
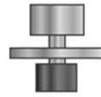







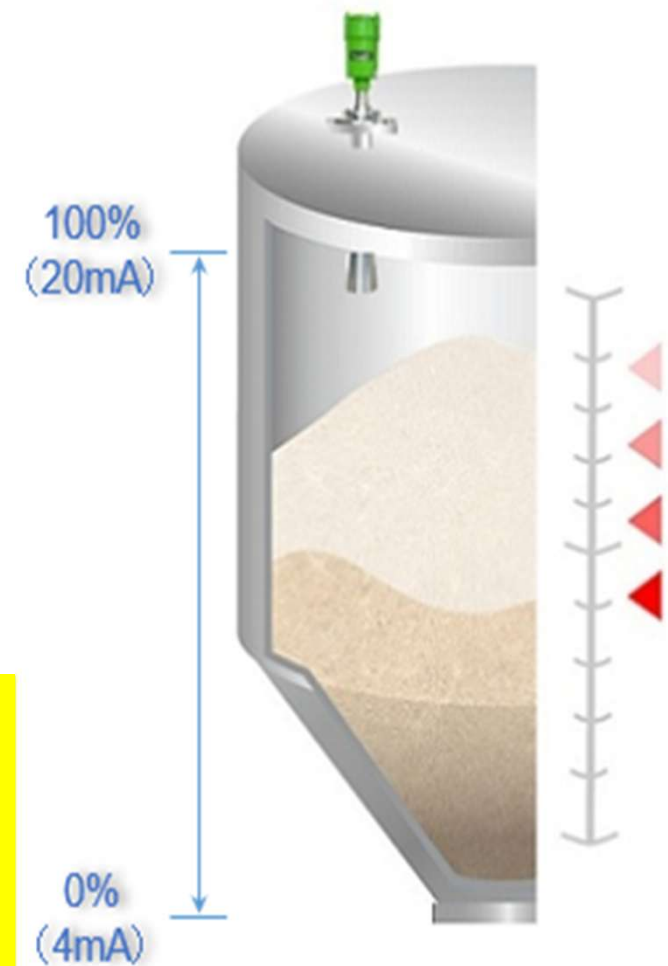


Level Transmitters (WEBINAR)

Typical kinds, Basic principles, Advantages, Weak points and Latest information

<p>Sounding (Yo-yo type)</p> 	<p>Ultrasonic</p> 	<p>Rader Transmitter (Microwave)</p> 
<p>Guided Rader</p> 	<p>Laser</p> 	<p>Float</p> 
<p>Displacer</p> 	<p>Capacitance</p> 	<p>Pressure</p> 



LIVE WEBINAR !!!

- **Aug.31, 2021** / 15:00-15:50 (Japan,UTC+9)
6:00- 6:50 (UTC)
- **Online Free Web Seminar**
- **Mamoru Omura / Industrial Marketing**

PRECAUTIONS for the webinar



Your microphone is muted during the webinar.



Please use the Q&A column on the right side of the screen if you have any question.



Questions are welcome at any time.
You can send a text on the Q&A column at any time.



We will have the Q&A session at the end to reply to your questions.



If we don't have enough time to reply to your question, we'll send an answer later by separate email.



Company name	Matsushima Measure Tech Co., Ltd.
Founded	1946
Products and services	<p><u>Level Sensing</u> Radar level transmitter, Various level switches, Customized level measuring systems for harsh applications.</p> <p><u>Dust Sensing</u> Various dust monitoring sensors for industrial dust collector, piping, stack, open workplace, clean room, etc.</p> <p><u>Safety Sensing</u> Safety switches for belt conveyor, conveyor belt automatic adjusting carrier, belt tear detector, belt cleaner, etc.</p> <p><u>Robot System</u> COBOT (Human Collaborative Robot) system, automation engineering, etc.</p> <p><u>Others</u> Actuators, Position sensors, etc.</p>
Network	Subsidiaries in: China and South Korea Distributors in: Taiwan, Indonesia, India, Thailand, Malaysia, Vietnam, Philippines, Australia, Mongolia, Russia and US
Reference	Steel, Cement, Power, Metal, Fertilizer, Chemical, Food, Mining, etc.

