



## Wet chemistry and enzyme analysis

# Riding the dairy megatrend: Are your wet chemistry analysis and enzyme analysis workflows holding you back?

Consumers are increasingly willing to pay for healthier food and beverage products that are low in sugar, high in fiber, and have minimum lactose content. For dairy manufacturers, these trends present opportunities to introduce innovative products, such as lactose-free milk and cheese, low-calorie yogurt and ice cream, as well as goods high in protein for muscle gain or prebiotic dietary fiber for better gut health.

Dairy products are chemically complex, containing multiple components such as sugars, fats, and proteins—all of which must be analyzed both during and after production to ensure consistency and quality. Additionally, various dairy enzymes, including lactase, lipases, proteases, esterases, and catalases, must also be analyzed. These enzymes play a key role in product processing, enabling manufacturers to achieve desired taste, texture, and nutritional properties, as well as making production more efficient by increasing speed and yields while reducing waste.

To capitalize on increased consumer demand for innovative dairy products, manufacturers, therefore, require high-throughput, multi-parameter wet chemistry and enzyme analysis capabilities—not only for process intermediate monitoring and quality control but for regulatory compliance, too. Importantly, these workflows must be low-cost, efficient, and expandable to support continued growth in this evolving market.

## The limitations of traditional wet chemistry analysis techniques

Traditional methods for process intermediate and quality control of dairy products are based on wet chemical analysis using titration and continuous-flow techniques. The most common types of continuous-flow technologies are flow injection analyzers (FIAs) and segmented flow analyzers (SFAs).

While these technologies are effective for testing specific parameters, they are associated with several limitations. Typically, FIA and SFA systems are built from modules customized to analyze specific chemistries. If additional analyses are needed (for example, when developing a new product), the relevant modules must be purchased and incorporated within the system. This lack of flexibility can be a major challenge for manufacturers seeking multi-parameter testing, requiring multiple technologies and techniques. This can result in long hands-on sample and response times, reduced throughput, and increased per-analysis costs.

Given the complexity of FIA and SFA systems, their operation and maintenance can also be resource-intensive, necessitating ongoing investment in training for laboratory personnel. Moreover, because continuous-flow methods rely upon visual detection of liquid samples, they utilize large quantities of reagent. This not only contributes to high consumable usage costs but also generates substantial amounts of waste which must be properly disposed of.

## Flexible, multi-parameter, high-throughput dairy product analysis

Multi-parameter testing using discrete analyzers provides a flexible and expandable solution to the challenge of dairy product process intermediate monitoring and quality control. The **Thermo Scientific™ Gallery™ and Gallery™ Plus Discrete Analyzers** are integrated, automated platforms for routine wet chemistry analysis, enabling simultaneous analyses of up to 20 parameters in a single instrument.

More than 50 ready-to-use colorimetric and enzymatic reagents and standard solutions are available for the analyzers to support a comprehensive range of testing parameters, including:

- Organic acids
- Sugars (including lactose, galactose, fructose and glucose)
- Sulfate, chloride, phosphate, nitrite, and nitrate
- Divalent ions (e.g., calcium and magnesium)
- Urea
- Total proteins
- pH and conductivity

As fully automated platforms, the Gallery and Gallery Plus analyzers ensure each test is performed according to precise, pre-defined workflows. Once reagents are loaded into the analyzer, these workflows require no user intervention, and can be left unattended, boosting laboratory productivity by freeing staff to work on other tasks. This ease of use also substantially reduces training requirements, helping laboratories achieve more with their existing resources.

The Gallery and Gallery Plus analyzers are capable of performing up to 350 tests per hour using a maximum of 300 µL of reaction liquid volume (sample volume is max 120 µL) per test. As a result, they also help reduce waste and are associated with per-analysis costs 10–20 times lower than those of traditional wet chemistry methods.

