Expanding in scope

Water treatment embraces reuse, digitalization

Big trends are shifting priorities in the water treatment chemicals industry, even as the market outlook remains robust. Strong interest in water reuse and recycling grows ever stronger, as firms have turned to big data and digitalization to enable reuse and help improve customers' operations.

Vincent Valk

These are bright times for makers of water treatment chemicals. Demand for their products and services has grown, both from industrial and municipal customers. Industrial customers are embracing new technologies—often driven, at least in part, by regulation—around water reuse and recycling. On the municipal side, the improving economy has boosted demand as more projects have gotten under way, and public concern about drinking water quality has led to a renewed focus on the issue. Digitalization and big data technologies are also increasing the value of the offerings that water treatment firms can provide.

While it is not the fastest-growing chemicals market, growth in water treatment chemical consumption is expected to outpace GDP over the next few years. Consumption of specialty chemicals in water treatment is expected to grow by an average of 3.6%/year over the period 2018–2022 from about $8.8 billion in 2017, the most recently-available data, according to IHS Markit. Global GDP, by comparison, is expected to grow by 2.6% this year, and 2.7% in 2021 and 2022, IHS Markit says.

The IHS Markit figure only includes chemicals at the manufacturers' sales level—many companies in the industry also sell equipment. Often, chemicals are supplied by manufacturers to service providers, who package them with equipment and service offerings, and may do formulation work or produce other materials in-house.

"We feel that this is a good growth segment, and it is continuing to grow," says John Panichella, CEO of Solenis. While the overall growth rate is solid, some parts of the industry are growing faster than others. Wastewater treatment and process water purification are the fastest-growing parts of the industry, Panichella adds.

Regulate, reuse, recycle

Greater reuse and recycling of industrial process waters play into trends in both wastewater treatment and water purification. "It's driven by regulation around effluent water quality on the front end, and a lot of places are having trouble getting enough water and the right kind of water to do what they want to do," Panichella says.

Regulation and climate are also key drivers. "Wastewater closed-loop recycling and wastewater recovery and reuse (ultrafiltration of wastewater for direct use) strategies are increasingly being implemented in the United States and in other developed regions because of increased occurrences of drought and deteriorating quality of water sources," IHS Markit says.

PANICHELLA: Regulation around effluent drives reuse.

Climate change strategies play directly into this. "Many companies are looking to not only ... mitigate risk around climate change, but to adapt," says Emilio Tenuta, chief sustainability officer at Ecolab. This means figuring out how climate change impacts water sourcing and supply, and evaluating ways to adapt to those impacts, he adds.

BARNES: Aiming to expand with big data.

Discharge of industrial wastewater containing certain chemistries has come under increasing regulatory scrutiny. "[There are now] strong limits on phosphorous discharge in some states," says LaMarr Barnes, CEO of U.S. Water Services, a division of Kurita Water Industries. This is controlled through the permitting process. "For example, in Wisconsin, new permits or re-permits are getting very close to zero phosphorous discharge allowed," Barnes says. There are also regulations on overall water quality and utilizing groundwater. "States like Iowa are taking a hard line in not degrading certain kinds of water," Barnes says. "Operations that would have taken more water out of the ground and then discharged that water to the surface have found that is not allowed under the new rules in Iowa."

The trend toward tougher limits is universal, at least in the US. "Discharge permits are regulatory agencies' lever," says Edward Connors, president/paper and water, Americas at Solenis. "When the permits get renewed, the allowable levels are constantly driven lower. So the more they drive the levels lower ... that drives all kinds of technological change upstream that customers now need to get to the lower levels."

In the US at the moment, the key regulatory drivers are at the state level. Due to the Trump administration's regulatory loosening, "the federal government is being less intense on regulations," Barnes says. But while the administration may be pushing in the opposite direction, states have lots of leeway with environmental rules, and water scarcity issues are not going away. "Longer term, the forces are still going to drive more regulation and more resource conservation," Barnes says.

Rules are also tightening outside the US. Regulation "varies substantially around the world," Panichella notes, but the broad trend is toward more restrictions. Europe tends to be a leading indicator in this regard, with rules that start there spreading to other places around the world, Connors notes.

Developing countries, meanwhile, often have major water quality and water scarcity problems. China, for one, has 21% of the world's population and 7% of the world's freshwater resources, according to the UN. The step-up in environmental enforcement in China in recent years has taken aim at water issues, around both scarcity and quality. "Continued industrialization in countries like China and India has significantly reduced the quality of local water resources," says H.P. Nanda, global vice president and general manager/water solutions at DuPont.

