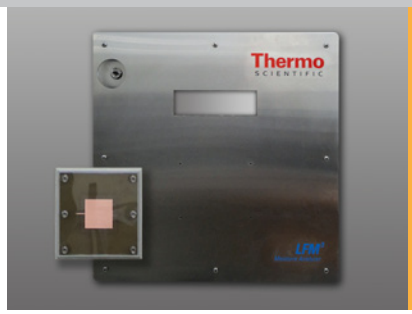
Product Specifications

The Thermo Scientific Low Frequency Microwave (LFM³) moisture analyzer provides accurate, real time, cost effective measurements and can be easily integrated and installed in a variety of applications.

Thermo Scientific LFM³

A moisture analyzer for mining applications



Features

- Digital circuitry ensures effective operation in conditions where microwave attenuation is high
- Large dynamic range for measurement of high moisture content, thick beds or highly attenuating materials
- True continuous moisture measurement
- Rugged, light-weight, low-profile microwave antennae for easy installation
- High-performance, low-frequency microwave electronics provide exceptional accuracy in demanding climatic conditions
- Inexpensive field maintenance due to easily replaceable electronic modules
- Flexible and user-friendly interface for calibration, operation and diagnosis
- Direct output to plant with industry standard 4-20mA, MODbus serial and ethernet interfaces
- Diagnostic analysis for control efficiency
- LFM³ radio modem communications for remote system diagnostics and operation
- Very low microwave power emitted < 20 nano-watts makes the LFM³ EMC compliant in all countries.

Applications

The Thermo Scientific LFM³ moisture analyzer can be used by mining and mineral processing companies to achieve:

- Dust reduction by preconditioning bulk minerals with water addition. The key challenge is to add just enough water to achieve dust extinction but not so much that the ore becomes sticky and clogs chutes and blinds screens.
- Specified moisture for shipment, both for the customers and the shipping operators.
- Feed forward control in critical drying or calcining applications.
- Moisture compensation for accurate metallurgical accounting.
- Control of critical moisture levels in pelletizing and sintering applications.
- Moisture specification monitoring in thermal power applications.
- Control of filter presses and centrifuges in dewatering applications.

How the Technology Works

Microwave moisture analyzers work on the principle that water has a very high dielectric constant compared to most other materials. When microwaves intersect with water molecules within the material they slow down (and hence change phase) and weaken (attenuate) as the energy is transferred to the material.

The LFM³ moisture analyzer has a low profile antenna, which transmits a beam through the material on the conveyor belt. The signal is received by a receiver patch located below the conveyor belt. The received signal is compared to the transmitted signal for phase and amplitude change.

The methodology and electronics used to detect these signal changes are part of the analyzer's proprietary technology.

An Engineered Solution

The LFM³ moisture analyzer is fitted with third party mobile or fixed phone modems to enable remote monitoring and upload of calibration settings.

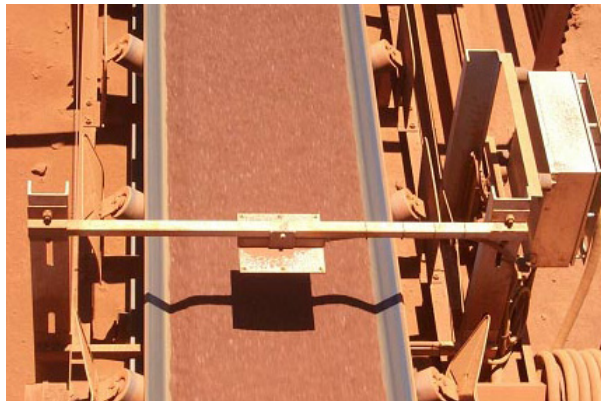
Since phase shift and attenuation also depend on the amount of material present, a measurement of the mass loading on the belt is required to compensate or "normalize" the microwave measurements. A Thermo Scientific weigh scale is usually provided for this purpose.

A wider engineered solution that considers sampling and feeders can be offered to optimize the accuracy and calibration of the LFM³.

Elemental analysis can be provided by the Thermo Scientific CB Omni, our cross-belt online analyzer.

