Quality Control in a Chocolate / Cocoa Plant

Cocoa is a commodity used as an ingredient in many food products as well as in chocolate manufacturing. Variations in the raw materials and processing steps creates cocoa and chocolate of varying properties. Quality is a key driver in the cocoa processing and chocolate manufacturing industries, both as payment criteria as well as final product quality control.

Fast, accurate analysis is critical for both cocoa processors and chocolate manufacturers to optimize their process and insure quality. Optimizing the process will save the plant time and money and provide very rapid payback. Near Infrared (NIR) analysis is a proven technique designed to provide fast, accurate, and reliable results for the cocoa industry.

Process Control in a Cocoa Processing Plant

There are multiple points in the cocoa processing and chocolate manufacturing procedures where accurate and timely analytical values can help control the process, saving money and improving quality. In addition, intermediate products in the process are sold based on quality parameters such as fat content, and real time analysis of these samples can help optimize the yield of high quality product.
Cocoa Process

Incoming cocoa beans are roasted and undergo a winnowing process to remove the shells. The cocoa beans can be analyzed for moisture at intake to determine the quality and to monitor the roasting process.

The resulting product is called nibs and can be analyzed for moisture and oil content to predict the quality of the resulting liquor.

The nibs are ground into cocoa liquor or mass, which at slightly elevated temperature is a thick liquid. The cocoa liquor can be analyzed for fat and moisture to determine its quality, and it is sold based on its fat content.

Cocoa liquor can then be pressed into cocoa butter and pressed cake, which in turn can be ground into cocoa powder. Cocoa butter can be analyzed for free fatty acids and iodine value which relate to the melting characteristics of the butter. The cocoa powder can be analyzed for fat, the basis on which it is sold.

To make chocolate, cocoa liquor is mixed with sugar and cocoa butter to produce the final product. Chocolate can be analyzed for fat, moisture and sugar. Chocolate is typically sold by fat content, which is controlled by the addition of expensive cocoa butter.

Value Proposition

Cocoa processing requires consistent control and management of expensive fat across all areas of the process. Cocoa liquor is frequently sold on the basis of fat content, and processing the liquor involves maximizing the production of expensive fat while producing cocoa powder to specification.

Typical cocoa powder is sold as containing 10 - 12% cocoa butter. When cocoa butter prices are high, as they are in 2014 at over $7,000 / ton, there is a large financial benefit to a complete press of the liquor to remove the maximum amount of cocoa butter, selling 10% cocoa powder. Accurate analysis of these products and tight control of the process will yield more expensive cocoa butter and in-spec cocoa powder.

In Chocolate processing, the quality of the ingredients can be evaluated before mixing to reduce re-work and rejected batches. The chocolate itself can be analyzed for sugar and fat to precisely control the quality of the final product and maximize the use of expensive cocoa butter.
Unity Solutions to this Industry

Chocolate / Cocoa Plant Solutions

Unity Scientific offers a variety of ready-to-use solutions tailored to the chocolate / cocoa plant industry. All of our chocolate / cocoa analyzer packages start with the SpectraStar XT analyzer, an advanced, high performance at-line scanning monochromator. All SpectraStar XT models come standard with the following features:

- TRUE ALIGNMENT® Spectroscopy technology with best performance in the industry
- Advanced dual-cooled InGaAs detector and custom 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 TAS standards for instrument alignment and performance validation

Robust and Ready to Use for At-Line or Lab Use

The Unity Chocolate Analyzer is robust enough to be used both at-line or in the lab. The system features a long life lamp and no air filter or fan, providing for very low cost of ownership. The built in computer is fully networkable and LIMS compatible, allowing for plant management to immediately access results. The Chocolate Analyzer is a valuable tool to control every step in the chocolate manufacturing process, from incoming ingredients to final product verification.

Unity Chocolate / Cocoa Analyzers are based on the SpectraStar Analyzer, featuring a sealed analyzer case and touch screen operation ready for at-line process control in Chocolate / Cocoa plants. The Chocolate / Cocoa analyzer packages are offered in the following configuration:

The Chocolate Analyzer package includes the following:

- SpectraStar 1400 XT (1400 nm - 2500 nm) with built in 17” touch screen, prediction software, multi-cup adapter, US-RTIR-0016 adapter ring, Unity check cell, Unity R99 standard.
- 5 Ring cups US-ISIH-0007 for the analysis of powders
- Large cup US-LGOP-0001 for analysis of cocoa beans
- Small cup US-SRCP-0025 for analysis of powders and cocoa butter
- Gold Reflector US-TSTD-0005 for analysis of cocoa butter and liquor
- Unity Chocolate Calibration package for cocoa, chocolate and ingredients