



NETL Life Cycle Inventory Data

Process Documentation File

Tracked Input Flows:

Wellhead Reciprocating Compressor	<i>Fraction of wellhead natural gas compression utilizing a gas-powered reciprocating compressor</i>
Wellhead Gas-Powered Centrifugal Compressor	<i>Fraction of wellhead natural gas compression utilizing a gas-powered centrifugal compressor</i>
Wellhead Electrically-Powered Centrifugal Compressor	<i>Fraction of wellhead natural gas compression utilizing an electrically-powered centrifugal compressor</i>

Tracked Output Flows:

Natural Gas, Compressed	<i>Mass of compressed natural gas (reference flow)</i>
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Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_O_Assembly_Natural_Gas_Compressors_2011.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process covers the elements required for the operation of natural gas compression, which follows natural gas extraction, dehydration, and sweetening processes within the natural gas production chain. Once the natural gas has been compressed, it will be transported under LC Stage #2 to the power plant under LC Stage #3, as described below and in **Figure 1**. Input flows for the natural gas compressors assembly include each of the three types of natural gas compression considered: gas-powered reciprocating compressors, gas-powered centrifugal compressors, and electrically-powered centrifugal compressors. This unit process estimates the fraction of amount of each type of compressor that is included in the natural gas production operations, in order to evaluate the total energy use and emissions associated with natural gas compression, as relevant to each natural gas extraction profile (conventional onshore, conventional offshore, associated gas, Barnett Shale, Marcellus Shale, and coal bed methane). This unit process calculates the proportion of emissions

and flows from each natural gas compression process that is needed to compress 1 kg of natural gas, based on the parameters shown above and in the DS.

Natural gas compression operation data, including the energy (natural gas or electricity) requirements and airborne emissions needed to compress the natural gas, are calculated in separate unit processes. Therefore, the following unit processes are considered to be embedded in this assembly unit process:

DF_Stage1_O_NG_WellCompression_Recip_2011.01.doc,

DF_Stage1_O_NG_WellCompression_GasCentrif_2011.01.doc, and

DF_Stage1_O_NG_WellCompression_ElecCentrif_2011.01.doc. For a discussion of energy requirements and environmental emissions associated with the use of this equipment, as well as other pertinent information, please refer to these separate unit processes.

Boundary and Description

Figure 1 provides an overview of the boundary of this unit process.

Specifications for the fraction of each type of natural gas compressor utilized were estimated by NETL, as relevant to each of the following types of natural gas extraction profiles: conventional onshore, conventional offshore, associated gas, Barnett Shale, Marcellus Shale, and coal bed methane. Values for each of the three adjustable parameters contained in this unit process can be varied from 0 to 1, based on the applicable proportion of each type of compressor that is utilized (**Table 1**).

Table 2 provides a summary of modeled input and output flows, using a well with all compression from a reciprocating compressor. Additional details showing calculation methods for input and output flows, and other relevant information, are contained in the associated DS.

Figure 1: Unit Process Scope and Boundary

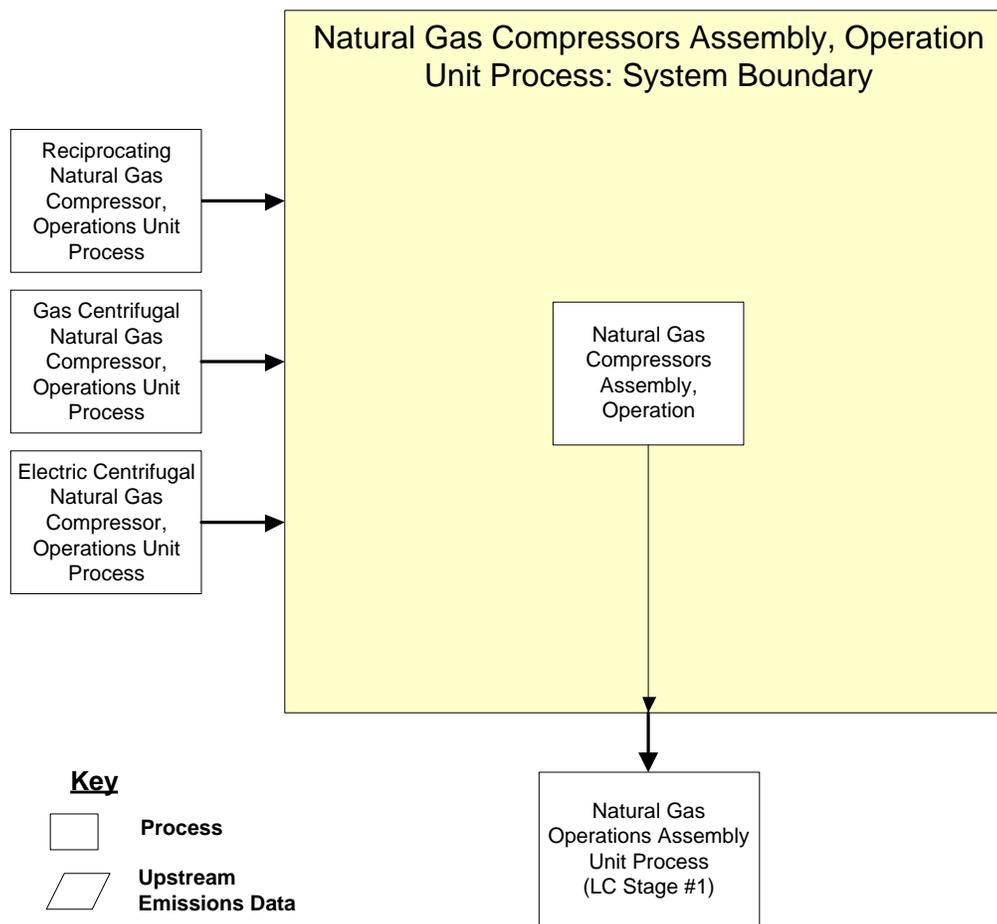


Table 1: Adjustable Parameter Values for Natural Gas Compressor Assembly

Natural Gas Profile	Fraction of Each Compressor Type Utilized		
	Gas-Powered Reciprocating	Gas-Powered Centrifugal	Electrically-Powered Centrifugal
Conventional Onshore	1	0	0
Conventional Offshore	0	1	0
Associated Gas	1	0	0
Barnett Shale	0.75	0	0.25
Coal Bed Methane	1	0	0

Table 2: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Wellhead Reciprocating Compressor	1.00	kg
Wellhead Gas-Powered Centrifugal Compressor	0.00	kg
Wellhead Electrically-Powered Centrifugal Compressor	0.00	kg
Outputs		
Natural Gas, Compressed	1	kg

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows. See also the documentation for embedded unit processes, as shown below. Note, values shown are applicable only to conventional onshore natural gas production. To calculate values for other natural gas profiles, please update DS with parameter values shown in **Table 1**.

Embedded Unit Processes

DF_Stage1_O_NG_WellCompression_Recip_2011.01.doc;

DF_Stage1_O_NG_WellCompression_GasCentrif_2011.01.doc;

DF_Stage1_O_NG_WellCompression_ElecCentrif_2011.01.doc

References

N/A

Section III: Document Control Information

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