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Natural gas — Vocabulary

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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.

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The committee responsible for this document is ISO/TC 193, *Natural gas*.

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Introduction

ISO/TC 193 Natural Gas was established in May, 1989, with the task of creating new standards and updating existing standards relevant to natural gas. This includes gas analysis, direct measurement of properties, quality designation, and traceability.

In these activities, a comprehensive and uniform review of the definitions, symbols, and abbreviations used in the standards was not previously systematically pursued. The development of standards with terminology created to suit specific purposes often resulted in the detriment of uniformity and cohesiveness between standards.

Thus, there is the need for a work of harmonization of the terminology used in the standards pertaining to natural gas. The intention of this International Standard is to incorporate the reviewed definitions into the ISO/TC 193 source International Standard.

As the aim is to create a coherent body of standards which support each other with regard to their definitions, common and unambiguous terms and definitions used throughout all International Standards is the starting point for the understanding and application of every International Standard.

The presentation of this International Standard has been arranged to facilitate its use as follows:

- Major headings pertain to specific fields of the natural gas industry. All definitions that fall under these headings, as gleaned from ISO International Standards issued through ISO/TC 193, are listed under that heading. A review of the contents will serve to facilitate finding specific terms.
- Notes are given under numerous definitions where it was deemed important to give informative guidance for a given definition. The Notes are not considered a part of the definition.

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Natural gas — Vocabulary

1 Scope

This International Standard establishes the terms, definitions, symbols, and abbreviations used in the field of natural gas.

The terms and definitions have been reviewed and studied in order to cover all aspects of any particular term with input from other sources such as European Standards from CEN (The European Committee for Standardization), national standards, and existing definitions in the IGU Dictionary of the Gas Industry.

The definitive intention of this document is to incorporate the reviewed definitions into the ISO/TC 193 source standards.

2 Terms and definitions

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

2.1 General conditions

2.1.1 Natural gas

2.1.1.1 natural gas

NG

complex gaseous mixture of hydrocarbons, primarily methane, but generally includes ethane, propane and higher hydrocarbons, and some non-combustible gases such as nitrogen and carbon dioxide

Note 1 to entry: Natural gas can also contain components or containments such as sulfur compounds and/or other chemical species.

2.1.1.2

raw gas

unprocessed gas taken from well heads, through gathering lines, to processing or treating facilities

Note 1 to entry: Raw gas can also be partially processed well-head gas, taken from basic upstream processing facilities.

2.1.1.3

substitute natural gas

SNG

gas from non-fossil origin which is interchangeable in its properties with natural gas

2.1.1.4

manufactured gas

synthetic gas

gas which has been treated and can contain components that are not typical of natural gas

Note 1 to entry: Manufactured (synthetic) gases can contain substantial amounts of chemical species that are not typical of natural gases or common species found in atypical proportions as in the case of wet and sour gases.

Note 2 to entry: Manufactured gases fall into two distinct categories, as follows:

a) those that are intended as synthetic or substitute natural gases, and that closely match true natural gases in both composition and properties;

b) those that, whether or not intended to replace or enhance natural gas in service, do not closely match natural gases in composition.

Case b) includes gases such as town gas, coke oven gas (undiluted), and LPG/air mixtures. None of which is compositionally similar to a true natural gas (even though, in the latter case, it can be operationally interchangeable with natural gas).

2.1.1.5

lean gas

natural gas having a relatively low energy content, close to or lower than that of pure methane

Note 1 to entry: Lean gas typically contains high amounts of nitrogen and carbon dioxide.

2.1.1.6

rich gas

natural gas having a relatively high energy content, higher than that of pure methane

Note 1 to entry: Rich gas typically contains high amounts of ethane or propane or higher.

2.1.1.7

wet gas

gas which falls short of qualifying as pipeline quality natural gas by the inclusion of undesirable components such as free water, water vapour and/or high hydrocarbons in such amounts that they can condense at pipeline conditions

2.1.1.8

sour gas

gas containing significant amount of acid gases such as carbon dioxide and sulphur compounds

Note 1 to entry: The presence of acid compounds is more detrimental in wet gases.

Note 2 to entry: Typically, wet and sour gases can be unprocessed (well head) or partially-processed natural gases and can also contain condensed hydrocarbons, traces of carbonyl sulphide, and process fluid vapours such as methanol or glycols.

Note 3 to entry: Carbon dioxide in the presence of free water can be an important cause of corrosion damage to pipelines.

2.1.1.9

dry natural gas

natural gas containing a mole fraction of water of no more than 0,005 % [50 ppm (molar)] in the vapour phase

Note 1 to entry: Water vapour content in natural gas can also be expressed in terms of water concentration (mg/m^3).

