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Petroleum and natural gas industries — Offshore platforms handling streams with high content of CO_2 at high pressures

Industries du pétrole et du gaz naturel — Plates-formes en mer traitant des courants à fort teneur en CO_2 à haute pression

Reference number
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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.

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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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*.

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Introduction

In recent years, the oil industry has been facing challenges in developing and operating high-CO_2 content offshore fields. The CO_2-rich streams, separated from the produced natural gas, can be injected to enhance oil recovery from the reservoirs. Even in cases where the oil recovery increase is not so significant, operators have to consider the CO_2-rich stream compression and injection, in order to avoid its venting to the atmosphere.

Main concerns comprise surface safety system and material selection areas, which lack specific standards and regulations for this scenario. The commercial tools available, for instance, to model the dispersion of gases, need to be validated for CO_2 and CO_2/hydrocarbon mixtures, which have distinctive thermodynamic behaviour. This will affect the choice of materials and plant design.

This International Standard addresses concepts and criteria for processing CO_2-rich streams, as a supplement to existing standards for offshore installations.

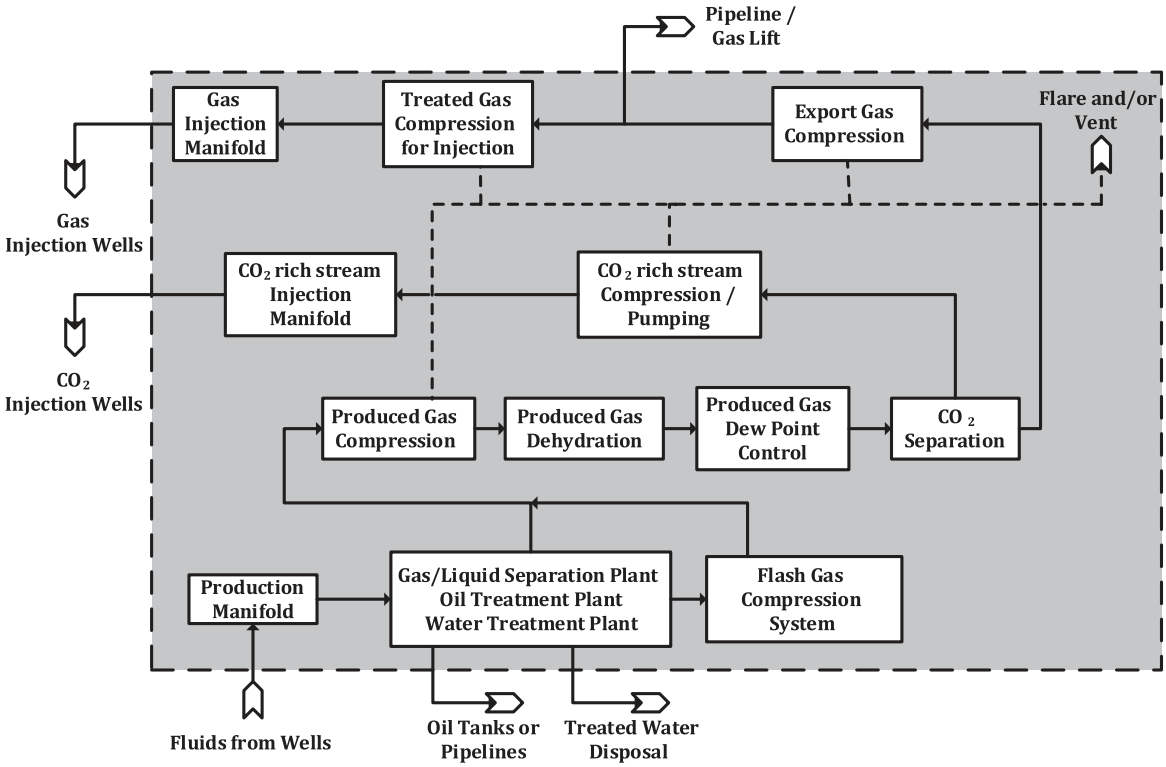
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Petroleum and natural gas industries — Offshore platforms handling streams with high content of CO_2 at high pressures

1 Scope

This International Standard contains provisions for design of topside facilities for offshore plants handling CO_2-rich streams at high pressures; i.e. CO_2 molar concentration above 10 %. The surface systems include usual offshore process unit operations, as shown in Figure 1.

