

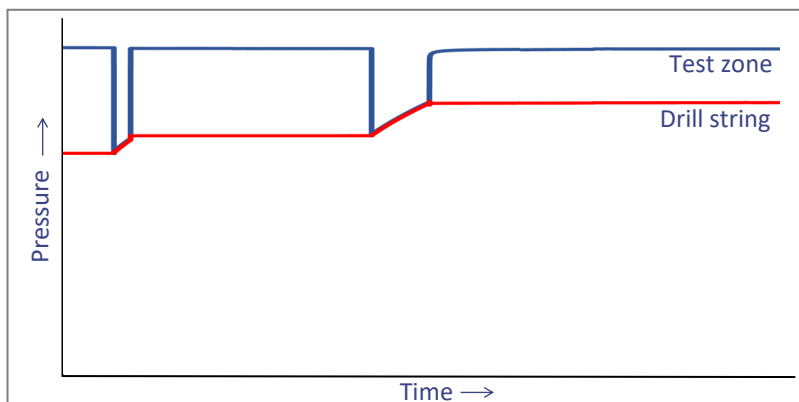
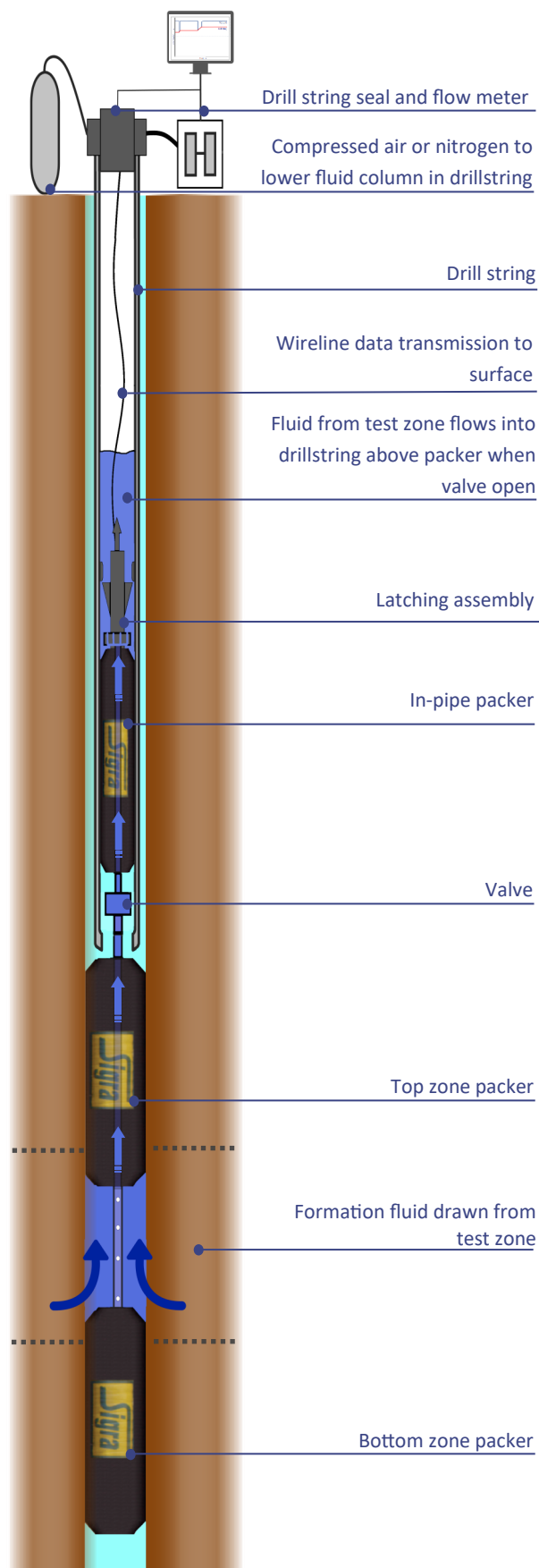
Description

Sigra can provide in-situ measurements of permeability and pore-fluid pressure in rocks and soils by using Sigra's own Drill Stem Test (DST) equipment and software. The DST yields greater accuracy of permeability, barriers to flow and recharge boundaries compared with traditional falling-head and lugeon test techniques. Testing is normally undertaken in HQ size (96mm) exploration holes, however they can be performed in larger diameter holes. Fluids can be drawn from, or injected into the formation; the basis of the analysis is independent of the flow direction.