Note 2 to entry: The correlation between water content and water dew point is given in ISO 18453.[\[17\]](#)

2.1.1.10

saturated gas

natural gas that at the specified conditions of temperature and pressure is at its water dew-point

2.1.1.11

compressed natural gas

CNG

natural gas that has been compressed after processing for storage and transportation purposes

Note 1 to entry: CNG is mainly used as a fuel for vehicles, typically compressed up to 20 000 kPa in the gaseous state.

2.1.1.12**liquefied natural gas****LNG**

natural gas that has been liquefied after processing for storage or transportation purposes

Note 1 to entry: Liquid natural gas is revaporized and introduced into pipelines for transmission and distribution as natural gas.

2.1.1.13**gas quality**

attribute of natural gas defined by its composition and its physical properties

2.1.1.14**biogas**

generic term used to refer to gases produced by anaerobic fermentation or digestion of organic matter, and without further upgrading nor purification

Note 1 to entry: This can take place in a landfill site to produce landfill gas or in an anaerobic digester to produce biogas. Sewage gas is biogas produced by the digestion of sewage sludge. Biogases comprise mainly methane and carbon dioxide.

2.1.1.15**biomethane**

methane rich gas derived from biogas or from gasification of biomass by upgrading with the properties similar to natural gas

2.1.1.16**biomass**

mass defined from a scientific and technical point of view as material of biological origin excluding material embedded in geological formations and/or transformed to fossil

Note 1 to entry: Biomass is organic material that is plant-based or animal-based, including but not limited to dedicated energy crops, agricultural crops and trees, food, feed and fibre crop residues, aquatic plants, alga, forestry and wood residues, agricultural wastes, processing by-products and other non-fossil organic matter.

Note 2 to entry: See also herbaceous biomass, fruit biomass, and woody biomass.

2.1.2 Pipeline network**2.1.2.1****pipeline grid**

system of interconnected pipelines, both national and international that serve to transmit and distribute natural gas

2.1.2.2**local distribution system****LDS**

gas mains and services that supply natural gas directly to consumers

2.1.2.3**custody transfer point**

location between two pipeline systems where the quantity of energy of the natural gas has to be accounted for

Note 1 to entry: At such location a change of pressure regime can also occur.

2.1.2.4**transfer station**

system of pipelines, measurement and regulation (pressure control), and ancillary devices at a custody transfer point necessary to account for the quantity of gases transferred and the adaptation to the possible different pressure regimes of the networks

2.2 Measurement methods

2.2.1 General definitions

2.2.1.1

absolute measurement

measurement of a property from fundamental metrological quantities

Note 1 to entry: For example, fundamental metrological quantities are length, mass, and time.

Note 2 to entry: For example, the determination of the mass of a gas using certified masses.

2.2.1.2

direct measurement

measurement of a property from quantities that, in principle, define the property

Note 1 to entry: For example, the determination of the calorific value of a gas using the thermometric measurement of the energy released in the form of heat during the combustion of a known amount of gas.

2.2.1.3

indirect measurement

measurement of a property from quantities that, in principle, do not define the property, but have a known relationship with the property

Note 1 to entry: For example, the determination of the calorific value from measurements of the air-to-gas ratio required to achieve stoichiometric combustion that is related linearly to the calorific value.

2.2.1.4

lower range value

lowest value of a quantity to be measured (measurand) that a measuring system or transmitter is adjusted to measure

2.2.1.5

upper range value

highest value of a quantity to be measured (measurand) that a measuring system or transmitter is adjusted to measure

2.2.1.6

span

algebraic difference between the upper and lower range values

2.2.1.7

relative measurement

measurement of a property by means of comparison with a value of the property taken from an accepted standard, for example, reference material

Note 1 to entry: For example, determining gas density from the quotient of the mass of gas contained in a given volume to that of air contained in the same volume at the same temperature and pressure, and multiplying by the density of air at that temperature and pressure.

2.2.2 Specific methods

2.2.2.1

gas chromatographic method

method of analysis by which the components of a gas mixture are separated using gas chromatography

Note 1 to entry: The sample is passed in a stream of carrier gas through a column that has different retention properties relative to the components of interest. Different components pass through the column at different rates and are detected as they elute from the column at different times.

2.2.2.2**potentiometric method**

method of analysis by which a known quantity of gas is first passed through a solution, where a specific gas component or a group of components is (are) selectively absorbed, then the absorbed analyte(s) in the solution is (are) evaluated by potentiometric titration

Note 1 to entry: The result is a titration curve showing the potentiometric end points for the components being sought versus the titration solutions required. From this data, the concentrations of the various components can be calculated.

2.2.2.3**potentiometric titration**

method where the amount of titrant consumed for reaction of the gas component with the titrant is proportional to the gas component concentration, and the endpoint of reaction is determined by the variation of potential inside the cell

Note 1 to entry: The volume increments of titrant (titration solution) added determine the difference in potential to be measured. Different volume increments of titrant, specifically smaller volume increments close to end points, can permit a better evaluation of the end points.