Advantages

- Full digital signal processing capability enables very precise frequency emission and measurement. The very low power transmission of less than 20 nano-watts ensures EMC (electro-magnetic compatability) compliance in all countries
- LFM material analysis is inherently more accurate than surface measurement NIR (near infrared) and local measurement (microwave resonance)
- Remote monitoring and control is available via dial up interface
- Extremely robust phase analysis in highly attenuating environments or high precision applications
- Rugged, light-weight construction
- Continuous moisture measurement



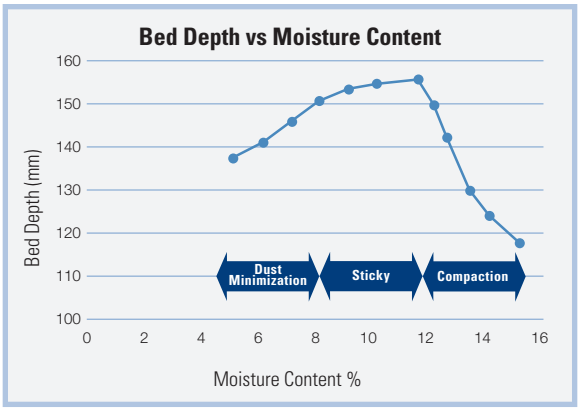
The Thermo Scientific LFM³ moisture analyzer provides continuous, accurate measurement of moisture in the most demanding conveyor handling environments.

Moisture Control / Dust Suppression

The physical properties of materials can present bulk handling challenges requiring precise moisture measurement and careful adjustment. If insufficient water is added, excessive dust is generated; if too much water is added, the material becomes sticky, clogging chutes and blinding screens.

The Thermo Scientific LFM³ moisture analyzer identifies potentially serious compaction issues by the radio frequency signature; our analyzer identifies the relationship between moisture, swelling, rheology and radio frequency response giving an alarm when serious compaction is likely. This allows for precise addition of water from mine to port, helping operators to control dust extinction while keeping moisture below maximum shipping limits.

Measurements are not affected by vertical segregation of the material on the belt.



Moisture Analysis in Varying Applications:

The Thermo Scientific LFM³ moisture analyzer can be used in varying applications offering accurate analysis. It provides accurate metallurgical accounting for your material handling operations. It has been used in pelletizing and sinter applications allowing the end user to control their moisture levels.

Other uses exist in dewatering applications (controlling the presses and filters); or for the moisture specification in shipping or thermal power, and has been applied in the use of critical drying and calcining applications.

The Thermo Scientific LFM³ moisture analyzer provides real time analysis in many commercial applications and is part of our commitment to understand your process needs as a total solution provider.

Thermo Scientific LFM³ moisture analyzer

Operational	
Conveyor width	Up to 1600 mm from mounting point to centre as standard
Conveyor speed	No limit
Conveyor bed depth	Generally 50-900 mm but this is material, moisture range and application dependant
Material top size	Nominal 300 mm - Application Specific
Moisture range	Typically 1-20wt% but this depends on bed depth and material microporisity
Measurement time	Instantaneous, output as a rolling average updated at 1-10 second intervals
Performance	
Transmitted power	< 20 nW
Attenuation	90 dB; Belt dependent
Phase shift	90 dB; Belt dependent
Accuracy	Standard error of estimate
Display	
Type	Alphanumeric LCD 4 x 40 characters
Information	Time / Date, Instantaneous moisture content, Status
Inputs	
Belt weigher	4-20mA from belt weigher - linear mass or tonnes per hour compensation
Level device	4-20mA from radar / laser - linear height compensation
Calibration switching	Available over serial or ethernet interface
Outputs	
Standard plant interface	4-20 mA, MODbus RTU (Serial RS232) or TCP (Ethernet) (Profibus DP and other protocols available on request)
Error signal to plant	Available over serial or ethernet interface
Watchdog timer	Advises plant if LFM is operational
Remote Communications	
Cellular networks	GSM or 3G (WCDMA)
Landlines	PSTN
Internet	Customer LAN with VPN connection Any one of the above used for downloading data and uploading calibrations. Allows ongoing remote support and software upgrade programs.
Environment	
Operating temperature	0-55° C with protection from direct sun (see sunshades in optional accessories below)
Humidity	0-95% relative humidity (non condensing)
Physical	
Low profile antennaes	All antennae are 10mm 304 stainless steel and Lexan®
Electronics enclosure	IP66 Stainless steel and heavy duty cover 600 x 600 x 260 mm with standard heat-shield and 600 x 600 x 220 mm without heat-shield
Calibration	
Time-stamped sample data provided by plant	Recommend sampling to ISO standards. Where sampling is difficult we can provide mixed static and dynamic sampling methodologies.
Software and Electronics	Industry standard QNX operating system Moistmeas software TPX Digital circuitry for microwave measurements

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