AquiTraq

Groundwater Monitoring

Groundwater is an essential resource for agricultural, municipal, industrial, stock and domestic users. Careful management of groundwater resources is essential to optimising social, environmental and economic quality of life. Most groundwater is stored in porous strata, referred to as aquifers. Development and production of unconventional hydrocarbon resources can potentially interfere with those aquifers and threaten quality of life for local communities and wildlife.

Qteq's AquiTraq downhole multi-node sensing technology enables continuous, long-term fluid level monitoring of one or more discrete aquifers from within a single borehole. This provides an immediate indication of whether nearby hydrocarbon well drilling, completion or production operations are drawing down or invading groundwater and deeper aquifer resources.

AquiTraq's sensor technology platform integrates systems developed for harsh environment applications that have been adapted to provide long-term reliability at an affordable price point in more benign conditions encountered in aquifer monitoring boreholes. The technology platform is also highly flexible, enabling a variety of pressure sensor types to be incorporated into a freely-configurable, modular and extendable system architecture.

Qteq's AquiTraq systems can be further customised for either permanent deployment behind casing, or retrievable deployment on production tubing or suspended inside tubing.

Features and Benefits

- The gauge is a fully welded assembly and incorporates an integral cable head to minimise number of potential leak paths, and is available with Exd certification.
- The cable head design facilitates a metal-to-metal seal with the downhole tubing encapsulated cable (TEC).
- The gauges can either be housed in dedicated sensor mandrels or clamped using special sensor protectors for deployment on casing, completion tubing, or coil tubing.
- Each gauge can be connected to a dedicated TEC, allowing multiple gauges to be deployed on combination of casing, and/or completion tubing, and/or coil tubing in a single well.
- Alternatively, multiple gauges can also be connected to a single common TEC, with all gauges deployed on casing, completion tubing, or coiled tubing, in a single well.
- Use of an armoured TEC design extends metal-to-metal sealing through the wellhead and casing spool outlet manifold systems.
- The TEC armour has strong tensile and crush resistance, while still accommodating a small bend radius.
- Each TEC is terminated inside an explosion-proof surface junction box, with armoured cable used to carry the signals from the downhole sensors to the Surface Data Acquisition (SDA) unit for added protection.
- The SDA unit is housed in an enclosure with suitable zone and climate rating to comply with electrical safety requirements and maintain reliable operation.

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Applications

- Monitor aquifer integrity
- Delineate pressure variations between aquifers
- Monitor for communication between aquifers
- Conduct inter-well interference or pulse tests

Key Components

Digital Pressure & Temperature Gauge **TSS 000001**

Employs a monocrystalline silicon piezo-resistive sensor, with a wheatstone bridge etched into the silicon substrate. This results in excellent long-term stability characteristics and optimises sensor sensitivity. Pressure and temperature measurements are transmitted digitally to the Surface Data Acquisition unit for decoding and archiving.

Gauge Interface Card – Type D-GP **TSS 000007**

Decodes digital signals transmitted by the downhole gauges and applies calibrations files to the decoded data to compute measured pressure and temperature values in the desired units. The computed values, together with diagnostics and system health data, are output through an RS485 interface using Modbus protocol to the PLC.

Gauge Mandrel **TSS 000003**

Comprises a pocket welded to a short pup joint to protect gauges during deployment and to insulate them from excessive vibration during well life.

Tubing Encapsulated Cable (TEC) **TSS 000004**

Provides a reliable, high performance electrical pathway for transmission of encoded measurements from the digital gauges to surface. The cable is engineered to maintain mechanical and electrical integrity for the life of the well, and comprises an insulated braided conductor inside a pressure-rated control line armour. This armour isolates the insulated conductor from the well environment. The TEC is protected from damage during deployment by means of a thermoplastic encapsulation that is suited to contend with in-situ chemical and temperature conditions.

Cross Coupling Protectors (CCP) **TSS 000005**

Designed to secure the downhole electrical TEC to the casing, completion tubing or coil tubing, and protect it from damage during deployment and well completion operations across all casing and pipe connections and other external upsets.

Wellhead Outlet (WHO) – Type D-10K **TSS 000006**

Designed to facilitate cable feed-through and termination of the downhole electrical TEC through the wellhead. The TEC is fed through the tubing hanger, sealed at both top and bottom sides and then wrapped around the neck of the hanger. The TEC is then routed through a port in the spool piece and into the bore of the wellhead flange.

Surface Data Acquisition (SDA) Unit **TSS 000009**

Comprises one or more Gauge Interface Cards to power one or more digital pressure and temperature gauges in one or more well. Pressure and temperature data computed by each card is presented to a single separate Modbus card. This card is either interfaced to an in-field SCADA system, via a wired connection or wireless RTU system, or to a separate GSM or Iridium modem card within the SDA unit. This card transmits data from all sensors to a 3rd party or dedicated Data Historian and Visualisation Server.