An Overview of Water Level Monitoring Instrumentation

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watershed monitoring instrumentation

Overview of 5 Most Popular Types of Instruments used to Measure Water Level:

- Float & Pulley
- Capacitive Rod/Probe
- Ultrasonic/Radar Sensor
- Bubbler Sensor
- Submersible Pressure Transducer

Comparison Criteria

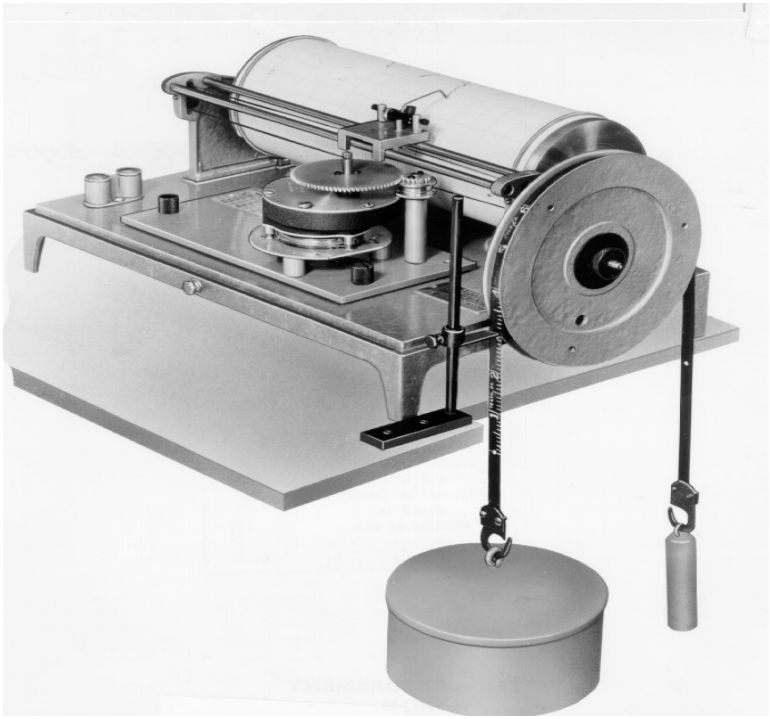
- Cost
- Ease of installation
- Accuracy
- Range

Other:

- Application
- Compatibility with existing Instruments or Systems

Float & Pulley

- Used mainly in surface water monitoring applications



Float & Pulley

Advantages:

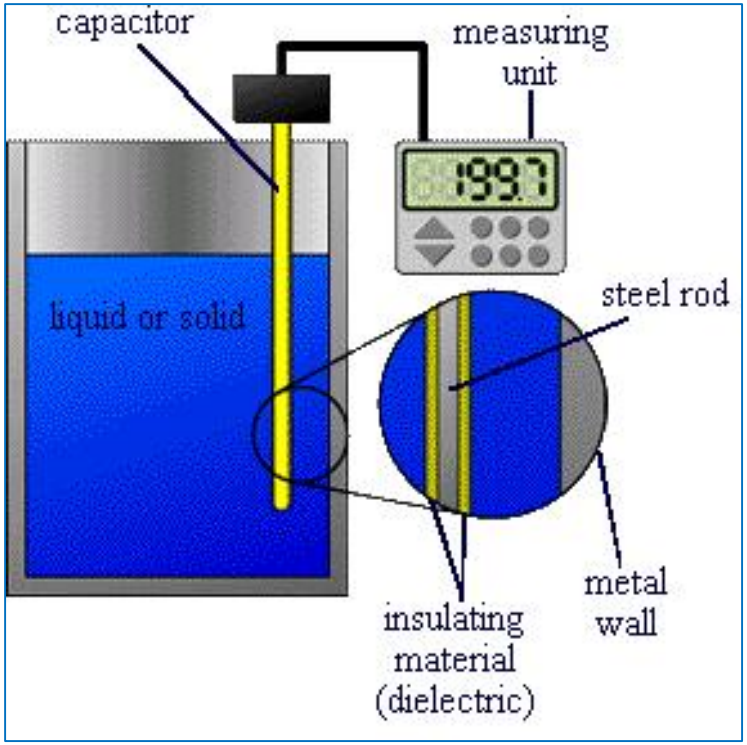
- The most accurate water Level Instrument
- No drift in readings
- Can get a visual reading from tape
- Can be used in freezing conditions

Disadvantages:

- Requires a large > 3” Stillwell
- requires a housing on top of the well
- Can be expensive

Capacitive Rod/Probe

- Used mainly in industrial tank monitoring application



Capacitive Rod/Probe

Advantages:

- Inexpensive
- Can be used in freezing conditions

Disadvantages:

- Low accuracy and resolution (> 1cm)
- Range Limited to 6 meters or less

Ultrasonic/Radar Sensor

- Used mainly in industrial tank & turbulent water monitoring applications as well as for snow depth

Ultrasonic/Radar Sensor

Advantages:

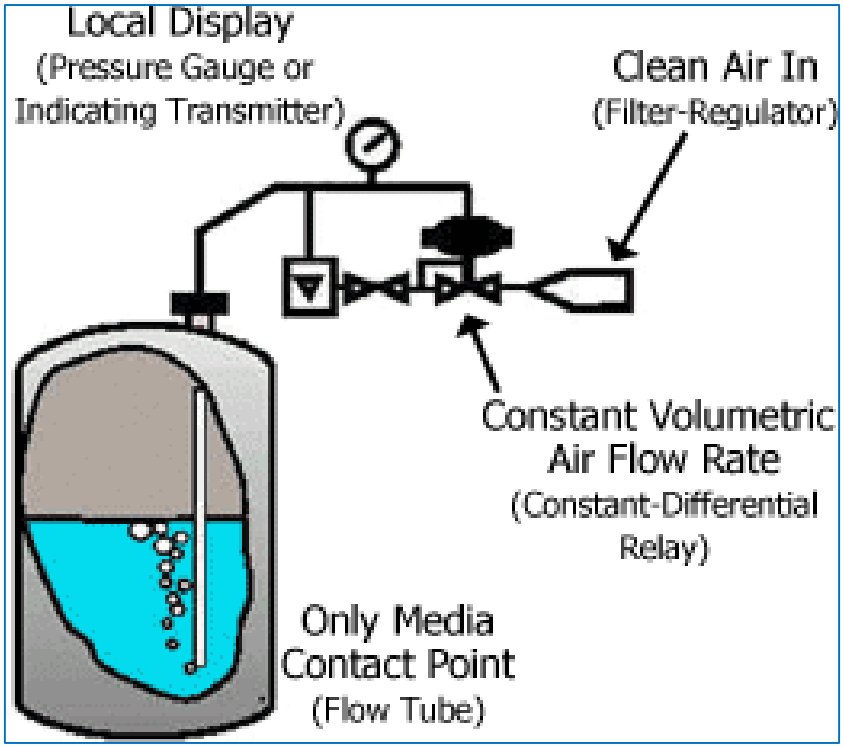
- Non-contact:
  - Can be used to monitor hostile liquids...caustic, hot, solid debris, sewage sludge, etc.
  - Can be used to monitor unstable/turbulent rivers
- Can be used in freezing conditions

Disadvantages:

- Low accuracy and resolution (> 1cm)
- Need an overhead structure for mounting

Bubbler Sensor

- Like Ultrasonic/Radar Sensors used mainly to monitor hostile liquids in industrial tank & turbulent water monitoring applications



Bubbler Sensor

Advantages:

- Readings not affected by foam
- An inexpensive orifice tube is in contact with the water
- Can be used in freezing conditions

Disadvantages:

- High Maintenance
- Expensive

Submersible Pressure Transducer

- **The most popular Water Level Sensor** - Used for industrial tank, river & ground water monitoring applications

Vented

Non Vented

Pressure Transducer

Advantages:

- Easy to deploy
- Inexpensive
- Accurate
- Available in a large variety of ranges & accuracies

Disadvantages:

- In contact with the water
- Should not be Frozen!

Submersible Pressure Transducer

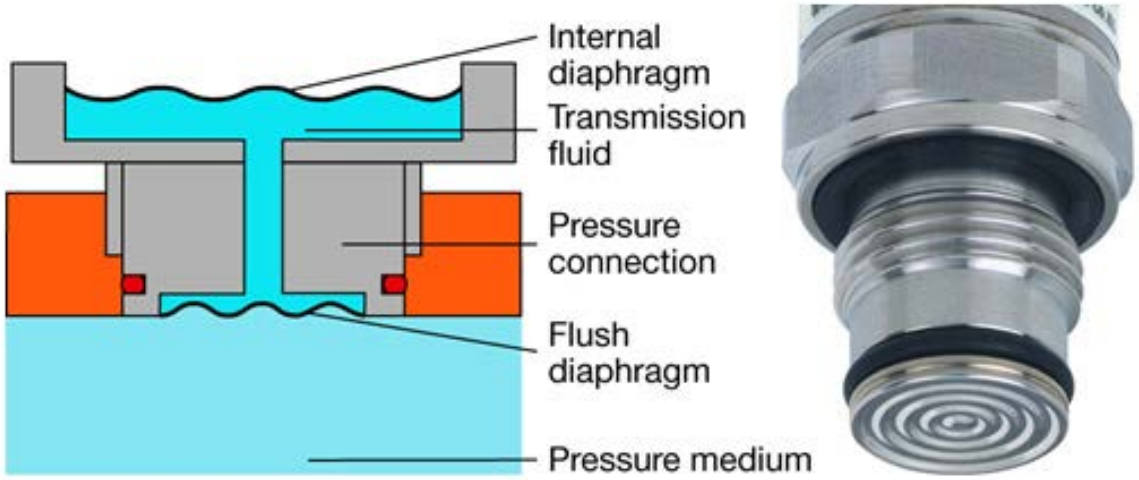
- All Pressure Transducers have a circular diaphragm that converts pressure into an analog electrical signal. The most common is the strain-gage base transducer.