Topics

1. The role of level monitoring in factories

- 1) Level switch and level sensor
- 2) Role of level sensor

2. Types of level sensors

- 1) 9 main types of level sensors
- 2) Model selection guide

3. Matsushima level sensors

- 1) Radar Transmitter (MWLM-series)

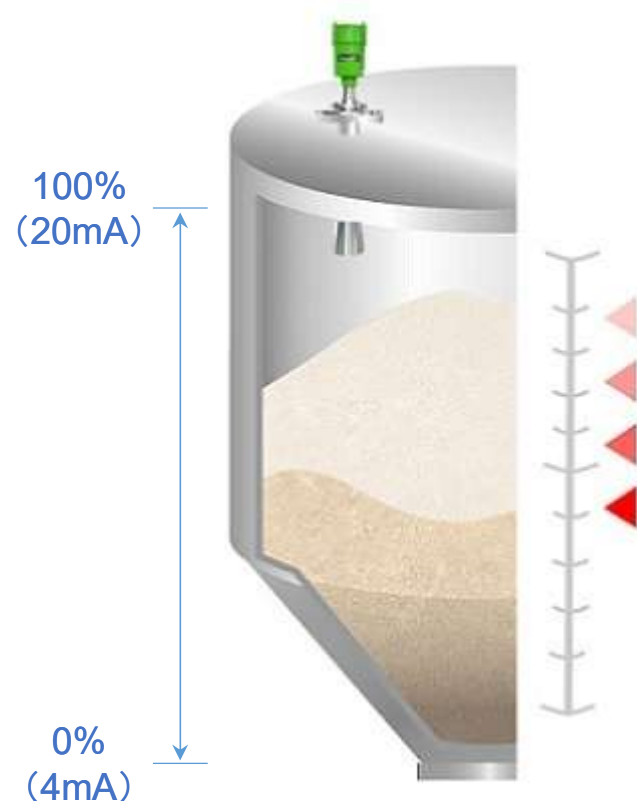
Why is sensor necessary ?

2 ways of level sensing

Level Switch and **Level Sensor**

Why is sensor necessary ?

Level Sensor



Level Sensor monitors change in material level in real-time and indicate in percentage or distance.


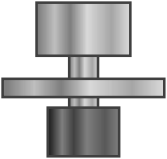

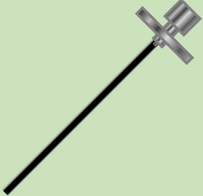
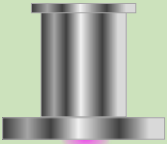

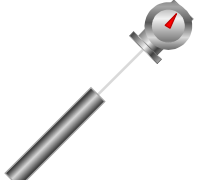


For example, Level Sensor applied at silo sends output signal (DC4~20mA or 1~5V) that is equivalent to the material level.

This output signal is converted into 0 ~ 100% to express the material level on your display.

How do they work ?

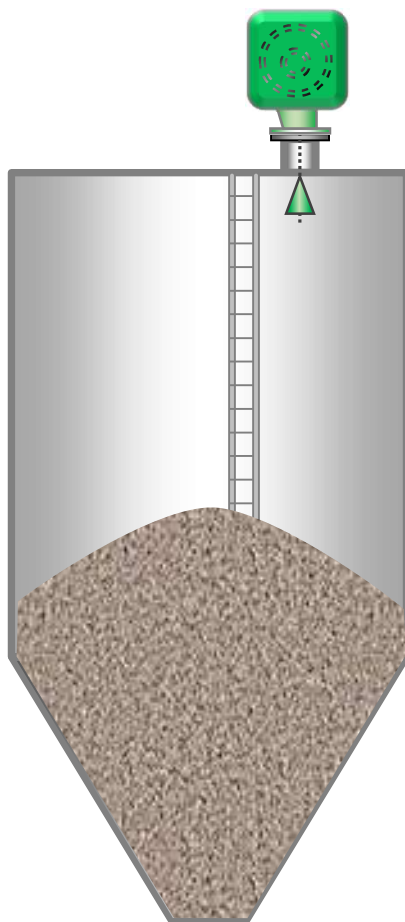
Level Sensor Types

9 main principles

<p>Sounding Type (Yo-yo type)</p> 	<p>Ultrasonic Type</p> 	<p>Rader Transmitter (Microwave)</p> 
<p>Guided Rader Type</p> 	<p>Laser Type</p> 	<p>Float Type</p> 
<p>Displacer Type</p> 	<p>Capacitance Type</p> 	<p>Pressure Type</p> 

How do they work ?

