

Testing of Heavy Brines

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Introduction

This standard is based on API Specification 13J, 5th Edition and covers the testing of heavy brines commonly used in petroleum and natural gas completion, fracturing, workover, and drill-in fluids. These brines can be purchased or rented from multiple sources and are available worldwide. No single source or limited source of supply is included, either by inference or reference.

Annexes A through E are given for information.

In this standard, quantities are expressed in the International System (SI) of units and are also, where practical, expressed in U.S. Customary (USC) units in parentheses.

NOTE The units do not necessarily represent a direct conversion of SI units to USC units, or of 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; therefore, temperature values have been rounded to the nearest degree. However, for certain critical measurements (such as brine crystallization), thermometers are typically calibrated and used to 0.05 °C (0.1 °F).

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; or both. A result is valid if it is both accurate and precise.

This document uses a format for numbers that follows the examples given in the API Document Format and Style Manual, October 2020. 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).

Testing of Heavy Brines

1 Scope

This standard covers the physical properties, potential contaminants, and test procedures for heavy brine fluids manufactured for use in oil and gas well drilling, completion, fracturing, and workover fluids.

This standard provides methods for assessing the performance and physical characteristics of heavy brines for use in field operations. It includes procedures for evaluating the density or specific gravity, the clarity or amount of particulate matter carried in the brines, the crystallization point or the temperature at which the brines make the transition between liquid and solid at atmospheric pressure (a discussion of crystallization temperature under pressure is provided Annex C), the pH, iron contamination, and buffering capacity. This standard also contains a discussion of gas hydrate formation and mitigation (Annex B), brine viscosity (Annex D), corrosion testing (Annex E), and a daily completion fluids report with example (Annex F).

NOTE Procedures for evaluating the crystallization point, pH, and buffer capacity of brines are not applicable to formate brines. Procedures applicable to formate brines are found in ISO 13503-3:2022 [4].

This standard is intended for the use of manufacturers, service companies, and end users of heavy brines.

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

ASTM E77¹, *Standard Test Method for Inspection and Verification of Thermometers*

ASTM E617, *Standard Specification for Laboratory Weights and Precision Mass Standards*

NIST SRM 185h², *Potassium Hydrogen Phosphate, pH Standard*

NIST SRM 186g, *Potassium Dihydrogen Phosphate, pH Standard*

NIST SRM 191C, *pH Standard*

NIST SRM 3126a, *Iron (Fe), Standard Solution*

3 Terms, Definitions, Acronyms, Abbreviations, and Symbols

3.1 Terms and Definitions

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

3.1.1 ACS reagent grade

Grade of chemical that meets purity standards as specified by the American Chemical Society (ACS).

¹ ASTM International, PO Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428, www.astm.org.

² National Institute of Standards and Technology, 100 Bureau Drive, Gaithersburg, MD 20899, www.nist.gov.