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Protecting the Global Water Supply

Ensuring accurate water sampling and analysis through proper equipment selection is critical to meeting environmental compliance and keeping the world's water safe and clean

By Iuliana Nita

Water is vitally important to every aspect of life. From harboring millions of aquatic species to providing the essential resources to grow food and supply drinking water, the world's network of oceans, lakes, rivers and tributaries serve multiple fundamental purposes.

And the cleanliness of a body of water can significantly impact the quality of life in the communities surrounding it and beyond. As such, ensuring proper water sample collection and analysis are key to determining the effects of potential contamination on receiving waters and their aquatic life.

This article explores environmental regulations that oversee the world's water supply to ensure safe conditions, as well as methods to provide accurate water sampling and analysis through proper equipment specification and procedure to help achieve compliance.

Environmental Water Quality Regulations

In the interest of seeking compliance with federal and international regulations, as well as the desire to provide safe drinking water around the globe, engineers are regularly charged with monitoring municipal and industrial wastewater before it is discharged. Measuring water quality is not an easy task, especially as increasing environmental concerns have heightened the need for even greater diligence and tighter restrictions on water quality standards and protocols.

Some of the key U.S. and international environmental regulations on water quality include the Clean Water Act and Safe Drinking Water Act (U.S.) and the Codex Alimentarius standards (international).

Clean Water Act (CWA)

The CWA is known as the principal federal law governing water pollution and regulating quality standards for surface waters from both direct and indirect discharges. Under the CWA, the U.S. Environmental Protection Agency (EPA) regulates the discharge of pollutants that can potentially threaten water quality, human health and the environment — including 126 "priority" (toxic) pollutants such as oil and grease, animal waste and more.

Through the CWA's National Pollutant Discharge Elimination System (NPDES) program, the EPA targets enforcement through a permit system — in coordination with state environmental agencies — to monitor direct discharges from municipal and industrial wastewater treatment plants, sewer collection systems, and storm water discharges from industrial facilities and municipalities, among others.

According to the EPA, direct discharges into navigable waters from "point sources" (such as pipes or sewers) require a NPDES permit, which contains industry-specific, technology-based and/or water-quality-based limits, along with established pollutant monitoring and reporting requirements. A facility that intends to discharge into the nation's waters must

obtain a permit, which requires the applicant to provide quantitative analytical data that identifies the types of pollutants present in the facility's discharged material.

To monitor compliance with clean water laws, the EPA works with its federal, state and tribal regulatory partners to conduct facility inspections. Permit holders are inspected through a comprehensive review process, including evaluation of discharge monitoring reports, on-site compliance evaluations and samples of wastewater discharges, as well as a thorough review of how samples are collected and analyzed by laboratories and more.

Parties that are not in compliance with clean water regulations could face major fines and potential civil or criminal charges. For example, a first-time offense of criminal negligence could incur up to $25,000 in fines per day of violation.

Safe Drinking Water Act (SDWA)

The SDWA is the primary federal law that ensures the quality of the nation’s drinking water. Understanding that clean drinking water is vital to human health, the SDWA establishes provisions to protect the safety of more than 160,000 public water systems in the U.S. and their sources.

Federal standards are defined under the National Primary Drinking Water Regulations (NPDWR), which seek to protect public health by limiting the levels of contaminants in drinking water. The regulations are monitored by primacy agencies, which are either state government agencies or EPA regional offices.

Public water systems are required to regularly monitor their water for contaminants, which can be classified into six different contaminant groups: microorganisms, disinfectants, disinfection by-products, inorganic chemicals, organic chemicals and radionuclides. Drinking water samples must be periodically analyzed by laboratories that are certified by either the EPA or a state agency. Public water systems are also required to follow stringent EPA-approved testing methods to demonstrate that their water meets national health-based standards, which is then reported to their primacy agency.
If a public water system does not meet the required standards, a notification from the primacy agency is typically issued, then followed by formal orders and fines if the system does not seek compliance.

Codex Alimentarius

The World Health Organization (WHO), a specialized agency of the United Nations, provides guidelines for monitoring water quality internationally through the Codex Alimentarius standards.

While there are various environmental and governmental organizations that oversee the quality of water sources in their respective countries, the Codex Alimentarius standards help to establish a global minimum that should be followed. They are well known as food safety protection standards; however, the WHO cites that food safety, including water safety, is at the heart of Codex work to protect the health of consumers.

