

New Product Innovation Award

Water Quality Monitoring Industry Europe



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Background and Company Performance

Industry Challenges

Water management in urban cities and industrial corridors involves identifying existing hazardous parameters in effluent wastewater as well as in potable water. The industry requires extensive water quality monitoring equipment based on best-in-class technologies to identify parameters precisely, along with concentrations, to perform treatment processes that effectively restore the water's good qualities. Water monitoring predominantly involves rationally managing the water quality through procedures that reveal accurate information about treatable hazardous parameters. However, the following are several technical challenges associated with water quality monitoring:

- Improper configuration of the water monitoring equipment because of bad calibration and lack of data can result in the incomplete and inaccurate measurement of hazardous components in water. In addition, the entire process is time consuming.
- The lack of stringent guidelines and regulations, along with the ageing infrastructure of the monitoring equipment, can lead to uncertainty in the accurate measurement of quality parameters.
- The lack of quality assurance programs for water monitors can lead to the inability to measure specific hazardous parameters because of the absence of versatile equipment that could be used to monitor an array of parameters and provide precise data on the concentration of parameters present in the water.
- Highly expensive equipment used in quality monitoring and sampling can increase the expenditure involved in collecting accurate water quality data. In addition, frequent corrosion and fouling of stainless steel parts, faulty cables, and other broken components can result in high maintenance and repair costs.
- Several types of water quality monitoring equipment are used for analyzing different types of water, including drinking water, industrial and municipal effluents, ground water, and surface water, thereby increasing the cost of equipment.

New Product Attributes and Customer Impact

Match to Needs

UK-based Modern Water plc has developed advanced bioluminescence technological systems for monitoring water quality. The company's Microtox[®] Continuous Toxicity Monitor (CTM) is an automated instrument that uses bioluminescence for continuously measuring chemical toxicity. This monitor offers no manual intervention and can detect thousands of chemical compounds, even in lower concentrations, compared to other water monitoring sensors.

The Microtox CTM's autonomous detection of a broad range of contaminants requires a low level of expertise, thereby drastically reducing operating and maintenance expenditures, compared to other expensive systems. Furthermore, Microtox CTM tests take only two minutes to provide a precise response and are faster than other toxicity and water monitoring tests that can take a minimum of 15 to 30 minutes for a response that may be inaccurate.

Microtox CTM's simultaneous response to toxicity events using bioluminescent bacteria enables the detection of harmful toxins, without any time-consuming and expensive detection methods. Furthermore, Modern Water's Microtox CTM requires a shorter maintenance time of two hours per month and has a broad range of applications, including industrial effluents, drinking water, storm water, surface water, and municipal effluents, unlike other sensors used for water quality monitoring purposes.

In addition, the on-line Microtox CTM system protects biological treatment tanks in wastewater treatment plants in real time. The response is rapid enough to allow the incoming wastewater to be diverted to a holding tank if toxicity is detected, thus protecting biotanks and providing large cost savings.



The Microtox CTM System

Image Courtesy of Modern Water

Reliability

Each Microtox test uses millions of bacterial cells. Conventional water quality tests with higher organisms use a much smaller population size of 10 to 100 animals or plants, making them statistically less accurate than Microtox. Additionally, larger organism tests require animal species, algae, or plants to be cultivated in a lab, which requires a high level of skill and a significant amount of space. The small number of organisms contained in the instrument based on higher organisms means that results are statistically less reliable than with the Microtox CTM that uses a large number of bacterial species. Because the bioluminescence reaction in the bacterial cell is connected to the bacteria's cellular metabolic functions, the Microtox CTM tests' response and relevance are accurate and reliable, compared to tests based on higher organisms.

Frost & Sullivan recognizes one such success story of Modern Water's Microtox technology. This product has been used at all but one summer Olympics and Paralympics event since 1984 to detect toxins in water. The Microtox rapid toxicity test has proved to be a more useful monitoring tool than traditional analytical methods as all major Olympic venues have used Modern Water's Microtox products to provide safe and clean drinking water to all athletes in the Olympic village participating in major sporting events. The feedback from Olympic authorities indicates that the real-time detection of any toxic substance by Microtox technology has completely changed the quality of water used at these sporting events. The monitoring product's high reliability has enabled the continuation of the long tradition of using Modern Water's products at Olympic Games organized by the International Olympic Committee.

