

QUALITY CONTROL IN A Dairy Plant

Introduction to the Market



Quality Control in a Dairy Plant

Dairy products are a common staple and important part of our diet. Globally, over 300 million metric tons of milk were produced in 2014. This production of raw milk was then processed into fresh pasteurized milk, milk powders and whey products, butter, cheeses, yogurts and cultured products, and many other end products for consumers.

As raw milk is a commodity, many dairy products are very price-competitive and consistent and efficient production is required to make a profit. Many dairy products such as milk powders are also sold based on quality parameters, and thus accurate analysis is also a key factor to producing consistent product

Process Control Analysis Points in a Dairy Plant

In many dairy plants, the raw milk is processed through a separator to remove the cream (40% butter fat). If fluid milk is being produced, the cream is added back in to produce milk of the desired fat content. The milk can then be further processed into milk powders through the use of spray and / or oven drying, cheeses or cultured products.

During cheese production, raw or pasteurized milk of specific fat and solids content is acidified and a starter added to curdle the milk. The curd is eventually separated from the liquid (whey) and processed into various types of soft and hard cheeses. The whey is usually dried to produce whey powders, which is used as a protein source and a food additive.

Butter, ice cream and cultured products are made from the cream and various mixtures of the milk components blended together to form specific compositions.

For all dairy products, virtually every step and ingredient must be of a specified quality and composition to produce a consistent end product. Strict control of the incoming materials maximizes the production from expensive ingredients.



NIR analysis is a proven technique that provides simultaneous results for moisture, protein, fat, lactose, solids and other parameters in under a minute. Applications and measuring points for the dairy plant include:

- Liquid milk can be analyzed for fat pre-separator or at any time in the fluid milk process.
- Milk powders are for moisture, protein, fat and lactose.
- Liquid whey can be analyzed for total solids to help optimize the drying process.
- WPC or MPC are analyzed for moisture, fat and protein after the dryer to ensure target levels and proper drying.
- Cheese is analyzed after curding or during aging processes for moisture, fat and protein.
- Butter is analyzed for solids, fat and salt after the churn to ensure product specifications are met.
- Ice cream mixes can be analyzed to ensure proper formulation before production, reducing waste and re-work.

The speed of analysis allows 100% measurement of incoming ingredients and finished products. Raw ingredients suppliers can be verified to ensure they are providing quality materials, ensuring production and product consistency and reducing re-work and discard costs. Final products can be monitored to ensure product quality targets and labeling requirements are met while and optimize the manufacturing process.

Value Proposition



Moisture Control

A very common application for dairy plants is to measure the moisture of MPC, WPC and other powders coming out of the dryer. Too much residual moisture in the sample will lead to spoilage problems, handling issues and possibly violate labeling specifications. Over-drying the sample wastes energy and raises the cost of the product as it is sold by weight and the proper level of moisture is not included. A difference of even 0.5% in moisture has huge profit implications for the plant and can translate to a payback time of a couple of months in a medium sized plant.

MPC and WPC Protein Control

MPC and WPC powders are usually sold based on a specified protein level. At-line analysis of dried protein concentrates can instantly verify the protein levels and ensure that the product is properly binned to the specified protein level. Timely analysis of the powders will reduce re-work and claims, significantly lowering costs for the plant.

Liquid Whey Analysis

Liquid whey can be analyzed immediately after the curds have been separated and at each stage through the drying process. Obtaining total solids and protein values during this process allows the plant operators to adjust and optimize the process to maximize yield of correct products at optimal efficiency. This will result in significant energy savings and less waste to animal feed or discard.



Unity Solutions to this Industry



Dairy Plant Solutions

Unity Scientific offers a variety of ready-to-use solutions tailored to the dairy industry, including models ready to analyze liquids, powders and slurries. All of our dairy analyzer packages start with the SpectraStar XL analyzer, an advanced, high performance at-line scanning monochromator. All SpectraStar XL models come standard with the following features:



- TRUE NIR™ Spectrometer for ultra-performance
- Advanced TRUE NIR detector and electronics for low noise and high repeatability
- 17" high resolution touch screen for intuitive, easy operation
- Fast Windows®7 computer with Solid State Drive for reliability and speed
- Sealed case for reliable operation at-line
- 5 W 10,000 hr lamp
- Unity Check Cell for daily performance validation

Unity Scientific offers several analyzer packages in support of the dairy plant industry. Each analyzer package comes complete with Unity Calibrations for the products of interest and include 1 year calibration development and validation support to ensure smooth and rapid implementation.

All Unity dairy analyzers are based on the SpectraStar Analyzer, featuring a sealed analyzer case and touch screen operation ready for at-line process control in dairy plants. The dairy analyzer packages are offered in two configurations:

The **US-1400-DRY1 Dairy Powder Analyzer Package** includes

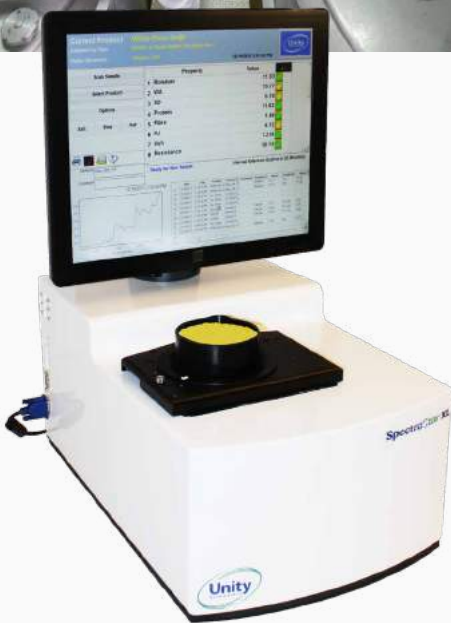
- SpectraStar 1400XL (Static) and powder cups US-MPCP-0001
- Unity calibrations for non-fat dry and whole milk powder, WPC powder, MPC 56 and MPC 70
- 1 year free calibration development and validation support

The **US-2500-DRY1 Dairy Analyzer Package** includes:

- SpectraStar 2500XL, large open sample cup (US-LGOP-0001), 25mm cup (US-SRCP-0025), gold reflector stand (US-TSTD-0003)
- Adapter ring for Standard Petri Dish
- Unity calibrations for non-fat dry and whole milk powder, WPC powder, MPC 56 and MPC 70, Ice cream mix, cheese, butter – salted and butter – non-salted
- 1 year free calibration development and validation support

The **US-2500-DRY2 Whey Processing Analyzer Package** includes:

- SpectraStar 2500XL-R, large open sample cup (US-LGOP-0001), 25mm cup (US-SRCP-0025), gold reflector stand (US-TSTD-0003)
- Adapter ring for Standard Petri Dish
- Unity calibrations for liquid whey protein concentrate and various whey protein powders
- 1 year free calibration development and validation support



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