

INDUSTRIAL TANK LEVEL MONITORING



(Source: Pixelbay.com)

APPLICATION BACKGROUND

Measurement of levels in tanks is important across many industrial applications. There are many tank monitoring applications, for example fuel monitoring, mining process liquids monitoring, and pipeline corrosion inhibitor liquid monitoring.

The monitoring is required for two purposes. One purpose is to make sure the liquid does not run out / the tank does not run dry.

Another purpose is to ensure the liquid is being drawn from the tank in line with the expected usage, which is another indicator that the process using the liquid is operating correctly, and is a derived measure of the flow from the tank.

APPLICATION DETAIL

For this application, it would be appropriate to use a pressure sensor, and use the pressure from that sensor to determine the level in the tank. The sensor would be most likely strain gauge technology, sometimes called a hydrostatic sensor.

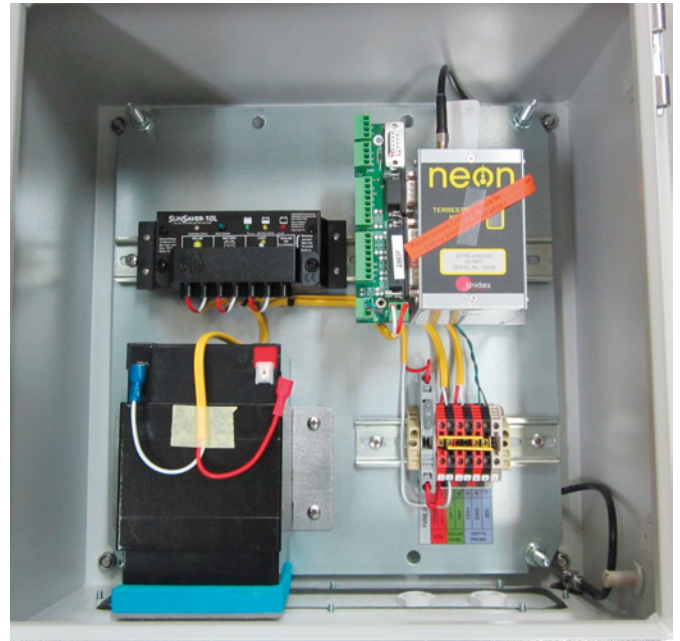
These sensors can be either vented or non-vented. Vented sensors have one side of the sensor exposed to the liquid being measured and the other side of the sensor open to the air, either directly exposed, or exposed by using a small vent tube inside the cable with a vent to the atmosphere at the termination end of the cable. Non vented sensors need a barometric pressure sensor at the location of the measurement to provide the current atmospheric pressure, which is then used in a calculation to compensate / normalise the pressure reading based on the current atmospheric pressure at that location and at that time.

The casing for such sensors can be either stainless steel or titanium. Titanium is chosen for more corrosive environments. The output of such sensors can be 0 to 5 volts, 4 - 20mA, SDI-12 or Modbus.

The diagram shows two methods of connecting the sensor. The first method is to immerse the sensor in the liquid and the cable exits from the top of the tank. The second method involves adding the T piece with an attached pressure sensor to the tank output pipe. Pressure measured within the T piece is directly related to the level in the tank.

Consideration should be also given to the choice of communication channel for the telemetry function. The most economical choice, if available, would be to use a cellular network. All Unidata Neon Remote Loggers support this option.

