

Image: Ricardo/AdobeStock

Ecoplas Measuring System

Online Monitoring Device for Near Real-Time On-Site Detection of *E. coli* Bacteria

The Ecoplas measuring system is an innovative, compact online analyzer for the detection of *E. coli* bacteria in freshwater. It enables on-site monitoring and measures *E. coli* concentrations without requiring complex culturing procedures or the detection of metabolic products. Instead, bacterial concentrations are determined through shifts in plasmon resonance, while cell viability is assessed via fluorescence emission.

The system operates fully automatically: sampling, measurement, regeneration, and cleaning are performed autonomously on-site. Integrated sample preparation adapts to the respective water quality conditions. The Ecoplas measuring system can be used as a portable unit, a benchtop device, or a floor-mounted system for integration into plant control systems. It is also suitable for remote operation. The system utilizes pre-calibrated sensor substrates and features an integrated self-monitoring function.

The measuring system is suitable for use in standardized monitoring procedures. It provides concentration data for the indicator organism *E. coli,* as specified in relevant regulations and guidelines, including EU 2020/741, EC 2017/C 163/01, 2006/7/EC, and DIN 19650, as well as reference analysis methods such as ISO 9308-1 and ISO 9308-3.

The software supports various operating modes, documentation functions, and user interventions. Measurement data can be exported and displayed in external systems. The device can be operated automatically using adjustable measurement cycles, either through an external control signal or manually.

The estimated purchase price is approximately EUR 50,000, depending on the configuration. The cost per analysis is estimated at ≤ EUR 60.

Applications

Potential application areas include:

- Wastewater treatment process control, particularly in advanced treatment processes and water reuse applications
- Monitoring of irrigation water and service water in agricultural and urban environments
- Surface water and bathing water quality monitoring





Fig. 1: Application examples for the measuring system. Top: Monitoring of irrigation water, e.g., during overhead irrigation of a cornfield. Bottom: On-site monitoring of water quality at the waterbody. (Images: Lumin Osity/Unsplash, kaninstudio/Adobe Stock)

Advantages: Resource-efficient operation with low maintenance requirements

- Fully automated on-site analysis system with remote-control capability
- Pre-calibrated sensor substrates
- Adjustable cleaning modes to prevent fouling
- Reduced consumption of consumables with low waste generation
- Low operating costs, with maintenance typically required only once per year
- Up to one month of maintenance-free operation with respect to consumables and sensor chips when measuring once per day

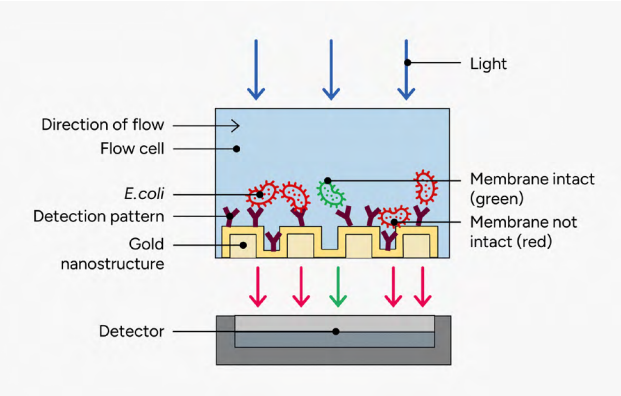


Fig. 2: Operating principle of *E. coli* detection based on concentration and cell viability. (Image: Fraunhofer IKTS)

Technical Specifications

Measurement principle	Shift in plasmon resonance followed by cell viability determination via fluorescence emission
Measurement range	10–10,000 CFU/100 ml
Measurement uncertainty	±10% (minimum detectable concentration: 10 CFU/100 ml)
Installation requirements	Protected environment; temperature 10–30°C; non-condensing humidity
Sample volume	100 ml
Analysis duration	30 minutes to a maximum of 2 hours, depending on the measurement run
Power supply	230 V AC or autonomous battery-powered operation, if required

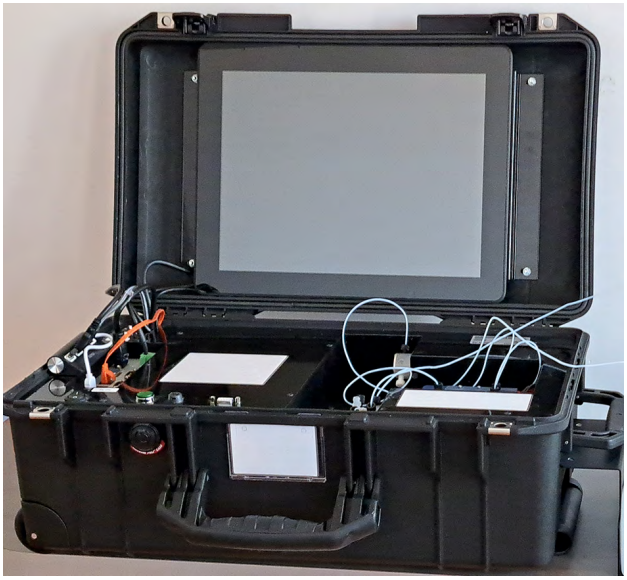


Fig. 3: Mobile application of the Ecoplas measuring system in a protective transport case. (Image: ECH)

Contact

Ecoplas measuring system:

Dr. Michael Hahn
ECH Elektrochemie Halle GmbH
Otto-Eißfeldt-Straße 8
06120 Halle (Saale), Germany
michael.hahn@ech.de

Responsible for user dialogue:

Dr. Martina Winker
Institute for Social-Ecological Research (ISOE)
Hamburger Allee 45
60486 Frankfurt am Main, Germany
martina.winker@isoe.de

With funding from the:

Federal Ministry of Research, Technology and Space

Note: The Ecoplas measuring system is currently under development and is not yet commercially available. Consequently, several of the specifications presented above represent target values defined by the research consortium. The development of the Ecoplas measuring system is being funded through the research project *Ecoplas – Measuring System with a Plasmonic Sensor for On-Site Analysis of E. coli Contamination for Water Reuse* by the Federal Ministry of Research, Technology and Space (BMFTR) of Germany under its Quantum Systems funding programme.