Manual of Petroleum Measurement Standards Chapter 22.6

Testing Protocol for Gas Chromatographs

FIRST EDITION, AUGUST 2015

AMERICAN PETROLEUM INSTITUTE

Special Notes

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

Users of this Standard should not rely exclusively on the information contained in this document. Sound business, scientific, engineering, and safety judgment should be used in employing the information contained herein.

Foreword

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

Shall: As used in a standard, “shall” denotes a minimum requirement in order to conform to the specification.

Should: As used in a standard, “should” denotes a recommendation or that which is advised but not required in order to conform to the specification.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 1220 L Street, NW, Washington, DC 20005. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 1220 L Street, NW, Washington, DC 20005.

Suggested revisions are invited and should be submitted to the Standards Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

Contents

Introduction

Gas chromatographs (GCs) with improved design and performance claims are regularly introduced to the natural gas industry. Natural gas companies that purchase these GCs often have to debug these units, eliminate problems, and evaluate field performance characteristics and specifications of the units at their own expense. Often several companies form a consortium to conduct performance verification tests on such devices, while individual companies may also perform their own tests that unnecessarily duplicate effort.

The need for a standardized testing protocol to assess the performance of GC technology that will allow test results to be recognized by regulators and accepted by the user community is recognized by the natural gas industry. Test results published in a specified format and obtained by following an industry-accepted uniform testing protocol will benefit the natural gas industry and save the industry from duplication of effort. To meet this need, this general GC performance test protocol specifies the scope and reporting requirements of GC tests for repeatability, reproducibility, and response. This document specifies requirements for tests over a range of gas compositions, tests over a range of operating conditions, and tests with variations in other external parameters that may influence GC performance.

Many existing industry standards and accepted practices for the analysis of natural gas by gas chromatography were reviewed for the development of this protocol. Applicable standards at the time this document was written are listed in the Bibliography. It is not the intent of this protocol to replace these standards, but to allow those who perform the tests to incorporate these standards into the testing process where possible.

This protocol does not specify acceptance criteria for GCs undergoing tests, nor does it permit those who perform the tests to set acceptance criteria within the test procedures or judge the usefulness of a GC for a particular application. The end-users of test reports created using this protocol should choose acceptance criteria for GCs based on their individual applications and requirements.

Testing Protocol for Gas Chromatographs

1 Scope

This standard is a general gas chromatograph (GC) performance test protocol. It specifies the scope and reporting requirements of GC tests for repeatability, reproducibility, and response linearity. The protocol specifies requirements for tests over a range of gas compositions, tests over a range of environmental conditions, and long-term performance tests.

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 *Manual of Petroleum Measurement Standards* (*MPMS*), Chapter 14—*Natural Gas Fluids Measurement*, Part 1—*Collecting and Handling of Natural Gas Samples for Custody Transfer*, February 2006

GPA Standard 2198 [1], *Selection, Preparation, Validation, Care and Storage of Natural Gas and Natural Gas Liquids Reference Standard Blends*

3 Terms, Definitions, Acronyms, Abbreviations, and Symbols

3.1 Terms and Definitions

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

3.1.1
acceptance criteria
Defined upper and lower limits for accepting the value of a process variable which is being monitored.

3.1.2
ambient conditions
The conditions (pressure, temperature, humidity, etc.) of the medium surrounding an object such as the case of a meter, instrument, transducer, etc.

3.1.3
atmospheric pressure
The pressure exerted by the weight of the atmosphere. At sea level, the pressure is approximately 14.7 pounds per square inch (101 kilopascals), often referred to as 1 atmosphere, atmospheric pressure, or pressure of one atmosphere.

3.1.4
barometric pressure
Ambient pressure in an absolute pressure scale monitored or displayed by a barometer.

3.1.5
bias
Any influence on a result that produces an incorrect approximation of the true value of the variable being measured. Bias is the result of a predictable systematic error.

[1] Gas Processors Association, 6526 E. 60th Street, Tulsa, Oklahoma 74145, www.gpaglobal.org.