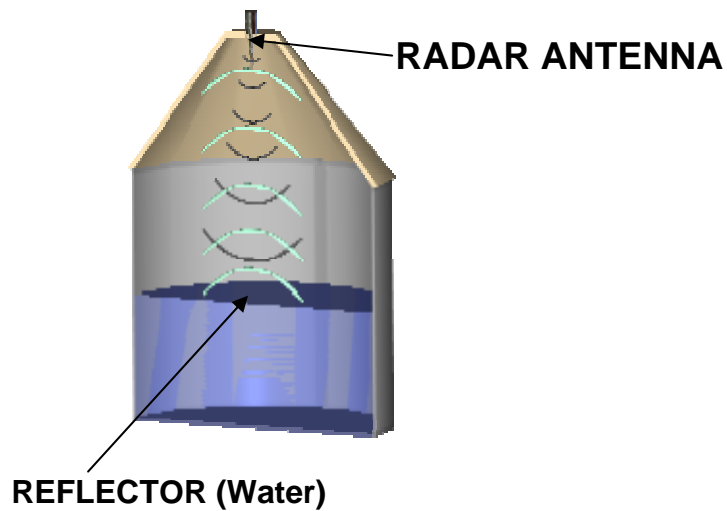
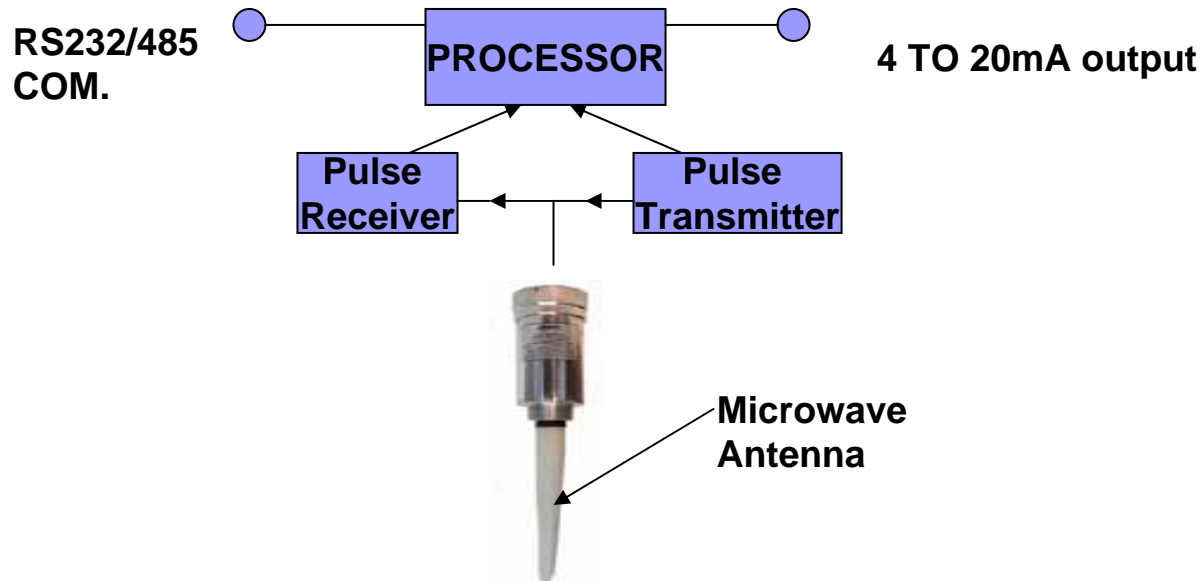


# Propagation of Electromagnetic Waves



- Speed of electromagnetic waves used in radar =  $300,000,000\text{m/s}$
- Speed of electromagnetic waves changes due to temperature, pressure and humidity in air can be neglected
- Reflection is given by conductive materials and dielectrics of different dielectric constant than air

