Emission Calculation Fact Sheet

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OIL AND GAS PRODUCTION FACILITIES

This document lists Source Classification Codes (SCC) and emission factors for various activities at oil and gas production facilities. They are provided as an aid in calculating emissions. These factors present one way to calculate emissions, **it is not required that facilities use these listed factors to quantify their emissions.** If a facility disagrees with any emission factor in this document, it may use other emission factors or methods of calculating emissions provided the emission factor or method correctly characterizes the processes at the facility and the resulting emissions. A facility doing so must provide documentation for the source of the emission factors or method used and justification for their use. For example, stack test data and manufacturer emission specifications provide more accurate emission estimates than the use of general emission factors.

Control factors

The listed emission factors are for uncontrolled emissions. If a facility has control equipment, such as a condenser, the emissions can be multiplied by the control factor. Calculate the control factor by subtracting the percent control efficiency from 100 and then divide that number by 100. For example, if the control efficiency is 87%, the control factor would be (100 - 87)/100 = 0.13. Control efficiencies may be listed on the equipment or in the equipment documentation. Alternatively, equipment suppliers can provide control efficiency values.

Scientific notation

The emission factors are expressed in scientific notation, which means that the decimal point has been moved. If the exponent is negative, move the decimal point to the left. If the exponent is positive, move the decimal point to the right. If the exponent is zero, the decimal point does not move. For example, if a number is expressed as 2.0E-1, move the decimal point one place to the left to get 0.20. If a number is expressed as 2.0E2, move the decimal point 2 places to the right to get 200. If a number is expressed as 2.0E0, the decimal point does not move. The number is 2.0.

NATURAL GAS FIRED ENGINES

Report all "standard" engine emissions together, and report all "lean burn" emission engines together. For facilities with both "standard" and "lean burn" emission engines, report "standard" engines and "lean burn" emission engines as separate emission units. Split the total fuel gas between the two different types of engines based on your best estimate of the relative amount of fuel burned in each type of engine at the facility.

You may group all natural gas combustion equipment with your standard "rich burn" or lean burn engines using the SCCs below. For example you may group all standard "rich burn" engines, natural gas process heaters, production compressors, and flares together under the SCC 2-02-002-53. Process heaters can also be reported separately using the appropriate SCC on page 2 of the fact sheet.

While the factors below are acceptable for MAERS reporting, it is highly recommended that emission factors from equipment vendor guarantees or from source specific testing (stack testing) be used.

SCC	DESCRIPTION	POLLUTANT	EMISSION FACTORS	CONTROL EFFICIENCY
2-02-002-53	**Standard "rich burn" engines** May include: • Natural gas process heaters • Natural gas production, compressors • Natural gas production, flares-excluding SO_2	CO NOx PM10 PM2.5 SO_2 VOC	3.794E3 LB/MMCF NATURAL GAS* 2.254E3 LB/MMCF NATURAL GAS* 9.69E0 LB/MMCF NATURAL GAS* 9.69E0 LB/MMCF NATURAL GAS* 6.00E-1 LB/MMCF NATURAL GAS* 3.02E1 LB/MMCF NATURAL GAS*	3-way Catalyst CO - 80%** NOX - 90%** VOC - 50%**
2-02-002-54	**Lean burn engines** May include: • Natural gas process heaters • Natural gas production, compressors • Natural gas production, flares-excluding SO_2	CO NOx PM10 PM2.5 SO_2 VOC	5.68E2 LB/MMCF NATURAL GAS* 4.162E3 LB/MMCF NATURAL GAS* 7.90E-2 LB/MMCF NATURAL GAS* 7.90E-2 LB/MMCF NATURAL GAS* 6.00E-1 LB/MMCF NATURAL GAS* 1.204E2 LB/MMCF NATURAL GAS*	Oxidation Catalyst CO - 80%** VOC - 50%**

* The emission factors listed are derived from AP-42 Chapter 3.2 (Tables 3.2-2 and 3.2-3).

** The control factors listed above can only be used if documentation is on file showing that the catalyst was inspected and maintained. If actual control efficiencies are different then those listed above, use the actual control efficiency.

