

Instrument: TGM800

Determination of Moisture in Pet Food

LECO Corporation; St. Joseph, Michigan USA

Introduction

Determining moisture in pet food is fundamental for quality control, regulatory compliance, and nutritional evaluation. Pet food nutrient guarantees (protein, fat, fiber, etc.) are expressed on an as-fed basis and moisture content affects how these nutrients are calculated. High moisture content often reflects a lower nutrient concentration. To compare different pet food products fairly, nutrients are often converted to a dry matter basis, requiring accurate moisture data. High moisture content in non-canned pet food products can also lead to mold growth, toxin production, and yeast proliferation, which can be detrimental to an animal's health. This is especially important in semi-moist products, fresh/frozen diets, and treats.

Pet food regulations and industry standards worldwide establish requirements for product labeling, nutritional declarations, and quality control. Moisture content is a critical parameter, as declared values must accurately reflect product composition and meet applicable requirements. Moisture levels that exceed declared values can result in product recalls, customer complaints, reduced shelf life, and increased product waste. As a result, accurate and reliable moisture determination is essential for maintaining product quality, protecting brand reputation, and preserving consumer confidence.

Instrument Model and Configuration

Thermogravimetric analysis (TGA) is an analytical technique in which changes in sample mass due to changes in the physical and chemical properties of materials is measured as a function of temperature and time. TGA is commonly used to determine selected characteristics of materials that exhibit either mass loss or gain due to decomposition, oxidation, or loss of volatile materials such as moisture. Macro TGA systems typically use a nominal one-gram sample mass to allow more accurate mass change measurements in heterogeneous materials.

The LECO TGM800 is a macro thermogravimetric analyzer designed to determine the moisture content of materials using a mass loss-on-drying technique. Mass loss of the sample is measured as a function of the oven temperature while controlling the atmosphere and ventilation rate. The TGM800 allows up to 16 samples to be analyzed simultaneously, with a maximum oven temperature of 175 °C.



Method Reference*

AOAC 950.46: Moisture in Meat*

AOAC 983.18: Meat and Meat Products - Preparation of Test Sample

*A modified version of this AOAC Method was utilized for the generation of data included in this application note.

Sample Preparation

Samples must be of a uniform consistency to produce suitable results. Samples should be prepared in accordance with AOAC 983.18.

Accessories

621-010-956 Large Aluminum Foil Crucibles (2.4 in) with the 621-011-237 Carousel (11-place carousel), or 621-010-236 Small Aluminum Foil Crucibles (1.5 in) with the 621-010-642 Carousel (16-place carousel), 621-011-507 Double Ended Scoop.

Sample Mass

~1.0 g or 2.0 g (depending on the crucible size being utilized)

Analysis Time

~40 minutes to 2.5 hours

General Method Parameters

Parameter	Small Crucibles	Large Crucibles
Crucible Type	Small Foil	Large Foil
Minimum Crucible Weight	0.8000	1.1200
Maximum Crucible Weight	5.0000	1.6800
Crucible Density	0.5	0.5
Sample Type	Feeds	Feeds
Sample Density	1.5	1.5
Minimum Sample Weight	0.8000	1.8000
Maximum Sample Weight	1.2000	2.2000

Method Step Parameters

Parameter	Small Crucibles	Large Crucibles
Step Type	Preset	Preset
Preset Method Step	Moisture	Moisture
Cooling Option	Active	Active
Start Temperature	25.0 °C	25.0 °C
End Temperature	125.0 °C	125.0 °C
Ramp Rate	20.0 °C/min	20.0 °C/min
Hold Time	00:30:00	00:30:00
Maximum Time	04:00:00	04:00:00
Flow Rate	5.0 LPM	5.0 LPM
Final Weight	At Constancy	At Constancy
Constancy Window	00:09:00	00:09:00
Constancy Level	0.0010 g	0.0020 g

Method Step Calculations

Moisture

Calculation Type	Preset
Preset Method Step	Moisture
Measurement Type	Mass Ratio
Moisture Calculation	$(\text{Initial Mass} - \text{Moisture Mass}) \div \text{Initial Mass}$

Procedure

1. Create and/or select a method using the Method Step Parameters listed above, following the procedure outlined in the TGM800 Instruction Manual.
2. Log in and load samples following the procedure outlined in the TGM800 Instruction Manual.

Typical Results

Sample	Small Crucibles		Large Crucibles	
	Initial Mass (g)	Moisture (%)	Initial Mass (g)	Moisture (%)
Pet Food #1	0.9946	2.75	1.9964	2.74
Dry Pet Food	1.0229	2.78	2.0197	2.74
Select Formula	1.0133	2.78	2.0166	2.76
	1.0141	2.78	2.0142	2.75
	1.0057	2.78	2.0127	2.75
	$\bar{x}$ =	2.77	$\bar{x}$ =	2.75
	s =	0.01	s =	0.01
Pet Food #2	0.9991	3.75	2.0681	3.76
Dry Pet Food	1.0200	3.74	2.0039	3.77
Ferret Food	1.0045	3.77	2.0154	3.79
	1.0288	3.80	2.0626	3.73
	1.0042	3.70	2.0624	3.74
	$\bar{x}$ =	3.75	$\bar{x}$ =	3.76
	s =	0.03	s =	0.03
Pet Food #3	1.0615	3.32	2.0048	3.63
Chicken Meal	1.0324	3.42	2.0268	3.62
	1.0491	3.38	2.0263	3.65
	1.0167	3.40	2.0537	3.58
	1.0655	3.45	2.0264	3.66
	$\bar{x}$ =	3.39	$\bar{x}$ =	3.63
	s =	0.05	s =	0.03
Pet Food #4	1.0884	73.4	2.0040	73.3
Canned Dog Food	1.0125	73.5	2.0436	73.2
Healthy Blend	1.0590	73.1	2.0718	73.2
Chicken and Apple Pâté	1.0180	73.3	2.0688	72.9
Label Claim = 78 % Moisture Maximum	1.0547	73.3	2.0401	73.0
	$\bar{x}$ =	73.3	$\bar{x}$ =	73.1
	s =	0.2	s =	0.1
Pet Food #5	1.0266	81.7	2.0585	81.7
Canned Cat Food	1.0033	81.6	2.0268	81.0
Salmon and Sweet Potato in Broth	1.0009	81.7	2.0382	82.0
Label Claim = 84 % Moisture Maximum	1.0657	81.8	2.0802	81.7
	1.0635	81.6	2.0800	81.7
	$\bar{x}$ =	81.7	$\bar{x}$ =	81.6
	s =	0.1	s =	0.4

$\bar{x}$ = Sample Mean; s = Sample Standard Deviation