



Water Quality is Mission Critical



● **JMAR** Technologies, Inc. is revolutionizing the industry with BioSentry™, the world's first real-time, continuous on-line microbial water monitoring system.



The design, operation and maintenance of pharmaceutical-grade water systems are critical to production quality and safety. Even though significant planning and resources are invested in Purified Water and Water for Injection supply needs, relatively little effort is dedicated to improving contamination control, a crucial component of ongoing operations efficiency.

Microbiological contamination is a pressing concern in pharmaceutical water supplies; diligent monitoring is essential. Unfortunately, established methods under perform. Whether the result of sudden breach or random biofilm populations, contaminants are not uniformly distributed. As such, microbes cannot be reliably detected by traditional grab sample analysis. Moreover, in cases where the presence of microbes is detected, the system has undergone many hours of contamination prior to confirmation and subsequent corrective action.

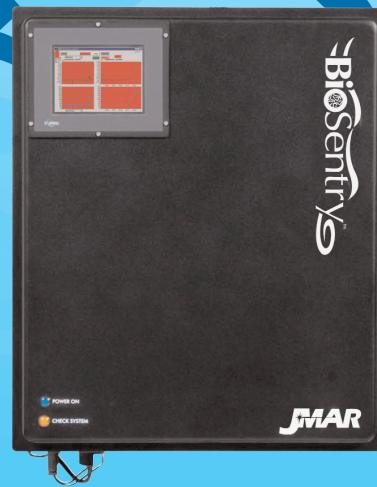
BioSentry™ satisfies the need for rapid, real-time microbiological detection in pharmaceutical processing.

Continuous Monitoring: The Real-Time Solution

JMAR's state-of-the-art BioSentry™ system for detection of waterborne microorganisms utilizes multi-angle light scattering (MALS) technology to continuously monitor your water supply in real time. **Immediate detection and classification integrates true quality control into your process.**

The BioSentry™ Difference: Simply Effective

JMAR has overcome the challenges of traditional grab sample analysis by going directly to the source. Through the use of laser technology to identify the unique bio-optical signatures (BOS) of various microbes, the BioSentry™ detection module is wholly integrated into your water supply system. **Continuous analysis is then available when and where you need it via graphic display, on-line access, email notifications or directly through your information system.**



**EPA Tested
and
Performance
Validated**

Benefits:

- Continuous monitoring detects biological contamination of your process water in real time
- Significantly lowers costs by reducing product loss and product recalls due to contamination
- Monitors effectiveness of water purification processes
- Automated system offers low maintenance and low cost of ownership

Features:

- Provides continuous, on-line, real-time detection and classification of potentially harmful microorganisms
- Total system flow up to 250 ml/min (360 liters per day)
- Inspection volume rate approximately 1 ml per minute (1.4 liters per day)
- Detects and monitors HPCs
- Requires no consumables or reagents for detection
- Low maintenance with automatic cleaning
- Integrates into customer's SCADA or information system
- Uses universal library for detection
- Factory tunable for specific pathogens

Test Method Feature	JMAR BioSentry™	Traditional Microbiology	Rapid PCR	ATP Luminescence	Immunoassay
Sample Type	<i>Continuous flow</i>	Grab sample	Grab sample	Grab sample	Grab sample
Time to Result	<i>Minutes</i>	Hours to days	Hours	Hours	Hours
Performance Approach	<i>Full automation</i>	Manual	Semi-automated	Semi-automated	Semi-automated
Remote Operation	Yes	No	No	No	No
Automated Notification	Yes	No	No	No	No
Customized Thresholds	Yes	No	No	No	No
SCADA/MIS System Compatible	Yes	No	No	No	No
Consumable /Reagent Costs	<i>No Cost</i>	High Cost	High Cost	High Cost	High Cost

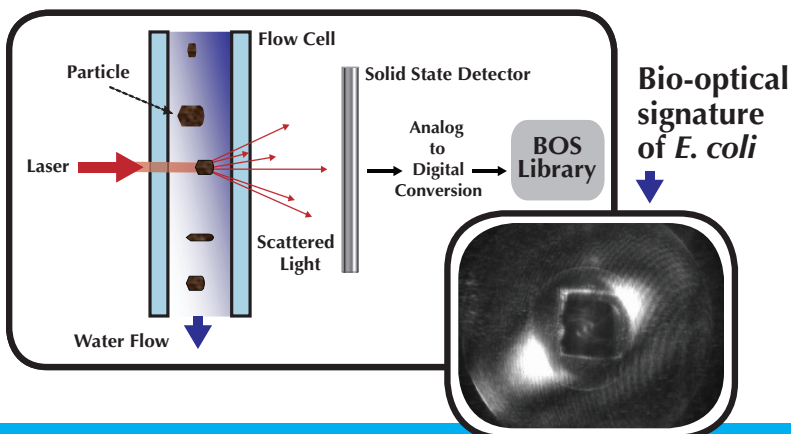
The Only Real-time Solution

BioSentry™ is the first to offer comprehensive, closed-loop, zero-delay contamination notification allowing for immediate corrective action.