damaged
stainless steel diaphragm

undamaged
stainless steel diaphragm

Submersible Pressure Transducer

- The conversion of pressure into an electrical signal is achieved by the physical deformation of strain gages which are bonded into the diaphragm of the pressure transducer and wired into a Wheatstone bridge configuration.



- Pressure applied to the pressure transducer produces a deflection of the diaphragm which introduces strain to the gages. The strain will produce an electrical resistance change proportional to the pressure.

Vented vs. Non-Vented

Vented

- Must have vent tube from back of pressure sensor to surface of water

Non-Vented

- Usually factory sealed at One Atmosphere

Vented vs. Non-Vented

Vented

- **Ideal Applications:**
  - Long term monitoring
  - When connecting to an external data recorder
- No post processing barometric pressure compensation require
- Vented Cable can be connected to external data logger, PLC, SCADA

Non-Vented

- **Ideal Applications:**
  - Cluster monitoring
  - Versatile short term monitoring
- Not restricted by Vented Cable length
- No Vented Cable hence no issues with Vented Cable...cut, crushed, moisture in the cable

Sensor Signal Output

Analog

- Can be Voltage(V) or Milliamp (mA) output.
- Voltage output draws less power but cable length is restricted
- **4 to 20 mA output is most common**. Can run cable 2 to 3 km
- 4 to 20 mA output can run the through multiple devices in series.

Digital

- RS-232/ RS-485 (Hardware)
- Modbus or SDI-12(Protocol)
- Usually draws less power than analog sensors
- Calibration values are stored in the sensor so easier to swap out sensors.

Data Loggers

Dedicated

- Logger and sensor are combined
- Low cost & easy to setup

Universal/Multi-channel

- Separate logger and sensor
- More flexibility – a variety of sensors can be connected
- Logger can be combined with telemetry

Manual Water Level Meter

Water Level Meter

- Conductivity Sensor with graduated conductor tape

Ultrasonic Water Level meter

- Handheld Meter with Ultrasonic sensor

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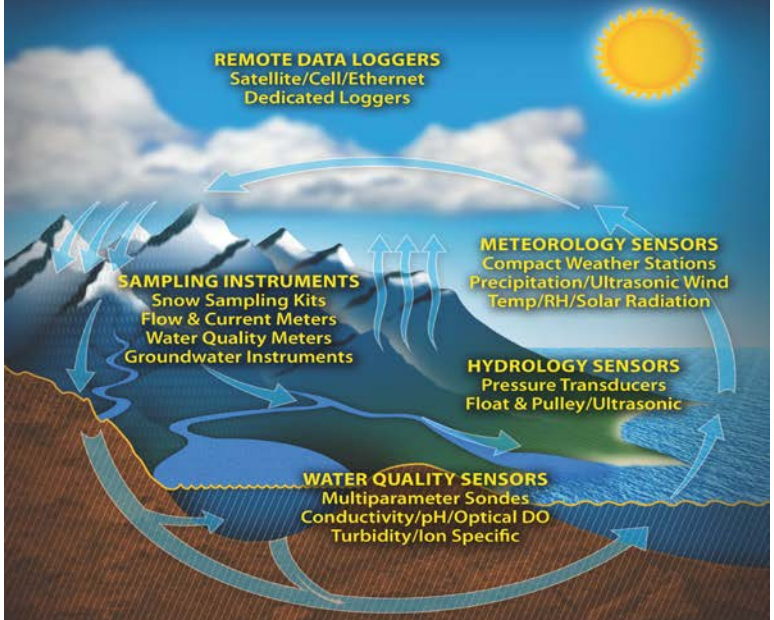

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