## Dairy enzyme analysis using automated enzyme analyzers

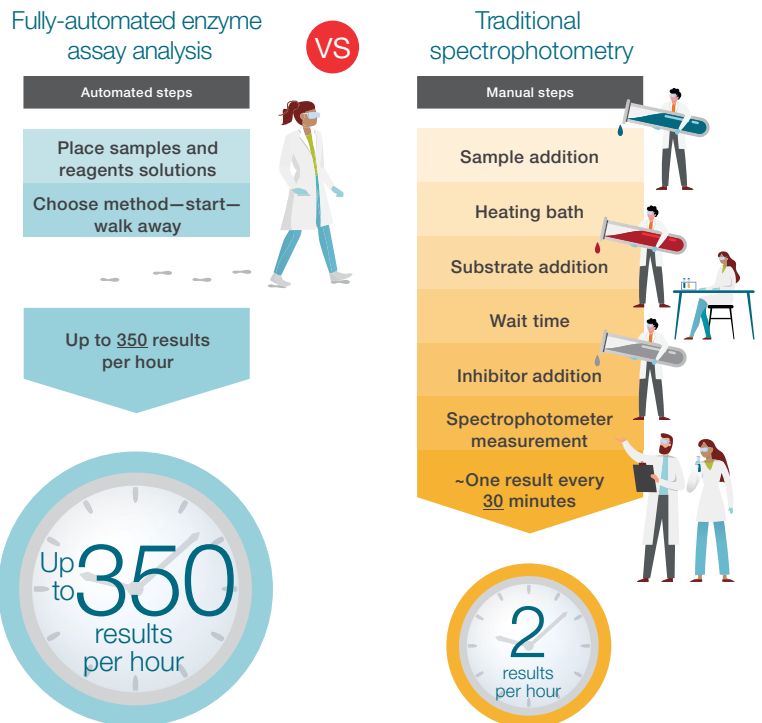
Enzyme analysis has long played a key role in dairy manufacturing. However, its application has become increasingly important given the increased demand for innovative dairy products. Take lactose-free milk, for example; the production of which relies on lactase to

minimize lactose content. As enzyme processing can be sensitive to manufacturing conditions, factors such as temperature must be carefully controlled to maximize enzyme efficacy. Without effective enzyme activity monitoring, the production of these innovative dairy products can result in waste and increase costs.

The Gallery and Gallery Plus analyzers provide a convenient solution to this challenge. In addition to routine wet chemistry analysis, the analyzers offer automated enzyme analysis as an additional feature for dairy product and process development, application development, and quality testing.

The **Thermo Scientific™ Gallery™ Enzyme Master and Gallery™ Plus Enzyme Master Enzyme Analyzers** are the first automated discrete analyzers designed specifically for enzyme assay applications. By automating the key steps involved in enzyme analysis, including liquid handling, incubation time, and incubation temperature, Gallery Enzyme Master enzyme analyzers provide precision control over the key variables affecting assay results, making method development faster and routine enzyme analysis more convenient. The speed and simplicity of these automated systems means analysts can generate up to 350 results per hour. By comparison, traditional spectrophotometric methods typically take around 30 minutes to produce a single result.