Quality

According to Frost & Sullivan analysis, a striking difference between Modern Water and its competitors, in terms of product functionality, is that Modern Water's Microtox CTM performs toxicity tests that measure all unknown contaminants present in drinking water or wastewater, whereas most competitors offer tests that only monitor and analyze specific contaminants. The best-in-class quality of Microtox CTM means this device regularly performs tests on industrial wastewater effluents for toxicity based on an already established toxicity baseline. If the toxicity test deviates from the established baseline, a rapid response is generated that allows incoming wastewater to be diverted to a holding tank, thereby protecting the secondary wastewater treatment process from excessive contaminant loading and offering large savings in terms of operational expenditure. This unique quality of protecting the treatment process in real time separates Modern Water from its competitors. In addition, this proactive method of managing and measuring effluents' toxicity with real-time instruments is useful for wastewater treatment plants with highly varying influents as well as helps wastewater treatment plants comply with stringent regulatory standards. This best-in-class product quality creates a huge difference between Modern Water and its competitors.

Positioning

A unique feature of Microtox CTM is that it is a truly continuous monitoring system and takes one reading every two minutes, while other on-line bioluminescence test systems and water quality monitoring systems are batch analyzers that take intermittent samples, which is more time consuming and inaccurate than Modern Water's Microtox CTM. The instrument has a continuous slow stream of sample, and the fermenter has a continuous slow stream of reagent. The two streams meet in a tube, and the bacteria are allowed to react with the sample for two minutes. The change in luminescence is measured, and a percentage inhibition is calculated, thus providing a quick response time, which is not offered by Modern Water's competitors. In addition, the Microtox CTM bio reagent only needs replacing once a month, while competing systems require more frequent replacement.

Traditional monitoring processes using on-line instruments based on higher organisms, including algae, fish, and mussels, can take hours or even days, which is much longer than Modern Water's Microtox CTM that takes only minutes to respond. The Microtox CTM has built-in, automatic quality control testing and cleaning cycles, which are not offered by competing solutions, and alarms are issued if the proper quality control check does not meet requirements. Furthermore, Modern Water's Microtox CTM detects synergistic effects of harmful toxins.

Design

An important product design strategy that has augmented the Microtox CTM's ease of use is its simple design. The Microtox CTM output is communicated in several different formats, including Analogue 4-20 mA, Modbus, LAN, and a Web server connection through Wi-Fi. In addition, the monitor has a built-in Web server that allows access to comma separated values (CSV) data, graphical data, and the current status by using a standard Web browser. The Wi-Fi router allows anyone within range to connect to the Microtox CTM or remotely connect through the LAN. The monitor can easily be connected to a plant's process control system and initiate automatic flow diversions or shut offs, as required. Alarms can be sent as SMS text messages through the plant's control system.

This simple but effective design that consistently and easily provides real-time information on water quality ensures safe and clean drinking water for users and provides updated information on the treated water's toxicity levels.

With traditional solutions, users have to spend extra time and money searching for various instruments to monitor and detect several contaminants as well as track all of the above parameters manually.

Brand Equity

Modern Water strengthens its brand equity by directly selling its products worldwide, including in China, the United States, and Europe. The company has taken several initiatives, such as improving shipping cost recovery and providing strong sales of water quality monitors and reagents, resulting in an overall positive margin of \$80,000. The net profit margin of \$80,000 is the measurement of the company's operating profitability of its total revenue.

Modern Water's monitoring division is experiencing revenue growth, with a geographical focus in the United States and China, apart from its operations in Europe. Continued revenue growth in the water quality monitoring division because of recent increased sales has resulted in a revenue increase of 12% and a gross profit margin increase of 54%. The complete restructuring of the water monitoring division in the United States has enabled Modern Water to generate strong revenue growth, with a gross margin of more than 50% in the United States alone.

Conclusion

A main challenge in the water quality monitoring industry is water monitoring equipment's inability to identify and measure hazardous parameters accurately. Conventional water quality monitoring systems are designed so that the equipment utilizes time-consuming processes for monitoring the water's quality. Modern Water's Microtox CTM uses futuristic bioluminescence technology to perform biosensor testing that detects the presence of all unwanted toxic substances within two minutes and can be ideally installed in drinking water and wastewater treatment plants. Frost & Sullivan recognizes that Microtox CTM's ability to detect hazardous compounds present in water within minutes significantly helps users reduce the toxicity in their drinking water as well as in industrial wastewater.

Furthermore, Modern Water's Microtox CTM provides continuous measurements and real-time results to identify hazardous compounds and formulate treatment processes in water and wastewater treatment plants. This instrument helps treatment plants comply with effluent discharge limits that are based on stringent regulatory guidelines. Real-time monitoring allows influents to be diverted if toxins are detected, thereby reducing the load on the plant's treatment processes. This ability eliminates the damage to treatment processes because of the overload of hazardous components, thus reducing operational and maintenance costs.

With its strong overall performance, Modern Water is recognized with Frost & Sullivan's 2018 New Product Innovation Award.