# Microwave Probes

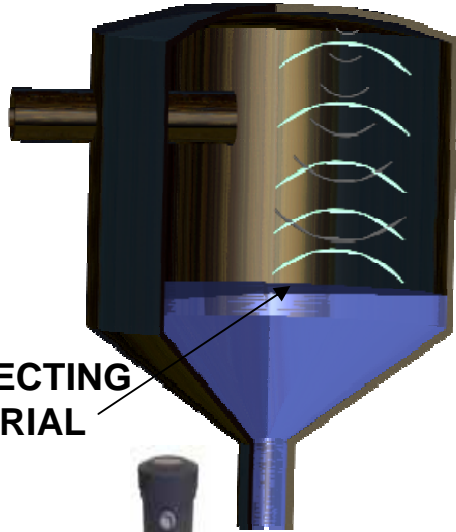


Microwave rod antenna is stimulated by an electromagnetic pulse transmitter and sends very short pulses to a target. They reflect from a target and then they are received by the same antenna. The electrical signal from the antenna is amplified and processed. Distance to an object is calculated and converted to 4mA to 20mA and also optionally, level information is sent to a PC via RS232 or RS485 for diagnostic data logging and programmable set-up.

DEVICE →

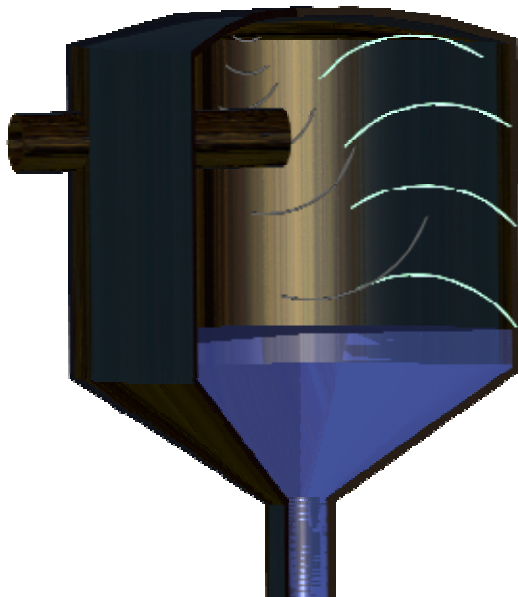


GOOD INSTALLATION



REFLECTING MATERIAL

BAD INSTALLATION



## Typical Application of Ultrasonic and Microwave Devices

- For Ultrasonic Devices the tanks can be made of any material (Metal, plastic, concrete,...)
- For Microwave use metal tanks only
- Devices are mounted at the top of a tank with ABM Sensor Tech. Standard Threading or in some cases custom mounting.
- Devices have to be directed straight down to a discharge hole, even if a material is not flat (sloped). This is typical for pellets/powder applications; the devices will still receive an echo
- When installed properly the devices transmit microwave/ultrasonic waves down to a material (liquids or solids)
- During installation make sure that you do not have any large objects in front of transducer or antenna
- Reflected pulses from materials are received and processed to obtain correct distances
- Due to very narrow and uniform polar patterns (directivity) and signal processing of ultrasonic/microwave devices, small unwanted echoes from tanks walls, ladders, filling pipes, ext. can be ignored or cancelled.

# Architecture of Microwave Device

ALUMINUM ENCLOSURE with 1/2" conduit for wiring

## Device

1 1/2" and 2" NPT (Thread). For 1 1/2" NPT thermal De-coupler for high temperature is available