Sounding type (Yo-yo type)



Principle

The sensor has a sensing weight attached to the wire rope. The material level is calculated by the time for the sensing weight to reach the surface of measuring material.
(Distance = Velocity × Time)

Advantage

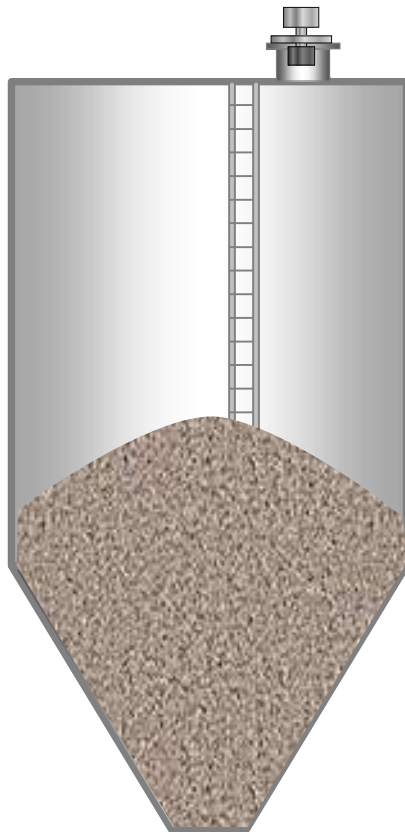
- Simple mechanical function.
- Less affected by dust and vapor.
- Applicable for deposit in liquid.

Weakness

- Need to replace spare-parts including a wire rope and a guide pulley.

How do they work ?

Ultrasonic Type



Principle

The material level is calculated from the traveling time which takes for ultrasonic pulse to reach the surface of measured materials and its reflection is received.

Advantage

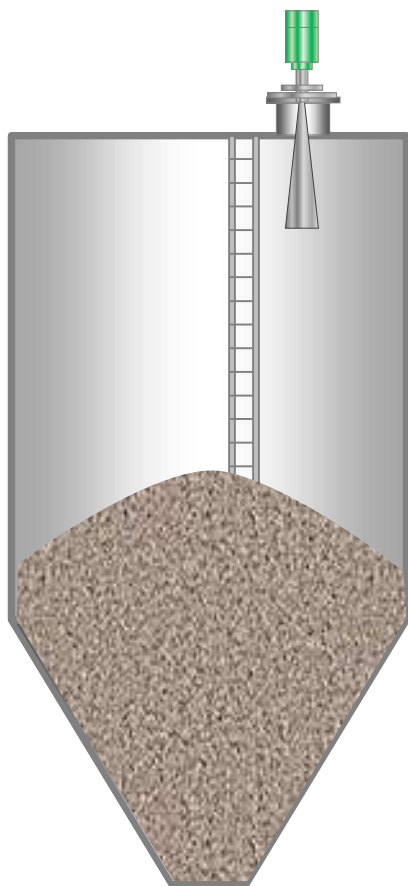
- Non-contact measurement with affordable price.

Weakness

- Affected by dust and vapor
- Temperature change and gas in the tank may affect velocity of ultrasonic wave that result in non-reliable measurement.

How do they work ?

Rader Type (Microwave type)



Principle

The material level is calculated from the traveling time which takes for microwave to reach the surface of measured materials and its reflection is received.

Advantage

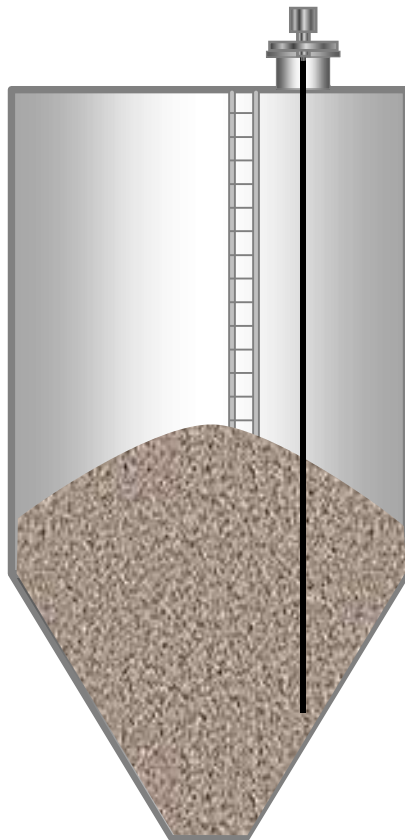
- Less affected by temperature and gas.
- Less affected by dust and vapor because of the high permeability.

Weakness

- Not suitable for the materials with low dielectric constant because of weak reflection.

How do they work ?

Guided-Wave Radar Transmitter (GWR)



Principle

The sensor transmits microwave which is guided along a cable (rod probe). The material level is calculated from the round-trip time for microwave.

Advantage

- Suitable for narrow space as it has no beam-angle due to the guide cable.

Weakness

- Material adhesion to the probe may result in unstable measurement.
- Breakage or kink of the cable may cause noise reflection and unstable measurement.

How do they work ?

