APPLICATION BRIEF

NIR - Diode Array

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Online measurement of snackfood seasoning addition using modern NIR technology

Erroneous amount of seasoning is a common source of customer complaints and a primary source of costly product waste. The Perten DA 7440 On-line NIR instrument uses modern diode array technology to provide real-time measurement of seasoning addition in many types of snackfoods, helping reduce both waste and customer claims.

Many snack producers periodically collect a sample from the production line and take it to the lab for analysis. One of the common analysis methods is titration using silver nitrate to determine the salt content. Salt is generally a fixed percentage of the seasoning therefore its measurement correlates to the amount of seasoning present on the snack. The complete procedure from sampling until the analysis result is available is at least 10 minutes.

Figure 1. DA 7440 measuring moisture, fat, and seasonings in potato chips.

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This means the result is what was actually happening on the line 10 minutes ago and not necessarily what is happening in real-time. Variation is greatest at startup and this lag in knowledge means that it takes time to dial in the correct production run settings. During this dial-in time, production may be either wasted or quarantined. Both actions incur significant costs each time production switches to a new product. Figure 2 shows real-time measurement of seasoning and its variation during start-up. Measurements were performed by a Perten DA 7440 On-line NIR installed on a potato chip processing line where multiple flavors of chips are produced. Real-time measurement of seasoning allows production personnel to quickly dial in the dosage and verifies content throughout the entire run.

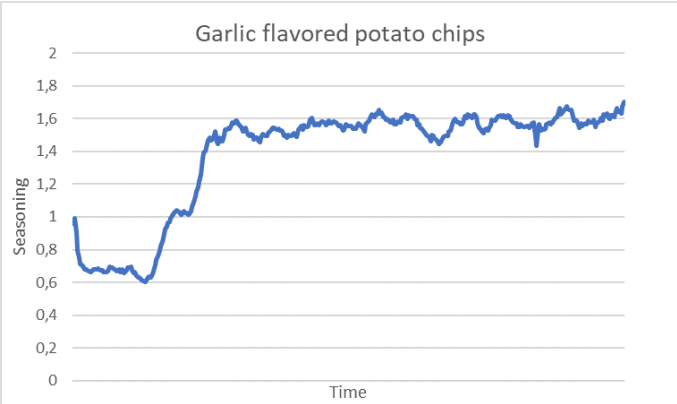

Figure 2. Measurement of seasoning addition during start-up.

Additionally, periodically sampling often misses short-term issues. Figure 3 is from a potato chip manufacturer and shows DA 7440 measurements of seasoning over a longer period of time. The dip in the curve indicates a blockage in the seasoning station. Such a blockage would result in a large number of bags with very little seasoning which in turn results in consumer claims. Studies have shown that even one such experience can sour a consumer on a particular brand. The DA 7440 helps detect problems such as blocked dosing stations and protects valuable brand images.

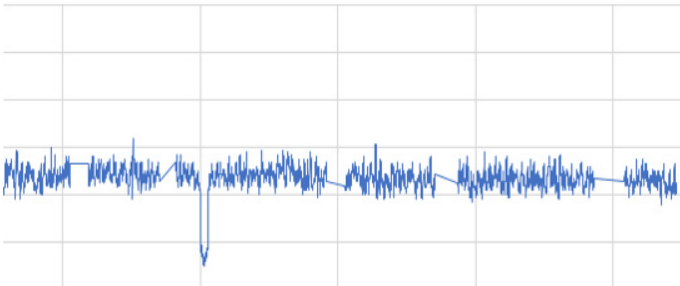

Figure 3. Detecting a blockade in the seasoning station.

The snackfood industry has used on-line NIR instruments based on optical filter technology for decades. This basic technology was developed in the late 1970s, and while beneficial, has limitations including the inability to determine the amount of seasoning. Filter technology only measures a few wavelengths of near-infrared light - insufficient for measurement of seasoning on snacks.

The more sophisticated diode array technology used in the Perten DA 7440 collects a full spectrum of near-infrared light and has proven to be able to determine seasoning accurately and in real-time.

Figure 4 shows how the two technologies differ. The two black lines demonstrate what a filter technology instrument collects – just two data points. The blue curve represents the spectral information that the diode array instrument collects – a continuous spectrum with data at each wavelength. The continuous spectrum ensures the right information is captured and allows the use of advanced algorithms.

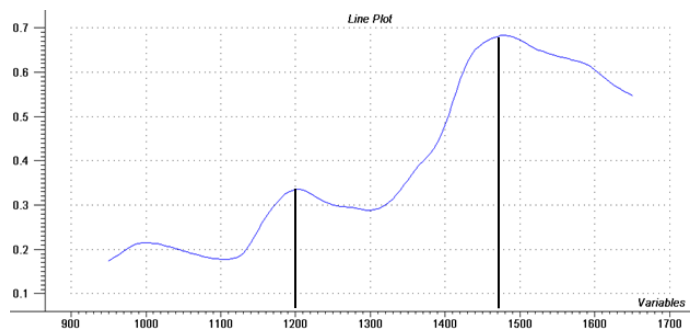

Figure 4. Spectral information from diode array and filter technology.

The DA 7440 can be ordered with a factory calibration for measurement of seasonings. The same calibration can be used for many different types of seasonings. Current users often measure 10-15 different flavored products using the same calibration. Measurement results are expressed as % Salt as this is how seasoning addition is typically measured – remember the aforementioned correlation of salt to seasoning - and what the DA 7440 is calibrated against. The factory calibration should be optimized to local products using a small set of samples analyzed in the lab for seasoning/salt content.

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