Significance of New Product Innovation

Ultimately, growth in any organization depends upon continually introducing new products to the market and successfully commercializing those products. For these dual goals to occur, a company must be best-in-class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.



Understanding New Product Innovation

Innovation is about finding a productive outlet for creativity—for consistently translating ideas into high-quality products that have a profound impact on the customer.

Key Benchmarking Criteria

For the New Product Innovation Award, Frost & Sullivan analysts independently evaluated two key factors—New Product Attributes and Customer Impact—according to the criteria identified below.

New Product Attributes

Criterion 1: Match to Needs

Requirement: Customer needs directly influence and inspire the product's design and positioning.

Criterion 2: Reliability

Requirement: The product consistently meets or exceeds customer expectations for consistent performance during its entire life cycle.

Criterion 3: Quality

Requirement: Product offers best-in-class quality, with a full complement of features and functionalities.

Criterion 4: Positioning

Requirement: The product serves a unique, unmet need that competitors cannot easily replicate.

Criterion 5: Design

Requirement: The product features an innovative design, enhancing both visual appeal and ease of use.

Customer Impact

Criterion 1: Price/Performance Value

Requirement: Products or services offer the best value for the price, compared to similar offerings in the market.

Criterion 2: Customer Purchase Experience

Requirement: Customers feel they are buying the most optimal solution that addresses both their unique needs and their unique constraints.

Criterion 3: Customer Ownership Experience

Requirement: Customers are proud to own the company's product or service and have a positive experience throughout the life of the product or service.

Criterion 4: Customer Service Experience

Requirement: Customer service is accessible, fast, stress-free, and of high quality.

Criterion 5: Brand Equity

Requirement: Customers have a positive view of the brand and exhibit high brand loyalty.

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan analysts follow a 10-step process to evaluate Award candidates and assess their fit with select best practice criteria. The reputation and integrity of the Awards are based on close adherence to this process.

STEP	OBJECTIVE	KEY ACTIVITIES	OUTPUT
1 Monitor, target, and screen	Identify Award recipient candidates from around the globe	<ul style="list-style-type: none"> • Conduct in-depth industry research • Identify emerging sectors • Scan multiple geographies 	Pipeline of candidates who potentially meet all best-practice criteria
2 Perform 360-degree research	Perform comprehensive, 360-degree research on all candidates in the pipeline	<ul style="list-style-type: none"> • Interview thought leaders and industry practitioners • Assess candidates' fit with best-practice criteria • Rank all candidates 	Matrix positioning of all candidates' performance relative to one another
3 Invite thought leadership in best practices	Perform in-depth examination of all candidates	<ul style="list-style-type: none"> • Confirm best-practice criteria • Examine eligibility of all candidates • Identify any information gaps 	Detailed profiles of all ranked candidates
4 Initiate research director review	Conduct an unbiased evaluation of all candidate profiles	<ul style="list-style-type: none"> • Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles 	Final prioritization of all eligible candidates and companion best-practice positioning paper
5 Assemble panel of industry experts	Present findings to an expert panel of industry thought leaders	<ul style="list-style-type: none"> • Share findings • Strengthen cases for candidate eligibility • Prioritize candidates 	Refined list of prioritized Award candidates
6 Conduct global industry review	Build consensus on Award candidates' eligibility	<ul style="list-style-type: none"> • Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates 	Final list of eligible Award candidates, representing success stories worldwide
7 Perform quality check	Develop official Award consideration materials	<ul style="list-style-type: none"> • Perform final performance benchmarking activities • Write nominations • Perform quality review 	High-quality, accurate, and creative presentation of nominees' successes
8 Reconnect with panel of industry experts	Finalize the selection of the best-practice Award recipient	<ul style="list-style-type: none"> • Review analysis with panel • Build consensus • Select recipient 	Decision on which company performs best against all best-practice criteria
9 Communicate recognition	Inform Award recipient of Award recognition	<ul style="list-style-type: none"> • Present Award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance 	Announcement of Award and plan for how recipient can use the Award to enhance the brand
10 Take strategic action	Upon licensing, company is able to share Award news with stakeholders and customers	<ul style="list-style-type: none"> • Coordinate media outreach • Design a marketing plan • Assess Award's role in future strategic planning 	Widespread awareness of recipient's Award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan’s 360-degree research methodology represents the analytical rigor of our research process. It offers a 360-degree-view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, leading to errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry participants and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS



About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best-in-class positions in growth, innovation and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best practice models to drive the generation, evaluation, and implementation of powerful growth strategies. Frost & Sullivan leverages more than 50 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on six continents. To join our Growth Partnership, please visit <http://www.frost.com>.

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