Laser Type (TOF Type)



Principle

The material level is calculated from the traveling time which takes for laser to reach the surface of the measured material and its reflection is received

Advantage

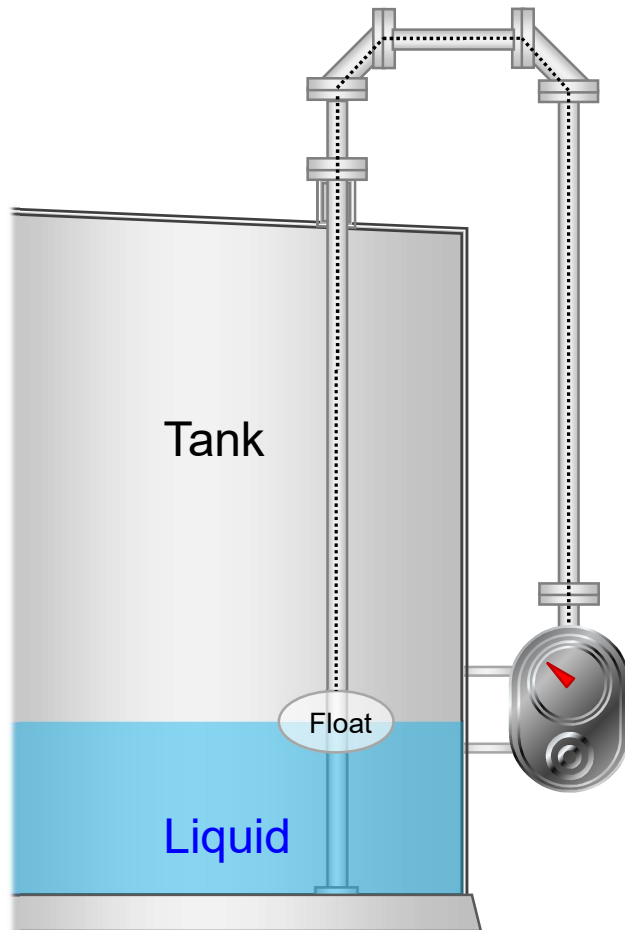
- Applicable for the narrow space because of high directivity.
- Applicable for long distance.
- Rapid response

Weakness

- Dust and vapor may cause diffused reflection which results in unstable measurement.
- The materials whose surface is like a flat mirror and has a repose angle may weaken reflection, and it results in the unstable level measurement.

How do they work ?

Float Type



Principle

The sensor has a tape connected to the float.

It measures the length of the tape that changes as the float following the liquid level.

Advantage

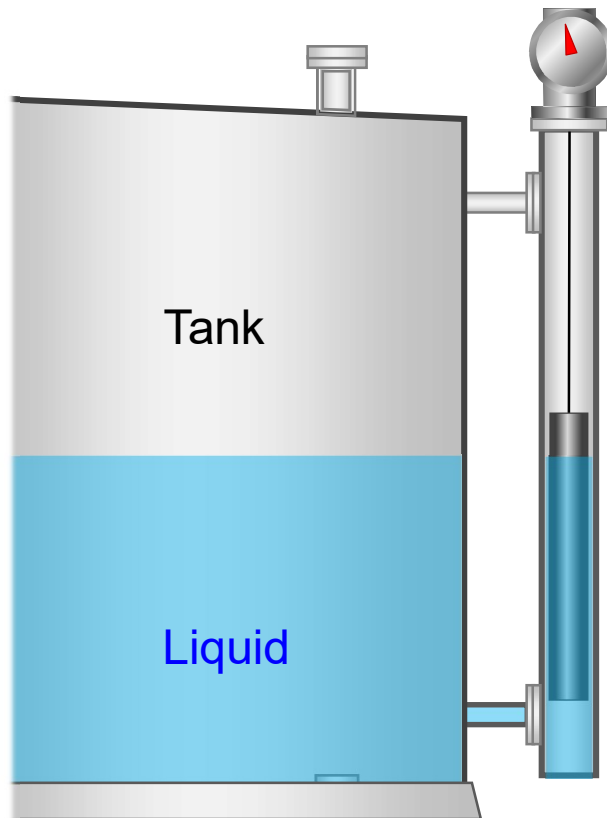
- Simple mechanism
- Applied in various size of tanks

Weakness

- Affected by build-up materials
- Needs to exchange spare parts.
- Accumulated materials to the float may cause non-stable level measurement.

How do they work ?

Displacer Type



Principle

The “Displacer” is a float which is higher specific gravity than the liquid’s one, and it is immersed in the measured liquid.

Liquid level is calculated from the buoyant force to the displacer.

