

How one company's nitrate sensor improved its efficiency and cost-effectiveness

Water Remediation Technology increases gallons per cycle and reduces the cost of salt consumption and waste brine disposal



Colorado-based Water Remediation Technology (WRT) LLC specializes in providing the simplest, safest, most cost-effective and environmentally sound processes available for removing radium, uranium and other contaminants from water. With over 200 full-scale systems in operation, WRT has the experience, resources and capabilities to address radioactive and other emerging contaminant issues. WRT's total solution approach represent the industry's most efficient and environmentally progressive services for meeting regulatory compliance standards.

Summary: Colorado-based Water Remediation Technology (WRT) LLC specializes in providing processes to remove radium, uranium and other contaminants from water. Their total solution approach represents the most efficient and environmentally responsible approach in the industry for meeting regulatory compliance standards. WRT has over 200 full-scale systems in operation in 22 states. WRT recently used Endress+Hauser equipment to make major

improvements to its nitrate removal system. By working with Endress+Hauser and one of its representative partners, WRT reduced operating costs and eliminated the risk of nitrate dumping which occurs when the media is run past the point of exhaustion.

Challenge: WRT has a customer with stringent requirements on their waste volumes and the amount of chloride they can send to waste from their nitrate



WRT uses Endress+Hauser's Viomax CAS51D digital nitrate sensor and a Liquiline CM444 four-channel transmitter.

removal system. Before implementing Endress+Hauser's CAS51D nitrate sensors, WRT used conservative projections for regeneration cycle length, and blended treated water at a fixed blend ratio. For this customer, WRT needed to get waste volumes down to significantly lower numbers than a typical nitrate removal system could provide. To accomplish this, WRT needed to extend their customer's run times to fully utilize the media capacity between each regeneration.

WRT designed a low-waste nitrate removal system that includes Endress+Hauser's CAS51D and Liquiline transmitter to carefully monitor every process step, fully utilize all the salt they are using and obtain full cycles from their media.

Initially, WRT selected a type 2 Anion Exchange resin for this project, which has a lower capital cost, operating cost and replacement cost than a nitrate-selective resin for this application. However, type 2 resins can dump nitrate, meaning if the cycle runs too long before a regeneration, sulfate in the water can begin forcing nitrate back off the resin. In a worst-case scenario, this can increase the nitrate in the water over the maximum contamination level (MCL).

"On an ion exchange system, if we don't continuously monitor the nitrate, then we're just estimating a run time and saying, 'OK, we're going to treat for, let's say, 200,000 gallons between regeneration cycles,'" said Marc Malone, Senior Applications Engineer at WRT. "But by using real-time monitoring, we can watch the exchange system's leakage curve. And so, we can run it right to the end of the cycle before we trigger the next regeneration. That can extend our run times by 10–20%."

WRT moved forward with two Endress+Hauser instruments, the Viomax CAS51D digital nitrate sensor and a Liquiline CM444 four-channel transmitter.

Solution: Using the Viomax CAS51D digital nitrate sensor and the Liquiline CM444 four-channel transmitter, WRT was able to eliminate waste.

The Viomax CAS51D measures nitrates, SAC or several sum parameters in drinking water, process water and wastewater applications and the utility sector. The instrument allows for:

- Measurement of organic load or nitrates in the inlet and outlet
- Determination of COD_{eq}, TOC_{eq}, BOD_{eq} or DOC_{eq}
- Monitoring, control and optimization of treatment processes and nitrate monitoring in the aeration basin and denitrification stage

The Viomax CAS51D is cost-effective, easy to use, requires no consumables and is safe and environmentally

friendly. Additionally, the instrument saves on operational expenditure and offers a fast response time.

Furthermore, the Liquiline CM444 is a state-of-the-art transmitter that allows users to connect up to four Endress+Hauser Memosens sensors of their choice from over 12 measurement parameters and has the ability to expand to eight total sensors. The instrument offers:

- Automatic sensor recognition
- Flexible expandability and standardized spare parts with all other devices of the Liquiline platform
- Complete control over cleaning systems and dosing pumps with inputs, outputs, relays, controllers and mathematics modules

In addition, Heartbeat Technology helps find the ideal balance between measuring point availability and maintenance costs. Heartbeat Technology consists of diagnostics, verification and monitoring functions and ensures reliable, in-depth sensor and process insights.

"We integrated these instruments into the equipment we provided for our customer when they needed a solution," added Malone. "They didn't have any nitrate treatment and we were able to provide a nitrate treatment system with Endress+Hauser's instruments."

Results: If WRT had not implemented online nitrate sensors, they would have advised running the cycle length – at most – to 90% of the theoretical maximum capacity, i.e. 207,000 gallons per cycle. However, due to the ability to monitor effluent nitrate in real-time with Endress+Hauser's Viomax CAS51D nitrate sensors, they can eliminate any risk of nitrate dumping and have been averaging run lengths of 285,000 gallons per cycle. This reduces two of the operator's most significant variable operating costs, salt consumption and waste brine disposal, by 26%.

"Based on modeling, we would just regenerate based on a certain number of gallons treated instead of waiting until we got through our treatment," said Malone. "We basically would regenerate earlier than we needed to on every regeneration. We were using extra salt and extra water volume to waste. The nitrate sensor allows us to reduce those waste volumes."

Using Endress+Hauser nitrate sensors allows for the active blending of water treated for nitrate and water not treated for nitrate to achieve the desired effluent concentration. Over the first five months of operations, the average blending ratio has led to a 51% reduction in salt consumption and waste brine disposal costs compared to treating the total flow.



Endress+Hauser's CAS51D and Liquiline transmitter enhanced WRT's nitrate removal system. WRT can now better monitor process steps, fully utilize all the salt they are using and obtain full cycles from media.

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