

Wireless Water Quality Monitoring Solutions

EAT 2Q

Environmental monitoring is crucial in combating pollution in surface water such as rivers, lakes, reservoirs, and coastal waters.



GLOBAL NEED FOR WATER QUALITY MONITORING

Globally, surface water quality monitoring has become a pressing issue due to increasing pollution levels in rivers, lakes, and coastal areas. Effective monitoring is the first step in implementing quantifiable improvement programs aimed at combating pollution. Continuous data collection is essential for understanding pollution patterns, implementing mitigation strategies, and ensuring compliance with environmental regulations. The ability to deploy robust monitoring systems in environmentally sensitive and remote areas is critical to achieving these goals.



THE EM-2Q ADVANTAGE FOR SURFACE WATER QUALITY MONITORING



• Rapid Deployment:

EM-2Q's wireless technology enables quick and easy deployment of integrated sensor packages near the riverbed, eliminating the need for extensive riverbank or shore infrastructure

Reliable Communication:

Utilizing Electromagnetic Field Signaling (EMFS), the EM-2Q system ensures dependable data transmission from submerged sensors to topside devices, even through challenging mediums including fresh and salt water, ice, concrete, and rock

 Minimal Environmental Impact: The system is designed to be environmental

The system is designed to be environmentally friendly and non-disruptive to existing ecosystems

Flexibility:

EM-2Q easily integrates with various sensor packs, including multiparameter sondes and security systems. The topside EM-2 gateway unit can be installed up to 100 meters away, offering significant flexibility in locating the communication relay point.

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CSignum EM-2Q Wireless Water Quality Monitoring



WATER QUALITY MONITORING APPLICATIONS AND BENEFITS

Continuous Water Quality Monitoring

Many applications require continuous, real-time monitoring, such as compliance with the UK Environment Act 2021. CSignum's EM-2Q, connects to multi-parameter sondes from leading vendors and may be deployed on the riverbed. The system can be recovered for sensor calibration by remote command from the riverbank inflating a recovery bag. By placing sensors directly on the riverbed and using remote-controlled recovery mechanisms like the airbag system, the EM-2Q system eliminates the need for permanent, visible infrastructure on the riverbank, significantly reducing the risk of theft or vandalism. The EM-2 gateway, discretely installed in locations up to 100m from the EM-2Q, provides the cellular interface and enables measurements to be published online.

Manual Data Harvesting

vulnerable on-site.

Suitable for scenarios where realtime data is not required, such as broader environmental monitoring. For efficient data harvesting, an EM-2Q communications system connected to a sonde is deployed on the riverbed. Water quality measurements



are taken at regular intervals and logged on the EM-2Q device. No permanent topside equipment installation is necessary. When required, an operator, standing on the riverbank or shore, carrying an EM-2 gateway device, requests upload of logged time series data from the riverbed system. The absence of fixed topside installations minimizes exposure to tampering. The system allows for secure, on-demand data retrieval using portable EM-2 gateways, ensuring no equipment is left unattended and

Drone Data recovery

The EM-2Q solution is ideal for situations where data retrieval via drones is the most efficient option. Multiple sensor-equipped EM-2Q devices can be submerged along a river, providing continuous data logs that reveal when and where pollution events occur. Drones equipped with the EM-2 gateway device automatically retrieve data from the EM-2Qs, eliminating reliance on exposed equipment. This approach not only protects against theft or vandalism but also provides precise, tamper-proof data to deter polluters and support regulatory enforcement, and drive environmental improvements.

CSignum's EM-2Q solution combines concealment, remote operability, and innovative recovery methods to safeguard equipment while delivering robust water quality monitoring capabilities.

The system offers the following benefits:

• Ease of Deployment and Retrieval:

Rapid setup with minimal, or no, civil engineering/ construction, reducing deployment time and costs. Airbag recovery technology allows the device to be retrieved without divers, saving both time and cost and improving operational safety.

• Flexibility:

The topside EM-2 gateway unit can be placed in various locations, providing optimal positioning for data transmission without the constraints of cables or terrain.

Mobility:

The semi-permanent system can be moved to new locations as needed, providing flexibility in addressing emerging pollution concerns.

Enhanced Project Margins:

Using the EM-2Q system can increase project margins by overcoming high-cost traditional monitoring options.



Addressing Combined Sewage Overflow Impacts

The EM-2Q system is particularly effective in monitoring the impacts of CSOs. These events, which discharge untreated sewage and stormwater into rivers during heavy rainfall, pose significant environmental risks. By deploying one combined EM-2Q and sensor system upstream from the discharge pipe and a second system downstream, continuous sensor monitoring can detect the timing and location of CSO events and seamlessly relay the captured data to a single topside EM-2 gateway which publishes the measurements online. This data is crucial for compliance with environmental regulations and for implementing timely mitigation strategies.

Impact on Reservoirs, Estuaries and Coastal Waters

Pollution in inland waterways eventually flows into the sea, impacting coastal waters and estuaries. Effective monitoring of rivers and lakes with an EM-2Q system helps



track pollutants from their source and into these coastal waters, providing essential data to mitigate downstream effects on coastal ecosystems.

