



Quality Control in a Dairy Plant

APPLICATION BRIEF

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.



WHAT IS NIR ANALYSIS?

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.



SpectraStar™ XT Series NIR Analyzers, shown above, offer outstanding accuracy and reliability for rapid compositional analysis of solid, slurry, or liquid samples.



VALUE PROPOSITIONS FOR NIR IN CEREAL PLANTS

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.

ABOUT THE SPECTRASTAR™ XT SERIES NIR ANALYZER

From analyzing moisture, protein, fat, sugar, and fibers, to more complex parameters such as ash, fatty acids, and lignin, the SpectraStar™ XT NIR Analyzer Series is trusted by thousands of quality laboratories and production facilities to enhance their processes and make data-driven decisions.

- Obtain vital quality parameter data in about 30 seconds, enabling quick response for quality control.
- Access an extensive library of robust calibrations developed from hundreds-to-thousands of samples. Calibration customization is also available.
- Minimal sample preparation, only minimal training required, and environmentally friendly.
- Available with KPMLink™, a cloud-based software suite to support the real-time remote configuration of product settings, calibrations, and more.



Ready-to-Use SpectraStar XT-R Calibrations for Dairy Product Manufacturers

SUBSTANCE	CONSTITUENTS	SAMPLING ACCESSORIES	PART NUMBER
Butter Milk Powder	Moisture, Fat, Protein	US-LGOP-0001 Large Open Cup with plunger	APPS-CALB-029
Cheddar Cheese	Solids, Fat, Salt, pH	US-LGOP-0001 Large Open Cup with plunger	US-CALB-228
Cheese - Various	Moisture, Fat, Salt, pH	US-LGOP-0001 Large Open Cup with plunger	US-CALB-231
Cheese Mix Europe	Moisture, Fat, Protein, Total Solids, Salt, Acidity, pH	US-LGOP-0001 Large Open Cup with plunger	APPS-CALB-037
Cheese Powder	Moisture, Fat	US-LGOP-0001 Large Open Cup with plunger	APPS-CALB-070
Cottage Cheese	Moisture, Fat, Protein, Acidity	US-LGOP-0001 Large Open Cup with plunger	APPS-CALB-045
Cream	Fat	US-SRCP-0025A Small Round Cup 25mm (and 0.3mm reflector)	APPS-CALB-072
Dairy Powders	Moisture, Protein, Fat, FFA, Ash, Lactose	US-LGOP-0001 Large Open Cup with plunger	APPS-CALB-069
Greek Yogurt	Protein, Fat, Total Solids	US-ISIH-0307 Ring cup or US-SRCP-0025A Small Round Cup 25mm	APPS-CALB-077
Ice Cream Mix	Solids, Fat	US-SRCP-0025 Small Round Cup, 25 MM Height	US-CALB-225
Infant Formula Powder	Moisture, Protein, Fat	US-LGOP-0001 Large Open Cup with plunger	US-CALB-229
Liquid Milk	Fat, Protein, Carbohydrates, Lactose, Total Solids	US-SRCP-0025A Small Round Cup 25mm (and 0.2mm reflector)	APPS-CALB-060
Liquid Whey	Protein, Solids, Fat	US-LIQK-0003 Liquid Sampling Kit	US-CALB-233
MPC 56	Moisture, Fat, Protein	US-LGOP-0001 Large Open Cup with plunger	US-CALB-223
MPC 70	Moisture, Fat, Protein	US-LGOP-0001 Large Open Cup with plunger	US-CALB-224
Processed Cheese	Moisture, Fat, Salt, pH	US-ISIH-0307 Ring cup	US-CALB-232
Quark	Moisture, Fat, Protein, Acidity	US-LGOP-0001 Large Open Cup with plunger	APPS-CALB-121
Salted Butter	Solids, Fat, Salt	US-ISIH-0307 Ring cup	US-CALB-226
Skim Milk Chocolate	Fat	US-SRCP-0025A Small Round Cup 25mm (and 0.2mm reflector)	APPS-CALB-118
Skim Milk Powder	Moisture, Protein, Fat, Lactose	US-LGOP-0001 Large Open Cup with plunger	US-CALB-220
Sweet Whey	Moisture, Protein, Fat	US-LGOP-0001 Large Open Cup with plunger	APPS-CALB-149
Sweetened Condensed Milk	Fat, Solids, Sucrose, Protein	US-SRCP-0025A Small Round Cup 25mm (and 0.2mm reflector)	APPS-CALB-040
Unsalted Butter	Solids, Fat	US-ISIH-0307 Ring cup	US-CALB-227
Various Cheeses	Moisture, Fat, pH, Salt, Protein	US-LGOP-0001 Large Open Cup with plunger	APPS-CALB-006
Whole Milk Powder	Moisture, Protein, Fat, Lactose	US-LGOP-0001 Large Open Cup with plunger	US-CALB-221
WPC Powder	Moisture, Fat, Protein, Ash	US-LGOP-0001 Large Open Cup with plunger	APPS-CALB-012

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