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Guidance on Practice for Fluid Quality Measurement Systems

GP 64-04

BP GROUP
ENGINEERING TECHNICAL PRACTICES

Foreword

This is the first issue of Engineering Technical Practice (ETP) GP 64-04 Guidance on Practice for Fluid Quality Measurement Systems. This Guidance on Practice (GP) is based on parts of heritage documents from the merged BP companies as follows:

BP (BP Measurement Standards Manual)

BPMS 1.1.4	Crude Oil - Static Methods - Sample Handling
BPMS 1.1.5	Crude Oil - Static Methods - Laboratory Methods of Measurement
BPMS 2.1.3	Products - Static Methods - Manual Sampling & Temperature Measurement
BPMS 2.1.4	Products - Static Methods - Analysis Methods
BPMS 3.2.4	Gas Sampling & Analysis

British Petroleum (RPSE)

BP RP 30-1	Instrumentation and Control — Design and Practice
BP RP 30-2	Instrumentation and Control — Selection and use of Measurement Instrumentation
BP RP 42-1	Piping Systems
BP GS 130-1	Automatic Pipeline Sampling of Liquid Hydrocarbons

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1. Scope

This GP provides guidance for fluid quality measurement systems, i.e. equipment and processes associated with quality determination of fluids.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice 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.

American Petroleum Institute (API)

API MPMS 8.1	Sampling: Standard Practice for Manual Sampling of Petroleum and Petroleum Products
API MPMS 8.2	Sampling: Standard Practice for Automatic Sampling of Liquid Petroleum and Petroleum Products
API MPMS 14.1	Manual of Petroleum Measurement Standards Chapter 14 - Natural Gas Fluids Measurement Section 1 - Collecting and Handling of Natural Gas Samples for Custody Transfer.
API MPMS 14.7	Manual of Petroleum Measurement Standards Chapter 14 - Natural Gas Fluids Measurement Section 7 - Mass Measurement of Natural Gas Liquids-GPA STD 8182.
API MPMS 14.8	Manual of Petroleum Measurement Standards Chapter 14 - Natural Gas Fluids Measurement Section 8 - Liquefied Petroleum Gas Measurement

BP Engineering Technical Practices (ETP)

GIS 31-012	Guidance on Industry Standards for Sample Systems
GIS 31-013	Guidance on Industry Standards for Gas Chromatographs
GP 12-45	Guidance on Practice for Electrical for Packaged Equipment
GP 30-65	Guidance on Practice for Control Panels
GP 30-70	Guidance on Practice for Control and Instrumentation in Vendor Packaged Equipment
GP 31-01	Guidance on Practice for Analyser Systems
GP 42-10	Guidance on Practice for Piping Systems (ASME B31.3)
GP 62-01	Guidance on Practice for Valves
GP 64-01	Guidance on Practice for Fluid Measurement Management

International Organization for Standardization (ISO)

ISO 3170	Petroleum Liquids: Manual Sampling (BS EN ISO 3170)
ISO 3171	Petroleum Liquids: Automatic Pipeline Sampling (BS EN ISO 3171)
ISO 4257	Liquefied Petroleum Gases - Method of Sampling (BS EN ISO 4257)
ISO 6974	Natural Gas – Determination of composition with defined uncertainty by gas chromatography
ISO 8943	Refrigerated hydrocarbon fluids — Sampling of liquefied natural gas — Continuous method (BS 7576)



ISO 10715
ISO 10723Natural Gas – Sampling Guidelines
Natural Gas – Performance evaluation for on-line analytical systems

3. Fluid quality measurement and systems

- a. Commercial or regulatory requirements should dictate permissible limits for various fluid properties.

These are commonly called “quality specifications”. As example crude might have a limit to the amount of water allowed; natural gas might have minimum and maximum heating value limits.

- b. Quality measurement systems shall fit into two broad categories, manual and automatic.

Quality is a non specific term and, as used in this document, refers to physical or chemical characteristics of a fluid.

- c. Liquid and gas quality measurements shall be based on samples that are manually or automatically collected, using equipment and procedures that have been highly scrutinized, tested and documented within the global industry standard communities.
- d. Samples shall be transported, handled, conditioned and tested in accordance with documented industry standards.
- e. The appropriate industry standard should be dictated by commercial or operating agreement.

These are also influenced by geographic norms. As examples, in the Western Hemisphere Gas Processor Association (GPA) standards are frequently used for gas sampling and many routine quality tests. Also, American Society for Testing of Materials (ASTM) laboratory and other test methods are relied on heavily. American Petroleum Institute (API) offers standards for common crude oil tests and both manual and automatic liquid and gas sampling.

ISO, BSI and the EI publish equivalent standards, which address similar issues.

GN 64-001 contains a comprehensive list of the industry standards utilized in hydrocarbon measurement practice.

4. Fluid quality measurement system requirements

4.1. General

- a. Fluid quality measurement systems shall be in accordance with regulatory and commercial requirements.
- b. Fluid quality measurement systems shall be specified and operated in accordance with the recommendations and requirements of GP 64-01.
- c. Quality measurement systems shall be in accordance with the manufacturer’s recommendations for the specific application.
- d. Fluid quality measurement systems and equipment shall be classified according to GP 64-01, considering the following:
1. Classification of the associated dynamic or static measurement system
 2. Application of the quality measurement data
 3. Commercial impact of quality measurement data



- e. Fluid quality measurement systems shall be designed to achieve specified performance requirements for given fluid properties over full design range of process operating conditions.
- f. Fluid quality measurement systems shall be designed to accommodate product release and purging in an environmentally sound manner.
- g. If continuous operation is required, fluid quality measurement systems shall be designed for “online” access and maintenance without process shutdown.
- h. Quality measurement data reporting shall be configured to provide data in the engineering units specified.

Often there are commercial agreements or measurement system specifications that have to be adhered to and reporting requirements and security precautions that need to be observed.

- i. Fluid quality measurement systems shall be designed to communicate with other systems when dictated by BP.

Traditionally RS 232 & RS 422 communication links using modbus protocol have been the norm, however modern systems favour integration into a LAN network to communicate data to other systems. A strictly controlled access facility may be required under exceptional circumstances where system builders are able to enter the system remotely and correct faulty software, but this facility should be used only in exceptional circumstances where “time is of the essence”. Such remote access facilities will need to comply with BP’s digital security policy and practices.

Exceptionally, in local, stand alone systems, a communication facility may not be required.

- j. Power for Class 1 fluid quality measurement systems shall be provided via UPS.
- k. On initiation of power the system shall be capable of resuming operation without disruption of process control and further loss of measurement data.
- l. The system should be capable of retaining information for a defined period.

Typically the time period would extend to at least one month of data, but may depend on the specific operational circumstances.

- m. In the event of a loss of communication, the system should be capable of retaining information for an extended period and downloading the data without interruption.
- n. Piping shall be designed and installed in accordance with GP 42-10.
- o. Adequate vent, drain, and pressure relief facilities shall be provided to prevent pressure build-up due to trapped process fluid and to allow maintenance.

Hazard examples:

- *Build up of gases which could increase the electrical area classification within the enclosure.*
- *Build up of toxic gas which may be a hazard to personnel.*
- *Detrimental back-pressure that affects analysis performance. This is especially relevant to gas analysers where repeatability can fluctuate with varying back pressure on vent systems.*

- p. Positive isolation shall be provided at any point in the sampling and analysis system requiring component access.
- q. Associated piping which can constitute a bypass route through which flow can prejudice the integrity of samples shall be avoided.
- r. Isolation valves shall be capable of demonstrable leak free closure.

