

Application Note

Using Level TROLL[®] Devices in Soil Vapor Extraction (SVE) Systems

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Introduction

Soil vapor extraction (SVE) is an easy and low-cost remediation method for removing volatile hydrocarbons, typically from petroleum products, from contaminated soil and ground water. Designs of SVE systems vary, but the basic concept involves 1) pumping air through the vadose zone to volatilize hydrocarbons to a gas and 2) pumping these vapors through an extraction well. As a result, these gases introduce new pressure fluctuations into an aquifer, affecting groundwater elevations (Wong, 1997).

Pressure fluctuations caused by SVE systems, in conjunction with barometric pressure fluctuations, pose a unique challenge to accurately monitoring groundwater elevations in borehole monitoring wells. By setting up the monitoring well using one of the methods described below, groundwater level fluctuations in monitoring wells can be accurately measured in sealed-well SVE systems.

Method 1

Equipment Required:

Level TROLL 300, 500, or 700, **absolute**
BaroTROLL[®]
Twist-Lock Hanger
Well Dock (2")
Teflon[®]-coated stainless cable
Win-Situ[®] 5 software (available at www.in-situ.com)

Software Setup:

1. Set up a scheduled log for the Level TROLL using Win-Situ 5. For instructions on setting up a scheduled log, consult the online help in the Win-Situ 5 software.
2. Set up a scheduled log for the BaroTROLL that is identical to the scheduled log for the Level TROLL.

Hardware Setup:

1. Place the Level TROLL into the bore hole using a Twist-Lock Hanger and a Teflon[®]-coated stainless cable anchored by a well dock.
2. Place the BaroTROLL at the top of the monitoring well (out of the water) to monitor pressure fluctuations during the SVE test.
3. Seal the top of the monitoring well during the SVE test.

Advantages:

- The BaroTROLL captures the borehole pressure fluctuations over the entire SVE test.
- This method simplifies sealing the well, making the setup easier.

Disadvantages:

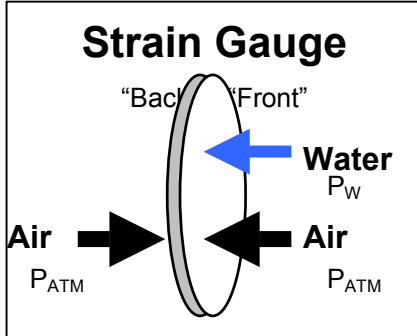
- Two pressure transducers per monitoring well means increased costs. There is no communication to either sensor during the SVE application. This prevents viewing the well data in real-time.
- The data from the Level TROLL has to be post-corrected using the BaroTROLL data to reflect the true groundwater elevation. Refer to the In-Situ Technical Note "Manual Barometric Corrections," or use the software utility Win-Situ BaroMerge

Method 2

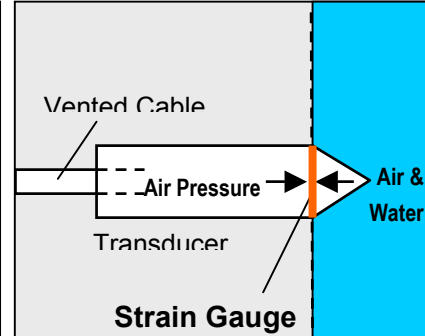
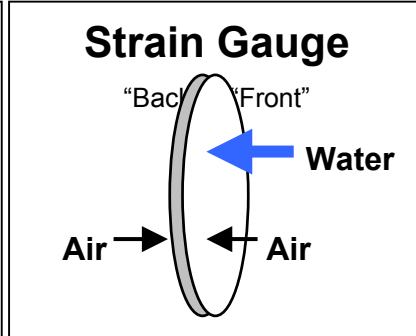
In this setup, the Level TROLL, vented cable, and part of the TROLL Com are sealed inside the well using a well cap cable holder. Borehole pressure fluctuations are captured through the vent on the TROLL Com through the cable to the back of the Level TROLL pressure sensor. This allows the Level TROLL to capture accurate water level elevations with varying pressure fluctuations within the monitoring well's borehole. In addition, the field technician can communicate to the Level TROLL to download data and to setup additional logs.

