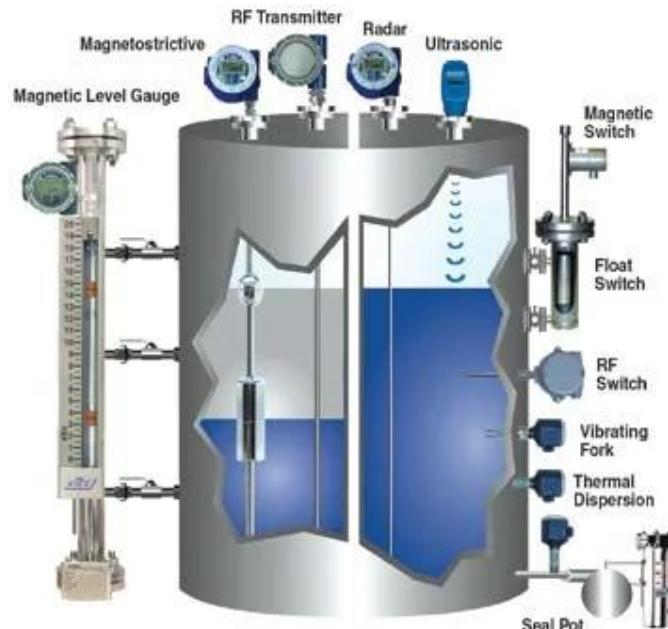


LIQUID LEVEL SENSORS

There are many ways to detect levels of liquids.

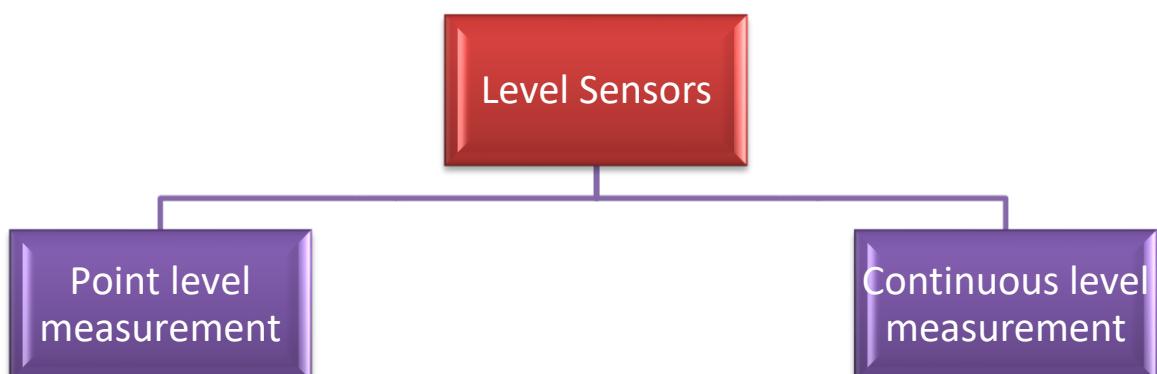
They include use of the resistive , optical , magnetic and capacitive sensors.

The choice of a particular sensor depends on many factors, but probably the defining factor is a type of a liquid.



Level Sensors can be broken into two classifications;

- Point level measurement
- Continuous level measurement



Point level measurement indicates when a product is present at a certain point

Continuous level measuring indicates the continuous level of a product as it rises and falls.