Advantage

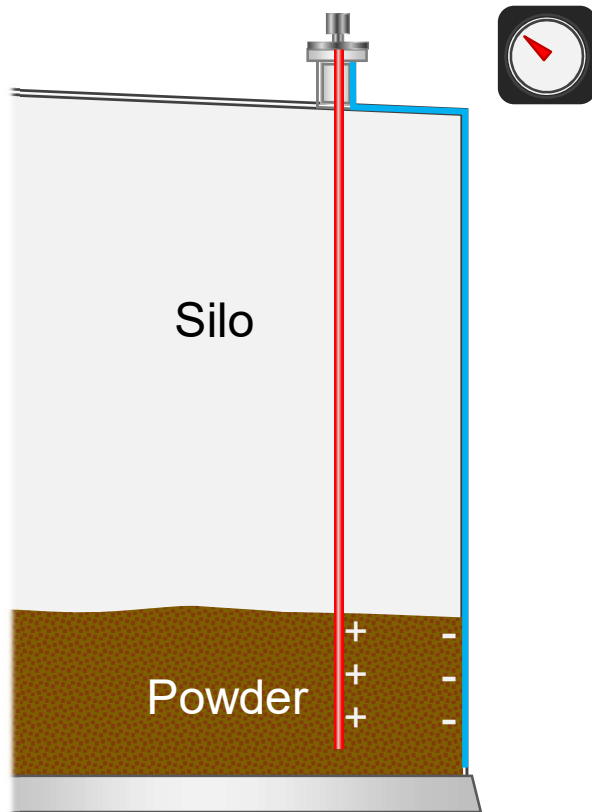
- Suitable for measurement in low specific gravity and high-pressured measuring environment.

Weakness

- Applicable measuring range is relatively short 3,000mm
- Displacer may be stuck with build-up materials.
- Spring needs to be replaced periodically.
- Recalibration is required for the environment where the material characteristics is not stable.

How do they work ?

Capacitance Type



Principle

The capacitor is formed by the probe electrode and the sidewall of the tank. It measures a change in capacitance which is positively correlated with the material level.

Advantage

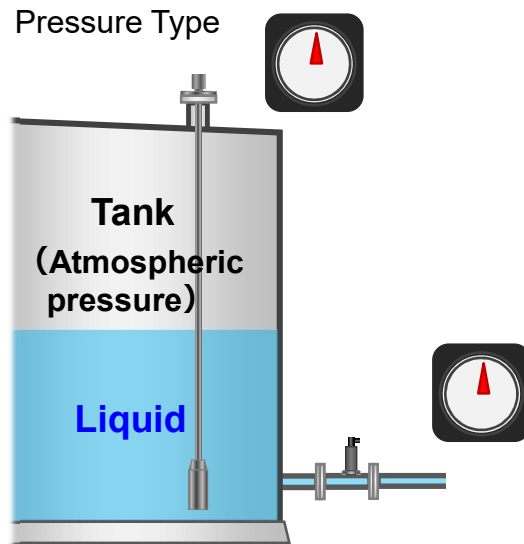
- Suitable for narrow space.

Weakness

- The electrode physically contact with measured material.
- Needs zero adjustment at the empty condition.
- Change in material's characteristics may result in non-reliable measurement.

How do they work ?

Pressure Type



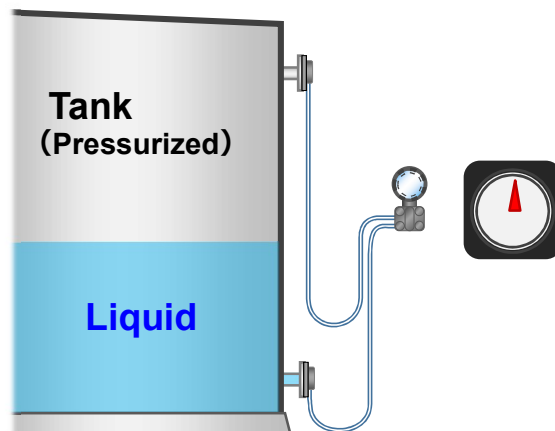
Principle

The hydraulic pressure correlated with the liquid level is measured by a diagram, which is converted into the storage level. It must be the atmosphere pressure inside the tank.

Advantage

- Easy to install in the small space.

Differential Pressure type



Weakness

- Adhesive materials, sediment, and bubbles in a liquid may affect measuring accuracy.
- It needs 0-100% adjustment for every liquid material.
- The tank needs to be empty for every maintenance or exchanging the sensor.

