Application Note

Instrument: TGM800

Determination of Moisture in Feed Products

LECO Corporation; Saint Joseph, Michigan USA

Introduction

The TGM800 is a thermogravimetric analyzer designed to determine moisture content of materials using a loss-on-drying technique. Mass loss of the sample is measured as a function of the oven temperature by controlling the atmosphere and ventilation rate.

An accurate determination of moisture content in feed product's provides important information related to the food quality and safety (texture, taste, microbial stability) as well as a key variable used to calculate a products purity, yield, and/or resulting constituent analysis on a dry basis.

Sample Preparation

Samples should be ground to pass through a 1.0 mm screen.

Method Reference

AOAC Official Method 930.15 Moisture in Animal Feed

Fixed Drying Time Method

With 2.4 in crucible using ~2 g sample mass.

Accessories

621-010-956 Aluminum Foil Crucible (2.4 in), 621-011-237 Carousel (11-place), 621-011-507 Scoop

Sample Mass ~2.0 g

Method Reference

AOAC Official Method 930.15 Moisture in Animal Feed

Analysis Time ~2.5 h

Method General Parameters

Crucible Type	Large Foil
Minimum Crucible Weight	1.10
Maximum Crucible Weight	1.75
Crucible Density	0.5
Sample Type	Feed
Sample Density	1.5
Minimum Sample Weight	1.8
Maximum Sample Weight	2.5

Method Step Parameters

Step Name	Moisture
Ramp Rate*	10.0 °C/min
Start Temperature	25.0 °C
End Temperature	135.0 °C
Hold Time	120 min
Maximum Time	240 min
Flow Rate	4.0 LPM
Final Weight	At End of Step

**A ramp rate of 20 °C/min can be used, and may speed up the analysis and improve the temperature overshoot without any detrimental effects.*

Method Step Calculations

Calculation Name

Moisture

Calculation Equation

((((Initial Mass - Moisture Mass)) ÷ Initial Mass) x 100)

Procedure

1. Create and/or select a method using the parameters described above following the procedure in the TGM800 Instruction Manual.
2. Login and load samples following the procedure outlined in the TGM800 Instruction Manual.

Typical Results—Fixed Drying Time, 2.4 in Crucible

Sample	*Mass (g)*	*% Moisture*
Distillers Grain	1.9901	12.92
	2.0071	12.85
	2.0155	12.84
	2.0192	12.82
	2.1362	12.93
	2.0032	12.83
	2.2046	12.84
	Avg =	***12.86***
	s =	***0.043***
Corn Silage	2.0226	4.18
	2.0716	4.13
	2.0884	4.18
	2.0167	4.10
	2.0269	4.18
	2.0065	4.17
	2.0421	4.16
	Avg =	***4.16***
	s =	***0.03***
Corn Grain	2.0778	2.20
	2.0277	2.17
	2.0876	2.20
	2.0093	2.19
	2.0398	2.23
	2.0267	2.19
	2.0073	2.24
	Avg =	***2.20***
	s =	***0.03***
Hay	2.0094	3.39
	2.1150	3.37
	2.0561	3.41
	2.0175	3.38
	2.0935	3.45
	2.0136	3.37
	2.1129	3.40
	Avg =	***3.40***
	s =	***0.03***

Fixed Drying Time Method

With 1.5 in crucible using ~1 g sample mass.

Accessories

621-010-236 Aluminum Foil Crucible (1.5 in),
621-010-642 Carousel (17-place),
621-011-507 Scoop

Sample Mass ~1.0 g

Analysis Time ~2.5 h

Method General Parameters

Crucible Type	Small Foil
Minimum Crucible Weight	0.80
Maximum Crucible Weight	1.20
Crucible Density	0.5
Sample Type	Feed
Sample Density	1.5
Minimum Sample Weight	0.80
Maximum Sample Weight	1.20

Method Step Parameters

Step Name	Moisture
Ramp Rate*	10.0 °C/min
Start Temperature	25.0 °C
End Temperature	135.0 °C
Hold Time	120 min
Maximum Time	240 min
Flow Rate	4.0 LPM
Final Weight	At End of Step

Method Step Calculations

Calculation Name
Moisture
Calculation Equation
((((Initial Mass - Moisture Mass)) ÷ Initial Mass) x 100)

**A ramp rate of 20 °C/min can be used, and may speed up the analysis and improve the temperature overshoot without any detrimental effects.*

Procedure

1. Create and/or select a method using the parameters described above following the procedure in the TGM800 Instruction Manual.
2. Login and load samples following the procedure outlined in the TGM800 Instruction Manual.