ZERO DISTANCE

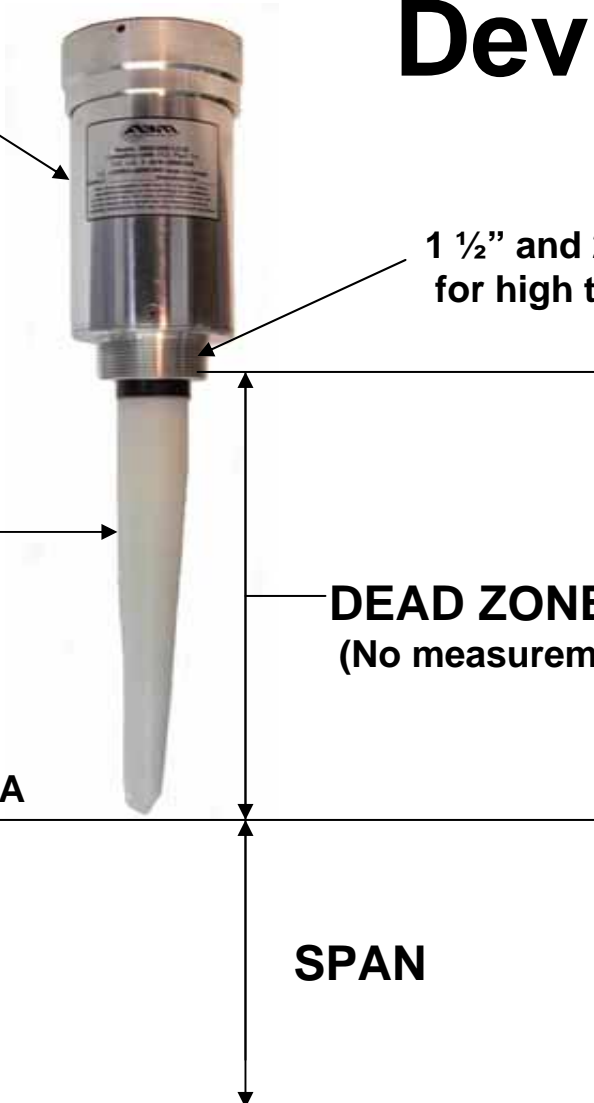
ROD ANTENNA

DEAD ZONE or Minimum range  
(No measurement in Dead Zone)

20mA or 4mA

SPAN

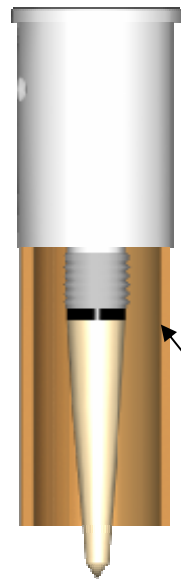
4mA or 20mA (TARGET)



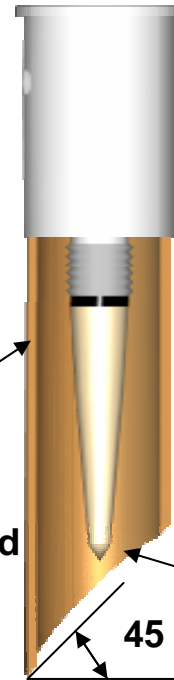
# Stand Pipe Mounting for Microwave Device

No Termination  
Required for

ID	LENGTH
2"	2.5"
3"	3.5"
4" and 5"	6"
6"	10.5"



If a pipe is submerged in liquid, a vent hole is required



Termination is required for pipes longer than 10.5" and ID of pipes must be greater than 6"

Remove sharp edges

45 °

# Applications for Microwave Devices

1. Liquids with foam
2. Liquids with gases (CO<sub>2</sub>, methane) and other fumes
3. Highly corrosive liquids such as acids and solvents
4. High temperature liquids up to 300F
5. In vacuum
6. Rapid temperature changes
7. High acoustical noise
8. No foam influence
9. No ammonia fumes

# New Features of Ultrasonic and Microwave Level Devices

1. **Automatic power, pulse width and sensitivity adjustment to any tank condition (plug and play operation)**
2. **Rejections of any unwanted echoes from stand pipes, tanks walls and any other small obstructions**
3. **Self-cleaning of the ultrasonic transducers radiating faces**
4. **Ignorance to build-up on microwave antenna**
5. **Measurement of very low dielectric constant materials given by microwave device**
6. **Echo detection of materials with high angle of repose**
7. **Perfect operation in pipes, no influence**
8. **No influence of mounting structures**
9. **Very narrow and uniform polar patterns of the ultrasonic transducers and antennas**
10. **Very wide operating bandwidth of the ultrasonic transducers and antennas**