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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/ Figure/Table/Note	Type of comment	Comment (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



DRAFT International Standard

ISO/DIS 13503-9

Oil and gas industries including lower carbon energy - Completion fluids and materials —

Part 9: Methods for evaluating performance of acidizing fluids

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ISO/TC 67/SC 3

Secretariat: **UNI**

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2025-06-17

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 67, *Oil and gas industries including lower carbon energy*, Subcommittee SC 3, *Drilling and completion fluids, well cements and treatment fluids*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 12, *Oil and gas industries including lower carbon energy*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement). A list of all parts in the ISO series 13503 can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This part of ISO 13503-9 covers acidizing fluids commonly used in the acidizing of oil and natural gas. These procedures were developed to improve the quality of the acidified working fluid. These tests should allow the user to compare the physical and chemical properties of various acidified working fluids. Conditions and materials selected for acidifying operations.

The procedures described in this part of ISO 13503-9 are not intended to inhibit new development techniques, material improvements or improved operating procedures. Qualified engineering analysis and suitability for specific situations need to be evaluated.

In ISO 13503-9, where practical, USC (United States Customary) units are included in parentheses.

[Annexes A, B, C, Annex D](#) and E of ISO 13503-9 are for information only.

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Oil and gas industries including lower carbon energy - Completion fluids and materials —

Part 9: Methods for evaluating performance of acidizing fluids

1 Scope

This document provides testing procedures for evaluating proppants used in hydraulic fracturing and gravel packing operations.

NOTE Proppants mentioned in this document refer to sand, ceramic, resin-coated, gravel packing proppants, and other materials used for hydraulic fracturing and gravel packing operations.

This document supplements API Std 19C, 2nd edition (2018), the requirements of which are applicable with the exceptions specified in this document.

This document provides consistent methodology for testing performed on hydraulic fracturing and/or gravel packing proppants.

2 Normative References

There are no normative references in this document.

3 Abbreviations

API	American Petroleum Institute
ASTM	American Society for Testing and Materials
HCl	Hydrochloric acid
CAS	Chemical abstract service

4 Terms and definitions

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

4.1 Basic Acid

Acid fluid that does not contain additives such as drainage agent and iron control agent. E.g., hydrochloric acid and mud acid.

4.2 Hydrochloric acid

A hydrochloric acidizing fluid system used during acidizing procedure of petroleum- or natural-gas-producing wells in carbonate rock reservoirs.

4.3 Mud acid

A mixture of hydrochloric acid and hydrofluoric acid under a certain concentration, which is used to acidify the calcareous matter in sandstone reservoirs.

4.4 Acidizing Fluid

Basic acid mixed with additives such as drainage agent and iron ion stabilizes. E.g., hydrochloric acidizing fluid, mud acidizing fluid.

4.5 Acidizing fluid

An acidizing fluid system formed by adding additives into acid, to meet the requirements for acidizing and acid fracturing of petroleum- or natural-gas-producing wells under reservoir conditions. E.g., polymer based acidizing fluid, crosslinked acidizing fluid, emulsified acidizing fluid.

5 Acidizing fluid preparation

5.1 Purpose

Samples are prepared before testing to facilitate subsequent steps.

5.2 Description

Certain aspects of sample preparation and handling can affect properties of a fluid. During all procedures, steps shall be taken to minimize air entrainment into the fluid.

The procedure used to prepare the fluid sample shall be documented as follows:

- a) Description and/or composition of the baseline fluid composition.
- b) Pre-treatments, such as baseline fluid composition filtration.
- c) Fluid preparation, noted that this part should start with baseline fluid composition such as deionized water and tap water.
- d) Location and/or type of base water.
- e) Mixing apparatus, container volume and total volume of fluid prepared.
- f) Mixing time under one or different mixing speed.
- g) Confirm fluid composition and additive amount.
- h) Mixing sequence and protocol of each additive.
- i) Aging and holding time under certain temperature, if required.
- j) Test temperature.
- k) pH (for aqueous fluids when applicable).
- l) All other known aspects that might affect the measurement result during fluid preparation.

