

Three Benefits of NIR Technology

It may not be as familiar as other methods, but near-infrared technology is growing in popularity for papermakers.

DEL WILLIAMS

For the pulp and paper industry, measuring and controlling moisture content is critical to ensure product quality and efficient production since the amount of moisture in deliverables can have diverse effects when converting feedstock into products. Moisture content can impact product quality, production throughput, and processing efficiency, as well as the purchase price of wood chips, pulp, and converted paper products, not to mention shipping costs.

However, when deciding on the best moisture measurement technology for pulp and paper production, it is important to avoid choosing solely on the initial purchase price of the instrument. Weighing the benefits of owning and using a moisture meter and understanding how it can impact both efficiency and profit is key to making a successful long-term acquisition.

Compared to traditional moisture measurement methods such as Karl Fischer (KF) or Loss On Drying (LOD), an advanced technology using near infrared (NIR) measurement offers significant benefits. Today, NIR moisture meters can help pulp and paper producers and converters achieve substantial production labor savings and superior product quality, while optimizing raw input purchase price, end product sales price, and shipping cost.

THE ADVANTAGES OF NIR TECHNOLOGY

How does NIR technology work? Understanding the basics, and which uses best suit the technology, will help pulp and paper facility managers appreciate how it can save them money and improve their bottom line.

NIR measurement uses reflectance and absorbance principles for calculating the moisture content of an item. The meter bounces a beam of light off the product and in some cases transmits the light through the sample. The light is filtered to a wavelength or multiple



With Kett's KJT130 Handheld Portable Instant Moisture Meter, the user points the instrument at the product and the moisture content is instantly shown on a digital display.

wavelengths that excite the moisture molecules, according to John Bogart, managing director of Kett US, a manufacturer of a full range of moisture and organic composition analyzers.

"The higher the moisture content, the higher the amount of light absorbed. The instrument measures the light reflected back, and an algorithm determines the light absorbed by the sample," says Bogart. He notes that the moisture meters enable very accurate measurement of solids, pastes, and liquids without contact or sample preparation, so there is no contamination in handheld and online models. Pulp and paper producers can benefit from NIR technology in three notable ways:

More efficient personnel and production: If a pulp and paper producer or converter is still using the KF or LOD method for determining moisture, chances are that a considerable amount of personnel time is being tied up conducting these tests when they should be carrying out more profitable activities.

The KF test involves adding chemical reagents to the sample to separate the water

from the remaining product. The water removed is then compared with the initial mass or volume. Since chemical reagents are used, skilled personnel must determine the initial parameters, confirm that the system is properly calibrated and maintained and, at times, are required to conduct the tests. These tests take time and destroy the sample. Disposal of the waste products can be very costly and time consuming as well.

The LOD test, which measures the total material weight change after drying, typically requires a sample to be prepared and brought to a lab. The test takes at least 15 minutes to several hours to perform, which is too slow when more immediate measurements are necessary. It also requires the sample to be altered or destroyed.

In contrast, NIR technology enables the user to get the accurate measurement results needed instantly and is simple enough for virtually anyone to use with minimal training. Generally, only 7-10 samples are needed for a valid calibration; once calibrated, the moisture level in a product is determined immediately.

As an example, with Kett's KJT130 Handheld Portable Instant Moisture Meter, the user simply points the instrument at the product and the moisture content is instantly shown on a digital display, with results accurate to .01 percent in a 0-100 percent measurement range. For ease of use, the unit is operated via menu commands that any worker can operate. The unit, which is the size of a camcorder, is designed for frequent spot checks wherever necessary, on both stationary and moving (process line) products. Moisture measurement data may be stored in the instrument, downloaded continuously, or manually recorded.

Improved quality control: Quality can be compromised if pulp and paper producers do not have the correct amount of moisture in their product. This can result in either product loss or reduced shelf life. Just as important, it can also result in unhappy customers who could forgo future purchases and even share their displeasure on social media.

Fortunately, the speed and accuracy with which pulp and paper producers can obtain results from NIR technology will enable them to conduct more tests within a given time period. Because facilities can conduct more tests more

frequently, production managers will achieve tighter control of their product quality.

"Since no direct contact or sample alteration is required with NIR moisture meters, particle size variation and unusual textures are not an issue. This can be important when used with a range of feedstocks, formulations, or end products in different settings," says Bogart.

The versatility of this technology means the pulp and paper industry can achieve accurate moisture measurements when needed, whether on the process line, in the lab, or in the field. All of this equates to faster test results and feedback. The approach enables managers to ensure high quality at all levels of production.


Because the process is non-destructive, samples also remain unaltered so they can be used for additional tests or, if removed for a desktop test, may be returned into the product stream.

Optimized buy/sell transactions and shipping cost: When moisture level is a factor in the purchase price of raw inputs or the end product sales price, accurate moisture measurement and adjustment can help to secure the best deal. For instance, if purchasing raw inputs with high moisture content, negotiating a discount might be possible in some circumstances. If selling a product by weight, moisture

content could be kept within acceptable limits, but modified to secure the best price.

Having the incorrect amount of moisture in a product can also reduce profit by increasing the cost of shipping. With extra moisture in the product the total shipment will be heavier, resulting in higher shipping costs. Properly drying a substance to acceptable limits before it is transported can substantially reduce shipping costs.

NEW OPPORTUNITIES

Although pulp and paper producers are more familiar with traditional moisture measurement methods like KF and LOD, the availability of advanced NIR technology is presenting an opportunity to the industry. By taking advantage of the speed, accuracy, versatility, and ease of NIR moisture meters, the pulp and paper industry can dramatically improve production, quality, and profit. For this reason, NIR technology for moisture measurement is growing in popularity across many industries, including pulp and paper, chemical, pharmaceutical, food, and textile. 

Del Williams is a technical writer based in Torrance, CA. To learn more about NIR moisture meters, contact Kett at 800-438-5388 or visit www.kett.com.

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