All of this means more demand for water treatment products, and more demand for new and more sophisticated water treatment products. Products tailored to meet the toughest regulations can often spread quickly because of scale. "Large global service companies want to have a standard product range," says Paul Turgeon, CEO of Anue Water Technologies (Tucker, Georgia). "So this leads them to design programs that meet the toughest requirements globally."

More intensive programs to treat and purify process water, so that such water can be reused and is cleaner if and when discharged, are a key focus in product development. In essence, the more water is used in a process, the dirtier it gets, and the more treatment it needs so it can be reused or discharged. "The challenge with systems that use process water is that the water becomes dirtier and dirtier, so you need mechanical and chemical means to keep it within an efficiency range so that it does not foul up equipment," Turgeon says.

Different technologies have developed to handle different aspects of this challenge. "Wastewater treatment, in particular, often requires more than one technology, and it also requires application know-how to design and apply the technologies based on wastewater content and specified or regulated purity," Nanda says. Reverse-osmosis (RO) membranes have been a key technology for DuPont. Last year, DuPont worked on a project at a textile plant in India using RO membranes to enable an approach that the company calls minimal liquid discharge (MLD). "By employing high-pressure RO membranes, the plant is able to remove color from water sources, decrease wastewater output, and lower overall system cost by more than 50%," Nanda says.

Reusing, recycling, and purifying water doesn't just require treatment technologies, however—detection is also critical. "You need a good ability to be able to detect [contamination] and know if you are feeding the proper amount [of dispersant]," Panichella says. Solenis has invested in sensor products to detect and properly treat impurities, including biofilms and scale formation. "To maximize the number of times you can use a water stream, you need to know the propensity for scaling and biofilm," Connors says.

Despite the focus on reuse, it is still relatively rare. "Less than 3% of the wastewater generated in the world is reclaimed and reused," Tenuta says. The figure is higher in developed countries, but still barely in the double digits, he adds. New products can be critical in driving adoption of water reuse.

Digital wave

Sensors are useful for more than improving the efficiency and effectiveness of a water treatment process, important though that is. They can gather data, which can help improve a facility's operations overall—and enable water reuse. With this background, water

treatment firms have begun to see the potential of digitalization and big data.

Solenis is "trying to dig into ... how we can use data to create valuable savings for customers," Panichella says. The company is developing algorithms that can use big data to optimize performance at customers' facilities. "You can have lots of data points, but sometimes there are only two or three that make a difference in terms of optimizing performance," Panichella says.

"You can think of it as predictive analytics," according to Connors. "If I take all the data from your refinery in the past year, I can look at trends and different process conditions." In refineries, for example, Solenis has built out a predictive analytics product based on such algorithms that can predict which of a system's heat exchanges will fail, and when. "When a customer does a maintenance turnaround or shutdown, they may not know which heat exchanger is going to fail," Connors says. "The tool we've developed allows them to zero in on the particular heat exchangers that are likely to fail, and not worry about the others. This is all based on customers' available data that they already collect. And we have proprietary algorithms that we've developed with our partners that give them predictive data and analysis."

Solenis is aiming to build these tools out in new applications, beyond heat exchangers. "We envision that in the next couple of years, we will have a pretty nice portfolio of these kinds of products that look at the value side," Panichella says.

U.S. Water has been marketing a technology pioneered by Kurita that amounts to "a sensing technology paired with a control technology," Barnes says. "It uses a laser to measure the effectiveness of a feed of coagulants in water. We also recently launched a more up-to-date technology for cooling tower control based on internet-of-things infrastructure." The data is collected digitally and stored on a cloud-based server.

While U.S. Water's technology is not currently capable of predictive analytics, there are plans to move in that direction. "We do have plans for more big data and analytics," Barnes says. "It takes some time to get enough data and create the right tools to extract the right kind of information from that data."

Digitalization has uses in municipal water treatment, as well. Ecolab has developed a tool that uses predictive analytics to forecast changes in water quality, which can vary significantly at a given location over the course of a year. The tool has both industrial and municipal users. "We can adjust it to our customers," Tenuta says. "We have customers in 170 countries pulling billions of data points every day from sensors at their locations around the world."

Such large-scale data collection is generally the first step toward creating such predictive tools. "We have a term called dark data," says Kevin Milici, vice president/marketing and technology with U.S. Water. "If someone takes a manual measurement of a water treatment control parameter that goes into a logbook and no one ever acts on it, that's dark data. The idea is to create a sensing system and machinery that enable us to get a high volume of quality, accurate data ... so that it never has a chance to become dark." ■