SCC	DESCRIPTION	POLLUTANT	EMISSION FACTORS	CONTROL EFFICIENCY
PROCESS HEATERS: include process heaters as a separate emission unit if they were not grouped with natural gas fired engines. The emission factors for process heaters come from the US EPA's Factor Information Retrieval (FIRE) data system, which can be accessed at **http://cfpub.epa.gov/oarweb/index.cfm?action=fire.main**. (Emission factors from Chapter 1.4 [Table 1.4-1] of US EPA's AP-42 *Compilation of Air Pollutant Emission Factors* may also be used to calculate emissions from process heaters.)				
3-10-004-04	Process Heater	CO NOx PM10 SO_X VOC	3.50E1 LB/MMCF NATURAL GAS 1.40E2 LB/MMCF NATURAL GAS 3.00E0 LB/MMCF NATURAL GAS 6.00E-1 LB/MMCF NATURAL GAS 2.80E0 LB/MMCF NATURAL GAS	
TANK STORAGE: You may also use the US EPA TANKS 4.0 software to estimate emissions from tank storage. This software can be downloaded at **www.epa.gov/ttn/chief/software/tanks/index.html**.				
4-04-003-01	Fixed roof tank: breathing loss	VOC	3.6E1 LB/KGAL-YR CRUDE OIL (storage capacity)	Vapor recovery system - 95% Flare - 95%
4-04-003-02	Fixed roof tank: working loss	VOC	1.1E0 LB/E3 GAL CRUDE OIL (throughput)	Vapor recovery system - 95% Flare - 95%
TRUCK LOADING				
4-06-001-32	Truck loading	VOC	2.0E0 LB/E3 GAL CRUDE OIL	Vapor recovery system - 95%
GAS DEHYDRATORS You may also use GRI-GLYCalc™ 4.0 software developed by the Gas Research Institute (GRI) to estimate emissions from glycol dehydrators. This software can be purchased at **www.gastechnology.org**.				
3-10-003-21	Glycol dehydrator – Niagaran	VOC	9.24E4 LB/YR-GPM GLYCOL*	Tube and shell condenser with flash tank - 90% Vapor recovery system - 95% Flare - 95%
3-10-003-22	Glycol dehydrator – Prairie du Chein	VOC	1.94E4 LB/YR-GPM GLYCOL*	Tube and shell condenser with flash tank - 90% Vapor recovery system - 95% Flare - 95%
3-10-003-23	Glycol dehydrator – Antrim	VOC	9.2E1 LB/YR-GPM GLYCOL*	Vapor recovery system - 95% Flare - 95%
* YR-GPM GLYCOL = gallon per minute glycol circulated, averaged over one year				
AMINE PLANT				
3-06-009-06	Amine plant	SO2	3.76E3 LB/TON HYDROGEN SUL	

SCC	DESCRIPTION	POLLUTANT	EMISSION FACTORS	CONTROL EFFICIENCY
FUGITIVE EMISSIONS: Facilities considered to be a "major source" under Title V of the Clean Air Act are required to calculate their regulated fugitive emissions (fugitive emissions from crude oil sumps do not have to be reported to MAERS).				
3-10-888-01	Fugitive emissions – Light crude production	VOC	1.44E1 LB/EACH-YR VALVE	
3-10-888-02	Fugitive emissions – Gas production	VOC	3.6E0 LB/EACH-YR VALVE	
3-10-888-03	Fugitive emissions – Gas plant	VOC	2.74E1 LB/EACH-YR VALVE	

SAMPLE CALCULATIONS

1. For a Glycol dehydrator (Niagaran) equipped with a vapor recovery system, where 0.3 GPM of glycol is circulated, the VOC emissions would be calculated as follows:

   VOC: 0.3 GPM x 9.24E4 LBS/YR-GPM x 0.0005 LB/TON x (100 – 95)/100 = 0.69 TON VOC
   Throughput *Emission Factor* *Conversion Factor* *Control Factor*

2. For standard "rich burn" engines with a properly maintained 3-way catalyst where 4.25 MMCF of fuel gas was burned, the CO emissions would be calculated as follows:

   CO: 4.25 MMCF x 3,794 LB CO/MMCF x 0.0005 LB/TON x (100 – 80)/100 = 1.61 TON CO

3. For lean burn engines where 4.25 MMCF of fuel gas was burned, the CO emissions would be calculated as follows:

   CO: 4.25 MMCF x 568 LB CO/MMCF x 0.0005 LB/TON = 1.21 TON CO

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