2.2.2.4**turbidimetric titration**

method to determine the content of sulfate ions whereby a barium salt solution is added to an absorption solution and the turbidity caused by the formation of any insoluble barium sulfate detected

Note 1 to entry: This method is valid for solutions having a total sulfur content below 0,1 mg.

Note 2 to entry: A photometer with galvanometer readout is employed with the titration procedure to determine the inflection point. From these data, the total sulfur content in mg/m³ can be calculated.

2.2.2.5**combustion method**

method by which a gas sample undergoes total combustion and the specific combustion products are measured to determine the total concentration of an element in the sample, e.g. sulfur

Note 1 to entry: Wickbold method: the Wickbold combustion method uses the combustion and complete thermal decomposition of compounds at a high temperature in a hydrogen/oxygen flame. It is performed with a special instrument (see ISO 4260[2]).

Note 2 to entry: Lingener method: the Lingener combustion method uses air, and it is performed using a special instrument (see ISO 6326-5[8]).

2.2.2.6**absorption**

extraction of one or more components from a mixture of gases when brought into contact with a liquid

Note 1 to entry: The assimilation or extraction process causes (or is accompanied by) a physical or chemical change, or both, in the sorbent material.

Note 2 to entry: The gaseous components are retained by capillary, osmotic, chemical, or solvent action.

EXAMPLE Removal of water from natural gas using glycol.

2.2.2.7**adsorption**

retention, by physical or chemical forces of gas molecules, dissolved substances, or liquids by the surfaces of solids or liquids with which they are in contact

Note 1 to entry: For example, retention of methane by carbon.

2.2.2.8**desorption**

removal of a sorbed substance by the reverse process of adsorption or absorption

2.3 Sampling

2.3.1 Sampling methods

2.3.1.1

direct sampling

sampling in situations where there is a direct connection between the natural gas to be sampled and the analytical unit

2.3.1.2

indirect sampling

sampling in situations where there is no direct connection between the natural gas to be sampled and the analytical unit

2.3.1.3

in-line instrument

instrument whose active element is installed inside the pipeline and makes measurements under pipeline conditions

2.3.1.4

on-line instrument

instrument that samples gas directly from the pipeline, but is installed externally to the pipeline

2.3.1.5

off-line instrument

instrument that has no direct connection to the pipeline

2.3.1.6

spot sample

sample of specified volume taken at a specified place at a specified time from a stream of gas

2.3.2 Sampling devices

2.3.2.1

floating piston cylinder

container that has a moving piston separating the sample from a buffer gas. The pressures are in balance on both sides of the piston

2.3.2.2

incremental sampler

sampler that accumulates a series of spot samples into one composite sample

2.3.2.3

flow-proportional incremental sampler

sampler that collects a series of spot samples over a period of time with the spot samples taken in such a manner as to ensure the incremental sample is proportional to the incremental totalised flow

Note 1 to entry: This is normally achieved by varying the frequency of extraction of a constant volume spot sample (grab).

2.3.2.4

sample container

container that is used to collect a representative sample and maintain the sample in a representative condition

Note 1 to entry: The sample container should not alter the gas composition in any way or affect the proper collection of the gas sample. The materials, valves, seals, and other components of the sample container shall be specified to maintain this principle.

2.3.2.5**sample line**

conduit to transfer a sample of gas from the sample place to the analytical unit or sample container

Note 1 to entry: Another word used for sample line is transfer line.

2.3.2.6**sample probe**

device inserted into the gas pipeline so that a representative sample of the flowing gas can be taken. The sample probe will have a conduit to convey the sample from the flowing gas to a point external to the pipeline

2.3.2.7**hot loop**

sampling configuration that returns the sample to the pipeline

Note 1 to entry: The loop requires a pressure differential from collection point to discharge so as to ensure a constant and steady flowrate through the sampling equipment located in the loop.

2.3.2.8**vent line**

section of the sampling system that diverts a portion of the sampled gas away from the analyser/instrument or sample container

Note 1 to entry: The flowrate and pressure loss in the open-ended line need to be controlled so as to ensure that sample accuracy cannot be affected from any cooling and condensation.

2.3.2.9**fast loop**

sampling system that takes more sample from the process than is needed to make the measurement so as to reduce the residence time

2.3.3 Conditioning device**2.3.3.1****condenser**

apparatus used to transform the condensable fraction (consisting of water vapour and/or of the higher hydrocarbons) of the vapour phase present in natural gas into a liquid phase by cooling

2.3.3.2**liquid separator**

unit, in the sample line, used to collect liquid fall-out

2.3.3.3**pressure reducer**

device used to reduce gas pressure immediately downstream of its installed position

Note 1 to entry: It has the ability to maintain a near constant outlet pressure within its design parameters regardless of changes in pressure or flow in other parts of the system.