The Drill Stem Test involves lowering the fluid column in the drill string to create a hydrostatic head differential between the drill string and the isolated formation test zone. A valve connecting the drill string to the test zone is opened, allowing formation fluid to enter the drill string. After this period of fluid inflow, the valve is closed and a pressure is allowed to build back up in the isolated test zone. Sigra engineers monitor the formation response to the test process at surface via a graphical interface. The test finishes upon stabilisation of pressure within the test zone. The drill string is filled with water, the packers are deflated and the DST string removed from the wellbore.

Features and Benefits

- Accurate measurement of permeability and formation pore fluid pressure.
- Effective in both high and low permeability formations.
- Through-the-bit and end-of-string configurations available.
- Through-the-bit packers are run in and out of hole via wireline through the HQ drill string enabling use in unstable hole conditions.
- End-of string packers allow for quick back to back testing at different depths.
- Single or straddle packer configuration available.
- All testing equipment can be transported to remote locations and has a compact design making it suitable for use on drill pads with a small footprint.



Example of DST pressure vs time plot

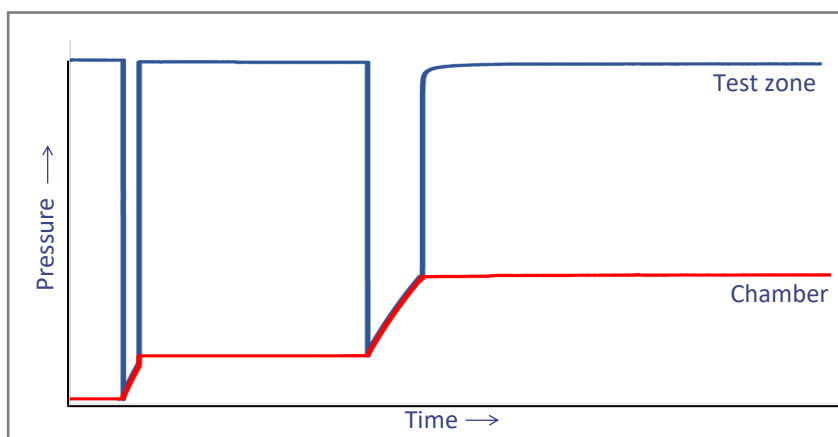
Description

Sigra's Closed Chamber Drill Stem Test (CC-DST) provides permeability and formation pressure data in low permeability formations. The CC-DST operates similarly to a DST with the added benefit of not needing to lower the fluid column in the drill string.

The CC-DST system is lowered into position on a wireline through the drill string. The zone to be tested is isolated by either a single or a set of packers which are inflated by either nitrogen, water or glycol. Once the isolated test zone fluid pressure reaches equilibrium, a valve in the system is opened allowing the collection chamber to fill with test zone formation fluid. After a period of inflow, the valve is closed and the test zone pressure recovers to equilibrium. The permeability, radius of investigation and skin effect are all calculated using Sigra's in-house software. The CC-DST is retrieved by wireline and drilling can continue.

Features and Benefits

- Quicker and more accurate testing in low permeability formations compared with a normal DST.
- Removes errors from leaky drill rod joints.
- No bulky air compressor required on site.
- Eliminates risk of blow outs or formation kicks by maintaining hydrostatic head in the drillstring at all times.
- Packers are run in and out of hole via wireline through the HQ drill string enabling use in unstable hole conditions.
- Single or straddle packer configuration.



Example of CC-DST pressure vs time plot

