Application Note

# Continuous Online Monitoring of Dairy Wastewater



## Introduction

One of the United Kingdom's leading dairy manufacturers produces a wide range of fresh dairy products, including drinking milk, cream and butter. As with most dairy processing facilities, wastewater generation is an integral part of daily operations. The resulting effluent is characterised by highly variable flow rates and pollutant loads, with elevated concentrations of organic matter originating from milk residues, fats, proteins, lactose and cleaning chemicals used during Cleaning-in-Place (CIP) operations.

Due to these fluctuating wastewater characteristics, effective treatment and continuous monitoring are essential to ensure stable plant operation and compliance with increasingly stringent environmental regulations. Even relatively small production losses or cleaning events can significantly influence wastewater quality, making real-time process information highly valuable for plant operators.

The facility operates its own on-site Effluent Treatment Plant (ETP), consisting of a **Dissolved Air Flotation (DAF)** unit for the removal of suspended solids and fats, followed by biological treatment to reduce the remaining organic load and nutrients. The treated effluent is ultimately discharged into a nearby river under a discharge permit issued by the Environment Agency (EA), requiring continuous compliance with strict environmental limits.

Historically, wastewater quality was assessed through routine laboratory analysis. While this approach provided reliable analytical data, it offered only periodic snapshots of process performance and required significant operator involvement. As environmental legislation evolved and monitoring requirements increased, the customer sought a fully automated online monitoring solution capable of delivering continuous, high-quality analytical data while simultaneously reducing manual laboratory workload and supporting proactive process management.

## Background

Prior to this project, the dairy relied on **Hach® benchtop laboratory instruments** for routine wastewater analysis. These instruments provided accurate and dependable measurements of key water quality parameters; however, the monitoring programme depended on manual sampling, laboratory preparation and periodic analysis. Consequently, operators only received delayed information regarding process performance and discharge quality.

The introduction of updated **Best Available Techniques (BAT)** conclusions and the associated **Best Available Techniques Reference Document (BREF)** for the Food, Drink and Milk Industries significantly increased the site's environmental monitoring obligations. In addition to routine Chemical Oxygen Demand (COD) analysis, the customer was now required to perform substantially more frequent measurements of **Total Nitrogen (TN) and Total Phosphorus (TP)** to demonstrate continuous compliance with environmental discharge permits.

These new regulatory expectations highlighted the limitations of traditional laboratory monitoring. The customer required a solution capable of providing continuous, automated measurements, allowing operators to identify changing process conditions immediately rather than waiting for laboratory results.

Beyond regulatory compliance, the customer also recognised the operational advantages of continuous monitoring. Real-time analytical data would improve visibility of treatment plant performance, enable faster responses to process disturbances and provide comprehensive documentation of discharge quality for the Environment Agency.

Several analytical suppliers were evaluated during the procurement process. Hach was ultimately selected based on its extensive experience in industrial wastewater applications, the proven robustness of its analytical technologies and the confidence provided by its long-term service organisation and technical support network. According to the customer, the principal competing solution originated from an unknown Chinese manufacturer and did not provide the level of reliability or long-term confidence required for a critical environmental compliance application.

The installation was completed in close cooperation with the appointed system integrator, who incorporated the online analysers into the existing effluent treatment plant and plant control system, ensuring seamless communication with the site's operational infrastructure.

During the engineering phase, an integrated **BioTector B7000 TOC/TN/TP** analyser was initially considered as a potential single-instrument solution. Following discussions with Hach Tier 2 Technical Support, this approach was reviewed in greater detail. Due to the possibility of residual milk components remaining within the treated wastewater, there was an increased risk that a combined nutrient analyser could require additional maintenance or experience reduced long-term operational stability. To maximise analytical reliability, simplify maintenance activities and ensure long-term instrument availability, Hach recommended the use of dedicated analysers for each nutrient parameter. This solution provided greater operational resilience while maintaining the highest level of analytical performance.

## Solution Details

The final installation consists of four complementary Hach online analysers, each selected to provide continuous monitoring of critical wastewater parameters immediately before the treated effluent is discharged to the receiving river.

### BioTector B7000i Dairy Analyser

The organic load of the treated effluent is continuously monitored using a **BioTector B7000i Dairy Analyser**. Designed specifically for dairy wastewater applications, the analyser is capable of handling samples containing fats, proteins, lactose and other complex organic compounds that are typically difficult for conventional TOC analysers.

The BioTector employs Hach's innovative **Two-Stage Advanced Oxidation (TSAO)** technology, delivering highly reliable Total Organic Carbon (TOC) measurements with minimal maintenance requirements. Continuous TOC monitoring enables operators to verify treatment performance, detect unexpected product losses or process upsets and demonstrate compliance with discharge requirements.

The selection of the Dairy version of the BioTector ensures optimum performance in applications where residual milk contamination may occasionally occur.







### EZ Total Nitrogen Analyser

Continuous measurement of **Total Nitrogen (TN)** is provided by an **EZ Total Nitrogen Analyser**. The instrument performs automatic online analysis of nitrogen concentrations, supporting compliance with updated BAT and BREF monitoring requirements while providing valuable insight into the efficiency of biological nutrient removal.