Selection Guide

Level meter type, model selection guide



Type of Level Meter

Level meter is a sensor for monitoring storage level of raw materials and products stored in tanks and silos.
 Raw materials and products have various states such as mass, particles, powders, liquids, slurries, and submerged deposits, and there are several measurement methods in consideration of physical characteristics and environmental factors.
 In addition, level meters are roughly divided into two methods: method of measuring empty scale distance from the tank ceiling to object to be measured, and method of directly measuring storage level of object to be measured.
 Level meters that measure aerial distances are sounding, ultrasonic, microwave, laser range finders, guide rope type, liquid level gauges, and displacers.
 Capacitance, pressure, and differential pressure gauges directly measure storage level.

Weight (Sounding) Level meter	Ultrasonic Level meter	Electric wave level meter [Pulse radar type]	Electric wave level meter [FMCW type]	Guide rope type Level meter	Laser type Level meter [TOF type]	Laser type Level meter [Phase difference detecting type]	Float type Level meter	Displacer	Capacitance type Level meter	Pressure type Level meter	Differential pressure Level meter
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Level Meter Model selection guide



Introduction There is no perfect level meter that can measure anything. It is necessary to consider main conditions such as physical characteristics, measurement environment, installation conditions, and disturbances when making a selection from multiple level meters. However, if these conditions are further subdivided, they will cover more than a dozen items, and combination will be astronomical numbers.

How to use Therefore, in this guide, we tried to narrow down the main factors to select the model. First, select one of the objects to be measured: bulk, particle, powder, liquid, slurry, and deposit in liquid. Then, select required number of physical characteristics and environmental factors from the remaining selection items. Judgment of ○, △, × is shown between the selected condition and each level meter. The strictest judgment among them is the total judgment of the level meter. Please select the best level meter from the total judgment. If multiple candidates appear, we propose to select them in consideration of installation conditions, price, maintainability, etc.

<Judgment>
 ○ : applicable
 △ : With any special specifications or option only, may be applicable
 × : not applicable

Material Physical property Application	Type	Weight (Sounding) Level meter	Ultrasonic Level meter	Microwave Level meter [Pulse radar type]	Microwave Level meter [FMCW type]	Guide rope type Level meter	Laser type Level meter [TOF type]	Laser type Level meter [Phase difference detecting type]	Float type Level meter [Mechanical winding type]	Displacer type Level meter	Capacitance type Level meter	Pressure type Level meter	Differential pressure Level meter
		○	○	○	○	○	○	○	○	○	○	○	○
Bulk	dia.10mm - 50mm	○	○	○	○	○	○	○	×	×	○	×	×
Particle	less than dia. 10mm	○	○	○	○	○	○	○	×	×	○	×	×
Powder	less than dia. 1mm	○	○	○	○	○	○	○	×	×	○	×	×
Liquid	Water, Chemical solution etc.	×	○	○	○	○	○	○	○	○	○	○	○
Slurry	Viscous material	×	○	○	○	○	○	○	×	×	○	×	×
Deposit in liquid	Deposit material in liquid	△	×	×	×	×	×	×	×	×	△	×	×
Low density	Less than 0.5	△	○	○	○	○	○	○	×	×	○	×	×
Low dielectric constant	Less than 2.0	○	○	△	△	△	○	○	×	×	×	×	×
High conductivity	Conduct electricity	○	○	○	○	○	○	○	×	×	○	×	×
Dielectric permittivity change	Dielectric constant and conductivity change	○	○	△	△	△	○	○	×	×	△	×	×
Dust	Dust blocks view	○	△	○	△	○	×	×	×	×	△	×	×
Steam	Steam obstructs view	○	△	○	△	○	×	×	×	×	△	×	×
Dust & Steam	Dust and steam generated at the same time	△	×	△	×	△	×	×	×	×	△	×	×
Adhesion	Can be wiped off with waste cloth	△	△	△	△	×	×	×	×	×	△	×	×
Foam	Unmeasurable due to foam	×	△	△	△	×	×	×	○	○	△	△	△
Corrosion	Corrosive material	△	△	△	△	△	△	△	△	△	△	△	△
High temperature	80 deg.C or higher	△	×	△	△	△	△	△	×	×	△	△	△
High pressure	Higher than atmospheric pressure	△	×	△	△	△	△	△	×	×	△	×	○
Negative pressure	lower than atmospheric pressure	△	×	△	△	△	△	△	×	×	△	×	○
Narrow place	Width Φ1m at measurement distance 10m	△	△	△	△	○	○	○	△	△	○	○	○
Waveguide measurement		×	×	○	○	×	○	○	○	○	○	○	○

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* In case of judgment △, judgment will change depending on conditions, so please contact us whether it is applicable.

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<https://www.matsushima-m-tech.com/english/>

Thank you for joining our webinar.

