

Analysis of Moisture, Fat and Protein in Pet Food Production Using HYBRID Trac and Sprint Protein Analyzer

Introduction

The Pet Food industry is being subjected to increased regulation every year and is becoming one of the most competitive markets in the food industry. Every manufacturer needs to ensure the product they produce is not only up to the expectation of the consumers, but economically viable so the product can be offered at a competitive price. Moisture, fat, and protein are three of the most important, and expensive, components of both wet and dry products. Whether testing protein of incoming meats, fat content in finished kibble, or water concentration of the flour additives, not having an accurate analysis of these ingredients will lower yields and cause a loss in revenue. The HYBRID Trac™ is able to analyze both incoming raw meats and finished dry products for moisture/solids as well as fat, and the Sprint® Protein Analyzer can analyze any food product for true protein.

With CEM's **HYBRID Trac**, moisture and fat are tested using TD-NMR coupled with iPower® drying, which has been proven to be the most accurate rapid method available. By analyzing the entire sample on a molecular level, not just the surface, precise, real time results are ensured. Additionally, NMR never requires calibration, which not only removes the possibility of results that may drift, but saves time and money throughout the life of the instrument over typical NIR systems.



Protein is also directly tested using the **Sprint** Rapid Protein Analyzer, eliminating calibrations and drifting results, using dye-binding technology. CEM's proprietary iTag Solution binds directly to protein molecules at 4 distinct locations, ensuring only true protein is read. Other technologies use nitrogen analysis, which can produce inaccurate data as a result of adulterants or miscalculations.

Method Development



Both the HYBRID Trac and the Sprint Protein Analyzer follow the same protocol for developing new methods. 3-8 samples, covering the production range in fat or protein, should be analyzed using an accepted form of reference (long method) analysis. Then each of these 3-8 reference samples are tested in triplicate on the corresponding CEM system, which then builds a linear correlation curve. Once the most representative points have been designated on the curve, the method is complete and ready for real-time analysis.

The samples below were collected from actual CEM Customers and the method built in CEM's own laboratory. For fat and moisture results, Soxhlet extraction and forced air oven drying were used as reference tests, respectively. For protein analysis, the Kjeldahl method was used as a reference test.

Results Analysis

Raw Chicken and Beef Blend

Sample #	Moisture Reference	Moisture Results	Moisture Error	Fat Reference	Fat Results	Fat Error	Protein Reference	Protein Results	Protein Error
1	63.22	62.99	0.23	17.54	17.54	0.00	13.38	13.32	0.06
2		62.92	0.30		17.57	0.03		13.65	0.27
3		63.07	0.15		17.33	0.21		13.47	0.09
4		63.11	0.11		17.43	0.11		13.88	0.50
5		62.90	0.32		17.52	0.02		N/A	
Average		62.99	0.23		17.48	0.06		13.58	0.20

Raw Meat Slurry

Sample #	Moisture Reference	Moisture Results	Moisture Error	Fat Reference	Fat Results	Fat Error	Protein Reference	Protein Results	Protein Error
1	56.53	56.23	0.30	26.52	26.69	0.14	8.42	8.46	0.04
2		56.44	0.09		26.24	0.28		8.35	0.07
3		56.36	0.17		26.63	0.11		8.42	0.00
4		56.73	0.20		26.68	0.16		8.44	0.02
5		56.65	0.12		26.39	0.13		8.50	0.08
Average		56.48	0.05		26.53	0.01		8.44	0.02

Finished Kibble

Sample #	Moisture Reference	Moisture Results	Moisture Error	Fat Reference	Fat Results	Fat Error	Protein Reference	Protein Results	Protein Error
1	6.42	6.51	0.09	15.27	15.32	0.05	21.29	21.35	0.06
2		6.61	0.19		15.17	0.10		21.38	0.09
3		6.19	0.23		15.23	0.04		21.14	0.15
4		6.37	0.05		15.09	0.18		21.33	0.04
5		6.46	0.04		15.15	0.12		21.30	0.01
Average		6.43	0.01		15.19	0.08		21.30	0.01

Finished Can Pet Food

Sample #	Moisture Reference	Moisture Results	Moisture Error	Fat Reference	Fat Results	Fat Error	Protein Reference	Protein Results	Protein Error
1	75.26	75.43	0.17	5.62	5.60	0.02	10.29	10.34	0.05
2		75.20	0.06		5.59	0.03		10.40	0.11
3		75.29	0.03		5.64	0.02		10.33	0.04
4		75.37	0.11		5.58	0.04		10.31	0.02
5		75.27	0.01		5.59	0.03		10.33	0.04
Average		75.31	0.05		5.60	0.02		10.34	0.05



HYBRID Trac

HYBRID Trac

- Utilizes AOAC 2008.06 for meat products
- Wet and dry sample capacity
- More accurate than NIR, FTIR, and FTNIR
- No costly calibration maintenance
- Large touchscreen for quick reference
- Interactive videos to help train users

The HYBRID Trac is the next generation NMR system developed by CEM that is able to analyze both wet and dry products. It couples an advanced NMR magnet for fat analysis with the SMART 6™ system for moisture analysis of wet raw meat products. The HYBRID Trac can exclusively use the NMR magnet for fat and moisture analysis of dry products, including flours and finished kibble, or the SMART 6 and NMR combined. It has full AOAC approval for meat products, and has proven to be more accurate than FTIR, NIR, and FTNIR systems. While its accuracy is in line with most reference methods, the easy-to-use interface produces full results in less than 5 minutes for wet products and less than 2 minutes for dry products. It eliminates the need for hazardous solvents and/or glassware that traditional wet techniques require. Finally, once a method is created, a process that takes only 3 samples and about an hour, changes to color, granularity, texture, or additives have no effect on results, removing the need for costly recalibrations.



Sprint Protein Analyzer

Sprint Protein Analyzer

- Utilizes AOAC 2011.04 for meat products
- Wet and dry sample capacity
- Simple to use
- Easy to maintain
- Directly determines amount of protein
- More accurate than Kjeldahl and combustion techniques
- Winner of 2009 Presidential Green Chemistry Challenge
- Easy and intuitive user interface

The SPRINT Protein Analyzer uses an AOAC Approved technology that automates and advances dye-binding techniques that have proven effective since 1970. Because it directly measures protein, there is no need for the calculation or calibration that is seen with Kjeldahl and combustion, and it is not swayed by the presence of adulterants or other NPN molecules. The hazardous chemicals along with complicated gas lines and tubes used with these other methods were replaced with CEM's patented iTag solution, winner of the 2009 Presidential Green Chemistry Challenge Award, presented by the EPA. Analysis is simple enough for first day technicians to use, and results are immediately recorded after a rapid 3 minute test and stored for future reference.

Conclusion

The HYBRID Trac and Sprint Systems were able to accurately and quickly determine the amount of moisture, fat, and protein for each sample - wet and dry. All results were within an acceptable amount of error.

APPLICATION NOTES

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