INTERNATIONAL STANDARD

ISO 6578

Second edition
2017-10

Refrigerated hydrocarbon liquids — Static measurement — Calculation procedure

Hydrocarbures liquides réfrigérés — Mesurage statique — Procédure de calcul

Reference number
ISO 6578:2017(E)

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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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 documents 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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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources,* Subcommittee SC 5, *Measurement of refrigerated hydrocarbon and non-petroleum based liquefied gaseous fuels*.

This second edition cancels and replaces the first edition (ISO 6578:1991), which has been technically revised.

Introduction

Large quantities of refrigerated hydrocarbon liquids such as liquefied natural gas (LNG), liquefied petroleum gas (LPG), etc. are transported by marine carriers dedicated for these applications. These gases are traded based on static measurement on board marine carriers rather than the measurement at shore tanks or pipelines due mainly to the nature of the tank operation.

The measurement on board involves determination of liquid/vapour interface, i.e. liquid level, average temperatures of liquid and vapour, and vapour pressure in the tanks of marine carriers. The volumetric quantity of the liquid and gas is then computed with the tank capacity tables.

This document is applicable to calculate the volume at standard condition, liquid density from chemical composition, mass and energy content of fully refrigerated hydrocarbon liquids at a vapour pressure near to atmospheric pressure from the results of custody transfer measurement. This document is also applicable to ascertain the inventory in shore tanks. Calculation procedures for refrigerated hydrocarbon liquids consisting predominantly of ethane or ethylene, or for partially refrigerated hydrocarbon liquids at pressures substantially above atmospheric, are not included. No recommendations are given for the measurement of small parcels of refrigerated liquids, which are directly weighed.

Aspects of safety are not dealt with in this document. It is the responsibility of the user to ensure that the procedure of measurement meets applicable safety regulations.

Basic data and source references used in the calculation procedures are given in annexes.

Annexes A to G form an integral part of this document.

Refrigerated hydrocarbon liquids — Static measurement — Calculation procedure

1 Scope

This document specifies the calculation procedure to convert the volume of liquefied petroleum gas (LPG) and liquefied natural gas (LNG) under the conditions at the time of measurement to the equivalent volume of liquid or vapour at the standard condition, i.e. 15 °C and 101,325 kPaA, or to the equivalent mass or energy (calorific content). It applies to the quantities of refrigerated hydrocarbon liquids stored in or transferred to/from tanks and measured under static storage conditions. Calculation of pressurized gases is out of the scope of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 91, *Petroleum and related products — Temperature and pressure volume correction factors (petroleum measurement tables) and standard reference conditions*

3 Terms, definitions and symbols

3.1 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1.1
compression factor
actual (real) volume of a given amount of gas at a specified pressure and temperature divided by its volume, under the same conditions as calculated from the ideal gas law

[SOURCE: ISO 6976:2016, 3.10]

3.1.2
gross calorific value
amount of heat that would be released by the complete combustion with oxygen of a specified quantity of gas, in such a way that the pressure, p_1, at which the reaction takes place remains constant, and all the products of combustion are returned to the same specified temperature, t_1, as that of the reactants, all of these products being in the gaseous state except for water, which is condensed to the liquid state at t_1

Note 1 to entry: t_1 and p_1 are combustion reference temperature and combustion reference pressure, respectively.

[SOURCE: ISO 6976:2016, 3.1, modified — Note 1 to entry has been replaced.]