

# FUEL GAS BEST MANAGEMENT PRACTICES



## Fuel Gas Measurement and Reporting

**MODULE 11 of 17**

SUBMITTED BY: CETAC WEST

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Natural Resources  
Canada



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## Background

The issue of fuel gas consumption is increasingly important to the oil and gas industry. The development of this Best Management Practice (BMP) Module is sponsored by the Canadian Association of Petroleum Producers (CAPP), the Gas Processing Association Canada (GPAC), the Alberta Department of Energy, Small Explorers and Producers Association of Canada (SEPAC) Natural Resources Canada (NRC) and the Energy Resources and Conservation Board (ERCB) to promote the efficient measurement, accounting and reporting of fuel gas in the upstream oil and gas sector. It is part of a series of 17 modules addressing fuel gas efficiency in a range of devices.

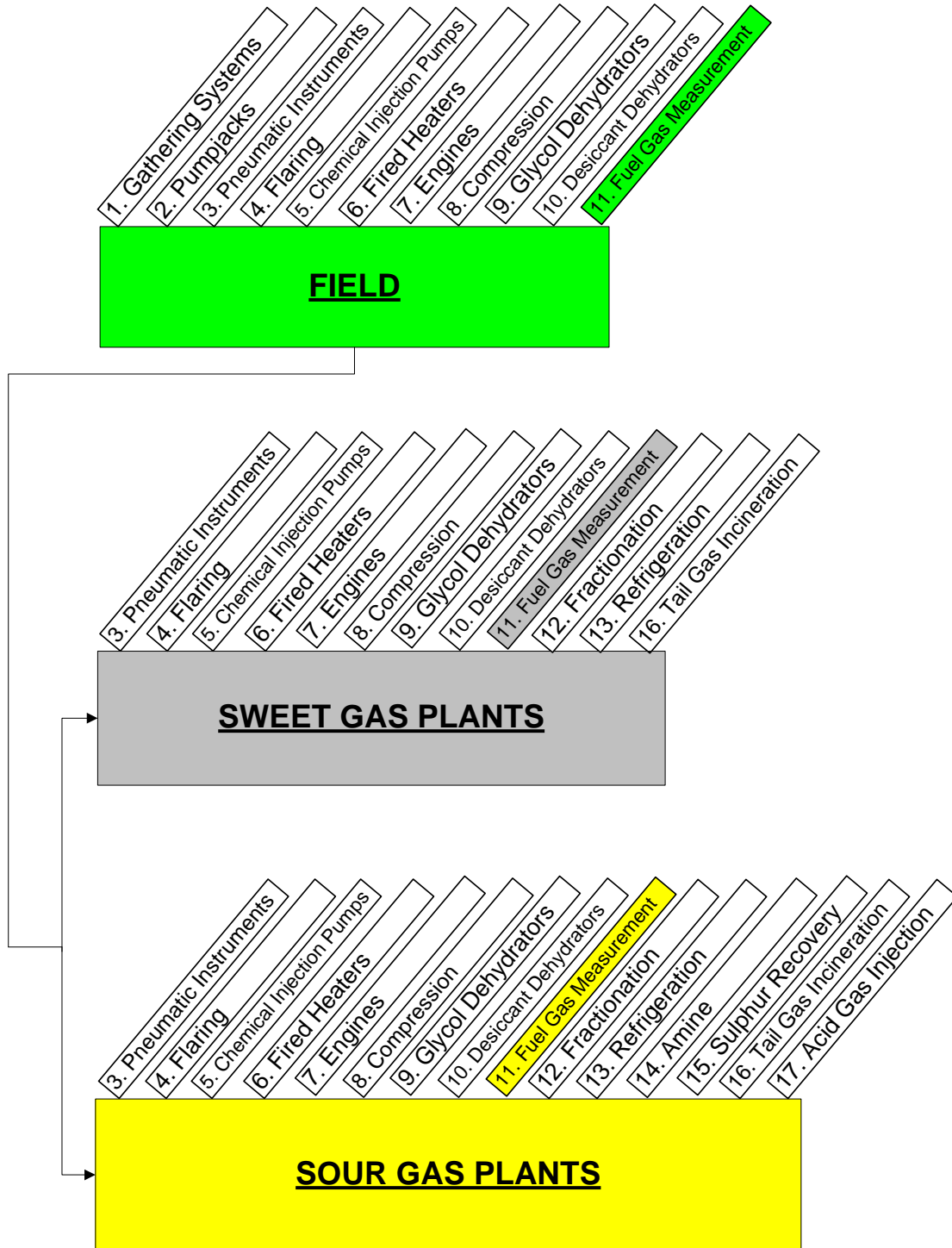
This BMP Module:

