



Qteq's ResTraq reservoir surveillance systems provide continuous, real-time downhole pressure data. The technology platform is highly flexible, enabling a variety of pressure sensor types to be incorporated into a freely-configurable, modular and extendable system architecture, with ResTraq systems tailored to suit well conditions.

They can be further customised for either permanent deployment on production tubing, or on semi-permanent (retrievable) basis - suspended inside tubing. Retrievable ResTraq systems enable long-term reservoir surveillance to be conducted in pre-existing boreholes or wells drilled to drain or monitor aquifers, in coal seams or in oil and gas reservoirs.

This retrofit ability is made possible through use of an innovative suspended deployment architecture, involving

the positioning of a pressure gauge, housed in a toolstring, inside the completion tubing/casing, on the end of tubing encapsulated cable (TEC). This specially armoured TEC is spooled off a conventional wireline unit or spooling unit through a Temporary PCE system to the target sensing depth.

The Temporary PCE is then removed and the TEC cut, anchored and sealed in a Permanent PCE system mounted on the top of the wellhead, which features an integral Wellhead Outlet (WHO). Once the pressure survey has been completed, or if the pressure sensor needs to be replaced, or even upgraded, the retrievable ResTraq system can be spooled and retrieved using the same wireline unit and Temporary PCE system. This rig-less capability can be significantly more cost-effective than conventional, rig-deployed, permanently installed pressure-monitoring systems.

## Features and Benefits

- A variety of pressure sensor types can be accommodated to suit survey objectives. The gauges can be housed in sensor mandrels for deployment on casing or completion tubing, or can be clamped to coil tubing using special sensor protectors.
- 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 or completion tubing or coiled tubing in a single well.
- The suspended gauge architecture enables systems to be retrofit to existing boreholes and wells.
- Rig-less deployment of suspended gauge systems minimises system cost and installation cost.
- The wall thickness of the armour has strong tensile and crush resistance, while still accommodating a small bend radius.
- The instrument cables are terminated inside a flameproof surface junction box, with armoured cable used to carry the signals from the downhole sensors to the Surface Data Acquisition system for added protection.
- The Surface Data Acquisition system is housed in an enclosure with suitable climate rating to comply with electrical safety requirements and maintain reliable operation.

## Applications

- Reservoir depletion surveillance
- Coal seam drainage monitoring
- Production monitoring
- Interference testing
- Hydraulic fracture stimulation monitoring
- Monitor pressure transients during planned and unplanned shutdowns

## Key Components

### Digital Pressure 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 Mandrel

**TSS 000003**

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

### Tubing Encapsulated Cable (TEC)

**TSS 000004**

Provides a reliable, high performance electrical pathway for transmission of 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 multi-strand 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 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.

### Gauge Interface Card – Type D-G6

**TSS 000007**

Decodes digital signals transmitted by downhole gauges and apply calibrations files to the raw 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.

### 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 satellite modem card within the SDA unit. This card transmits data from all sensors to a 3rd party or dedicated Data Historian and Visualisation Server.