**The Actual is Limited
The Possible is Immense**



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Seoul liaison office (Korea)

【Affiliated company】

SHANGHAI DAHONG MATSUSHIMA

MACHINERY CO., LTD

Matsushima
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Matsushima Level Transmitter



Why Radar (Microwave) ?

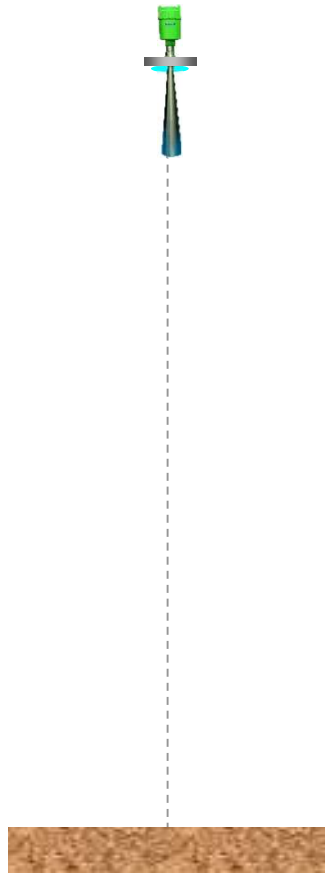
Because Microwave is **electromagnetic wave** like mobile, radar, etc. and never affected by temperature, pressure, etc.

So, **no influence** on flying dust, fume, etc.

And also applicable to **high temp. pressurized furnace, etc.**

	Flying dust	Fume	Temp.	Pressure	Harmful
Microwave	OK	OK	OK	OK	OK
Ultrasonic	Not	Not	Not	Not	OK
Laser	Not	Not	OK	OK	OK
Radioactive	OK	OK	OK	OK	YES

Radar Transmitter: MWLM-PR26 series



- 1) Less influenced by environmental condition
→ Measurable in dust or vapor
- 2) Not affected by temperature and pressure
→ Applied in melting furnace
- 3) No moving parts and no consumable parts
→ Easy maintenance
- 4) Permeating through the materials of low dielectric constant (PTFE or ceramic)
→ Measuring the level through PTFE tank or plate outside the tank

Highly experience and flexible designing

■ Customized model for various applications

Cooling box



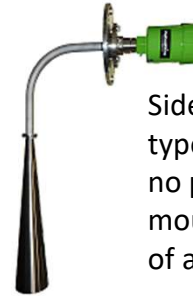
Sophisticated system for high temperature application including furnace and incinerator.

Antenna cap



Antenna cap for protecting the sensor part and internal antenna (e.g., incinerator)

Special antenna



Side-mounting type antenna for no place to mount the roof of a tank or a silo.

PTFE coated antenna



Antenna coating against dew condensation or dust (e.g., chicken dropping silo)

Flat antenna



When SUS material is not allowed as a wetted part or easily corroded. (e.g., chemical tank)

Special antenna



Side-mounting type antenna for shortening blind area. (e.g., CDQ)

Application at Steel Industry

Application: molten metal level in torpedo car

Temperature: around 1600°C (2900 °F)



Permeation measurement passing through the heat-resistance board for blast furnace (molten iron).

