



Hydronix

The Importance of Moisture Control in Almond Processing

The Almond is an edible nut which can be eaten whole or processed for inclusion in other food products. The United States is the largest producer of almonds in the world with production being centred in the California area where the climate is conducive to its successful growth. Other top producing countries include Australia and the Mediterranean area of Europe, with a total world production of nearly 3 million tonnes per year. Almond trees are harvested from late summer which is when the nuts are sent for processing, typically arriving hulled and ready for further treatment. This document will discuss how the addition of moisture measurement into the process can assist the producer with quality control and reduce the amount of spoilt material.



Almond Processing

Almonds are a food product so therefore require a high degree of quality control to ensure that the nuts are suitable for human consumption. Continuous quality control checks take place throughout various stages of production, and an important part of these checks is to ensure that the moisture content of the almonds is at the correct level for the relevant part of the process.

Natural almonds arrive at the processing plant with an existing moisture content of approximately 4%. They are initially passed through a system which removes any unwanted material before being pasteurised for about 8 hours using steam at approximately 93°C to kill any micro-organisms. The moisture level is then checked to ensure that the nuts are at the correct moisture percentage before being passed forward for the next part of the process.



Figure 1: Almonds exiting the blanching Process

If the almonds are going to be sold whole as a “raw” product they are moved through to another part of the plant where they are checked for quality and then packaged.

Almonds that are going to be further processed are moved through to a blanching process which uses steam to loosen and remove the skins leaving the white almond meat exposed. The very nature of the pasteurising and blanching processes adds moisture to the almonds, so once de-skinned the almond meats need to be dried to reach the recommended moisture target for the next part of the process.

The moisture level of the almonds is then checked again after drying and recorded for quality control purposes. The almonds are then sliced, slivered, ground or sent for inclusion into other products.

Why Moisture is Important

If the almonds are going to be packaged whole as a “raw” product, then they need to achieve a final moisture target of 5.2% to 5.9%. However, if the nuts are going to be further processed such as sliced, slivered or ground then they need to reach a moisture target of 6.5% to 7.3%. The moisture content is critical to ensure that packaged or stored almonds do not deteriorate and that processed almonds have minimum breakage or waste ensuring that the final products are of the best quality.

The Benefit of Installing Microwave Moisture Sensors

Installation of microwave moisture sensors at different stages throughout the process ensures that the almonds are at the correct moisture level for each stage. The process is also automated reducing the need for manual sampling.

Further benefits include:

- Dryers can be used more efficiently reducing energy costs, avoiding over or under drying the product
- Dryer temperature can be automatically adjusted allowing drying at the correct rate to avoid product damage
- Improved and consistent final product
- Reduction in level of spoilt / wasted materials
- Increased confidence that stored almonds will not deteriorate
- The sensors are not affected by dust or colour

Recommended Installation

Installation of moisture sensors is simple and can be included in either new or existing plant systems. Each installation may be different and will depend on the plant's specific requirements. However the moisture sensor should always be installed so that the flow of material across the ceramic faceplate is consistent and of a good depth.

Almonds that are blanched and dried should have a moisture sensor installed ideally after both processes but as a minimum after the dryer. This enables real time readings to be sent directly back to the plant control system allowing the dryer temperature or drying time to be immediately adjusted. This ensures that the material exiting the dryer is always at the correct moisture level and eliminates the need to wait for oven tests. There is also a reduction in the amount of substandard or wasted product caused by the time delay between periodic sampling and subsequent dryer adjustment.

The addition of a moisture sensor installed in the neck or underneath the bin or hopper where the "raw" or processed almonds are released for packing ensures that the nuts are at the correct moisture level enabling the Quality Control Manager to be confident that the almonds will not deteriorate.



Figure 2: Hydro-Probe installed above a scanner after the dryer enabling real time dryer control



Figure 3: Hydro-Probe moisture sensor installed in the neck of a bin to check the moisture content of the almonds before being released for packing

Hydronix Moisture Sensors

Hydronix has a range of sensors that are designed for flowing bulk materials such as nuts, grains and pulses. For installation either in or underneath the neck of the bin, a Hydro-Probe XT is recommended. For installation into ducting or a screw conveyor, the flush mounted Hydro-Mix sensor provides an excellent solution.

Hydronix moisture sensors are immune from the effects of colour changes in the almonds and dust or moisture in the atmosphere. They are fully temperature stable and are manufactured to exact tolerances ensuring that each sensor has identical measurement characteristics. This means that they are precise, easy to use and reliable.

The sensors have configurable parameters such as signal filtering and smoothing designed to eliminate measurement noise created by small fluctuations in material flow density. Other features include configurable alarms and a material temperature output. The user may select from a choice of output options such as 0-20mA (0-10V), 4-20mA, USB, Ethernet and RS485/232 and the sensors may be configured to output a moisture percentage value directly from the sensor. The Hydronix Hydro-Com software enables simple set-up and configuration of the sensor using a PC or laptop and USB connection.



Figure 4: Hydro-Probe XT Digital Microwave Moisture Sensor

Conclusion

The inclusion of a microwave moisture measurement system into the existing process will not only achieve consistent quality products while reducing the amount of spoil materials but also provide instant savings and repay its capital expenditure in a very short time.

About Hydronix

Hydronix is the world's leading manufacturer of digital microwave sensors for on line moisture measurement. Hydronix was established in 1982 and pioneered the microwave moisture measurement technique. With over 65,000 systems installed worldwide, and a quick return on investment, Hydronix is the preferred choice for many OEMs and end-users in industries ranging from nuts and pulses through to animal feed, grain, sugar, and many others.