Design of a Gauged Sensor

High Pressure



Low Pressure



Equipment Required:

- Level TROLL 500 or 700, **gauged**
- Vented Cable
- TROLL Com
- Well Dock (2 in.)
- Well Cap Cable Holder with Rubber Stopper
- Win-Situ 5 software (available at www.in-situ.com)

Software Setup:

The Level TROLL may be programmed in the office using connections shown in step 1 below, or in the field after installation using a RuggedReader[®] handheld and Win-Situ Mobile.

Hardware Setup:

1. Connect the Level TROLL, vented cable, and TROLL Com as shown below.



2. Thread the Level TROLL, cable, and TROLL Com through the top of the well cap cable holder, and attach the rubber stopper to the TROLL Com cable as shown below.



3. Thread the Level TROLL and cable through the 2" X 1.5" bushing and the 2" female bushing, and connect to the TROLL Com. (Bushings are user-supplied.)



- Orient the service grip on the cable 1' away from the surface connector. Attach the 2" well dock.



- Coil the TROLL Com through the 2" well dock as shown below. This will allow the service grip to support the cable on the 2" well dock.



- Thread the TROLL Com and cable into the well, allowing the TROLL Com cable to thread back out of the well through the bushings and well cap cable holder.



- Thread the bushings together, and thread the bottom of the well cap cable holder to the bushing. Epoxy the top 1.25" of the 2" well in order to seal the bushing assembly in place.



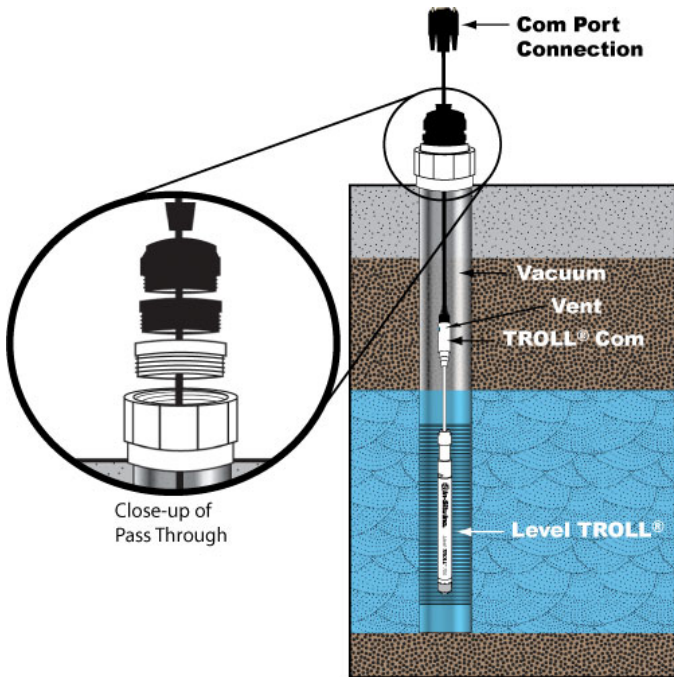
- Insert the rubber stopper to the well cap cable holder, and thread the top of the well cap cable holder together. Hint: Vacuum grease can be applied to the inside and outside of the rubber stopper to help ensure a tight seal once the cable holder is tightened around the compression fitting.



- Assemble bushings and well cap cable holder to a 2" well.



- Protect the DB9 connector from corrosion and the elements by putting a sealed zip-lock bag containing desiccant over the connector.



Advantages:

- Only one Level TROLL per monitoring well is required.
- The field technician has communication with the Level TROLL to allow data retrieval and the setup of additional logs.
- There is no need for post-data correction.

Disadvantages:

- The technician must precisely follow the setup instructions to deploy the Level TROLL in each monitoring well.
- The gauged Level TROLL doesn't capture pressure fluctuations within the borehole during the course of the SVE application.
- The gauged Level TROLL captures only water level elevations.

Conclusion

SVE systems are a very popular and relatively low cost groundwater remediation method, but capturing accurate groundwater elevations with a SVE application can be challenging. The Level TROLL pressure sensors are uniquely suited for capturing accurate groundwater elevations in SVE applications due to their accuracy, small diameter (0.72'), and programmability. Using Method 1 with absolute/non-vented Level TROLL devices allows for a simplified setup. However, Method 2 using vented/gauged Level TROLL devices is the best choice for two key reasons: 1) it allows the user to connect, program, and download data from each Level TROLL, and 2) it produces accurate results without post-data correction.

References

Wong, Jimmy, *Design of remediation systems*, Boca Raton, FL : CRC/Lewis Publishers, 1997.

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