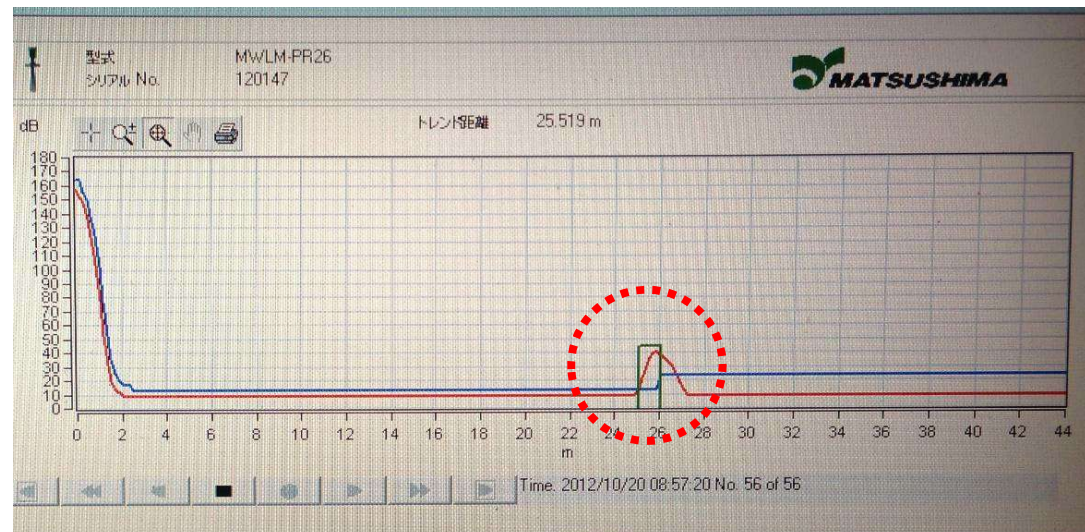
Application at Steel Industry

Application: Granulated blast furnace slag



Application at Feed Industry

Application: Feed grains silo



Application at Cement Industry

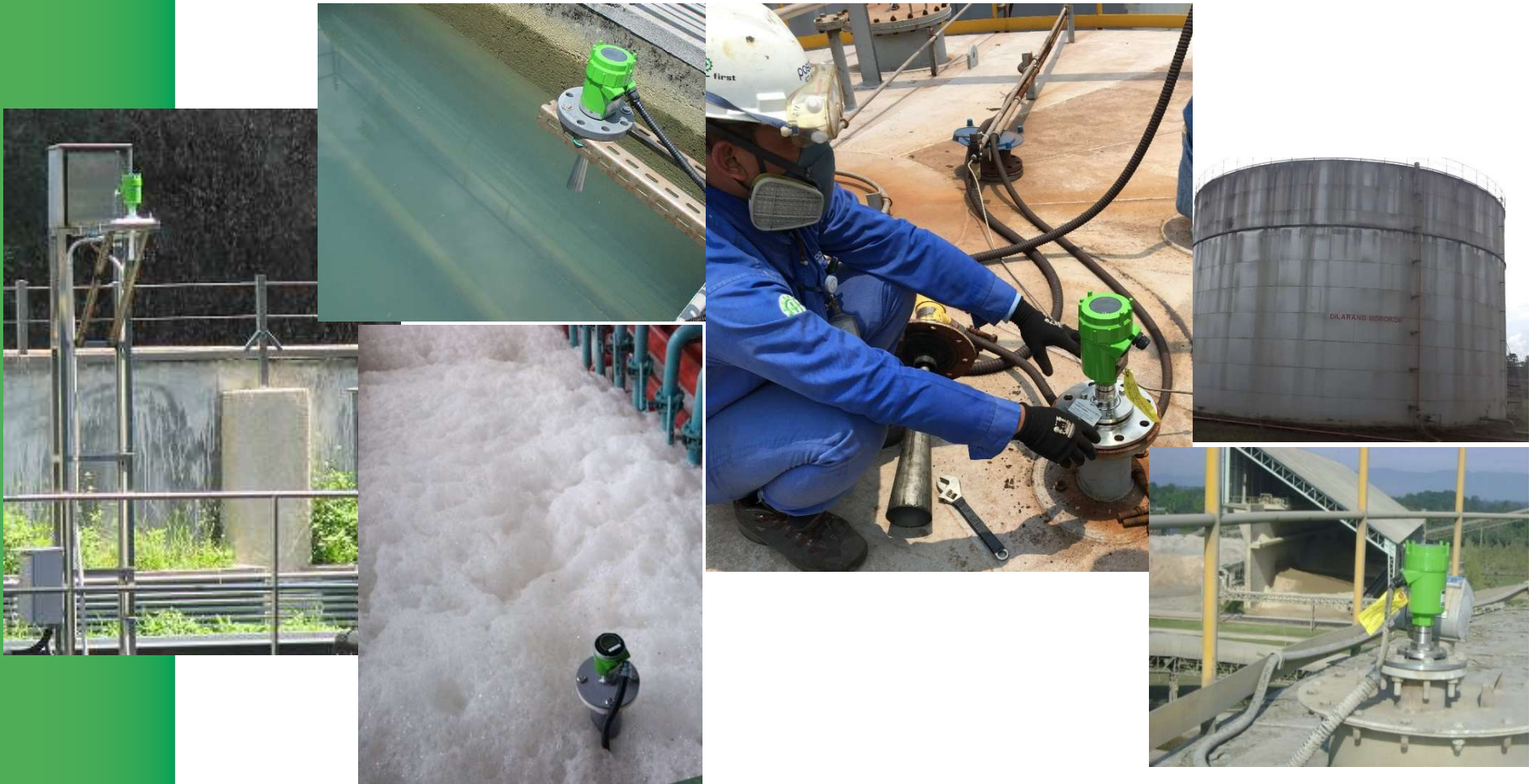
Application: Cement silo

Range: 230ft (70m)



Application for other applications

- *Water treatment*
- *Oil (Diesel)*



Thank you for your attention

Q & A