This International Standard is applicable only to topside facilities of fixed and floating oil and gas production offshore units up to the last barrier, such as an ESDV. Subsea production systems and Cryogenic CO_2 separation are not covered.



NOTE This example is within the scope of this International Standard.

Figure 1 — Example of a Process Flow Diagram (in grey zone)

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies..

ISO 13702, *Petroleum and natural gas industries — Control and mitigation of fires and explosions on offshore production installations — Requirements and guidelines*

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ISO 15156 (all parts), *Petroleum and natural gas industries — Materials for use in H_2S-containing environments in oil and gas production*

ISO 21457, *Petroleum, petrochemical and natural gas industries — Materials selection and corrosion control for oil and gas production systems*

ISO 23936-1, *Petroleum, petrochemical and natural gas industries — Non-metallic materials in contact with media related to oil and gas production — Part 1: Thermoplastics*

ISO 23936-2:2011, *Petroleum, petrochemical and natural gas industries — Non-metallic materials in contact with media related to oil and gas production — Part 2: Elastomers*

API STD 521, *Pressure-relieving and Depressuring Systems, API Standard, January 2014*

3 Terms and definitions

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

3.1
compressibility factor
Z
thermodynamic property for modifying the ideal gas law to account for the real gas behaviour

3.2
corrosion resistant alloy
CRA
alloy intended to be resistant to general and localized corrosion by oil field environments that are corrosive to carbon steels

[SOURCE: ISO 15156-1:2015, 3.6]

3.3
dense phase
fluid state (supercritical or liquid) above critical pressure

3.4
equation of state
EOS
thermodynamic equation describing the state of matter under a given set of physical conditions

3.5
free water
water not dissolved in the CO_2-rich stream

Note 1 to entry: This can be pure water, water with dissolved salts, water wet salts, water glycol mixtures or other mixtures containing water.

3.6
gas-assisted flare
flare with gas assistance system in order to increase gas net heating value

3.7
high-velocity tip flare
flare with gas exit velocities higher than 122 m/s

3.8
high-velocity vent
vent with gas exit velocities higher than 150 m/s

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3.9
hydrate
solid, crystalline compound of water and light hydrocarbons or CO_2, in which the water molecules combine with the gas molecules to form a solid

3.10
CRA clad
metallic coating of CRA in which the bond between the parent metal and liner is metallurgical

3.11
low-velocity tip flare
flare with gas exit velocities lower than 122 m/s

3.12
low-velocity vent
vent with gas exit velocities lower than 150 m/s

3.13
minimum design temperature
minimum temperature below which the application limits for the materials involved are exceeded

3.14
platform
complete assembly, including structure, topsides, foundations and stationkeeping systems

[SOURCE: ISO 19900:2013, 3.35]

3.15
rapid gas decompression
RGD
depressurization
explosive decompression
rapid pressure-drop in a high pressure gas-containing system which disrupts the equilibrium between external gas pressure and the concentration of gas dissolved inside any polymer, with the result that excess gas tries to escape from the solution at points throughout the material, causing expansion

[SOURCE: ISO 23936-2:2011, 3.1.10]

3.16
supercritical phase
fluid state above critical pressure and temperature

3.17
topsides
structures and equipment placed on a supporting structure (fixed or floating) to provide some or all of a platform's functions

Note 1 to entry: For a ship-shaped floating structure, the deck is not part of the topsides.

Note 2 to entry: For a jack-up, the hull is not part of the topsides.

Note 3 to entry: A separate fabricated deck or module support frame is part of the topsides.

[SOURCE: ISO 19900:2013, 3.52]

3.18
triple point
temperature and pressure where CO_2 exists as a gas, liquid and solid simultaneously

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