2.3.3.4**back-pressure regulator**

device used to control/maintain gas pressure immediately upstream of its installed position

Note 1 to entry: It has the ability to maintain a near constant inlet pressure within design parameters, regardless of pressure or flow fluctuations in other parts of the system.

2.3.3.5

heating device

device to ensure that the sample gas remains at a temperature sufficient to avoid a change of its composition due to condensation of some compounds

Note 1 to entry: Heating elements can be installed on the sample probe and sample lines. In some cases, heating the sample cylinder is also required. It is particularly important where Joule-Thomson cooling occurs as a result of pressure reduction.

Note 2 to entry: Heating devices are also used to maintain “wetted surface areas” at near constant temperatures to avoid changes in gas sorption coefficients when measuring components that are prone to strong sorption effects.

2.3.4 Other definitions

2.3.4.1

purging time

residence time plus the time to insure that the sample in the sampling system is representative of the gas stream

Note 1 to entry: The purging time can be much longer than the residence time and will be multiples of the residence time in poorly designed sampling systems.

2.3.4.2

representative sample

sample having the same composition as the natural gas sample when the latter is considered as a homogeneous whole

2.3.4.3

residence time

time it takes for a sample to flow through a piece of equipment

2.3.4.4

sampling point standards.iteh.ai/catalog/standards/sist/f8722c9a-fe98-45e2-b84f-3cc47a1027a1/iso-14532-2014
point in the gas stream or vessel where a representative sample can be taken

2.3.4.5

sampling place

location of a sampling point along a stream, or the location of the vessel

2.3.4.6

gas sorption effects

physical processes whereby some gases are adsorbed onto or desorbed from the surfaces of a solid without transformation of the molecules

Note 1 to entry: The force of attraction between some gases and solids is purely physical and depends on the nature of the participating material. Natural gas can contain several components that exhibit strong sorption effects. Special care should be taken when determining trace concentrations of heavy hydrocarbons, water, sulfur compounds, and hydrogen.

2.4 Analytical systems

2.4.1

measuring system

complete set of measuring instruments and other equipment assembled to carry out specified measurements

Note 1 to entry: System comprising, in general, a sample transfer and introduction unit, a separation unit, a detector and an integrator or a data processing system.

2.4.2**introduction unit**

unit for introducing a constant, or a measured amount of material to be analysed into the analyser

Note 1 to entry: Gas chromatographic analysers are comparative rather than absolute. Therefore, the introduction of equal quantities of a calibration mixture and of sample allows quantitative measurement of sample components.

Note 2 to entry: In gas analysis, the introduction device is frequently a multi-port valve, in which a fixed volume of a calibration mixture or sample is isolated, and by operation of the valve, passed into the analyser.

Note 3 to entry: Equimolar quantities can be obtained by controlling the pressure and temperature of the introduction device.

2.4.3**gas chromatograph**

device that physically separates components of a mixture in the gaseous phase and measures them individually with a detector whose signal is processed

Note 1 to entry: A chromatograph consists of the following main parts: an introduction unit, a separation unit, and a detector. The separation unit consists of one or more chromatographic columns through which carrier gas flows and into which samples are introduced. Under defined and controlled operating conditions, components can be qualitatively identified by their retention time, and quantitatively measured by comparing their detector response to that of the same or a similar component in a calibration mixture.

Note 2 to entry: In gas analysis, the range of components and their properties frequently cause more than one separation mechanism to be required. These can be and often are combined in a single separation unit or chromatograph.

Note 3 to entry: A gas chromatograph capable of temperature programming is a chromatograph whose columns are placed in an oven whose temperature is programmable in a defined and repeatable manner over the period of analysis.

2.4.4**carrier gas**

pure gas introduced so as to transport a sample through the separation unit of a gas chromatograph for analytical purposes

Note 1 to entry: Typical carrier gases are hydrogen, nitrogen, helium, and argon.

2.4.5**auxiliary gases**

gases required for detector operation, e.g. hydrogen and air for flame detectors

2.4.6**chemiluminescence detector****CD**

detector that uses a reducing reaction in which molecules give rise to characteristic luminous emissions that are measured by a photomultiplier and the associated electronic devices

Note 1 to entry: A chemiluminescence detector is used in gas chromatography mainly to detect components that contain particular elements, e.g. nitrogen (N) and sulfur (S).

2.4.7**electrochemical detector****ED**

detector consisting of an electrochemical cell that responds to certain substances contained in the carrier gas eluting from the column

Note 1 to entry: The electrochemical process can be an oxidation, reduction, or a change in conductivity. The detection can be very specific depending on the electrochemical process involved.