Reservoir pollution arises from agricultural and urban runoff, industrial discharges, sewage, mining

activities, and natural events like erosion or floods. Recreational use and atmospheric deposition also contribute contaminants such as nutrients, heavy metals, pathogens, and sediment. The EM-2Q offers transformative benefits for reservoir monitoring by enabling wireless, accurate, and continuous data collection without the need for permanent infrastructure providing vital data to ensure water safety, ecosystem health, and regulatory compliance.

CSignum wireless water quality monitoring systems are equally applicable to monitoring the littoral zone along the seashore. The EM-2Q can be interfaced with water quality sensors or multi-parameter sondes on the seabed communicating measurements directly to the EM-2 gateway on the shore. This holistic approach ensures that both inland and coastal waters are protected, improving overall water quality, and safeguarding both marine and human life.

The EM-2Q system provides a robust solution for monitoring these impacts, offering several key advantages:

Continuous Monitoring:

EM-2Q enables continuous data collection providing real-time insights into environmental conditions.

• Flexible Deployment:

The EM-2Q is paired with sensors or multi-parameter sondes and can be deployed on the seabed, reservoir bed, or submerged in coastal waters, ensuring comprehensive monitoring, while the wireless EM-2 gateway can be placed in a variety of locations without the need for cables or extensive infrastructure.

· Hands-free Retrieval:

The EM-2Q is equipped with airbag recovery technology that allows the device to be retrieved without divers. A remote command inflates an onboard airbag, which raises the device to the surface, saving both time and cost and improving operational safety.

· Compliance and Reporting:

Continuous monitoring ensures compliance with environmental regulations and provides wide-ranging water quality data.

Mitigation and Management:

Data collected can be used to implement mitigation strategies and manage the environmental impact effectively.

EM-2 INNOVATIVE FEATURES

- Electromagnetic Field Signaling (EMFS): EM-2Q systems employ electromagnetic fields to transmit data, bypassing the limitations associated with acoustic, optical, and traditional wired communication methods. This technology allows data transmission through water, ice, concrete, and rock, making it suitable for a wide range of environmental and industrial applications.
- Reliable Communication Through Water: Traditional acoustic and optical methods cannot communicate through the water surface and are affected by turbidity and biofouling. EM-2Q's EMFS technology seamlessly transmits data from underwater sensors to above-surface devices without signal degradation. The EM-2Q system supports bidirectional data transfer, enabling both data collection from and control of underwater devices.
- Communication Through Ice and Subterranean Environments:

The EMFS technology is effective through ice, making EM-2Q systems systems ideal for monitoring in polar regions and other icy environments. EM-2Q can also transmit data through rock and soil, supporting underground monitoring and control in mines, tunnels, and other subterranean settings.



Integration with Widely Used Sensor Systems:

EM-2Q is compatible with a wide range of industry-standard sensors, including multiparameter sondes, ADCPs, and security systems. The system can be easily integrated with existing sensor packs, enhancing its applicability across different monitoring scenarios.

Environmental Resilience: Unlike acoustic and optical methods, EMFS is not impacted by biofouling, turbidity, or environmental noise, ensuring consistent performance in diverse conditions. The wireless nature of the EM-2Q system reduces the physical footprint of monitoring systems, minimizing disruption to natural habitats and aquatic life.

 Airbag Inflation on Demand: For easy maintenance, the system can be deployed with an integrated airbag that brings the submerged EM-2Q, battery, and sonde system to the surface. This feature allows technicians to clean sensors and change batteries from the riverbank, shore or sea by simple retrieval, avoiding the need for divers to enter the water.

APPLICATIONS ACROSS DIVERSE ENVIRONMENTS

Rivers, Lakes, and Coastal Waters & Reservoirs: Ideal for environmental monitoring, pollution tracking, and compliance with global environmental regulations such as the UK Environment Act 2021.

Offshore Wind Farms: Ensures continuous monitoring of marine ecosystems around wind farms, helping to mitigate environmental impacts.

Subsea and Underground: Supports a wide range of applications from offshore energy infrastructure monitoring to underground mining operations.

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CONCLUSION

CSignum's EM-2Q wireless platform revolutionizes environmental monitoring by providing a flexible, reliable, and cost-effective solution for surface water quality monitoring.

Designed to overcome the limitations of traditional wired and wireless communication methods, the EM-2Q utilizes innovative electromagnetic field signaling (EMFS) to transmit data through challenging mediums, ensuring reliable and efficient communication.

Its robust features enable the deployment of numerous sensors with minimal environmental impact, offering continuous, real-time data that is critical for identifying pollution events and implementing effective mitigation strategies.

By proactively complying with regulatory initiatives, such as the UK Environment Act 2021, and effectively addressing the impacts of CSOs, the EM-2Q system ensures the protection of both inland and coastal waters, promoting a sustainable future for our planet.