Testing of Well Cements Used in Deepwater Well Construction

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Contents

Page

1 Scope . . . 1
1.1 General . . . 1
1.2 Applicability . . . 1

2 Normative References . . . 1

3 Terms and Definitions . . . 1

4 Sampling . . . 4

5 Preparation of Slurry . . . 5
5.1 Preparation of Conventional Cement Slurry . . . 5
5.2 Preparation of Specialty Cement Slurry . . . 5

6 Determination of Temperature and Pressure Schedules for Conditioning and Testing . . . 5
6.1 General . . . 5
6.2 Slurry Conditioning Methods . . . 7

7 Deepwater Well-simulation Strength Testing . . . 11
7.1 General . . . 11
7.2 Sampling Methods . . . 11
7.3 Preparation of Slurry . . . 11
7.4 Non-destructive Sonic Compressive Strength Determination . . . 12
7.5 Destructive Method for Determination of Compressive Strength . . . 15
7.6 Compressive Strength Determination . . . 20

8 Deepwater Well-simulation Thickening-time Tests . . . 21
8.1 General . . . 21
8.2 Sampling . . . 21
8.3 Apparatus . . . 21
8.4 Thickening-time Schedule Determination and Testing Method . . . 21

9 Static Fluid Loss Testing . . . 28
9.1 General . . . 28
9.2 Sampling . . . 28
9.3 Slurry Preparation for Fluid Loss Testing . . . 29
9.4 Testing Temperature Determination . . . 29
9.5 Conditioning the Slurry for Fluid Loss Testing . . . 29
9.6 Temperature and Pressure Testing Schedule Determination . . . 29
9.7 Fluid Loss Testing Methods . . . 29
9.8 Fluid Loss Results and Reporting . . . 29

10 Well-simulation Slurry Stability Testing . . . 29
10.1 General . . . 29
10.2 Sampling Methods . . . 29
10.3 Slurry Preparation for Slurry Stability Testing . . . 29
10.4 Testing Temperature Determination . . . 29
10.5 Conditioning the Slurry for Stability Testing . . . 30
10.6 Temperature and Pressure Testing Schedule Determination . . . 30
10.7 Slurry Stability Testing Methods . . . 30

11 Determination of Rheological Properties and Gel-strength using a Rotational Viscometer . . . 30
11.1 General . . . 30
11.2 Sampling Methods . . . 30

Contents

Page

11.3 Slurry Preparation for Rheological and Gel-strength Property Determination 30
11.4 Testing Temperature Determination 30
11.5 Conditioning the Slurry for Rheological and Gel-strength Testing 30
11.6 Temperature and Pressure Testing Schedule Determination 30
11.7 Rheological Property and Gel-strength Determination Testing Methods 30
11.8 Reporting and Characterization of Rheological Behavior 30

12 Compatibility of Wellbore Fluids 31
12.1 General 31
12.2 Sampling Methods 31
12.3 Preparation of Test Fluids Used in Compatibility Testing 31
12.5 Conditioning of the Fluids Used in Compatibility Testing 31
12.6 Temperature and Pressure Testing Schedule Determination 31
12.7 Compatibility Determination Testing Methods 31
12.8 Interpretation of Compatibility Testing and Spacer Surfactant Screening Test Results 31

Bibliography 32

Tables
1 Temperature and Pressure Schedule: Pressurized Consistometer Conditioning Method, Testing Location Shallower than Wellbore Hotspot Location 9
2 Temperature and Pressure Schedule: Pressurized Consistometer Conditioning Method, Testing Location Deeper than Wellbore Hotspot Location 9
3 Temperature and Pressure Schedule: Well-simulation Thickening-time for Casing or Liner without a Liner-top Packer / Non-expandable Liner Hanger System 22
4 Temperature and Pressure Schedule: Well-simulation Thickening-time for Casing or Liner with a Liner-top Packer/Non-expandable Liner Hanger System 24
5 Temperature and Pressure Schedule: Well-simulation Thickening-time for Open-hole and Cased-hole Plug 25
6 Temperature and Pressure Schedule: Well-simulation Thickening-time for Continuous-pumping Squeeze Cementing 27
7 Temperature and Pressure Schedule: Well-simulation Thickening-time for Hesitation-pumping Squeeze Cementing 28