- identifies the typical impediments to achieving high levels of operating efficiency with respect to fuel gas measurement;
- presents strategies for achieving cost effective improvements through inspection, maintenance, operating practices and the replacement of underperforming components; and
- identifies technical considerations and limitations.

The aim is to provide practical guidance to production accountants and operators to achieve accurate fuel gas measurement while recognizing the specific requirements of measurement devices and their service requirements. This module is applicable to the Alberta upstream oil and gas industry measurement guidelines. The measurement and reporting information outlined below may be used as a guidance document for all Canadian operators; however, it is the responsibility of the facility operators in other provinces to ensure compliance with the measurement and reporting guidelines of their respective provincial jurisdictions.

# EFFICIENT USE OF FUEL GAS IN THE UPSTREAM OIL AND GAS INDUSTRY

## Module 11 of 17: Fuel Gas Measurement and Reporting



# 1. Applicability and Objectives

In Alberta, operators have specific obligations under the Oil and Gas Conservation Regulations and ERCB Directives to measure and report fuel gas consumption associated with their operations. The ERCB expects all industry participants to understand its requirements and have an infrastructure in place to ensure compliance.

ERCB Directive 17 (Measurement Requirements for Upstream Oil and Gas Operations) specifies:

- what and how volumes must be measured,
- what, where and how volumes may be estimated,
- if accounting procedures must be performed on the determined volumes and what they are,
- what data must be kept for audit purposes, and
- what resultant volumes must be reported to the ERCB.

These requirements include the “measurement” (measurement, testing and reporting) of fuel gas.

As stipulated in the Oil and Gas Conservation Act, each oil and gas operator in Alberta must file a series of monthly statements (“S” statements) to the Energy Resources and Conservation Board (ERCB) through the Petroleum Registry. The Petroleum Registry is a shared, interactive, secure database accessed through the Internet. It facilitates the exchange of data among upstream oil and gas industry partners and among industry and the Alberta Ministry of Energy. The Web-based interface provides users with on-line access to information. Directive 007-Volumetric and Infrastructure Requirements (Dec. 2007) describes the procedure for completing volumetric reporting and submitting files electronically with the Petroleum Registry.

Fuel gas is used by a very large number of widely dispersed pieces of equipment so it is appropriate to apply systems that facilitate the collection, imputing and checking of data. The primary objective of this module is to provide a framework and guidance for the measurement and reporting of fuel gas at UOG facilities.

## 2. Basic Measurement Strategy

Proper and accurate “measurement” of fuel gas is facilitated by:

- a database containing all sites and devices that utilize fuel gas,
- the source of fuel gas for each site/device,
- knowledge of the anticipated fuel gas consumption at each site/device,
- installation of meters when gas volumes require this,
- calibration/proving and maintenance of gas meters,
- generation of estimates of fuel consumption when this is permitted and retention of such estimates,
- regular recording of fuel gas consumption,
- performance of tests on data quality, and
- timely reporting of fuel gas to the Registry.

The threshold requirement for measuring fuel gas as opposed to estimating consumption is 500 m<sup>3</sup>/d of fuel gas on an annual average basis, applied to a single ERCB registered reporting facility. Estimates are permissible for volumes of gas not more than 500 m<sup>3</sup>/d.

### 2.1 Data Base

Since fuel gas is required to be reported for each and every ERCB registered site, each company should develop an accurate and up to date inventory of equipment that physically use fuel. Tables suitable for compiling the data base are provided in Appendix A. Individual sheets are provided for the major types of devices that use fuel gas. For small sites it may be more convenient to combine all of the information on a single sheet.