More specifically, the Guidelines for Drinking-water Quality — which were developed by the WHO — outline detailed safety parameters explicitly for drinking water.

Included in the most recent Fourth Edition of the Guidelines are considerations for ensuring drinking water safety, including “minimum procedures and specific guideline

values and how these are intended to be used, microbial hazards that continue to be the primary concern in both developing and developed countries, and the important roles of many different stakeholders in ensuring drinking water safety," among others.

The Guidelines are directed toward water and health regulators, as well as policymakers and their advisors, to assist in the development of national standards that provide access to clean, safe drinking water for all.

While these standards are not legally enforced in individual countries, they are widely regarded as the minimum limits to protect consumers, while serving as a source of information on water quality and health, as well as effective management approaches.

Maintaining Water Safety and Compliance through Proper Testing

As environmental regulations continue to increase, so too does the need for accurate water sample collection and analysis for ensuring compliance.

It is imperative that water sampling instruments collect samples that accurately represent the body of water being extracted for subsequent analysis.

Peristaltic pumps are often employed in water sampling and analysis programs in order to prevent cross-contamination, as the only part of the device to come into contact with the water specimen is the interior of the pump's tubing system. During both the sampling and analysis process, the tubing within the pump has the potential to impact the characteristics of the water being transferred and could even affect the chemical composition of the sample, which could lead to inaccurate test results.

As such, pumps used for these purposes are required to meet a rigid set of performance standards, including repeatable pump control for accurate dosing, high suction lift, high flexural fatigue strength and chemical resistance in order to uphold the integrity of the sample.

For OEMs that develop water sampling and analysis instruments, selecting the appropriate equipment tubing is an essential component in meeting these criteria.

For instance, Saint-Gobain offers flexible tubing solutions that were specially engineered for accurate, reliable performance in water sampling and analysis applications.

Tygon® SPT-60 L is a platinum-cured silicone tubing developed for accurate dosing in peristaltic pumps, offering sample integrity along with reliability and long-life performance in water sampling applications. With its exceptional dimensional stability and surface smoothness, Tygon SPT-60 L enables peristaltic pumps to have a suction capability of up to 29 feet, eliminating the need for priming and providing added flexibility during installation.

Additionally, Tygon SPT-60 L was engineered with outstanding chemical resistance to decrease the likelihood of leaching or absorption of chemicals that could affect the overall composition and integrity of the sample.

Tygon® WSA-60 tubing is chemically inert* to reduce sample contamination in water analysis applications, as well as long-wearing to withstand the repeated flexing of peristaltic cycles. The tubing also offers repeatable pump control for accurate dosing and provides outstanding performance for helping to reduce downtimes and added costs due to pump tubing failure.

In summary, an effective course of action manufacturers can take to ensure water safety and regulation compliance among their customers is to evaluate and specify reliable tubing solutions in their equipment to help protect the world's vital water sources.

For more information on how to maintain water safety and regulation compliance with reliable tubing solutions, visit **www.processsystems.saint-gobain.com.**

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Saint-Gobain designs, manufactures and distributes materials and solutions which are key ingredients in the wellbeing of each of us and the future of all. They can be found everywhere in our living places and our daily life: in buildings, transportation, infrastructure and in many industrial applications. They provide comfort, performance and safety while addressing the challenges of sustainable construction, resource efficiency and climate change. With 2016 sales of more than $43 billion, Saint-Gobain operates in 67 countries and has more than 172,000 employees.

Saint-Gobain's Performance Plastics business is headquartered in Solon, Ohio, and employs 6,000 people in 22 countries. It is a world leader in high-performance plastics, including flexible tubing, seals, coated fabrics, foams, window film, barrier/release films, tapes, medical components, fluid handling systems and bearings.

Saint-Gobain's Process Systems business unit helps customers achieve safety, performance and brand assurance through a broad range of capabilities that rely on superior engineering and customer support. Our product applications include those in the food, beverage, habitat, aerospace, chemical and electronics sectors. We've helped customers in all of these industries achieve goals in innovation, efficiency, sustainability and product integrity through customized solutions such as flexible tubing, gaskets, seals, hoses, fittings, pumps, valves and manifolds.

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