Manual of Petroleum Measurement Standards
Chapter 11—Physical Properties Data

Section 5—Density/Weight/Volume Intraconversion

Part 1—Conversions of API Gravity at 60 °F

Adjunct to: ASTM D1250-08 and IP 200/08

FIRST EDITION, MARCH 2009

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Introduction

API *MPMS* Ch. 11.5.1, API *MPMS* Ch. 11.5.2, and API *MPMS* Ch. 11.5.3 are intended to replace API *MPMS* Ch. 11.1-1980 Volumes XI/XII (ASTM D1250-80, IP 200/80). This standard gives the following equivalents for any value of API gravity at 60 °F:

— relative density at 60 °F (old Table 3);

— absolute density at 60 °F;

— absolute density at 15 °C (old Table 3);

— pounds per U.S. gallon at 60 °F *in vacuo* and *in air* (old Table 8);

— U.S. gallons per pound at 60 °F *in vacuo* and *in air* (old Table 8);

— short tons per 1000 U.S. gallons at 60 °F *in vacuo* and *in air* (old Table 9);

— U.S. gallons per short ton at 60 °F *in vacuo* and *in air* (old Table 10);

— short tons per barrel at 60 °F *in vacuo* and *in air* (old Table 9);

— barrels per short ton at 60 °F *in vacuo* and *in air* (old Table 10);

— long tons per 1000 U.S. gallons at 60 °F *in vacuo* and *in air* (old Table 11);

— U.S. gallons per long ton at 60 °F *in vacuo* and *in air* (old Table 12);

— long tons per barrel at 60 °F *in vacuo* and *in air* (old Table 11);

— barrels per long ton at 60 °F *in vacuo* and *in air* (old Table 12);

— metric tons per 1000 U.S. gallons at 60 °F *in vacuo* and *in air* (old Table 13);

— metric tons per barrel at 60 °F *in vacuo* and *in air* (old Table 13);

— barrels per metric ton at 60 °F *in vacuo* and *in air;*

— cubic metres per short ton at 15 °C *in vacuo* and *in air* (old Table 14);

— cubic metres per long ton at 15 °C *in vacuo* and *in air* (old Table 14).

While not related to API gravity, the following are included for user convenience:

— U.S. gallons at 60 °F to litres at 15 °C (old Table 4);

— barrels at 60 °F to litres at 15 °C (old Table 4);

This standard is intended for application to bulk liquid quantities.

This standard provides implementation procedures for conversion of API gravity at 60 °F to equivalent densities in both *in vacuo* and *in air* values. A derivation of the *in air* equation is presented in Section B.4. *In air* values reflect the buoyancy effect of air if a substance were to be weighed in the air, and thus are slightly less than *in vacuo* values by approximately 0.1 % to 0.2 %. Although *in air* implementation procedures are presented in this standard in recognition

of certain common industry practices, *in vacuo* values are recommended because they more accurately represent the amount of material present.

Furthermore, as there is no known technical reason for the continued use of API gravity in the oil industry, absolute density is recommended instead (see API *MPMS* Ch. 11.5.3). This standard is presented, however, for the convenience of certain current common industry practices.

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Implementation Guidelines

This revised standard is effective upon the date of publication and supersedes the applicable parts of API *MPMS* Ch. 11.1-1980, Volumes XI/XII. However, due to the nature of the changes in this revised standard, it is recognized that guidance concerning an implementation period may be needed in order to avoid disruptions within the industry and ensure proper application. As a result, it is recommended that this revised standard be utilized on all new applications no later than TWO YEARS after the publication date. An application, for this purpose, is defined as the point where the calculation is applied.

Once the revised standard is implemented in a particular application, the previous standard will no longer be used in that application.

However, the use of API standards remains voluntary and the decision on when to utilize a standard is an issue that is subject to the negotiations between the parties involved in the transaction.

1 Scope

These intraconversion tables are applicable to all crude oils, petroleum products, and petrochemicals.

2 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 *MPMS* Chapter 11.1-2004, *Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils*

API *MPMS* Chapter 11.4.1-2003, *Density of Water and Water VCFs for Volumetric Meter Proving*

API *MPMS* Chapter 15-2001, *Guideline for the Use of the International System of Units (SI) in the Petroleum and Allied Industries*

ASTM D1250-1959 [1], *Report on the Development, Construction, and Preparation of the ASTM–IP Petroleum Measurement Tables*

12th General Conference on Weights and Measures (1964)

NIST Handbook 44-2002 Edition [2], *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*

NIST Handbook 44-2007 Edition, Appendix C

NIST Handbook 105-1 (Revised 1990), *Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures*

[1] ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.
[2] National Institute of Standards and Technology, 100 Bureau Drive, Stop 3460, Gaithersburg, Maryland 20899, www.nist.gov.