### 2.2 Expected Consumption

To assist in the review of monthly consumption data, typical fuel gas consumption patterns should be prepared and updated. These figures can be used by Production Accounting staff to spot missing or erroneous data from individual sites.

## 2.3 Installation of Meters

In accordance with Directive 017, fuel gas meters are required at each site where the annual average fuel consumption is more than 500 m<sup>3</sup>/d. Metering of devices within the site is not required by the ERCB except those specified in Directive 060 but may be advantageous to the Operator. Measurement by difference on fuel use is not acceptable unless special approval has been obtained from the ERCB.

## 2.4 Calibration of Meters

Directive 017, Section 2.5.1, requires gas meters to be calibrated as follows:

- within the first calendar month of operation of a new meter,
- immediately (by the end of the calendar month) following service or repairs to the meter,
- semi-annually if the meter is used in a gas plant or for sales/delivery point, and
- annually for all other meters.

## 2.5 Estimates of Unmeasured Fuel Consumption

ERCB Directive 017 outlines the measuring requirements for fuel gas volumes. In general, operators must be able to demonstrate that volumes of fuel gas are accurately and consistently captured. Engineering estimates may be employed when the annual average fuel gas consumption at a single registered site is not more than 500 m<sup>3</sup>/d.

Estimation methods must be:

- based on calculations that account for volume, device/process characteristics and loads,
- developed and documented by a technically knowledgeable person, and
- retained for review.

Appendix B provides the expected fuel gas consumption for the most common instruments and devices that are in use in the UOG.

## **2.6 Recording of Fuel Gas Consumption**

Fuel gas is required to be recorded and reported monthly. Each company should have procedures in place to ensure that appropriate individuals are assigned responsibility for compiling fuel gas consumption data including the source of the data, dates and times the data covers, supporting documents such as strip charts, the source of electronic data and estimated fuel gas consumption. This data should be checked for completeness and accuracy before being submitted to Production Accounting staff.

## **2.7 Tests of Data Quality and Completeness**

In order to validate fuel gas data, it is recommended that a program including the followings steps be implemented:

- compare data reported from each site with estimates derived from site equipment inventory,
- perform tests on data such as overall balances, and
- confirm that the data is complete.