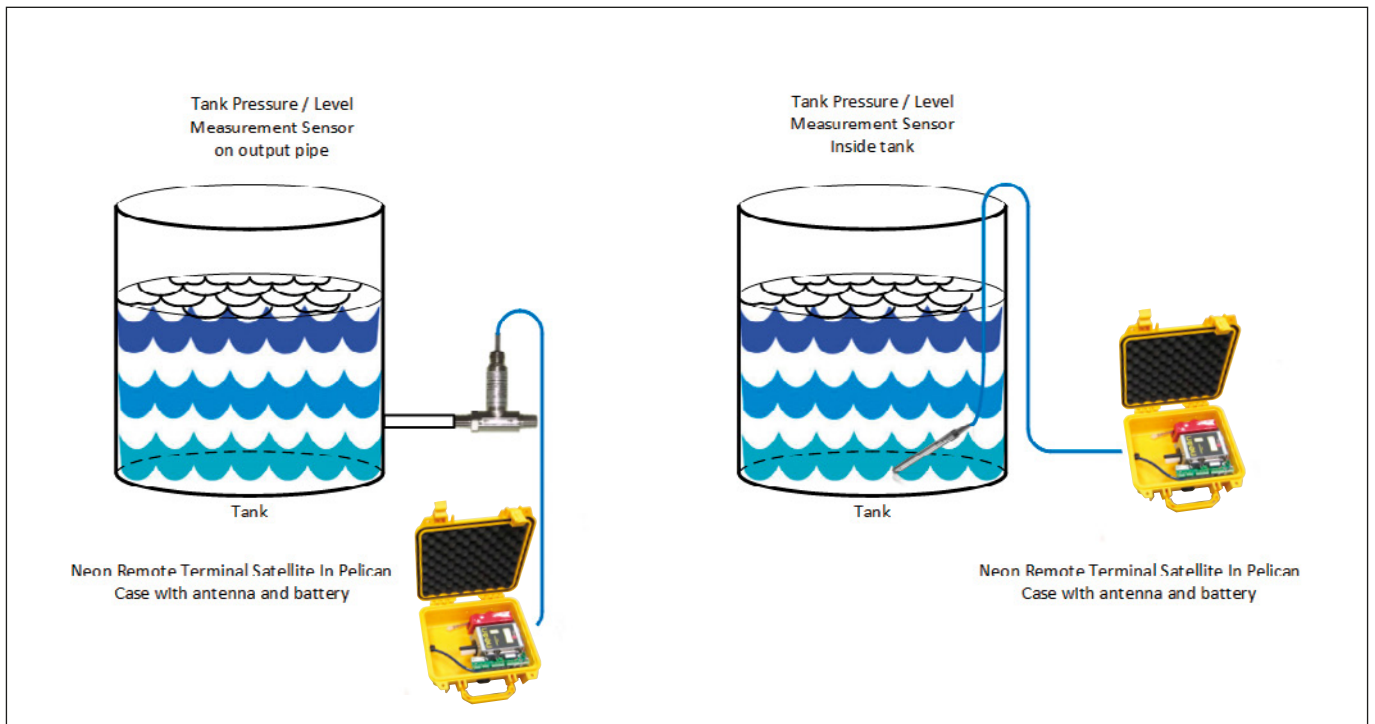
If there is no cell phone coverage then the Satellite Neon Remote Loggers would be the way to go. As tank monitoring is low volume data, services such as Iridium short burst data, Inmarsat ISAT Data pro or Orbcorn are probably the best options.

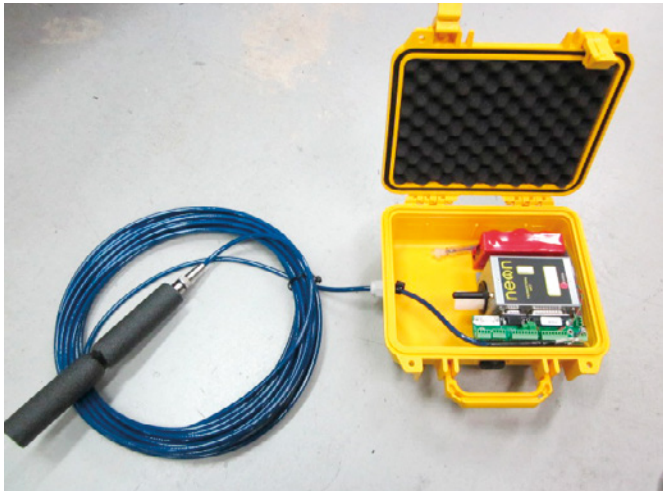


However, the data transmission costs escalate greatly for these services when the data rate is anything more than an occasional transmission of a short packet of data.

