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AMENDMENT 1
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Petroleum and natural gas industries — Cements and materials for well cementing —

Part 2: Testing of well cements

AMENDMENT 1: Water-wetting capability testing

Industries du pétrole et du gaz naturel — Ciments et matériaux pour la cimentation des puits —

Partie 2: Essais de ciment pour puits

AMENDEMENT 1: Essai de mouillabilité à l'eau

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Foreword

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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Amendment 1 to ISO 10426-2:2003 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*, Subcommittee SC 3, *Drilling and completion fluids and well cements*.

Petroleum and natural gas industries — Cements and materials for well cementing —

Part 2: **Testing of well cements**

AMENDMENT 1: Water-wetting capability testing

Page 6, 3.1, add the following term/definition:

3.1.52
water-wetting capability
capability of a fluid to alter the quality or state of being water-wetted

NOTE A fully water-wet state is considered most desirable to provide cement bonding.

Page 96, add the following new 16.8, including the addition of a new Equation (113), thereby changing the numeration of subsequent equations [e.g the existing Equation (113) becomes Equation (114) and so forth]:

16.8 Water-wetting capability test (WWCT)

16.8.1 Introduction

The water-wetting capability test (WWCT) is intended for use in determining the degree of compatibility of wellbore fluids in cementing operations. By the use of this procedure, the selection of proper preflushes and/or spacers, and/or surfactant components may be made when required. User discretion should be exercised in the selection of the portion(s) of the procedure needed.

The WWCT is specific to evaluation of water-wetting capability of spacers and/or preflushes designed to water-wet the surfaces after these surfaces have been exposed to non-aqueous fluids, specifically oil- and synthetic-based drilling fluids. The apparent water-wetting capability of various mud/spacer interface volumes and the apparent wettability of spacer systems against oil-wetted surfaces may be evaluated using this method. This procedure does not address bulk displacement issues, nor does it directly address spacer/mud compatibility issues.

The test is applicable to aqueous spacer systems only. This procedure is not suitable for evaluating non-aqueous or non-conductive systems or mixtures of surfactants in base oils.

16.8.2 Method and apparatus

The apparatus provides a continuous measurement of the electrical conductivity between electrode surfaces. From the conductivity measurements, the emulsion state and apparent wettability of the fluid can be inferred if the titrating spacer fluid is conductive and the titrated drilling fluid is not. Normally, oil-external fluids are not electrically conductive. Water-based or water-external emulsion spacers are electrically conductive with the actual conductivity dependent on the solution chemistry.

16.8.3 Safety procedures

Observe all usual laboratory safety requirements pertaining to working with oil, synthetic, and solvent-based fluids. Note the flash points of all fluids before testing and ensure proper ventilation in the work area. All safe-handling procedures for the fluids being tested shall be observed.

16.8.4 Sample preparation

a) Prepare a mud sample according to instructions from the supplier. Laboratory-prepared mud samples may require additional preparation, such as static aging or hot-rolling to more fully simulate field mud properties.

b) Mix the spacers and/or preflush fluids to be evaluated according to manufacturer's procedures. A 500-ml volume is normally sufficient to run a single test.

c) Condition all spacer fluids at anticipated Bottom Hole Circulating Temperature (BHCT) to ensure that fluids are stable and all chemicals have been conditioned and are in solution. If desired, the fluids may be conditioned for an additional 30 min ± 0,5 min at BHCT. Condition fluids under pressure using high-temperature, high-pressure (HTHP) equipment if conditioning at temperatures above 90 °C (194 °F). Fluids should be cooled below 90 ° (194 °F) before releasing pressure. Observe all safe-handling procedures for fluids being tested. This is a test conducted at atmospheric pressure. The test shall not be performed at temperatures exceeding 90 °C (194 °F).

16.8.5 Equipment set-up

a) Prepare equipment according to instructions from supplier.

b) Clean and dry test equipment before starting.

c) Add the mud sample to the container.

d) Heat the container to testing conditions to maintain the temperature of the test fluids. Use a stirring rate sufficient to quickly homogenise added fluids and prevent static areas. Avoid excessive shear, as it will cause air-entrainment that may affect readings and surfactant performance.

16.8.6 Test procedure and reporting

a) Evaluate the interaction of the spacer with the drilling fluid according to manufacturer's instructions. Observe safety precautions with respect to fluid temperatures and operator safety.

b) Record the starting volume of mud, volume of titrant (surfactant, flush, spacer), fluid conditioning procedure (time, temperature, etc.) and titration temperature. Slowly titrate into the mud while stirring the fluid in the test apparatus. Continue titrating until a stable conductivity measurement is reached. This indicates a water-continuous phase has been formed which is characteristic of a water-wetting state.

c) Report test results as the volume percentage, V, of spacer in the mud-spacer mixture that exhibits conductivity measurements indicative of complete water wetting according to the formula:

$$V = V_s/(V_s + V_m) \times 100 \qquad (113)$$

where:

V_s is the volume of spacer required to change from oil to water continuous phase;

V_m is the volume of mud initially in the test cell.

EXAMPLE For example, if 150 ml of spacer must be added to a starting mud volume of 200 ml in order to obtain a full-span reading, the result should be reported as 43 % (150 ml divided by 350 ml).

ICS 75.020; 91.100.10

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