# Understanding Accuracy Specifications vs. Applied Accuracy

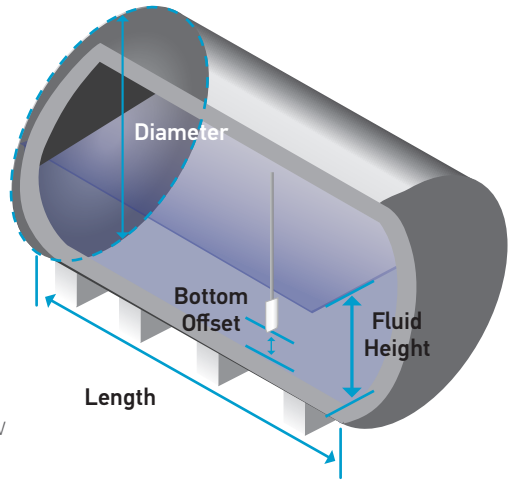
## Learning Point: Know what accuracy to expect. A +/- 100 gallon accuracy may be beyond the capability.

### Specifications 101

- Spec sheet accuracy is based on a test environment, with the following conditions constant: temperature, humidity, pressure, specific gravity and tank conditions.
- Spec sheet accuracy is also based on the full range of the sensor

**Example 1 – a sensor range of 120 inches with a 1% accuracy, means the reading can vary between +/- 1.2 inches.**

**Example 2 – a sensor range of 400 inches with a 1% accuracy, means the reading can vary between +/- 4.0 inches.**




### Specified Inaccuracy

- It is common to think of accuracy in terms of gallons. Incorrect conversion from the raw measurement value to gallons is the most common root cause of inaccurate readings.

**Example**

- **A 10,000 gallon horizontal cylinder tank, with a diameter of 10 ft and approx length of 17 ft (see image above/right)**
- **Accuracy in gallons will vary based on gallons per inch of the tank look up table. The middle or wider part of the tank will have less accuracy then the lower or upper part of the tank. From the look up table, there is approx 110 gallons per inch at the middle of the tank. Taking 1% accuracy from the specification of a 120 inch sensor range, equals a 1.2 inch accuracy band. Taking 1.2 inches times 110 gallons per inch from the lookup table equals +/- 132 gallons of potential inaccuracy (in best case lab conditions).**

### Field or Applied Inaccuracy

**Gallons Calculation (most common)**

- Lookup table inaccuracy
- Tank construction inaccuracy
- Incorrect offsets at bottom or top of tank

**Submersible Pressure**

- Incorrect bottom offset measurement
- Readings at the bottom of the tank where the sensor loses sensitivity
- Poor or slow tank venting
- Specific Gravity changes of the liquid contents perhaps due to seasonal blends or normal variance
- Unexpected water or sludge in the tank and associated specific gravity differences

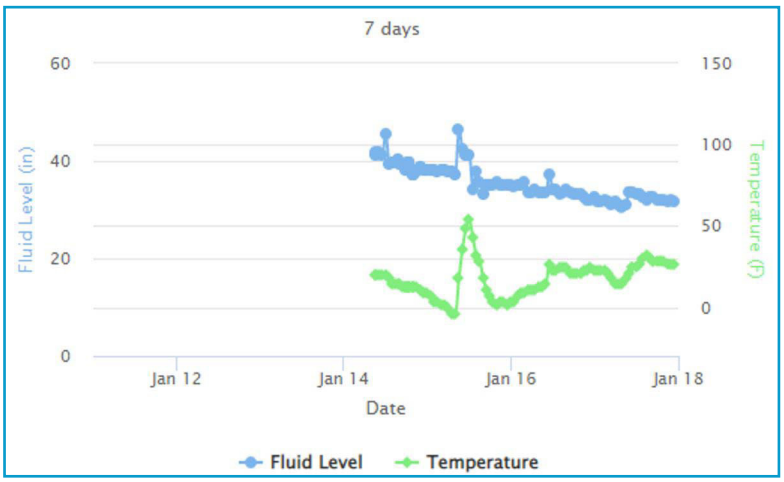
**Ultrasonic**

- Incorrect riser offset measurement
- Readings at the top of the tank in the sensor dead-zone
- Vapor in the headspace can slow the ultrasonic response
- Foaming surface or condensation in the tank