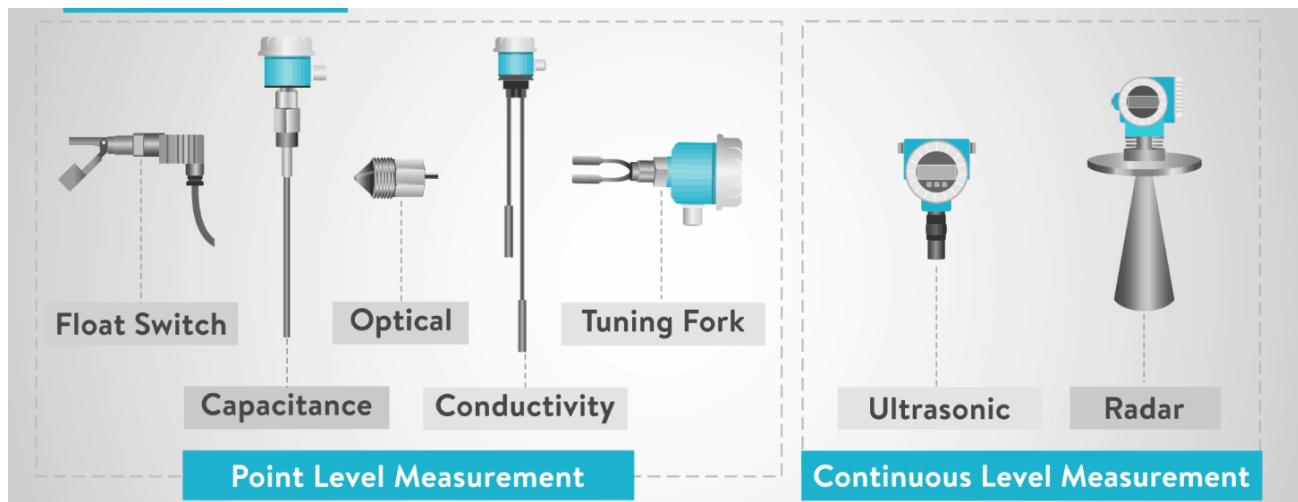
LIQUID LEVEL SENSORS

The sensors for point level indication are:

- **Capacitance**
- **Optical**
- **Conductivity**
- **Vibrating (Tuning fork)**
- **Float Switch**

The sensors for continuous level measuring are:

- **Ultrasonic**
- **Radar (Microwave)**

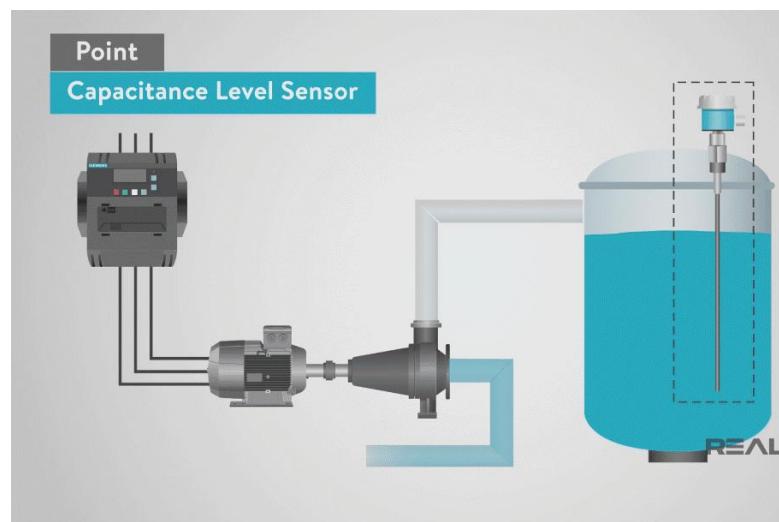


Capacitance Level Sensor

A **capacitance level sensor** is a proximity sensor that gives off an electrical field and detects a level by the effect on its electrical field.

These sensors are:

- Small
- Less expensive than other sensors
- Invasive to the product
- Accurate
- Have no moving parts



However, they do have to be calibrated and will only detect certain liquids.

Capacitance sensors can be used in liquid storage tanks. A water treatment facility that has storage tanks would be an ideal use for a capacitance sensor.