The third option is to use a LoRa Neon Remote Logger. In this case, water level sensors are read by the logger according to the scheme. A set of short data packets will be sent, as set by logging interval, to the LoRa WAN gateway over either private or public LoRa network.

LoRa WAN gateway transfers data packets to Neon Server using Ethernet, cellular or satellite network.

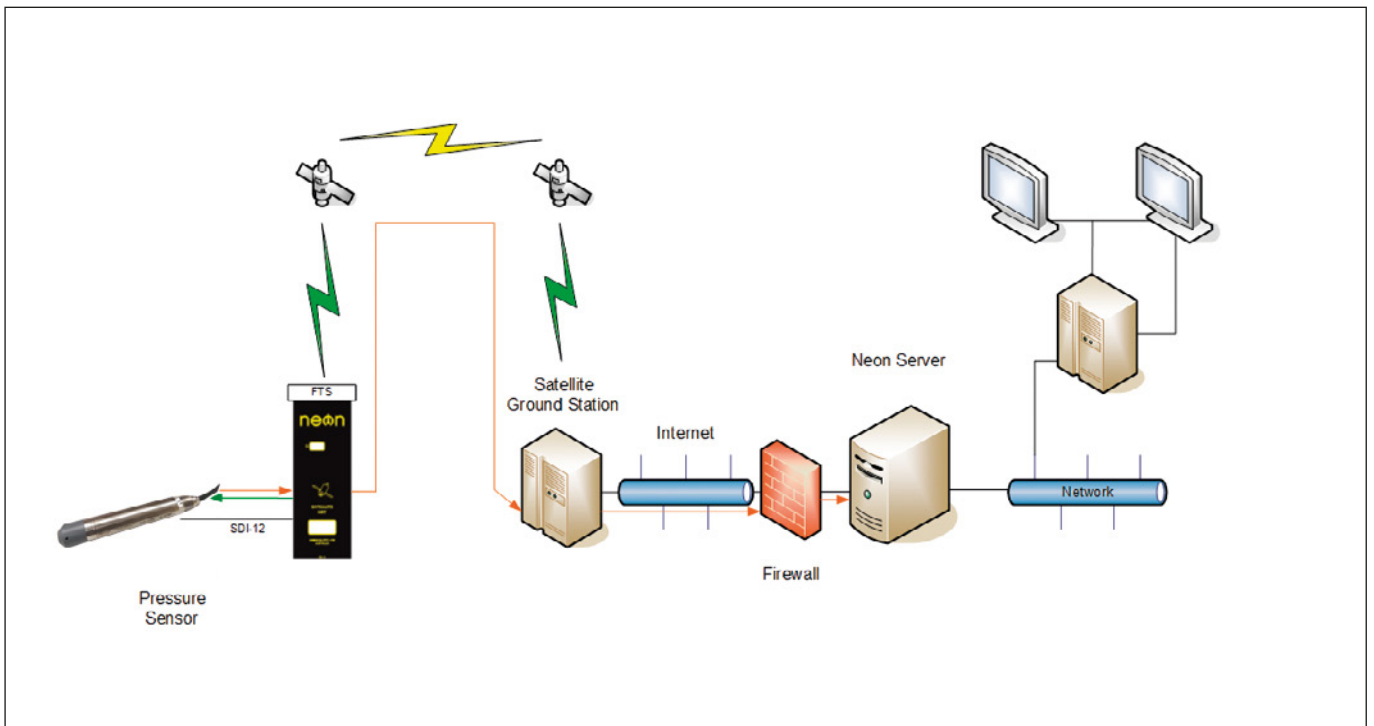




The LoRa WAN system has a typical range of up to 5km, the range reduces in built up areas depending on building density and increases where there is line of sight and when a larger antenna is used.