**Situation:** Pressure build up inside tank with pressure level monitor (more common in poly tanks)

**Result:** Level reading varies 10", and is outside of 1% accuracy specification

**Solution:** Install vent on tank or change sensor to ultrasonic or MIR type

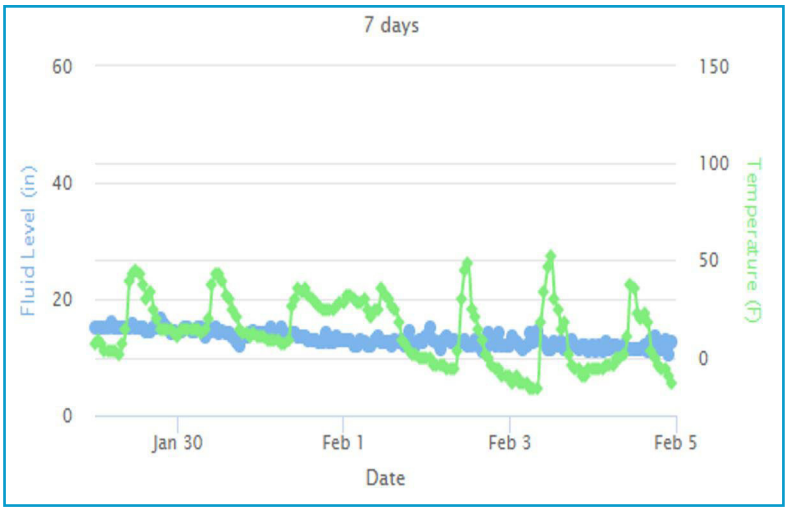



| SPECIFICATIONS | VALUE |
|---|---|
| Sensor Range Inches | 400 Inches |
| Accuracy | 1%, or 4 " |
| **FIELD CONDITION** | **VALUE** |
| Temperature Swing | 58º F |
| Unvented Poly Tank | N/A |
| Level Swing | 10 Inches |

**Situation:** Outdoor tank experiencing 60º F daily temperature swings

**Result:** Level reading varies 3", and is inside of 1% accuracy specification

**Solution:** Accept as-is, or change to higher accuracy sensor

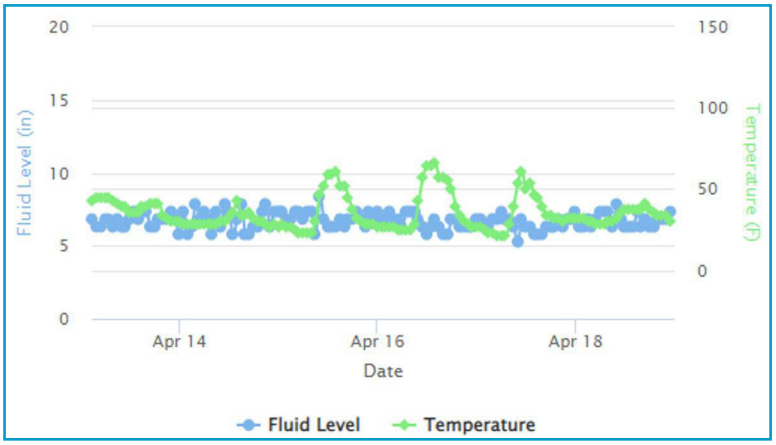



| SPECIFICATIONS | VALUE |
|---|---|
| Sensor Range Inches | 400 Inches |
| Accuracy | 1%, or 4 " |
| **FIELD CONDITION** | **VALUE** |
| Temperature Swing | 63º F |
| Level Swing | 3 Inches |

**Situation:** Mid range sensor - bottom of tank, actual level is steady, no change

**Result:** Level reading varies 1.2", and is withtin 1% accuracy specification

**Solution:** Accept as-is, or change to higher accuracy sensor

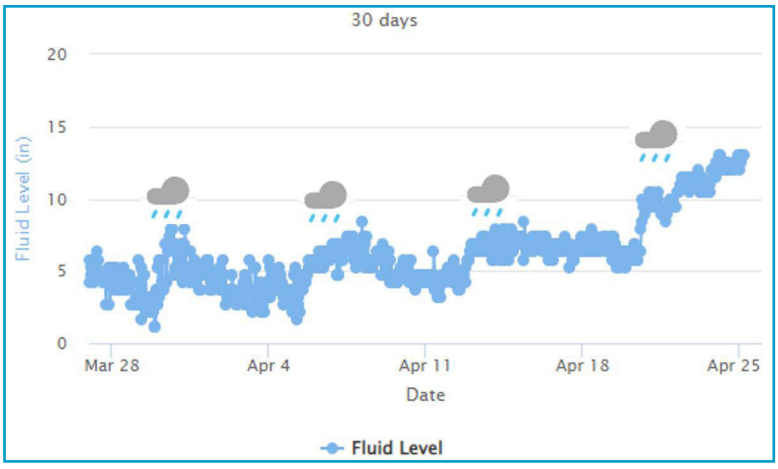



| SPECIFICATIONS | VALUE |
|---|---|
| Sensor Range Inches | 120 Inches |
| Accuracy | 1%, or 1.2 " |
| **FIELD CONDITION** | **VALUE** |
| Temperature Swing | 49º F |
| Level Swing | 1.2 Inches |

**Situation:** Extreme test - tall range sensor used as a rain gauge

**Result:** Level reading detects 1-3" increase corresponding to rain days. RIGHT ON!

**Solution:** Accept as-is, long range sensor applied in extreme application works well at detecting rain days. Absolute accuracy remains 1% or +/-4".




| SPECIFICATIONS | VALUE |
|---|---|
| Sensor Range Inches | 400 Inches |
| Accuracy | 1%, or 4 " |
| **FIELD CONDITION** | **VALUE** |
| Temperature Swing | 63º F |
| Level Swing | 3 Inches |

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