

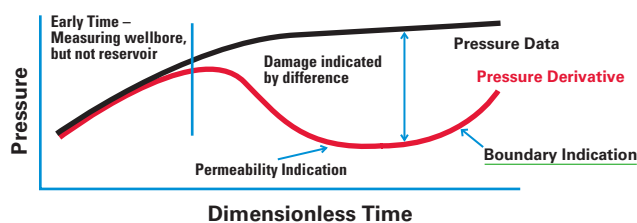
Mini Drillstem Testing (DST)/Fast Test with Shock Sensing Sub Tool

Mini DST/Fast Test with Shock Sensing Sub Tool Application

Conventional DST is a proven means of evaluating a well. However, sometimes a “quick look” pore pressure and permeability from early-to intermediate-time pressure transients are required. Halliburton improves this technique by integrating existing technology with recent developments in Shock Sensing Sub tools and combining this with Halliburton’s Remote Open Close Technology (ROCT).

Before the development of the Shock Sensing Sub tool, when a zone of interest required evaluation, a string of DST tools was the first choice for most operators. Now, the Shock Sensing Sub tool can be placed directly in the perforating gun string at multiple points, which enables mini DST/fast test analysis without the extra cost associated with long buildup time and tripping in and out of the well with a dedicated DST string.

By capturing actual reservoir response at multiple points throughout the perforation interval before, during, and after the perforating event, the mini DST/fast test can be used for production testing to obtain optimum flow rates, stabilized formation pressures, and the in-situ characteristics of the reservoir. The mini DST/fast test provides “quick look data” that will be utilized to enhance future designs and exploitation of your asset.



Mini drillstem testing example

Multiple flow and shut-in periods can be achieved by manipulating the ROCT and data recorded via the electronic downhole gauges. The data is used for analysis, giving the operator a formation interpretation, including permeability, reservoir pressure, formation damage, and reservoir anomalies. Real-time telemetry can also be added to the string to monitor flow and shut-in periods, enabling the operator to reduce or extend these periods when adequate data has been obtained and reducing rig time and costs.



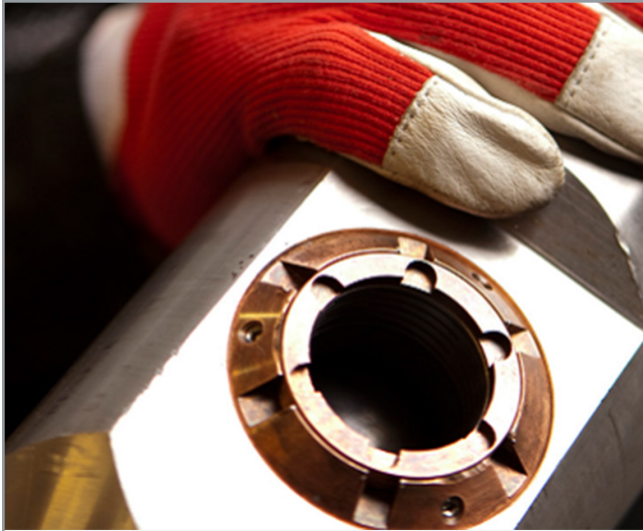
Shock Sensing Sub

Shock Sensing Sub Tool Benefits

- Can be placed anywhere in the perforating assembly
- More data available for job verification, post-job analysis, and model validation
 - 12 active channels available for high-speed recording
 - Each of the 12 channels provide 100,000 data samples
 - Tool string acceleration
 - Mechanical strain/stress in the tool string
 - Dynamic wellbore pressure
 - Static pressure/temperature
- Provides high-resolution characterization across non-homogeneous intervals with varying reservoir and wellbore parameters
- Captures stress and strain, which yields a more accurate characterization of downhole events
- Enables life-of-well, time-lapsed reservoir monitoring capabilities for proactive asset management
- Operates in deviated or horizontal wells for dynamic string shock loading response

ROCT Benefits

- Does not require any intervention or surface control lines, thereby reducing risk and saving money
- Is remotely operated
- Has a long battery life
- Can run open or closed
- Provides flexible deployment options and well control



ROCT Valve Flow Port

Mini DST/Fast Test Results

The exact solution of the spherical-flow well-test equation is valid for all time and is used to predict formation pressure and permeability from early to intermediate-time pressure transients. The exact-spherical flow model, derived from first principles, includes general wellbore storage effects. The model is solved in closed, analytical form, thus permitting convenient pressure response to theory matching using the complete time regime, including early, transitional, and late-time data.

Well test examples demonstrate accurate pore pressure and permeability predictions from the mini DST/fast test. Detailed numerical simulations over a wide range of conditions illustrate the utility and power of this new technique.

To provide more accurate pressure and permeability measurements, the mini DST/fast test was designed to run capture data within the zone of interest at sand face.

The mini DST/fast test is designed to circulate through the perforating string to ensure that differential sticking is minimized. This makes quick look for pore pressure and permeability in horizontal and extended reach wells less expensive and safer than testing with a standard drillstem testing string.

Features

- No need to account for pressure effect from distance of recorder from the producing zone
- Can achieve multiple flow and shut-in periods
- Combinability with tubing-conveyed perforating for ease of use
- Gauges placed directly in the perforating gun string at multiple points as close to the zone of interest without having to run a second trip with DST tools
- Direct measurement and analysis across non-homogeneous intervals with varying reservoir and wellbore parameters
- Measure reservoir characteristics such as pressure and temperature, which are captured on downhole recorders within the bottomhole assembly
- Full job history displayed visibly
- Trip in hole and out hole with all pressure cycles open to the wellbore



For more case studies or additional information, please contact your local Halliburton Business Development Representative.