Microwave Level Detector
Material presence detection

- **Remotely monitors material presence**
- **Signal is generated when flow stops during normal operation**
- **Highly reliable with highly abrasive material conditions**
- **Provides signal to trip a feeder before head seal is lost**
- **Adjustable time delay**
- **No nuclear sources**

Application

The microwave level detector has been developed to provide a reliable method of detecting material presence in valves, and downspouts. It is particularly suited to installations where, due to licensing or administrative restraints, nuclear type detectors are impractical.

The microwave level detector consists of three sub-assemblies: a transmitter and a receiver that mount on the downspout and a control unit suitable for wall mounting in a convenient location. The transmitter and receiver have UHMW polyethylene windows that are flush-mounted to the interior of a valve or downspout wall that allow the microwaves to pass, while also providing a long wear life against abrasive materials.

The control unit includes the electronics, comparator circuitry and alarm relay to advise system status. Adjustment and calibration are easily accomplished at the control unit. If a material void occurs during normal operation, the alarm signal can be used to automate vibrators, air cannons or other devices. A second microwave level detector may be located immediately above the feed system and used to trip the feeder if material presence has not been reestablished prior to loss of all material within the system.

As an alternative, this secondary alarm indication can be provided with a microprocessor controlled Stock® gravimetric feeder through “countdown” circuit within the feeder controls. Optional mounting fixtures and hardware are also available upon request.

Function

A relatively fixed amount of microwave energy will pass through a particular dielectric. Materials such as coal and limestone have dielectric constants that are significantly different than air. Because of the electrical characteristics of air versus other bulk solids, the presence of a bulk solid can be detected by monitoring the attenuation of a fixed power microwave signal. Under normal operation in a coal or limestone feed system, the amplitude of a microwave signal, as monitored by a detector located on a downspout, across from a transmitter, is relatively low. If there is a void in the downspout, the amplitude of the signal will increase, above a preset threshold, and a state change in a contact will occur.

An adjustable time delay, up to 30 seconds, is included to prevent nuisance alarms caused by temporary voids. This delay can be extended within a microprocessor controlled Stock® gravimetric feeder through “countdown” circuit within the feeder controls.

System Components
The transmitter unit consists of a power supply, pulse modulator, Gunn oscillator and directional antenna. The receiver unit consists of a directional antenna, microwave mixer cavity, amplifier, pulse coding network, voltage comparator and relay driver circuit.

Control Unit
The detector control unit consists of a NEMA 4x, dust- and watertight enclosure housing the electronic circuitry. The control features status light indicators, signal strength monitor (visual) and self-test switch.

Application
The microwave level detector should be mounted on the downspout as close to the bunker (or silo) outlet as is physically practical. By so doing, the earliest possible indication of loss of material is ensured. A microwave level detector has an advantage over acoustic flow monitors, in that there is no minimum material velocity. It will work on most feed systems, without regard to feed rate, or inlet size or shape. In addition, there is no protruding cone into the material path to cause hang-ups.

System Specification

Type
Flush-mounted microwave presence detector

Size
Transmitter and receiver – 2 ½” (64mm) pipe, 9” (229mm)long, Control Unit - 9-3/8”w (238mm) x 4-7/8”h (124mm) x 2 ½” d (61mm), suitable for wall mounting, bottom cable entry, front cover access

Power Requirement
120V ac, single phase, 50/60 Hz, 5 VA, 240 V ac, single phase, 50/60 Hz, 5 VA, or 24V dc, 5 VA

Outputs
DPDT Form C dry relay contact rated at 120 V ac, 5A resistive, 240 V ac, 3A resistive, or 24V dc, 3A resistive. Adjustable time delay - 10 to 30 seconds (Factory set @ 10 seconds)

Ambient Requirements
-30°C to 60°C (-20°F to 140°F) – Transmitter/Receiver, -40°C to 71°C (-40°F to 160°F) - Control Unit, (NEMA 4x - Standard)

Agency Approvals
CSA and FM approved for Class II, Division 1 – Groups E, F & G hazardous locations.

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