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Natural gas — Online gas chromatograph for upstream area

Gaz naturels — Chromatographe en phase gazeuse en ligne pour zone amont

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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Principle of measurement **1**
2.1 General 1
2.2 Gas composition 1
3 Sampling and conditioning **3**
4 Online gas chromatograph selection guideline **6**
5 Calibration guidelines **7**
5.1 Calibration procedure 7
5.1.1 General 7
5.1.2 Calibration 7
5.1.3 Calibration frequency 7
5.2 Calibration gases 8
5.3 Chromatogram verification 8
5.3.1 Response Factor (RF) 8
5.3.2 Retention Time (RT) 8
6 Verification procedure **8**
6.1 General 8
6.2 Visual inspection of Sample system 9
6.3 Visual inspection of analyser 9
6.4 Carrier Gas 9
6.5 Calibration Gas 9
6.6 GC verification 9
7 Maintenance and Corrective maintenance **10**
7.1 Preventive maintenance 10
7.2 Corrective maintenance 10
8 Alarm and diagnostic **10**
9 Repeatability and Reproducibility **12**
9.1 Repeatability 12
9.2 Reproducibility 12
10 Data handling during GC failure **12**
11 Quality Control of analysis data **13**
Annex A (informative) **Example, comparison between duty and backup GC** **14**
Annex B (informative) **Example, Typical chromatogram** **16**
Annex C (informative) **Example: Analysis result** **18**
Bibliography **19**

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Foreword

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The committee responsible for this document is ISO/TC 193, *Natural gas*, Subcommittee SC 3, *Upstream area*.

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Introduction

Online Gas Chromatograph (GC) is widely used to determine hydrocarbon components in natural gas because of its “Real time” measurement and ease of use. It has become a powerful tool for both custody transfer and upstream process gas monitoring. Especially for the custody transfer which the calorific value and others gas properties such as, relative density, compressibility factor, etc. are needed for energy determination. Therefore, accuracy and reliability of the equipment are crucial.

With proper maintenance and handling, GC can provide an accurate result with a minimum manpower as it analyzes and provides results continuously. With technology today, the unit can do auto-calibration, alarm setting, diagnostic, troubleshooting and configuring through Human Machine Interface (HMI). Its outputs can be linked directly with Flow computer, Distributed Control System (DCS) or any remote personal computer (PC).

The Natural Gas in upstream petroleum industry is normally wet. Then this Technical Report provides recommended application to handling GC focus on design, selection, operation, maintenance and verification of GC and its peripheral. The purpose is to provide the whole process to proper handling the GC until getting the accurate and reliable results. It is also included the sampling system to get the representative sample, data verification, alarm, diagnostic and troubleshooting including how to deal with the data in case of being used for custody transfer purpose. Some acceptance criteria are also identified in this paper based on our historical record and performance of the equipment.

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Natural gas — Online gas chromatograph for upstream area

1 Scope

This Technical Report concerns the determination of hydrocarbon components up to C7+ in natural gas in upstream petroleum industry, which describes the principle of operation of GC and provides guidelines for selection, evaluation, and factors impacting upon its performance such as sample probe, sample conditioning, installation, operation and troubleshooting.

2 Principle of measurement

2.1 General

The GC is a technique for separating and analysing compounds that can be vaporized without decomposition in a continuous and automatic manner of sample injection, separation, data integration and reporting. A precise volume of sample gas is injected into the column which contains a stationary phase (packing) that is either an active solid (adsorption partition) or an inert solid support that is coated with a liquid phase (absorption partitioning). The gas is moved through the column by means of a mobile phase (carrier gas). Selective retention of the components of the sample takes place in the column and causes each component to move through the column at a different rate. This action separates the sample into its gaseous constituents.

A detector detects the elution of component from the column and produces electrical outputs proportional to the concentration of each component. Output from the detector are amplified in the electronics, then transmitted to the controller for further processing.

2.2 Gas composition

Natural gas is composed primarily of methane with smaller amounts of higher hydrocarbons and of non combustible gases. Major, minor and trace components are as indicated in Tables 1, 2 and 3:

Table 1 — Major components

Component	Units
Methane	mole %
Ethane	mole %
Propane	mole %
Butanes	mole %
Pentanes	mole %
Hexanes	mole %
Heptanes plus	mole %
Nitrogen	mole %
Carbon dioxide	mole %

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