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Advanced Well Equipment
Standards Group

Recommended Practice For the Qualification of Downhole Instrumentation / Sensors

Issue date: September 2017

Document number: 3362-26v.3
3rd Edition
March 2019

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Thanks to the following companies for their contribution to this document:

Baker Hughes
Chevron
ConocoPhillips
DNV GL
Emerson/Roxar
Eni
Halliburton
Maersk Oil
Nexen
Petrobras
Quartzdyne
Saudi Aramco
Schlumberger
Statoil
Weatherford

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Abstract

- Version 1 of this Recommended Practice was issued in January 2016. This RP is version 2 of the Standard.
- Version 2 of the RP addresses and incorporates point sensing optical systems into the qualification procedures.

This Recommended Practice (RP) has been developed by users and suppliers/manufacturers of downhole instrumentation/sensors that are intended for use in the petroleum and natural gas industry globally. This RP is intended to provide requirements and information to both parties regarding qualification testing performed on the device to validate the functional specification.

Users of this RP should be aware that requirements, above those outlined in this recommended practice, may be needed for individual applications.

This recommended practice is not intended to inhibit a supplier/manufacturer from offering, or the user/purchaser from accepting, alternative equipment or engineering solutions. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the supplier/manufacturer should identify any variations from this recommended practice.

This RP provides requirements and guidelines for qualification testing of permanently installed downhole instrumentation/sensors. The following downhole instrumentation/sensors are covered by this RP:

- Electronic gauges/sensors
- Point optical gauges/sensors
- Downhole equipment containing electronics and/or optical components, as applicable,

Testing/equipment not covered by this RP includes:

- Well head and other related equipment
- Factory acceptance testing
- Tubing Encapsulated Conductor (TEC) (refer to AWES CCL TEC RP)
- Tubing Encased Fiber (TEF) (refer to AWES CCL TEF RP)
- Fiber optic sensor interrogators if they are situated outside the downhole environment
- Multiplexing of gauges
- Distrbuted fiber sensors (eg Distributed Temperature Sensors (DTS), Distributed Acoustic Sensors (DAS) Distributed Strain Sensors (DSS) etc

The document provides detailed qualification requirements including data collection and storage, instrumentation requirements, qualification test plan flow chart and a number of tests. The following tests are included:

- The functional test - aims to demonstrate that the original factory calibration of the EUT conforms to metrology specification pre and post testing
- Thermal cycling – aims to confirm the functionality of the EUT when exposed to temperature cycling within the stated operating limits
- Ambient random vibration – aims to confirm the functionality of the EUT when exposed to mechanical vibration
- Mechanical shock - aims to confirm the functionality of the EUT when exposed to mechanical shock
- Pressure cycling test – aims to confirm the metrology of the EUT when exposed to the stated operating limits
- Wetted internal pressure/thermal cycling test – aims to confirm the structural and seal integrity of the EUT when exposed to differential pressure at min and max operating temperatures with the pressure applied to the internally wetted components
- External pressure cycling test – aims to confirm the structural and seal integrity of the EUT when exposed to differential pressure at min and max operating temperatures with the pressure applied to the externally wetted components

- Seal pressure cycling test – aims to confirm the functionality of the EUT when exposed to differential pressure at minimum and maximum operating temperatures with the pressure applied in the direction designed to isolate pressure
- Storage/cold start test – aims to ensure the EUT functions according to functional specification after long term exposure to the minimum storage temperature stated
- Drift testing – aims to determine the cumulative error introduced to a sensor over time while subjected to maximum operating conditions such as pressure and temperature
- Long-term reliability test – aims to develop a long term reliability statement for the final product

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