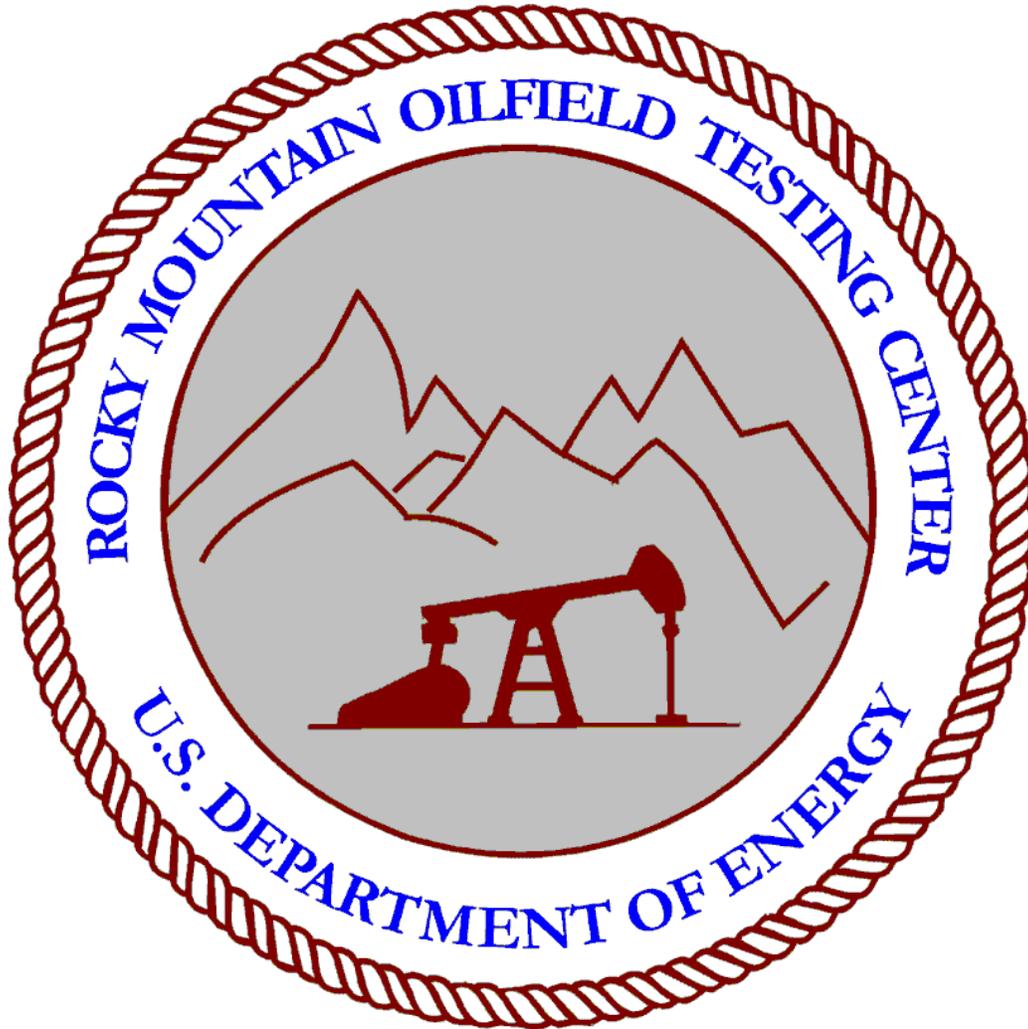


ROCKY MOUNTAIN OILFIELD TESTING CENTER

PROJECT TEST RESULTS



PERMANENT DOWNHOLE PRESSURE GAUGE

MARCH 15, 1998

FC9553/96PT16

**ROCKY MOUNTAIN OILFIELD TESTING CENTER
Sperry-Sun
Permanent Downhole Pressure Gauge
PROJECT TEST RESULTS
March 16, 1998**

**Michael R. Tyler
Project Manager**

Abstract

The Sperry-Sun Downhole Permanent Pressure Gauge (DPPG) is a pressure gauge that is designed to remain in the well for long periods of time providing real time surface data on borehole pressures.

The DPPG was field tested at the Rocky Mountain Oilfield Testing Center in well 63-TPX-10. The instrument was attached to the production string directly above a submersible pump. It was expected to monitor pressure draw-down and build-ups during normal production cycles. During the first two months of the test, the tool worked fine providing a pressure up survey that would normally never be seen when there was a power failure in the field. There was a lightning strike near by in the field and the next time the pressure data was checked, the gauge stopped producing usable data. All efforts to identify the fault and correct it was not successful. A workover was done on the well and the instrument was removed. Upon examination, all the individual parts were found functioning and the cause of the failure has not been identified.

The system is still not ready for commercial use. Development and testing of the system will continue when another test well becomes available. After initial field trials, it will be made available to the industry as a proto-type tool until confidence is gained and it becomes commercially viable.

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TECHNICAL DESCRIPTION:

The Sperry-Sun Downhole Permanent Pressure Gauge (DPPG) is a pressure gauge that is designed to remain in the well for long periods of time providing real time surface data on borehole pressures. In its current state, it is designed to sense pressures inside the side pocket mandrel. The side pocket mandrel has an electrical wet connect from inside the pocket to the outside of the mandrel so that power and signal may be transmitted up the outside of the production string leaving a full bore opening. The gauge is mounted in a side pocket mandrel so that it may be retrieved for repair or calibration without removal of the rest of the production string. The tool can be pulled and reinstalled with a standard slickline unit and a side pocket kickover tool.

PROBLEM:

The Sperry-Sun Downhole Permanent Pressure Gauge (DPPG) addresses the need for a low to medium price, reliable, high accuracy permanent pressure gauge for long term reservoir management. High accuracy gauges have had a history of failures with in a few weeks to no more than a year. Long term reliability has been a big problem. The key problems addressed by this gauge were conductor cable leakage, rope socket connection leakage and electronics failure.

SOLUTION:

The DPPG uses a metal sheathed conductor cable, similar to control lines, which when installed properly eliminates the possibility of fluid invasion. This allows a metal-to-metal seal in the rope socket using existing high pressure, gas-tight tube fittings to stop rope socket leakage. Sperry-Sun has adapted gauge electronics from wireline run and drill stem test (DST) type gauges that have been proven to stand up to extreme environment changes.

OPERATION:

The DPPG is placed at the bottom of the well. It uses control-line tube technology to house the sheathed conductor cable from the surface to the bottom of the well. The sheathed conductor is attached to the production tubing. The sheathed conductor cable exits the wellhead at the surface to communicate with surface monitoring equipment. All electrical connections are made inside the high pressure housings that are sealed with metal-to-metal fittings. The electronics was adapted from gauges that were designed for the shock of being close to perforating guns used at the bottom of the well.

BENEFITS:

Reservoir engineers and production managers will experience long term well evaluation without workover to repair or replace monitoring equipment.

TEST RESULTS:

The DPPG was field tested at the Rocky Mountain Oilfield Testing Center (RMOTC) in well 63-TPX-10. The instrument was attached to the production string directly above a submersible pump. It was expected to monitor pressure draw-down and build-ups during normal production cycles. During the first two months of the test, the tool worked fine providing a pressure up survey that would normally never be seen when there was a power failure in the field. There was a lightning strike near by in the field and the next time the pressure data was checked, the gauge stopped producing usable data. All efforts to identify the fault and correct it was not successful. A workover was done on the well and the instrument was removed. Upon examination, all the individual parts were found functioning and the cause of the failure could not be identified.

TECHNICAL OBSERVATIONS:

The unit failed to operate after a lightning strike. Further development of the instrument is required due to the frequency of lightning and power interruptions in oilfields.

SUMMARY

The system is still not ready for commercial use. Sperry-Sun plans to rerun the test in the same type of well to identify problems. During the next test, it is planned to have additional equipment to record the environment of the system to watch for conditions that might cause a failure. Development and testing of the system will continue when another test well becomes available. After initial field trials, it will be made available to the industry as a proto-type tool until confidence is gained and it becomes commercially viable.

ACKNOWLEDGEMENTS

This research was funded by the Department of Energy with work conducted by the Rocky Mountain Oilfield Testing Center (RMOTC). Work, was directed by Ralph Shulte, RMOTC Project Manager, supported by Michael R. Tyler, RMOTC Project Manager, and Brian Meindinger, RMOTC Field Technician. RMOTC is operated by Fluor Daniel (NPOSR), Inc., the Management and Operating Contractor for the Department of Energy Naval Petroleum Oil Shale Reserves in Colorado, Utah, and Wyoming (NPOSR-CUW).

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