LIQUID LEVEL SENSORS

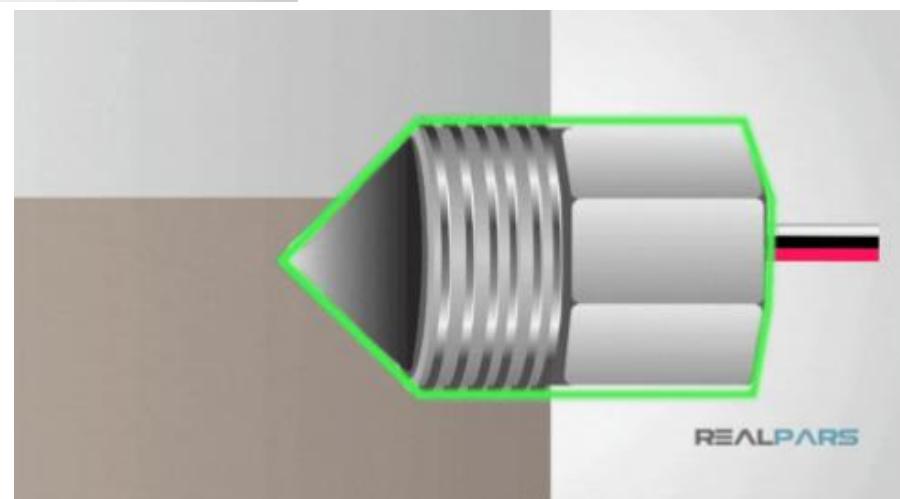
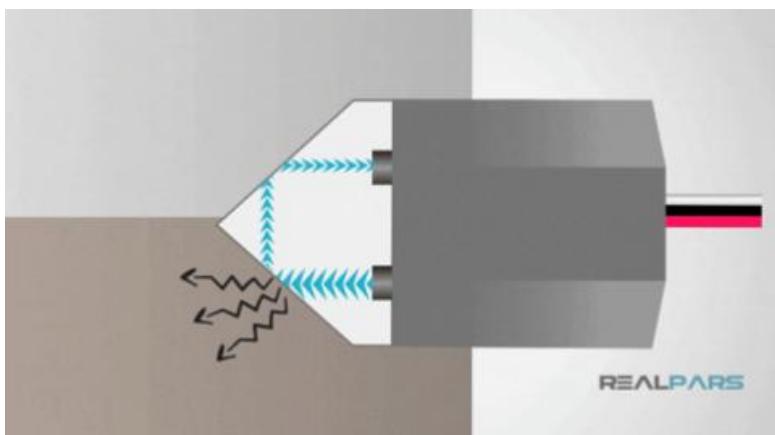
Optical Level Sensor

Optical sensors work by converting light rays into electrical signals which measure a physical quantity of light then translate it into a measurement.

- These sensors have no moving parts
- They are not affected by high pressure or temperature
- They are small in size
- They can be used in liquid applications

However, if the lens gets coated or dirty they would require cleaning.

They can be used as low-level indicators to prevent run dry conditions when using oil, coolant, or hydraulics.



LIQUID LEVEL SENSORS

Conductivity (Resistance) Level Sensor

Another style of point level sensor is conductivity or resistance.

A conductivity or resistance sensor uses a probe to read conductivity. The probe has a pair of electrodes and applies alternating current to them.

When a liquid covers the probe its electrodes form a part on an electric circuit, causing current to flow which signals a high or low level.

The advantages of using a conductivity level sensor are:

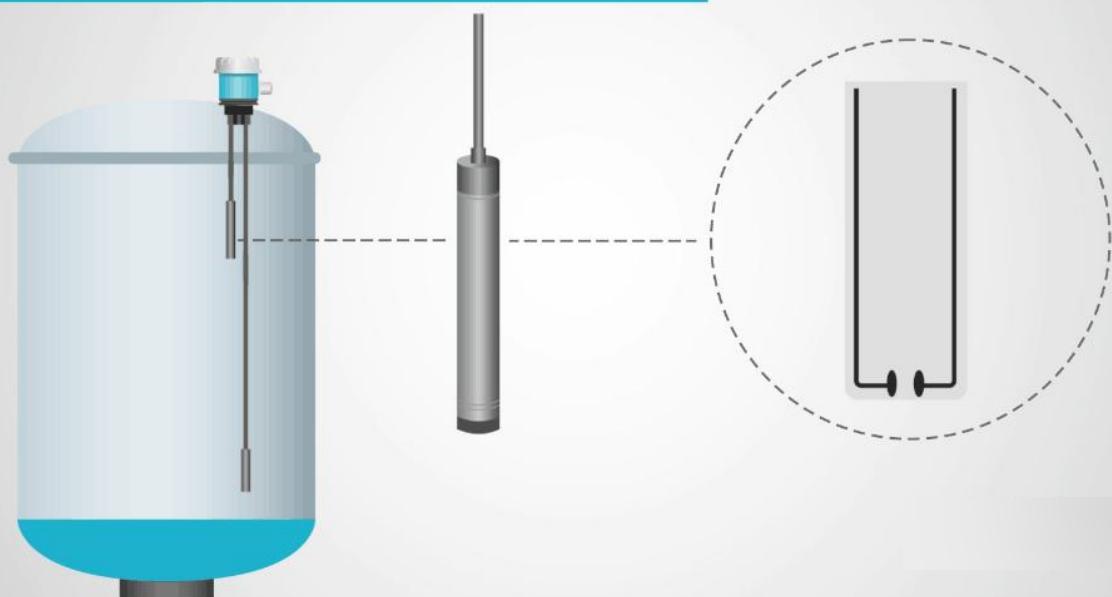
- There are no moving parts
- They are low cost
- Fairly easy to use

The disadvantages are:

- They are invasive (meaning they must touch the product being sensed)
- They only sense conductive liquids
- The probe will erode over time

Point

Conductivity (Resistance) Level Sensor



LIQUID LEVEL SENSORS

Vibrating (Tuning Fork) Level Sensor

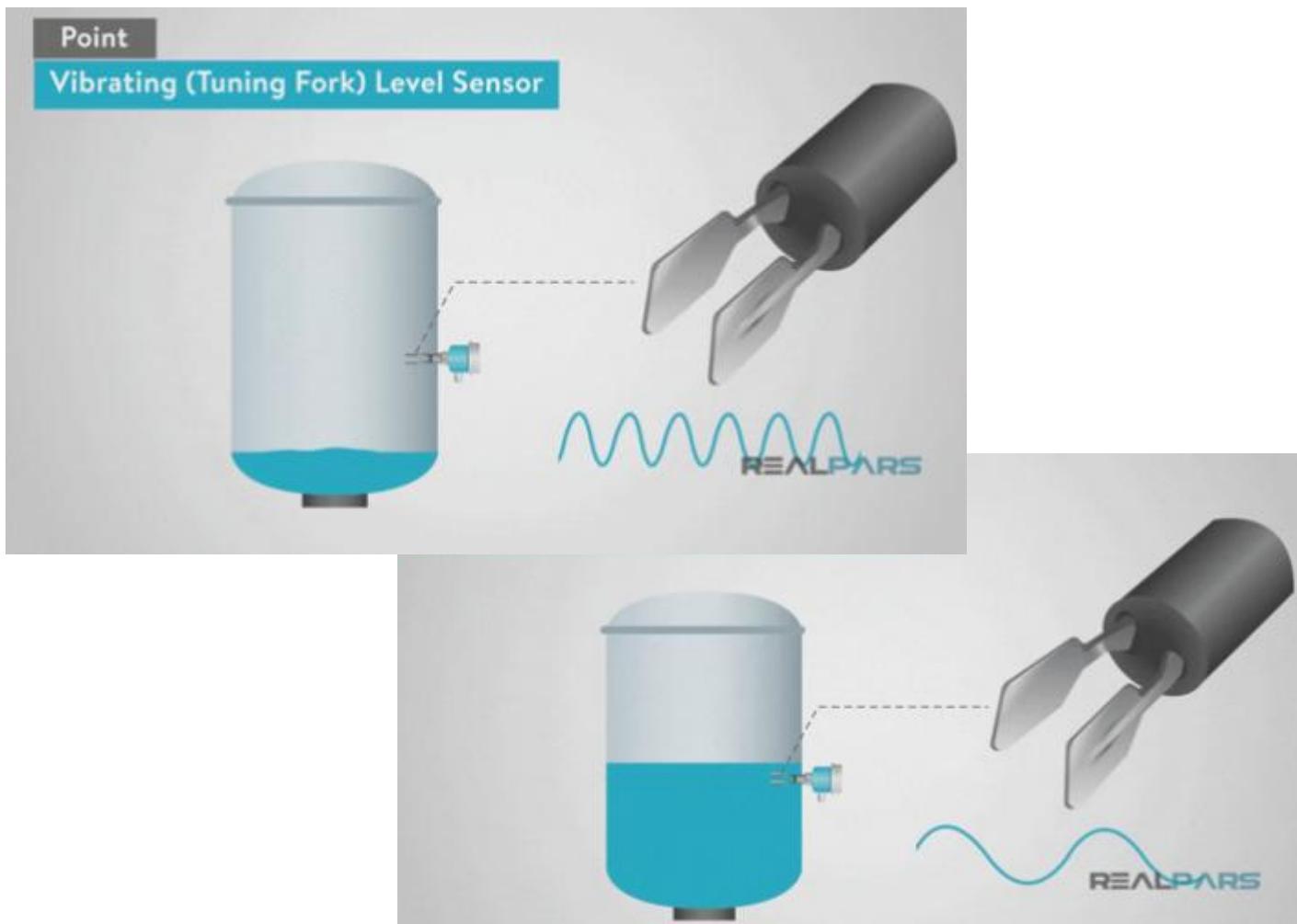
Vibrating or tuning forks is another type of point level sensor.

