# Procedure for Testing and Evaluating the Performance of Friction (Drag) Reducers in Aqueous-based Fluid Flowing in Straight, Smooth Circular Conduits

API TECHNICAL REPORT 13M-5
FIRST EDITION, OCTOBER 2018

AMERICAN PETROLEUM INSTITUTE

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## Introduction

The objective of this document is to provide a standard procedure for testing and evaluating the performance of friction (drag) reducers in straight, smooth circular conduits. This standard procedure was compiled on the basis of several years of comparative testing, debate, discussion, and continued research by the industry.

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.

This document uses a format for numbers which follows the examples given in API Document Format and Style Manual (Revision Date: November 2017). 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).

# Procedure for Testing and Evaluating the Performance of Friction (Drag) Reducers in Aqueous-based Fluid Flowing in Straight, Smooth Circular Conduits

## 1 Scope

**1.1** This document provides a consistent methodology to test and evaluate the performance of friction (drag) reducers in straight, smooth circular conduits. This standard includes only smooth-walled tubing and excludes any rough-walled tubing.

**1.2** The International System of Units (SI) is used in this Technical Report. However, testing data acquisition can be conducted using US customary units (USC).

**1.3** Factors included in Annex A Table A.1 permit conversions of USC units to SI units or SI units to USC units.

## 2 Terms and Definitions

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

**2.1**
**base fluid**
Aqueous liquid media (solvent with or without additives) used to prepare test fluid (see 2.8).

**2.2**
**friction reducer**
Agent that dissolves in base fluid, thereby reducing frictional resistance to flow.

**2.3**
**straight, smooth circular conduits**
Metallic-based smooth-walled straight tubing or pipe having a constant diameter.

**2.4**
**drag reduction**
**friction reduction**
Relative reduction in the change in pressure due to frictional resistance by the addition of friction reducer to the base fluid.

**2.5**
**Reynolds number ($N_{Re}$)**
The ratio of inertial forces to viscous forces within a fluid (a dimensionless number).

**2.6**
**Fanning friction factor ($f$)**
For a fluid, the ratio of pipe wall shear stress to the flow kinetic energy (a dimensionless number).

**2.7**
**solvent**
Aqueous liquid used to prepare the test fluid (water, brine, etc.) and the fluid used to determine the internal diameter of the tubing or pipe (see 5.3).

NOTE For the purpose of the document, for determination of internal diameter of the tubing or pipe, the solvent is fresh water.

**2.8**
**test fluid**
Fluid prepared with the base fluid and the friction reducer.