



COMPUTRAC®

by Arizona Instrument LLC

MAXIMIZING QUALITY CONTROL IN PETFOOD MANUFACTURING

Moisture analysis testing is one of the most pervasive test categories across all industries. For pet food manufacturers total moisture can be an indication of process quality (dryer efficiency, oven schedule, etc.). Moisture content can also have a significant impact on the shelf life, nutrition density, and nutrient uptake of a pet food. Furthermore, moisture content is a major component of the product's mouth feel and palatability. Even the most nutrient dense meal means nothing if the pet refuses to eat it.

MOISTURE CONTENT vs. WATER ACTIVITY

Total moisture content is not the same as water activity. While the two concepts are usually proportional, they attempt to look at very different parts of the overall picture. Water activity is concerned with the amount of water available to sustain bacterial growth. Total moisture content is a measure of the percentage of the product's total mass is derived from water. As moisture content increases, water activity normally increases also. Obviously moisture content can be manipulated by removing water from a system through drying, or by adding water to a system. Interestingly, the two methods of manipulation have different effects on the water activity of the material. In general, at identical moisture levels, a moisture level reached by drying a wet material will have a lower water activity than a moisture level reached by humidifying a dry material.

MOISTURE DETERMINATION METHODS

So now that the decision has been made to test for moisture, the next question is "What method should I use?" This question has many potential answers. The three most common methods are: Oven, Karl Fischer titration, and Rapid Loss on Drying analyzer. Oven loss on drying testing can further be subdivided into loss in weight by heating in convection oven, and loss in weight by heating in vacuum oven.

OVEN TEST

Oven tests are possibly the most ubiquitous tests in the industry. They are relatively straightforward and easy to conduct. However, oven loss on drying methods can suffer from low reproducibility if not performed in a completely consistent manner. In the presence of some preservatives, particularly in the semi-moist pet food sector, higher temperature LOD analysis is susceptible to bias due to the evaporation of additional volatile components. Another downside of oven loss on drying testing is the length of time required for analysis. Oven tests are typically run for anywhere from 2 to 18 hours. When decisions about product quality and changes in process need to be made quickly, the time necessary to conduct these tests is simply unfeasible. In business today time is money, and this type of cycle time can be expensive.

KARL FISCHER TITRATION

Karl Fischer titration uses a reaction of iodine with water to determine moisture content, Karl Fisher titration typically has better test times than oven testing, but comes with its own drawbacks. For materials not directly soluble in the KF analyte solution, the water must be extracted before testing. Usually this involves methanol extraction of the sample water. For this type of testing, the producer normally needs a dedicated lab to perform the analysis. KF titrations use fragile glassware and toxic chemicals that are not suitable for a production floor. Finally, after the analysis consideration must be given to how to dispose of the spent chemicals.

RAPID LOSS ON DRYING

Rapid loss-on-drying offers the best of both worlds: fast results with no toxic chemicals that require disposal. Typically results are obtained in less than 10 minutes, and there is no lab requirement for analysis. For most materials the analysis can be performed right on the production floor. Rapid LOD instruments do however require parameters tuned and specific to the product being tested.

RAPID LOSS ON DRYING DONE RIGHT

One academic study that reviewed 20 years worth of data concluded that for the most commonly used standard oven testing method in the pet industry, using the same sample, results ranged from 61 to 331% recovery.¹ This wide range of results underlines the great difficulty in getting these analyses right, even by the experts. What's needed is the simpler method offered by a rapid loss on drying analyzer. The instrument does most of the heavy lifting, which means more reproducible results between operators and sites.

However, as noted earlier, for accurate results a rapid LOD analyzer requires parameters that are specific to the material under test. Therefore the ideal solution is an instrument manufacturer who will partner with the producer to develop optimal parameters for their products.

The Computrac® MAX® 4000XL Rapid Loss on Drying Moisture/Solids Analyzer, manufactured by Arizona Instrument LLC, is a thoroughly modern instrument sensitive enough to detect moisture loss at parts per million levels, and rugged enough to move out of the lab, onto the production floor. It is easy to operate and delivers fast, accurate results. Furthermore, Arizona Instrument LLC supports its customers with free parameter development for the lifetime of the instrument. The parameters developed in the laboratory at AZI correlate to the test results produced by oven or Karl Fischer titration, but without using harmful chemicals or reagents.

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¹ Thiex, N and Richardson, C. R. 2003. Challenges in measuring moisture content of feeds. J Anim Sci. 81v12:3255-3266