Typical Results—*Fixed Drying Time, 1.5 in Crucible*

Sample	*Mass (g)*	*% Moisture*
Distillers Grain	1.0257	12.52
	1.0058	12.5
	1.0177	12.5
	1.0402	12.53
	1.0561	12.51
	1.0146	12.51
	1.0480	12.54
	Avg =	***12.52***
	s =	***0.012***
Corn Silage	1.0265	3.97
	1.0079	4.06
	1.0296	4.06
	1.0346	4.00
	1.0769	4.01
	1.0069	4.02
	1.0493	4.05
	Avg =	***4.02***
	s =	***0.04***
Corn Grain	1.0157	2.19
	1.0227	2.14
	1.0071	2.17
	1.0101	2.20
	1.0027	2.16
	1.0036	2.16
	1.0356	2.20
	Avg =	***2.17***
	s =	***0.02***
Hay	1.0328	3.35
	1.0653	3.38
	1.0845	3.39
	1.0087	3.44
	1.0202	3.44
	1.0293	3.42
	1.0147	3.50
	Avg =	***3.42***
	s =	***0.05***

Mass Constancy Drying Time Method

With 2.4 in crucible using ~1 g sample mass.

Accessories

621-010-956 Aluminum Foil Crucible (2.4 in),
621-011-237 Carousel (11-place), 621-011-507 Scoop

Sample Mass ~1.0 g

Analysis Time ~1.5 h

Method General Parameters

Crucible Type	Large Foil
Minimum Crucible Weight	1.10
Maximum Crucible Weight	1.75
Crucible Density	0.5
Sample Type	Feed
Sample Density	1.5
Minimum Sample Weight	0.80
Maximum Sample Weight	1.20

Method Step Parameters

Step Name	Moisture
Ramp Rate*	10.0 °C/min
Start Temperature	25.0 °C
End Temperature	135.0 °C
Hold Time	0 min
Maximum Time	240 min
Flow Rate	4.0 LPM
Final Weight	At Constancy
Constancy Window	9 min
Constancy Level	0.0010 g

Method Step Calculations

Calculation Name
  Moisture
Calculation Equation
  ((((Initial Mass - Moisture Mass)) ÷ Initial Mass) x 100)

**A ramp rate of 20 °C/min can be used, and may speed up the analysis and improve the temperature overshoot without any detrimental effects.*

Procedure

1. Create and/or select a method using the parameters described above following the procedure in the TGM800 Instruction Manual.
2. Login and load samples following the procedure outlined in the TGM800 Instruction Manual.

Typical Results—Mass Constancy Drying Time, 2.4 in Crucible

Sample	Mass (g)	% Moisture
Distillers Grain	0.9948	12.54
	0.9721	12.81
	1.0105	12.95
	1.0266	12.52
	1.0013	12.43
	1.0660	12.68
	1.0003	12.84
	Avg =	***12.68***
	s =	***0.19***
Corn Silage	1.0236	4.037
	1.0097	3.97
	1.0069	4.31
	1.0606	4.17
	1.0105	4.11
	1.0680	3.99
	1.0276	4.09
	Avg =	***4.10***
	s =	***0.12***
Corn Grain	1.0667	2.13
	1.0044	2.09
	1.0132	2.17
	1.0101	2.01
	1.0127	2.27
	1.0742	2.14
	1.0866	2.20
	Avg =	***2.14***
	s =	***0.08***
Hay	1.0645	3.49
	1.0145	3.28
	1.0191	3.41
	1.0281	3.26
	1.0796	3.17
	1.0275	3.30
	1.0019	3.28
	Avg =	***3.31***
	s =	***0.11***

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