Laboratory Testing of Drilling Fluids

API RECOMMENDED PRACTICE 13I
NINTH EDITION, DECEMBER 2020

ADDENDUM 1, JANUARY 2023

American Petroleum Institute

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Introduction

This standard, which establishes testing methodologies for drilling fluid materials, formulations, and various properties, is based on API 13I, Eighth Edition. This standard was developed in response to a demand for more exacting testing methodologies. The tests contained herein were developed over several years by a group of industry experts and were identified as being those which can yield reproducible and accurate results. The tests are anticipated to be performed in a laboratory setting but can be applicable in a field situation with more a rigorous apparatus and conditions than normally found in a drilling fluid field-test kit.

These tests are designed to assist in the evaluation of certain parameters for drilling fluids, with these properties not necessarily used for the maintenance of a drilling fluid in field use. The tests provide either more precision or different properties than those given in the field-testing standards API 13B-1 and API 13B-2.

It is necessary that users of this standard be aware that further or differing requirements can 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 individual applications. This may be particularly appropriate where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this standard and provide details.

As with any laboratory procedure requiring the use of potentially hazardous chemicals, the user is expected to have received proper knowledge and training in the use and disposal of these chemicals. The user is responsible for compliance with all applicable local, regional, and national regulations for worker and local health, safety, and environmental liability.

This standard contains footnotes giving examples of apparatus, reagents and sometimes the supplier(s) of those materials that are available commercially. This information is given for the convenience of users of this standard and does not constitute an endorsement by API of the products named. Equivalent products may be used if they can be shown to lead to the same results.

In this standard, quantities expressed in the International System of Units (SI) are also, where practical, expressed in U.S. customary units (USC) in parentheses for information. The values associated with the different units do not necessarily represent a direct conversion of SI units to USC units, or USC units to SI units. 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.

Calibrating an instrument refers to ensuring 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 accurate nor precise, or both accurate and precise. A result is valid if it is both accurate and precise.

This document uses a format for numbers which follows the examples given in *API Document Format and Style Manual*, November 2017. This numbering format is different than that used in API 13I, Eighth Edition. In this document the decimal mark is a period and separates the whole part from the fractional part of a number. No spaces are used in the numbering format. The thousands separator is a comma and is only used for numbers greater than 10,000 (i.e. 5000 items, 12,500 bags).

Laboratory Testing of Drilling Fluids

1 Scope

1.1 Objective

This standard provides procedures for the laboratory testing of both drilling fluid materials and drilling fluid physical, chemical, and performance properties.

1.2 Conditions of Applicability

This document is applicable to both water-based and non-aqueous drilling fluids, as well as the base or make-up fluid.

It is not applicable as a detailed manual on drilling fluid control procedures. Recommendations regarding agitation and testing temperature are presented because the agitation history and temperature have a profound effect on drilling fluid properties.

NOTE 1 This document does not include procedures related to testing barite specifications. These procedures are presented in API 13A.

NOTE 2 This document does not include procedures related to testing barite for mercury, cadmium, and arsenic. These procedures are presented in API 13K.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API 13A, *Specification for Drilling Fluids Materials*

API Recommended Practice 13B-1, *Recommended Practice for Field Testing Water-based Drilling Fluids*

API Recommended Practice 13B-2, *Recommended Practice for Field Testing Oil-based Drilling Fluids*

ASTM D86 [1], *Standard Test Method for Distillation of Petroleum Products and Liquid Fuels at Atmospheric Pressure*

ASTM D93, *Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester*

ASTM D97, *Petroleum Product—Determination of Pour Point*

ASTM D287-12b, *Standard Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)*

ASTM D445, *Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and Calculation of Dynamic Viscosity)*

ASTM D611, *Standard Test Methods for Aniline Point and Mixed Aniline Point of Petroleum Products and Hydrocarbon Solvents*

ASTM D1141, *Standard Practice for the Preparation of Substitute Ocean Water*

[1] ASTM International, 100 Barr Harbor Drive, West Conshohoken, PA 19428-2959, www.astm.org.