## Time and sample comparison of automated technology and traditional spectrophotometry

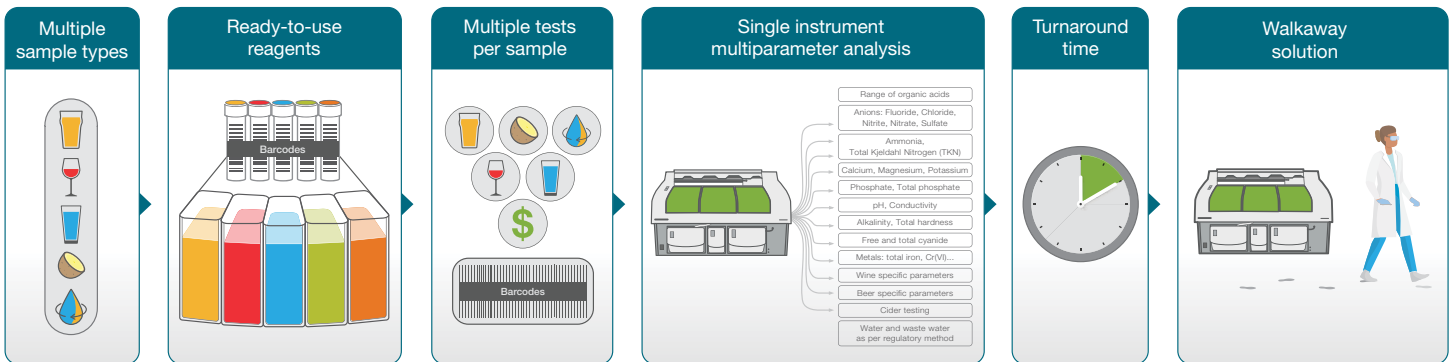


## Flexible and efficient dairy product analysis workflows

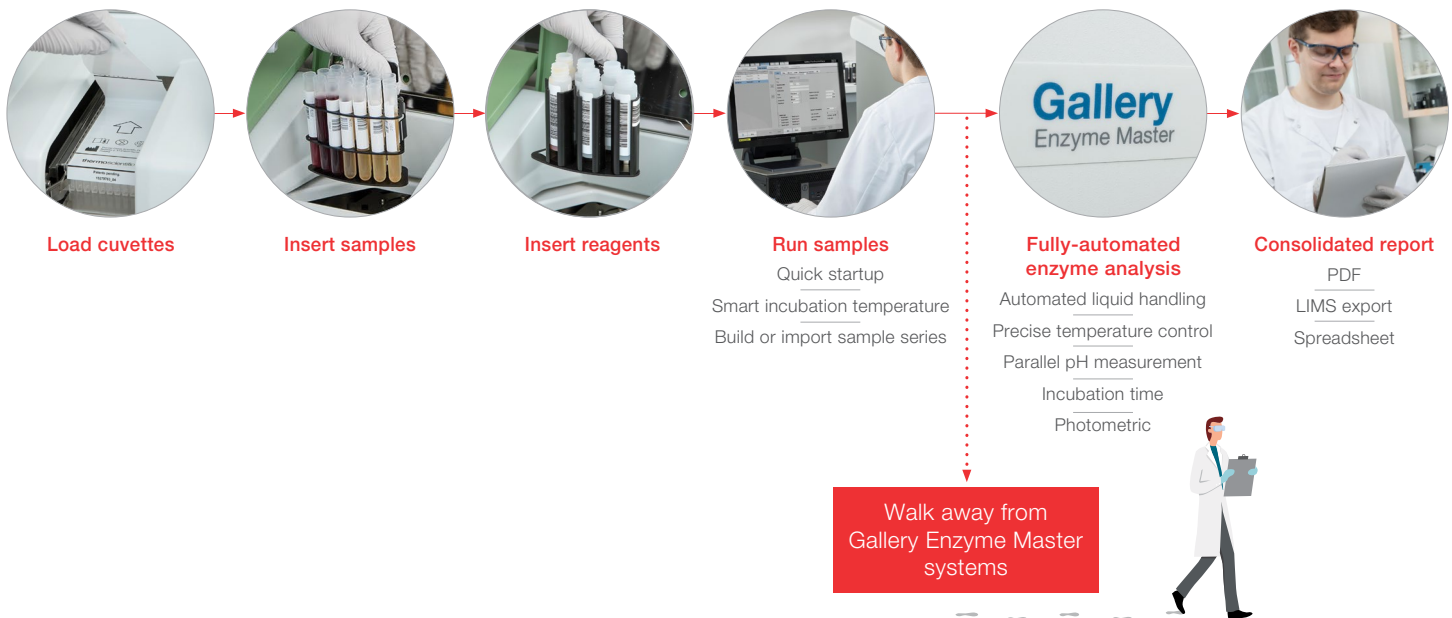
Growing consumer appetite for innovative milk-based food and beverages provides an opportunity for dairy manufacturers to expand their product offering. Modern discrete analyzers for routine wet chemistry and enzyme analysis provide a flexible and convenient solution for multi-parameter testing, helping manufacturers expand and scale to capitalize on the next dairy megatrend.

Looking to streamline dairy product quality control and process intermediate monitoring? See how discrete analyzers could make your **automated wet chemical analysis** and **enzyme analysis** workflows more flexible and efficient.

### Wet chemistry analysis workflow



### Enzyme analysis workflow



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