The application is quite a simple one; the tank level should be measured, perhaps hourly, and stored locally and then sent to the Neon Server daily to display the level on the Neon Web application. The Neon Remote Logger in the field would also have alarms set up based on any unusual condition, for example too fast level changes would indicate a leak and too slow level changes would indicate a blockage. In the event either of these conditions was detected an immediate transmission back to the server will be initiated and an alarm set to alert operators of the problem.

As the power requirements for this type of monitoring are light, the whole system could be housed inside a small pelican case and powered by a set of lithium batteries. The power budget is small as the sensor would be turned on every few hours and only for the short period of time needed to take a measurement. In this configuration a suitable lithium battery pack could power the entire system for up to 5 years.



TYPICAL CONFIGURATION

APPLICATION SPECIFIC INSTRUMENTS / INPUTS

Options	Unidata Part Number	Description
Hydrostatic Water Depth Probes	6542D-A / B / C	PT12 Pressure / Temperature Sensor SDI-12 3.5m, 10m or 20m
Hydrostatic Water Depth Probes Titanium	6542D-T-A / B / C	PT12 Pressure / Temperature Sensor SDI-12 3.5m, 10m or 20m
4-20mA Pressure Transmitter	6548A-B / C	Submersible Pressure Transmitter 4-20mA 5m or 10m

NEON TELEMETRY - NRL / RTU / FIELD UNITS

Options	Unidata Part Number	Description
Ethernet	3016A-000 / 3008A-000	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Ethernet & 3G / 4G	3016A-C00 / 3008A-C00	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Ethernet & 3G / 4G and LoRa	3016A-CLO / 3008A-CLO	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Equatorial Orbit Satellite - Inmarsat	3016A-001 / 3008A-001	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Equatorial Orbit Satellite - Inmarsat & 3G / 4G	3016A-C01 / 3008A-C01	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Low Earth Orbit Satellite - Globalstar	3016A-00G / 3008A-00G	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Satellite - Iridium Short Burst Data	3016A-00R / 3008A-00R	Neon Remote Logger-16 or 8 Analog Ch / Touch Screen Display
Standalone RTU / NRL - Industrial	3004A-00 / 3004A-0L	Neon Remote Logger-4 Analog Ch with or without Touch Screen Display
Cellular RTU / NRL 3G / 4G - Industrial	3004AC0 / 3004A-CL	Neon Remote Logger-4 Analog Ch with or without Touch Screen Display
M – Series Standalone RTU / NRL	3004B-M000 / 3004B-M0B0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series Cellular RTU / NRL 3G / 4G	3004B-MC00 / 3004B-MCB0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series LoRa RTU / NRL	3004B-ML00 / 3004B-MLB0	Neon Remote Logger-4 Analog Ch with or without Li Battery
M – Series Ethernet RTU / NRL	3004B-MEBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional
M – Series Microsatellite RTU / NRL	3004B-MHBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional
M – Series Iridium Short Burst Data RTU / NRL	3004B-MIBL	Neon Remote Logger-4 Analog Ch, Li Battery & LCD are optional

NEON APPLICATION SOFTWARE - CUSTOMER SERVER

Options	Unidata Part Number	Description
Neon Applications Software	2302A	Neon Server Software Licence Incl 5 NAL
Neon Applications Software	2302A-10	Additional 10 NRT Access Licence
Neon Applications Software	2302A-20	Additional 20 NRT Access Licence
Neon Applications Software	2302A-50	Additional 50 NRT Access Licence

NEON HOSTING SERVICE - UNIDATA SERVER

Options	Unidata Part Number	Description
Neon Hosting Service	2301A	Neon Data Initial Subscription Setup Fee
Neon Hosting Service	2301A-01	Neon Data Service Fee for 1-50 NRT
Neon Hosting Service	2301A-02	Neon Data Service Fee for 51-100 NRT
Neon Hosting Service	2301A-10	Neon Data Service Fee Metering

DATALOGGER MANAGEMENT SOFTWARE

Options	Unidata Part Number	Description
Starlog V4 Management Software	6308A-AUE	STARLOG V4 Full Licence Key