Tank Solutions

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TANK CONTENTS GAUGING SYSTEMS

When selecting a contents gauge various factors can effect the type of device utilized. These are :-

- ✓ Tank Type – Above or below Ground.
- ✓ Product stored.
- ✓ Remote or Local Display
- ✓ Availability fittings for sensor mounting
- ✓ Tank Shape. Is the relationship between Level and Volume Linear or Non Linear.
- ✓ Are level alarms required.
- ✓ Is Power or Air available.
- ✓ Are the vessels vented.

Self Powered Contents Gauges.

Fig 1

Self Powered Contents Gauges do not require power or air to operate. They monitor hydrostatic level and use the hydrostatic pressure transmitted from a diaphragm sensor via inert gas in a capillary to a capsule gauge indicator to display tank contents. The dial is marked with contents graduations in Engineering Units, normally Litres. They are suitable for any shaped tank as the level verses contents function is resolved on the dial. They are thus manufactured to suit a particular tank storing a particular product. The product is marked on the dial. E.g. Diesel @ SG0.84.
The sensor is normally side or base mounted via a ¾" BSP Socket on above ground tanks, or supplied on a flanged mounted pole for top mounting on underground vessels. They are extremely reliable devices and their only disadvantage is that once manufactured the armored capillary connecting the sensor and indicator cannot be broken. This can make them difficult to install where the display is required through a wall on across a roadway

Electronic Contents Gauges

Electronic contents gauges can use a number of level measurement techniques but the most common are gauge pressure devices monitoring hydrostatic head or Ultrasonic Level Transmitters using echo ranging techniques. For above ground tanks either method will product reliable results however on underground tanks vessel access restrictions and environmental conditions under the tank access cover tend to favor electronic submersible hydrostatic pressure transmitters.

Hydrostatic Level Transmitters

Fig.2

Figure 2 indicates a submersible transmitter. It is only 24mm OD and is suspended from a gland on a fitting on the top of the vessel via its IP68 submersible vented cable. This cable has a sheath that is impervious to hydrocarbons. In underground tank situations the cable may be terminated in the pit above the manhole cover however if this space is subject to flooding the unit is supplied with enough extra IP68 Cable to enable termination at a point above maximum flood level. There is no limitation to the vessel size to which these units may be applied however larger vessels are above ground and base or side mounted versions of the instrument may prove more cost effective as the submersible is expensive when compared to standard instrument cable. These devices are standard 2 wire loop powered devices with 4-20mA output. Exi versions are available for use in Hazardous Area Installations. The are available in accuracy's of 0.50,0.25and 0.10% of Span.

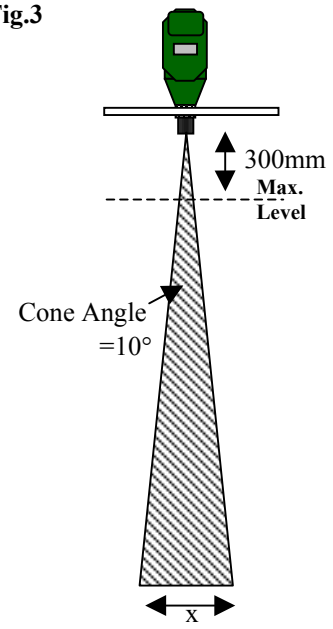
Ultrasonic Level Transmitters.

The Ultrasonic Level Transmitter is also a loop-powered device. They are site programmable for ranges 300 to 5000 mm. They measure direct level to an accuracy of 1.0%. The ultrasonic beam has a 10° cone angle so care must be taken with mounting the instrument. No internal tank fittings can impinge within the cone angle. See Figure 3.

Fig.4

Unlike the hydrostatic device the level reading is not affected by changes in SG or require a SG to be known for calibration purposes. The units do however have a 300mm dead band which means that the closest the liquid may come to the transducer face is 300mm. This is generally not a problem when mounted on the manhole cover or on large tanks. A standpipe can be used to raise the transducer in some cases. When a standpipe is being used it must be as wide as possible; i.e. the pipe diameter must be at least double its height .The base MUST have a 45° chamfer to reduce the echo size from the bottom of the standpipe. No welding should be present on the inside of the pipe as this causes false echoes.
These units are IP65 and will be available in Exi versions in the near future.

Fig.3



Distance From Transmitter M	X/2
1	88mm
2	175mm
3	263mm
4	350mm
5	440mm

Electronic System Displays.

There are various forms of digital level monitors, which are used with the above transmitters. The selection depends on the application. Factors to concider are:-

- Is level or actual contents required
- Is the vessel of linear or non-linear contents.
- Are Alarm Functions required
- Are the provisions of AS1940 to be meet (See Below)

When the vessel is of linear Level verses Contents function, or percentage level is adequate, a simple loop indicator or basic powered digital display can be used. The latter can provide alarm functions.

Fig 5. The Contrec 210 Loop powered indicator is IP67 for field or panel mounting. 24VDC Nominal Power is fed via 2 wires to the electronic level transmitter, which resolves the level in the tank as a 4 -20mA signal in the loop. The 210 is installed in series into the 2-wire loop. It may be scaled 0-100% or
In Engineering Units of contents if the vessel has a linear function.

Fig 6. The Contrec 220 Level Monitor is also loop powered but can linearise the Tank Function, provide density correction, and has four switched outputs available for alarm and control functions. The alarm can be set to be acknowledged from a key on the fascia making this the ideal instrument for use at the fill point as required by AS1940.

Fig 7. The Instrotech 4000 Series is a mains powered panel indicator, which provides the 24VDC supply to the level transmitter and provides the display functions as per the 210 in Fig 5. It is fitted with alarm/control contacts but if annunciation functions are required these are externally wired.

AS1940

5.3.4 Liquid level indication. It shall be possible to monitor or gauge the amount of Liquid in any tank intended to receive a delivery. This gauge or monitor shall also show the safe fills capacity of the tank.

Any tank filled by gravity shall be fitted with an automatic flow limiting device which reduces the flow rate into the tank by 98% when the safe fill level of the tank has been attained.

A remote contents gauge or monitoring device together with an overfill alarm shall be provided at the fill point in the following circumstances:

(a) Where the tank is located within a building or under a building and the dip point is more than 8 *m* from the entrance to the building or otherwise inaccessible.

(b) Where the tank is in a tank chamber and access to the dip point is prevented.

NOTE: The statutory authority may require additional liquid level indication as described in this Clause for tanks other than tanks inside buildings where the tank is out of sight of the attendant monitoring the filling flow controls.