissolved Oxygen Probe, which uses breakthrough luminescent technology that requires no membrane and no anode or cathode to clean or replace; a Hach UVAS sc Sensor, providing continuous UV 254 Absorbance/Transmittance measurements is used to measure organics and protect plant treatment processes from high organic loads; and a Hach SOLITAX sc, to provide accurate, color-independent measurement of turbidity and suspended solids.

Flexibility, Forecasting, Trending

"The feedback from our people in the field regarding the monitoring panel has been very positive," said Sayward. "It requires very little maintenance. Operators just flush out the sampling trough occasionally to clean up anything that might have built up on the bottom."

One of the biggest advantages gained has been the accuracy of the readings. Before the new panel was installed, it was often unclear whether questionable readings reflected an analyzer issue or a water quality issue.

"Now, if we see a real low turbidity reading, for example, it indicates a prechlorination failure, because the chlorine is supposed to oxidize the iron out of solution and create turbidity," says Van Wely. "The LDO monitor tells us when iron is on the high side because the DO reading drops off as the iron sucks oxygen out. Manganese will do the same thing." The DO unit also helps in determining the oxidation state of the metal constituents so that they can be adequately chlorinated for removal through

precipitation and flocculation.

Real-time monitoring of organic loading can also help prevent disinfection byproduct issues. "Plus, the panel's UVAS probe can warn us if one of the industrial sites along the river has a spill," says Van Wely, "because



our concentrations are typically very low. The advance warning of a spill in the river would allow our operators time and notification to handle it." With the monitoring panel providing continuous information on current conditions of the water entering the system, operators can easily establish accurate source water quality baselines for trending as well as for determining appropriate alarm set points that can alert operators to transient conditions.

Multi-Parameter/Multi-Benefits

The ability to standardize the sensors and controller by using a single manufacturer has proven cost-effective in the long run. Years ago, when the Clapper Road plant was in its design stage, bids were taken for the original pump station source water monitoring instruments and analyzers on an individual basis and the low-cost bidders were awarded the jobs. But the ensuing complications arising from differing plumbing and wiring requirements, large space consumption, and the likelihood of fouling and other accuracy-damaging influences soon eroded the initial cost savings.

The cost of an integrated monitoring panel is also offset quickly by the staff's increased ability to adapt treatment processes to incoming water conditions. Having several hours' notice of the changes in the source water builds efficiency. The proactive response based on accurate readings helps prevent the consequences and costs of under- and overtreatment.

The source water monitoring panel offers flexibility in parameters. It can be expanded with additional slots for a wider array of probes, as dictated by the need, such as for monitoring ORP for example, or for metering flow.

Direct and instantaneous communication between the source water monitoring panel and the Bethlehem plant's SCADA unit ensures that there are no surprises when the source water arrives at the plant after its two-mile journey. The new panel has brought no complicated maintenance and calibration procedures, and no system-induced errors in the water analysis.

"It feels like we've gone from a manual typewriter to a nice computer," says Van Wely. "Our old set-up just created problems, after problems, after problems. The new panel serves us very well. Maintenance is really low. The information is always accurate, which makes it always valuable."

Call 800-227-4224 or visit: www.hach.com

