ISO/~~TC193/WG5~~

~~ISO/DTS~~PRF TS 16922:2022(E)

ISO TC 193~~/WG 5~~

Date: 2022-~~07-27~~xx

Secretariat: NEN

Natural gas — Odorization

Gaz naturel — Odorisation

Style Definition: Heading 1: Indent: Left: 0 pt, First line: 0 pt, Tab stops: Not at 21.6 pt

Style Definition: Heading 2: Font: Bold, Tab stops: Not at 18 pt

Style Definition: Heading 3: Font: Bold

Style Definition: Heading 4: Font: Bold

Style Definition: Heading 5: Font: Bold

Style Definition: Heading 6: Font: Bold

Style Definition: ANNEX

Style Definition: AMEND Terms Heading: Font: Bold

Style Definition: AMEND Heading 1 Unnumbered: Font: Bold

Formatted: Font: Not Bold

ISO copyright office

CP 401 • Ch. de Blandonnet 8

CH-1214 Vernier, Geneva

Phone: +41 22 749 01 11

Fax: +41 22 749 09 47

Email: copyright@iso.org

Website: ~~www.iso.org~~www.iso.org

Published in Switzerland

Formatted: Pattern: Clear

Formatted: Pattern: Clear

Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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~~www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see ~~www.iso.org/patents~~www.iso.org/patents).

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

For an explanation of 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 ~~www.iso.org/iso/foreword.html~~www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 193, *Natural ~~Gas~~gas*.

This ~~second~~first edition ISO/TS 16922 cancels and replaces the first edition (ISO/TR 16922:2013), which has been technically revised.

The main changes ~~compared to the previous edition~~ are as follows:

— modification of the structure of the ~~technical report :~~Technical Report, new clauses~~:~~, 4.1 ~~Necessary odorant addition~~, 4.2 ~~Requirements and parameters for consideration when selecting an odorant~~, 4.3 ~~Public awareness~~, 5.1 ~~Masking and fading of odorants, ~~, Clause 7 ~~Odorization technique~~, 7.1 ~~Odorization of pipeline networks~~, 7.1.1 ~~Odorization of transmission pipelines~~, 7.1.2 ~~Odorization of distribution pipelines~~, 7.1.3 ~~Combined odorization of transmission and distribution pipelines~~, 7.3 ~~Design of installation~~, 7.3.1 ~~Odorization rooms~~, 7.3.2 ~~Ventilation~~, 7.3.3 ~~Installation of injection point and injection pipe~~, 7.3.4 ~~Tank design and operations~~, 7.3.5 ~~Spill kit.~~;

— modification of ~~clause~~ 7.2 ~~Odorizer~~.

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~~www.iso.org/members.html.

Formatted: Font: Italic
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: cite_sec
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear

Introduction

Processed natural gas normally has little or no ~~odor~~odour. For safety reasons distributed natural gas is therefore be odorized, to permit the detection of the gas by smell.

The odorization is predominantly a safety measure for the user of natural gas. Odorized natural gas needs to be recognized by the characteristic smell.

This ~~technical report~~document may also be applied to other gases used in gas supply as e.g. biomethane, blends containing hydrogen, regasified LNG or LBG, LPG for conditioning in gas supply, etc.

Natural gas - Odorization

1 Scope

This ~~Technical Specification~~document gives the specifications and guidelines for the methods to be used in the odorization of natural gas and other methane rich gases delivered through natural gas networks to gas applications under a safety point of view.

This ~~Technical Specification~~document also specifies the principles for the odorization technique (including handling and storage of odorants) and the control of odorization of natural gas and other methane rich gases.

NOTE The general requirements for odorants, and the physical and chemical properties of commonly used odorants are specified in ISO 13734.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Technical Specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this Technical Report are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

~~<std>ISO 5492, *Sensory analysis — Vocabulary*</std>~~

~~<std>ISO 14532, *Natural gas — Vocabulary*</std>~~

ISO 5492, *Sensory analysis — Vocabulary*

ISO 14532, *Natural gas — Vocabulary*

3 Terms and definitions

For the purposes of this Technical Specification, the terms and definitions given in ISO 5492 and ISO 14532 and the following apply:

3.1.1
odorant content
content of the odorant either in the gas or in air expressed as its mass concentration, volume fraction or mole fraction