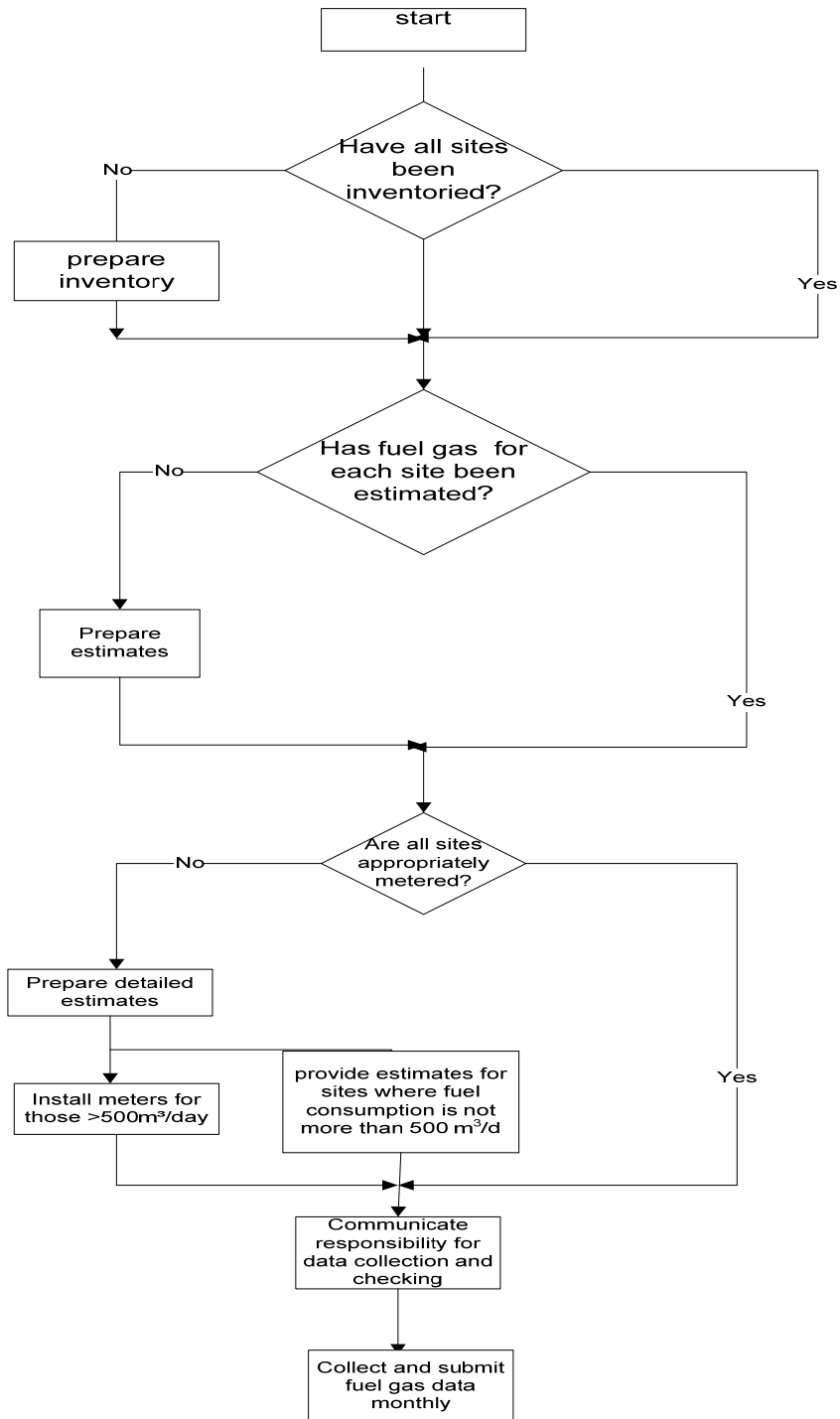
## **2.8 Reporting**

Directive 007 Volumetric and Infrastructure Requirements (Dec. 2007) requires monthly reports to be submitted by the 18<sup>th</sup> day of each month in the format prescribed on an “as per reporting facility” basis. Each record filed requires an individually named contact, who certifies that the information supplied is accurate and correct.

## **2.9 Retention of Data**

Paragraph 93 of the Oil and Gas Conservation Act requires each person who is required to keep records shall produce those records at all reasonable times when requested to do so by any board member or any person authorized by the board. This requirement includes the retention of estimates of fuel gas consumption when this is permitted. The process for measuring and reporting fuel gas consumption is summarized in Figure 2.

**Figure 1**  
**Fuel Gas Measuring and Reporting Process**



### **3. Rapid Assessment of Fuel Gas Consumption from Equipment Data**

In order to determine if measurement of fuel gas at individual sites is required, a check sheet that enables operators to quickly assess the expected fuel consumption at each site has been prepared (see Appendix B). This check sheet allows the fuel gas consumption for instruments, heaters, engines and pumps to be approximated based on the inventory of equipment and typical gas consumption figures for the devices commonly encountered. The derived total fuel gas consumption is not considered to be an engineering assessment of fuel consumption but is intended to provide an early indication of the need to measure fuel gas or if estimates will suffice.

When compiling the estimated fuel gas consumption using the factors provided in the attached sheet, the following points should be noted:

- fuel gas consumption for instruments is based on fuel gas pressure of 20 psig. If fuel gas pressure is higher, consumption will also be higher,
- the fuel gas consumption for fired heaters is based on continuous firing. If the heater has a firing cycle is less than 100%, the fuel gas consumption factor should be reduced accordingly,
- the efficiency of engines declines with load and therefore a higher factor should be applied to engines operating at less than rated capacity and/or speed,
- the fuel gas pressure for pneumatic pumps is assumed to be 75 psig. Higher or lower pressures will result in correspondingly higher or lower fuel gas consumption.

## 4. Detailed Estimation of Fuel Gas Consumption

When an operator can demonstrate that fuel gas consumption at an individual site is not more than 500 m<sup>3</sup>/d, on an annual average basis, an estimate of fuel gas consumption is acceptable to the ERCB for reporting purposes. Accurate information for quantifying fuel gas consumption is not always available but good quality estimates can be developed by personnel familiar with the equipment, current throughput and associated process parameters.