Introduction

This document was prepared with input from oil and gas operators, service companies, and consultants. The testing methods contained in this document are based on experience gained in deepwater operating areas and shelf operations in locations with low seafloor temperatures. These testing methods may also be of utility in other areas where low ambient temperatures exist. The content of this document is not all inclusive and not intended to alleviate the need for detailed information found in textbooks, manuals, technical papers, or other documents. The formulation, adoption, and publication of API standards are not intended to inhibit anyone from using any other practices.

Users of this standard should be aware that further or differing requirements may be needed for individual applications. This standard is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this standard and provide details.

In this standard, where practical, US Customary units are included in brackets for information. The units do not necessarily represent a direct conversion of SI to US Customary units, or US Customary to SI. Consideration has been given to the precision of the instrument making the measurement. For example, thermometers are typically marked in one degree increments, thus temperature values have been rounded to the nearest degree.

In this standard, calibrating an instrument refers to assuring the accuracy of the measurement. Accuracy is the degree of conformity of a measurement of a quantity to its actual or true value. Accuracy is related to precision, or reproducibility of a measurement. Precision is the degree to which further measurements or calculations will show the same or similar results. Precision is characterized in terms of the standard deviation of the measurement. The results of calculations or a measurement can be accurate, but not precise, precise but not accurate, neither and both. A result is valid if it is both accurate and precise.

All instruments, gauges, timing devices, temperature measuring systems, material requirements, system calibrations, and operational instructions contained in API 10B-2 apply to this document.

Warning—The tests specified in this document require the handling of hot, pressurized equipment and materials that may be hazardous and can cause injury. Do not exceed manufacturer's safety limits. Only trained personnel should perform these tests.

Testing of Well Cements Used in Deepwater Well Construction

1 Scope

1.1 General

This recommended practice provides procedures for testing well cement slurries and cement blends for use in a deepwater environment or wells drilled in areas with a low seafloor temperature or areas where low well temperatures exist. For the purposes of this document the term “deepwater” includes areas where low seafloor temperatures exist, independent of water depth.

1.2 Applicability

The procedures contained in this document serve as guidance for the testing of well cement slurries used in deepwater well construction. Additionally, testing methods contained in this document (most notably at mudline conditions) may also be used in those circumstances where low seafloor temperatures are found at shallow water depths. These conditions are found in areas including the North Sea, Norwegian Sea, Barents Sea, Kara Sea, Beaufort Sea, Chukchi Sea, Caspian Sea, and Black Sea.

The test methods contained in this recommended practice, though generally based on API 10B-2, take into account the specialized testing requirements and unique wellbore temperature profiles found in deepwater wells or wells in areas with low seafloor temperatures. This document does not address the mitigation of shallow water flow zones in deepwater wells, which is addressed in API 65, *Cementing Shallow Water Flow Zones in Deepwater Wells*.

2 Normative References

The following referenced documents are indispensable for the application of this document. For undated references, the latest edition of the referenced document applies (including any addenda/errata). For dated references, only the edition cited applies. However, not all documents listed may apply to your specific needs. The body of the standard should be referred to for how these documents are specifically applied.

API Recommended Practice 10B-2, *Recommended Practice for Testing Well Cements*

For a list of other documents associated with this standard, see the Bibliography.

3 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

3.1
additive
Material incorporated in a cement slurry to modify or enhance some desired property.

3.2
annulus
Space between the pipe and the wellbore wall or an outer pipe.

3.3
batch mix
Process of mixing the entire volume of cement slurry prior to placement in the wellbore.