3.1.2
~~odor~~odour perception
awareness of the effect of volatile substances by the olfactory organ

3.1.3

Formatted: Font: 12 pt
Formatted: Font: 12 pt
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear
Formatted: Pattern: Clear

~~odor~~odour character
distinctive and identifiable feature of an ~~odor~~odour or flavour

3.1.4
~~odor~~odour intensity
magnitude of the perceived odor

3.1.5
masking
phenomenon by which one or more constituents in the gas stream can change or reduce the ~~odor~~odour intensity and/or the ~~odor~~odour character of the odorized gas

3.1.6
fading of odorant
phenomenon where adsorption, absorption or chemical reactivity of the odorant result in loss of odorant across the network

4 General requirements

4.1 Necessary odorant addition

Because safety is paramount in the gas industry, it could be assumed that the stronger the ~~odor~~odour of gas, the better. However, an upper limit is usually set to avoid unjustified leakage complaints already caused by the small volume of unburnt gas escaping during ignition of the burner. An excessive odorization level can also lead to a slight and permanent gas smell related to micro leaks that cannot be localized and sealed. This could lead to habituation of the customer with the eventuality of a late reaction when actual leaks occur. Gas odorization is in most countries a legal or regulation requirement that specifies that natural gas in air be readily detectable by ~~odor~~odour at a concentration of 20 % (safety factor of 5) of the lower flammability limit (LFL). The LFL of natural gas is normally taken as a volume fraction of natural gas in air of 4 % to 5 %. However, local regulations may specify other odorization rules.

NOTE Consider potential masking issues when blending natural gas with other gases (e. g. biomethane, LPG), the ~~odor~~odour being either naturally present or artificially added.

4.2 Requirements and parameters for consideration when selecting an odorant

Information about different odorants is given in informative annex A of[1].

Formatted: Pattern: Clear

Various parameters are considered when selecting an odorant:

— Typical ~~odor~~odour character that is intense, unpleasant and universally associated with gas

— Physical properties: Freezing point, boiling point, vapour pressure

— Stability:

  — Stability with respect to oxidation in network:

  Mercaptans being more reactive than sulfides, they tend to form less odorous disulfides in presence of rust, thus lowering odorization efficiency.

  — Stability in storage:

Some chemicals developed for odorization displaying reactive function can undergo hazardous polymerization reaction if not stabilized adequately. Such reaction could occur in storage tank or within injection system.

— Toxicity

— Environmental issues

— Gas quality: wet gas, presence of other sulphur compounds or network displaying condensates will generate odorant scrubbing or cross contamination that may affect odorant efficiency

— Odorization practice in the region:

  — Centralized / decentralized

  — Odorization technique: (some odorants may not be compatible with Bypass odorizers, etc.)

— Network material (Carbon steel, plastics)

The level of the odorant added, that determines the ~~odor~~odour intensity, is based on different factors whereof not all are based on measurement, as e.g. local experience. The typical objective is that the population with a functional sense of smell will be able to smell odorized gas before its concentration reaches the specified limit (typically 20 % LFL) and thus takes the appropriate measures to protect itself. Different approaches are applied to define and estimate the concentration of odorant required to achieve this effect.

The ~~odor~~odour intensity of an odorant for natural gas or a gas is best determined by the human olfactory organ.

4.3 Public awareness

In some countries, local regulations require the operators to follow a public awareness program, which may include specific information about the risk of gas and guidance for leak recognition. The use of scratch-and-sniff cards containing the encapsulated odorant or other carriers is also frequently used in a number of countries, but other kind of smell samples are also encountered.

In the case of changing the odour character of the gas odorant, the need to provide adequate information to the members of the public and gas users should be considered.

5 General remarks on odorant behaviour

5.1 Masking and fading of odorants

Temporary fading in a new gas distribution system or after changing the odorant requires specific monitoring and can need temporary supplemental odorization or other measures (e. g. preconditioning).

Some components, e. g. present in some natural gases or biogases may react on or with the odorant applied, resulting in a major loss of smell of the odorant either by masking effects or by chemical reaction.

5.2 Seals and membranes

Liquid odorants may cause severe swelling or even dissolution of organic materials such as plastics, elastomeric seals and lubricants. Therefore, in odorization equipment and for joints close to the points where the liquid odorant is injected into the line, only sealing materials should be used which are