They use a fork-shaped sensing element with two tines. The fork vibrates at its natural resonant frequency. As the level changes, the frequency of the fork will change detecting the level.

These sensors are:

- Cost effective and compact
- Invasive to the product, meaning they have to touch the material to sense the level
- Easy to install
- Essentially maintenance-free

They have unlimited uses based on the material that they can sense. Mining, food and beverage, and chemical processing industries use these sensors for their applications.



LIQUID LEVEL SENSORS

Float Switch

The last point level sensor that we will talk about is a float switch.

Float switches use a float, a device that will raise or lower when a product is applied or removed, which will open or close a circuit as the level raises or lowers moving the float.

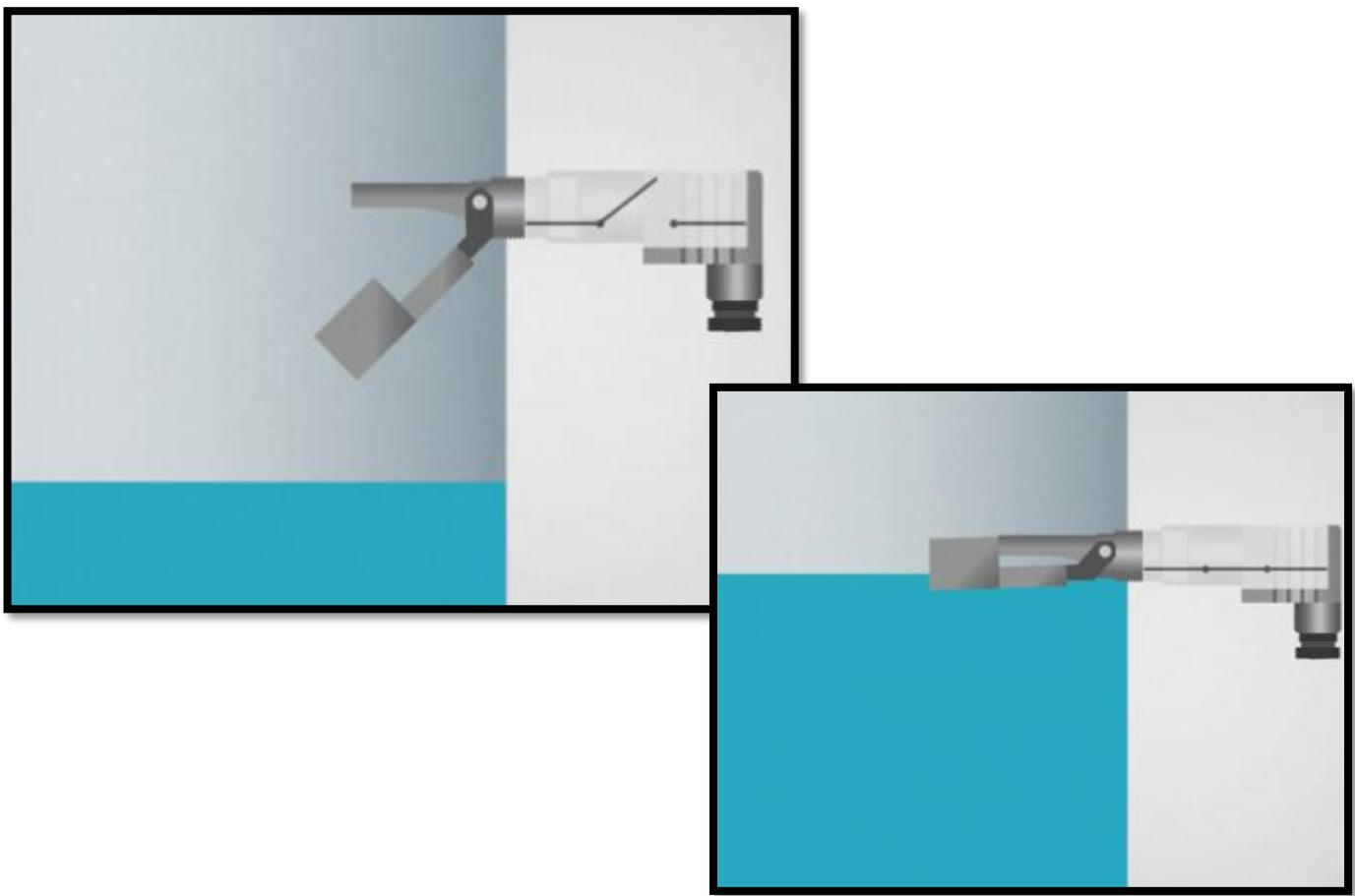
The advantages of a float switch are:

- They are non powered device
- They provide a direct indication
- They are inexpensive

The disadvantages are:

- They are invasive to the product
- They have moving parts
- They can be large in size

Float switches will only give an indication for a high or low level, they cannot measure a variable level. A great use for float switches is in liquid storage tanks for high or low-level indication.



LIQUID LEVEL SENSORS

Continuous Level Measurement Sensors

1. Ultrasonic Level Sensor

Ultrasonic level sensors work by emitting and receiving ultrasonic waves. The time it takes for the waves to reflect back is how distance is measured.

The advantage of using this type of sensor is that:

- These sensors have no moving parts
- They are compact
- They are reliable
- Non-invasive (Non-contact)
- Unaffected by the properties of the material they are sensing
- Self-cleaning because of the vibrations they give off

The disadvantage of using this type of sensor is that:

- They can be expensive
- In some situations, the environment can have a negative effect on them

An example application is a hot asphalt tank in a shingle manufacturing plant.

The ultrasonic sensor would be placed in the top of the tank away from the hot asphalt and used to sense the level in order to send a fill request for the tank.

Continuous

Ultrasonic Level Sensor



LIQUID LEVEL SENSORS

Radar Level Sensor

Radar or microwave is also a continuous level sensor.

These sensors transmit microwaves by an antenna on the radar sensor. The product that is being sensed reflects these microwaves back to the antenna and the time from emission to reception of the signal is proportional to the level of the product.

The advantages of radar sensors are that:

- They are not affected by temperature, pressure or dust
- They can also measure liquids, pastes, powders, and solids
- They are very accurate and require no calibration
- They are non-invasive because they do not have to touch the product that it is sensing

The disadvantages of radar sensors are that:

- They are expensive
- They have a limited detection range

If we go back to our shingle manufacturing plant example a Radar level sensor could be an ideal solution. Much like the ultrasonic sensor, radar sensors are ideal for hot liquid storage tanks.

Continuous

Radar (Microwave) Level Sensor