5.3 Equipment and materials

5.3.1 Electronic balance, with a precision of 0,01- 0,000 1 g.

5.3.2 Centrifuge tube.

5.3.3 Distilled water.

5.3.4 Hydrochloric acid:(7647-01-0).

5.3.5 Ammonium hydrogen fluoride:(1341-49-7).

5.3.6 Calcium carbonate:(471-34-1).

5.4 Hydrochloric acidizing fluids preparation

5.4.1 Hydrochloric acid preparation

5.4.1.1 Based on the concentration that needed, to calculate the volume of hydrochloric acid and distilled water required to prepare Refined Hydrochloric Acidizing Fluids at certain volume or mass fraction according to [equation \(1\)](#) and [\(2\)](#) (see [Annex D](#) for densities of Refined Hydrochloric Acidizing Fluids at different concentrations). During system configuration, hydrochloric acid is slowly added to distilled water, and continue to stir until the solution is uniform. After constant volume, it needs to be stored in a glass vial waiting for use.

5.4.1.2 Calculate the amount of hydrochloric acid

The amount of hydrochloric acid is calculated according to [formula \(1\)](#):

$$V_0 = \frac{V \rho W}{\rho_0 W_0} \quad (1)$$

Where

V_0 is volume of hydrochloric acid, in mL

ρ_0 is density of hydrochloric acid(See [Appendix A](#)), in g/cm³

W_0 is hydrochloric acid mass fraction, %

V is volume of hydrochloric acid, in mL

ρ is density of hydrochloric acid(See [Appendix A](#)), in g/cm³

W is mass fraction of the hydrochloric acidizing fluids to be formulated, %

5.4.1.3 The usage of distilled water is calculated according to [formula \(2\)](#)

$$V_w = V - V_0 \quad (2)$$

Where V_w is volume of distilled water, in mL

5.4.1.4 Example

Preparing 500 ml 20 % hydrochloric acid solution using 37 % concentration hydrochloric acid.

Volume of hydrochloric acid, $V_0 = 250,69 \text{ mL}$ ($V_0 = \frac{500 \times 1,0998 \times 20\%}{1,1857 \times 37\%}$). volume of distilled water

$V_{\text{water}} = 249,31 \text{ mL}$ ($V_{\text{water}} = 500 - 250,69$). During the preparation, hydrochloric acid was slowly added to distilled water, and stirring was continued until uniform. After constant volume, it was stored in a glass vial for use.

5.4.2 Hydrochloric acidizing fluids preparation

5.4.2.1 When preparing hydrochloric acid solution, the amount of hydrochloric acid is calculated according to [formula \(1\)](#), and other additives are added accordingly based on mass percentage. The amount of the additive is calculated by [formula \(3\)](#), and needs to be subtracted from the distilled water.

$$m_n = V \rho W_n \quad (3)$$

Where

m_n is additive weight, in g

W_n is additive weight percent, %

5.4.2.2 The amount of the distilled water is calculated according to [formula \(4\)](#).

$$V'_w = V_w - \frac{m_n}{\rho_w} \quad (4)$$

Where

V'_w is the amount of distilled water needed in hydrochloric acid working solution, in mL

ρ_w is density of distilled water, in g/cm³;

5.4.2.3 Example

- Conditions and requirements: 500 ml hydrochloric acidizing fluid was prepared with hydrochloric acid at a concentration of 37 %.
- Hydrochloric acidizing formula: 20 % hydrochloric acid + 3 % corrosion inhibitor + 0,5 % drainage aid.
- The amount of other additives is calculated by mass percentage: the amount of corrosion inhibitor is = 500 × 3 % (concentration of corrosion inhibitor) × 1,099 8 = 16,50 g, and the amount of the cleanup additive is = 500 × 0,5 % (concentration of cleanup additive) × 1,099 8 = 2,75 g, and the amount of the additive is deducted from distilled water. The amount of distilled water = 247,31 - (16,50 / 1,0) - (2,75 / 1,0) = 230,06 ml. During the preparation, hydrochloric acid is slowly added to the distilled water, and stirring is continued until uniform, and then the 16,50 g corrosion inhibitor and the 2,75 g cleanup additive are slowly added, stirred uniformly, and kept in a glass jar until use.

5.5 Mud-acid Streamlined Acidizing Fluid Preparation Process

Conventional mud acid is prepared in the same way as term [5.4](#), treating hydrofluoric acid as an additive. The acid-treating instrument is made of plastic or Teflon.

5.6 polymer based acidizing fluids preparation

5.6.1 Prepare the hydrochloric acid solution accordingly as required in [5.4](#).

5.6.2 Pour the hydrochloric acid solution into a blender, adjusting the stirring rate to make sure that liquid remains in vortex state, and the bottom of the blender is transparent.

5.6.3 Weigh the amount of thickening agent based on required concentration, pour the thickening agent into the blender slowly and evenly (adding time is less than 30 s), stir for 25 minutes, add the corrosion inhibitor, cleanup additive, iron control agent and other additives as the formula required, and stir for another 30 min.