Finally, a solution that ensures less downtime, optimal quality control, higher production yields and maximum confidence.

Award-winning Laser-based Technology

The BioSentry™ system from JMAR Technologies provides continuous, on-line, real-time monitoring for waterborne microorganisms, without the need for consumables or reagents. It utilizes laser-produced, multi-angle light scattering (MALS) technology to generate unique bio-optical signatures (BOS) for classification using JMAR's pathogen detection library. **BioSentry™ can immediately detect the presence of microorganisms and offer classification for suspected microorganisms in minutes.**



Applications:

Process Control

- Collects real-time data to provide baseline water quality levels and assess treatment protocols
- Detects the development of biofilms/microorganisms in process water system
- Monitors/measures microbiological quality of treated water before use in manufacturing process

Water Quality

- Post filtration: integrity and performance
- Monitors background flora (bioburden) trends and changes for water quality deterioration.
- Key complement to other water quality monitors

Pathogen Detection Library

Microbial Classification	Detection Library Microorganism	BioSentry™ Classification
Bacteria: Rod Shaped	<ul style="list-style-type: none">• <i>Pseudomonas</i>• <i>Legionella</i>• <i>E. coli</i>• <i>Salmonella</i>• <i>Shigella</i>	Rod-shaped (<i>bacilliform</i> bacteria)
Bacteria: Endospores	<ul style="list-style-type: none">• <i>Bacillus subtilis</i> spores• <i>Bacillus globigii</i> spores• <i>Bacillus cereus</i> spores	Spore-shaped (bacterial endospores)
Protozoa	<ul style="list-style-type: none">• <i>Cryptosporidium oocysts</i>• <i>Giardia cysts</i>	Protozoa-shaped (e.g. <i>Cryptosporidium</i> or <i>Giardia</i>)
Future Library Additions	<ul style="list-style-type: none">• Algae• Yeast & Molds	Currently classified as 'Unknown'

Simple to Install – Simple to Use

The BioSentry™ can be incorporated into most water delivery systems with little effort. Its compact size and rugged construction allows it to fit into confined spaces, while the flexible mount system supports either free-standing or wall-mounted installations. It offers a state-of-the-art touch screen interface which provides a real-time graphical depiction of water status. Information is refreshed in one minute increments and shows relative microbial counts for the species being monitored as well as unclassified microorganisms. At a glance, an operator can identify when concentrations are approaching user-defined thresholds for warning or alert conditions.

Flexible System Configuration

Fully automated and remotely accessible, the BioSentry™ system offers low maintenance and low cost of ownership. It integrates easily into existing SCADA or MIS systems, and can be configured to meet individual requirements for alert thresholds and notification procedures. Alerts can be relayed over a variety of communication protocols including email, encrypted internet, or directly into linked information systems. When an "event" is detected, the system can immediately capture a water sample for validation. **The system can be used both as a contamination alarm and as a biological monitoring device to complement your existing water instruments and quality processes.**

Contamination Detection & Water Quality Monitoring

Purified water is essential in the manufacturing of pharmaceutical and health care products. **Therefore, it is critical to maintain the quality of your process water through constant monitoring for biological contaminants that could result in loss of product, manufacturing recalls, and potential liability for consumer illness.** Most often, bacteria in pharmaceutical water systems exist in the form of a biofilm that attaches to the internal surfaces of the system. This is problematic as the microorganisms tend to be unequally distributed throughout the water system. For that reason, a typical quality sample taken at any given time may not accurately detect the actual level of contamination in the system, and could actually miss a contamination event completely. Because it is a continuous, real-time monitoring system, the BioSentry resolves this issue, efficiently and cost-effectively. With BioSentry, you also receive real-time data that allows you to close the loop on your water treatment process. No more over or under processing. No more guessing as to whether your treatment was completely effective.

Contact us today for more information or a system demonstration.

Additional Markets:

Beverage

- Incoming water or source water
- Water inspection for dilution and prior to beverage mixing
- Water inspection before bottling

Municipal Drinking Water

- Treated water prior to entering distribution
- Water in distribution systems
- Source water monitoring

Water Parks

- Limit widespread illness from *E.coli* and *Cryptosporidium* outbreaks

Water Reuse/Desalination

- Reclaim water/drinking water cross-connection contamination
- Monitor for membrane early break through

Water Security

- Distribution systems
- Military facilities
- Government and "at risk" buildings
- Public Events



JMAR
Advanced Laser &
Sensing Solutions

JMAR Technologies, Inc.
10905 Technology Place
San Diego, CA 92127

www.jmar.com

858-946-6800

biosentry@jmar.com

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