There are numerous tools that can be employed in developing fuel gas consumption estimates including:

- manufacturers' data,
- engineering calculations, and
- spot measurements.

Other chapters within the Best Management Practice set of modules provide more detailed data that can be used to refine site specific fuel gas consumption estimates. Before estimates are employed, they should be reviewed and approved by a Professional Engineer or a Registered Engineering Technologist.

When an operator chooses to not install meters for sites where the fuel gas consumption is not more than 500 m<sup>3</sup>/d, details of the fuel gas estimate must be retained and produced for inspection if requested.

Whenever possible, data derived from estimates should be compared with metered gas volumes. In some instances, single point measurement of fuel gas supplied to a number of sites will be available and should be used to check the sum of the estimated consumption downstream of the measurement point. Temporary meters may also be installed to check estimates.

It is expected that while fuel gas estimates will be employed for monthly reporting of fuel gas data, operators will need to make adjustments based on actual conditions or seasonal variations. As part of the data acceptance, parameters that may impact the fuel gas consumption should be identified so that field personnel are aware of the need to adjust estimates.

After compiling and checking estimated fuel gas consumption, the estimates should be accepted and authorized for use by field personnel responsible for collecting and reporting fuel gas consumption. The estimates should have an expiry date at which time new estimates will need to be prepared, checked and accepted. It is recommended that the review of fuel gas estimated be performed every three years or more often if conditions change rapidly.

## **5. Fuel Gas Metering and Calibration**

Section 4.3 of Directive 017, Base Requirements for Gas Measurement, and Section 2, Calibration and Proving, stipulate the requirements that must be applied to devices used for measuring gas volumes. These sections provide information relating to:

- system design and installation,
- volumetric calculations,
- data verification and audit trail,
- performance evaluations and tests,
- calibration frequency and accuracy.

Operating personnel responsible for the design, installation and maintenance of gas metering systems should be fully versed in the requirements.

## **6. Data Collection and Reporting**

### **6.1 Collection**

Fuel gas data is collected in a variety of formats including SCADA, strip charts, reading sheets and by using estimates. There is no regulatory requirement to use any one or set of these other than the need to document and retain the sources of information. Fuel gas data is required to be collected for each calendar month.

### **6.2 Comparison**

When fuel gas consumption data is collected each month, tests should be performed to determine if the data is complete, accurate and consistent. The availability of meter lists, site inventories and estimates of fuel consumption for unmetered sites will facilitate the checking of data. The responsibility for checking data that is submitted to production Accounting should be formalized within each operating entity.

### **6.3 Acceptance**

Prior to data being submitted, an individually named contact is required to certify that the information is accurate and correct. This individual should have appropriate training and understanding to make such a certification.

### **6.4 Submission**

Directive 007, Volumetric and Infrastructure Requirements, defines the format that must be employed to submit data. Acceptable methods, based on production and wells in service, include magnetic media, email, fax, mail and courier. Data must be received by the Registry on the 18<sup>th</sup> day of each month.



### Fired Heaters

Heater Number	Service	Type	Rating	Gas Type

### Gas Engines

Manufacturer	Model	Horsepower	Speed	Gas Type

### Pneumatic Pumps

Manufacturer	Model	Capacity	Gas Type	Supply Pressure

**Appendix B**  
**Preliminary Estimation of Site Fuel Gas Consumption**

**Location (LSD):**

**Description:**

**1. Instrumentation**

Number of Instrument Loops		Factor	Fuel gas per day (m <sup>3</sup> )
High bleed types		48	
Lo bleed types		12	

**2. Fired heaters**

Total rated capacity (MMBTU/h)	Factor	Fuel gas per day (m <sup>3</sup> )
	900	

**3. Engines**

Total installed horsepower	Factor	Fuel gas per day (m <sup>3</sup> )
> 100 BHP	5	
<100 BHP	8	

**4. Pneumatic pumps**

Capacity (gpd)	Factor	Fuel gas per day (m <sup>3</sup> )
	1.4	

Total Projected fuel gas consumption: m<sup>3</sup>/d

Metering required:

Prepared by:

Approved by: