

KLED 70 F

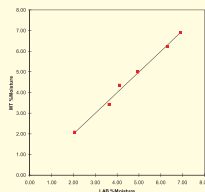
Non Contact Near Infrared (NIR)
Online Moisture Transmitter

Moisture and Fat in Biscuits and Cookies

A rapid moisture measurement taken at line, and in some instances on line, will not only lead to increased productivity and reduced energy costs, but will also result in a more consistent high quality product with greater shelf life. A fat measurement can be made simultaneously and is of value for labeling and quality assurance.

Biscuit Manufacturing Process : Production lines vary, but essentially comprise the following elements: mixer, dough dump station, lay time conveyor, lift conveyor, rotary molder, wire-cut machine, dispenser and oven.

Measurement Location and Performance : Measurements are typically made off-line, and can be made on whole or crumbed biscuits. The moisture read-out is instantaneous. At-line measurements are practical as measurements can be made on products from multiple production lines by simply selecting the different product calibration. Therefore, erroneous measurement through non-equilibration of the product is eliminated.



	Product	Cookies/Biscuits with no Inclusions	Cookies/Biscuits with added Chocolate Chips, Raisins, etc.
	Moisture Range %	Accuracy (+/-)	Accuracy (+/-)
Moisture	2-12% (product dependent)	0.1%	0.15 – * 0.6%
Fat	20-25%	0.2%-0.3%	0.3-0.5%

The best accuracies are achieved with crumbed cookies/biscuits in the case where they contain added nuts, chocolate, etc.

Moisture in Corn Flour

Moisture content of the meal or flour needs to be kept below a certain percentage in order to prevent spoiling within the storage bins. Typically moisture levels should not exceed 14% for the coarsely ground material, and 10% for the fine flour.

Corn Refining Process : Corn Dry Milling grinds corn into grits, meal, flour and bran. Corn is tempered with the addition of water before passing through a Beall Degerminator which breaks open the kernel, separating the endosperm, germ and pericarp(bran). Through the use of aspirators, gravity tables, sifters and dryers the different sized particles are separated and graded into grits, meal and flour.

Measurement Location : Choice of measurement location is dictated by the process and the conveying mechanisms. Ideally on-line moisture measurements are made prior to, or soon after the dryer in order that corrective action can be quickly implemented, often the moisture measurement can be used directly in closed loop control. If this isn't feasible, measurement can be made prior to the storage bins.

Gauge Installation

On-line gauges cannot be successfully installed in pneumatic ducts, but they can be configured to view product in a gravity chute or screw conveyors. If the product volume is low or the flow is discontinuous, a powder sampler is advisable, otherwise a viewing window or a sample probe can be used.



Measurement	Location	Target	Typical Accuracy
Moisture in meal	Exit of screw conveyer	12-14%	0.3%
Moisture in flour	Exit of screw conveyer	8-10%	0.3%

Fat & Moisture measurements in Chocolate making

Flow properties & particle size are important parameters in the processing of chocolate which are influenced to a large extent by the fat content. Too high a fat content will in addition to wasting high value cacao butter, have a detrimental effect on flavour, texture, melting properties & the rate at which it sets. Too low a fat content will create similar problems & could result in violation of the minimum fat levels legislated for chocolate & cocoa powder. Moisture levels generally have to be minimized as high levels will increase the viscosity & affect the flow & usage of the product in addition to reducing its shelf life.



Product	Constituent	Range %	Typical Accuracy %
Cocoa beans (whole)	Moisture	4 - 7%	+/- 0.8%
	Fat	45 - 55%	+/- 0.6%
Milled Crumb	Moisture	0.5 - 3%	+/- 0.25%
	Fat	12 - 23%	+/- 0.35%
Cocoa Powder	Moisture	2 - 4%	+/- 0.2%
	Fat	19 - 24%	+/- 0.4%
Drinking Choc. powder	Moisture	2 - 4%	+/- 0.2%
	Fat	3 - 8%	+/- 0.3%

Moisture & Oil in Potato Chips

Moisture Measurement and Control is extremely important in the production of potato chips, not only does it impact the taste, but also the texture and shelf-life. Oil measurement is required for labeling, is needed to ensure consistency in the flavor of the chips, and provides important process information concerning the replacement of slicing knives. Both measurements can be made off-line, but on-line measurement is advantageous as feedback is more immediate, the moisture measurement can be used in an automatic control loop by interfacing with SCADA systems.

Chip Manufacturing Process : Potatoes are peeled, sliced and de-starched prior to Frying and Seasoning. Measurements of oil and moisture are typically made shortly after the exit of the Fryer and after the Seasoning Cylinders prior to packaging. Moisture measurement at the exit of the Fryer can be used in closed loop control of the Fryer to optimize % moisture, this results in greater product consistency, longer shelf-life and less waste material.