Continuous TN monitoring allows operators to identify treatment performance trends and respond rapidly to any deterioration in biological treatment efficiency before regulatory limits are approached.

### EZ Total Phosphorus Analyser

An EZ Total Phosphorus (TP) Analyser continuously measures phosphorus concentrations in the final treated effluent.

The analyser supports regulatory compliance by providing **reliable online TP measurements** and reducing the need for manual laboratory testing. Together with the TN analyser, it enables comprehensive nutrient monitoring and provides continuous evidence of compliance with environmental discharge permits.







### NH6000sc Online Ammonium Analyser

To complement the total nitrogen measurement, the installation also includes an NH6000sc online ammonium analyser.

**Continuous ammonium ($NH_4$-N) monitoring** provides valuable information on the performance of the biological treatment process, particularly the nitrification stage. Elevated ammonium concentrations can indicate biological process disturbances or insufficient treatment capacity. Real-time monitoring enables operators to identify these issues immediately and take corrective action before permit limits are exceeded.

When combined with the Total Nitrogen analyser, the NH6000sc provides a comprehensive understanding of nitrogen removal performance throughout the treatment process.




## Future-Proof System Design

An important feature of the installation is the decision to supply both the **BioTector B7000i Dairy** and the **EZ nutrient analysers** as **dual-channel instruments**.

Currently, the analysers continuously monitor the final treated effluent prior to discharge into the receiving river. However, the facility also operates a separate sewer discharge under an independent environmental consent.

By selecting dual-channel analysers during the initial project, the customer has effectively future-proofed the monitoring system. Should future monitoring requirements expand, the second discharge can simply be connected to the existing analysers without the need for additional analytical equipment.

This forward-looking design provides significantly greater operational flexibility while reducing future capital expenditure and installation costs. It also allows monitoring strategies to evolve alongside changing regulatory requirements with minimal disruption to plant operations.

## Customer Benefits

The implementation of Hach's continuous online monitoring solution has fundamentally transformed the site's approach to wastewater management and environmental compliance.

Instead of relying solely on periodic laboratory measurements, plant operators now have access to continuous, **real-time analytical data for TOC, Total Nitrogen, Total Phosphorus and Ammonium**. This continuous visibility provides a far more complete understanding of treatment plant performance throughout the day, allowing trends and abnormal events to be identified immediately.

Early detection of process disturbances enables operators to respond before problems develop into permit exceedances or production interruptions. This proactive approach not only reduces environmental risk but also improves the stability and efficiency of the biological treatment process.

The automation of routine measurements has substantially reduced the workload associated with manual sampling and laboratory analysis, allowing laboratory personnel to focus on higher-value analytical activities while maintaining full confidence in regulatory compliance.

Furthermore, continuous online monitoring provides comprehensive documentation of discharge quality, simplifying reporting requirements for the Environment Agency and demonstrating ongoing compliance with environmental permit conditions.

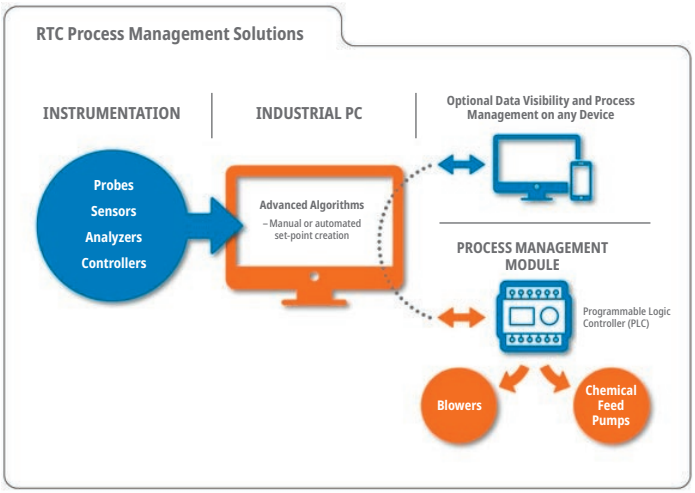
The successful completion of this project clearly demonstrates the benefits of integrating advanced online process analysers into modern dairy wastewater treatment plants. By combining robust analytical technology with expert application support and long-term service, Hach has delivered a reliable monitoring solution that supports regulatory compliance, improves operational efficiency and provides the customer with confidence for future environmental challenges.

## Comprehensive Portfolio and New Products

At Hach, we provide a comprehensive portfolio of laboratory instruments, online process analysers, digital sensors, software platforms and **Real Time Control (RTC)** solutions that help customers optimise water quality monitoring and wastewater treatment processes across a wide range of industries.

Our commitment to continuous innovation ensures that customers benefit from the **latest analytical technologies**. Recent developments, including the **DR4900 Spectrophotometer**, further enhance laboratory productivity, analytical accuracy and ease of operation while complementing online process monitoring solutions.

Whether supporting regulatory compliance, improving treatment efficiency or reducing operational costs, Hach solutions are designed to deliver reliable analytical data that enables informed operational decision-making.






DR4900
Spectrophotometer



## Ask the Experts

If you would like to learn more about our products, explore additional application examples or discuss how Hach solutions can improve process performance, regulatory compliance and operational efficiency at your facility, please contact us.

Our water quality specialists are ready to help you identify the most suitable analytical solution for your specific application and operational requirements.

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