Measurement Performance : Moisture in potato chips is a very well understood and documented application. Measurement wavelengths, algorithms, and sensor optical parameters are pre-set at the factory. Gauges

Measurement	Location	Range %	Typical Accuracy %
Moisture	Exit Fryer	0-5	+/- 0.15%
	Exit seasoning drum	0-2.5%	+/- 0.15%
Oil	Exit Fryer	20-40%	+/- 0.5%



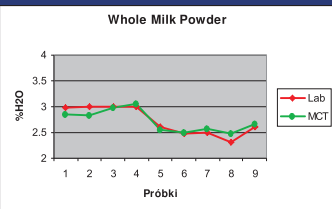
Moisture in Milk Powders

Moisture content at various stages throughout the production process will impact the energy costs, the efficiency of the process and the yield. Final moisture will affect storage and flow, and solubility properties. If by careful control the moisture content can be controlled closer to the quality specification upper limit, the gain is two fold; water is being sold as product and fuel costs have been reduced. Should final moisture exceed the upper limit it will cause the milk powder to cake and possibly discolour. More importantly it will lose solubility, making it difficult to reconstitute.

Overview of Process : Raw milk is pasteurised then separated into a skimmed milk and cream, then depending upon the end product, a fixed percentage of cream is added to the skimmed milk - Standardisation Process. The milk is evaporated to increase Total Solids %, then dried in a Spray dryer.

Measurement Location and Performance :

The KLED Gauge can be installed looking through a sapphire window into the Fluid Bed Dryer or a transparent section of pipe after exiting the dryer, alternatively it can be configured with a powder sampler for measurement within a pneumatic pipe.



Measurement Information	
Moisture Range 1.8 – 4.0%	Accuracy 0.1- 0.2%
4.0% - 10%	Accuracy 0.1- 0.2%
6.0%-12%	Accuracy 0.1- 0.2%
1% 2%	Accuracy 0.2- 0.3%

Moisture in Breakfast Cereals

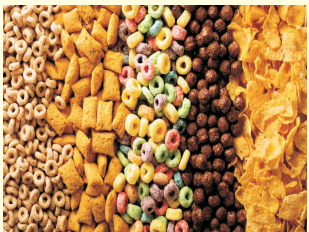
Knowledge of the moisture content at the exit of the cooker, cooker extruder and exit of the toaster, yields important information which can be utilized to maintain the consistent form, taste and texture of the cereal in addition to optimizing product yield, reducing scrap and saving on energy costs. On-line easurements give instantaneous information, enabling tighter process control than can be obtained through lab analyzed data.

Cereal Production Process : Processes vary, but one such example might contain: a Mixing stage where dry and liquid ingredients are mixed, Cooker, Extruder or Former, Cutter, Cooler, Flaking Roll, ryer/Toaster, Froster/Sprayer and Dryer.

Measurement Location : Moisture measurement at the exit of the Cooker, prior to the Former, reduces the quantity of missshapes through product sticking or disintegrating in the flaking process. Moisture measurement post Toaster enables maximization of final moisture, this optimizes yield, without compromising taste, texture and shelf life characteristics.

Measurement Performance

Measurement	Location	Target %	Typical Accuracy %
Moisture	Exit Cooker	20-30%	0.4%
Moisture	Exit Toaster/Dryer	2-8%	0.15%



Moisture and oil measurement in Tortilla chip Production

Moisture control is critical throughout the production cycle; from the raw corn, nixtamal and masa to the tortilla chips, it ensures the final product has a consistent texture and appearance and maximizes shelf life. Oil content also requires controlling as it affects the flavour of the chip. This measurement is made at the fryer exit and it can be used to control the temperature of the fryer or the duration of the chips in the fryer. Additionally, oil is measured post seasoning drum to ensure a consistent level of seasoning is applied to the chips.

Tortilla Chip Manufacturing Processes : A wet corn milling process is used to create the masa or dry masa is purchased and mixed with water to create the masa dough. The coarse masa is mixed and kneaded into an elastic masa which is extruded and fed through a sheeter prior to being die cut and baked for 30 seconds. Baking imparts alkaline taste characteristics and also serves to reduce moisture and oil absorption during the frying process. Following baking, the tortilla chips are cooled to allow equilibration which leads to less blistering in the rapid frying process.

Measurement Performance

Product/location	Moisture %	Moisture Error	Oil %	Oil Error
Masa	47- 52%			
Pre-oven				
Exit-fryer	<2%	+/- 0.15%	22-24%	+/- 0.5%
Exit-Seasoner	<1.5%	+/- 0.15%	22-45%	+/- 0.5%

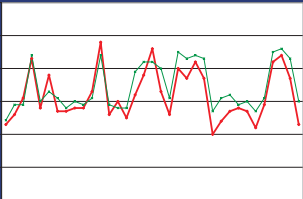


Moisture in Sugar derived from Beets

Final moisture content of crystalline sugar needs to be kept below a critical level to prevent it from clumping in the storage silos and to maximise its shelf life.

Sugar Processing : Beets are sliced into 'v' shaped wedges termed cossetts to maximize the surface area exposed to hot water in the diffuser. Owing to the osmotic gradient, sugar diffuses from the cossetts into the water. The sugar solution flows in one process direction and becomes increasingly concentrated. Once the solution exits the diffuser, it undergoes carbonation, then a filtering process to extract the non sugar impurities. Sugar liquor enters a multistage evaporator to reduce the water content prior to the boiler where crystallisation occurs. The crystals are separated from the mother liquor by centrifugation then dried with hot air before storage and transportation.

Measurement Location and Performance : Measurement can be made at either the exit of the Centrifuge or at the exit of the hot air dryer if consistent product presentation can be maintained, but measurement performance tends to be better off-line with static product presentation.



Measurement Information

Moisture Range %	0.02 – 0.05%
Accuracy (+/- %) - offline	0.003%

Local Contact