

GULF OF MEXICO AIR EMISSIONS CALCULATIONS INSTRUCTIONS and PRA Statement

General

This entire document (DOCD_AQ.XLS) was prepared through the cooperative efforts of those professionals in the oil industry including the API/OOC Gulf of Mexico Air Quality Subcommittee and the Bureau of Ocean Energy Management (BOEM), who understand calculations of air emissions. This document has been revised throughout the years to update emission factors and to estimate emissions for additional equipment types. This document is intended to standardize the way we estimate our potential air emissions for Development Operations Coordination Documents (DOCD) approved by the BOEM. It is intended to be thorough but flexible to meet the needs of different operators. This instructions document gives the basis for the emission factors used in the emission spreadsheet as well as general instructions for using the spreadsheet.

The following sections describe the spreadsheets in the DOCD_AQ.XLS workbook.

TITLE

The TITLE sheet requires input of the company's name, area, block, OCS-G lease number, platform, a list of all well(s), and contact information in the corresponding lines. This data will automatically be transferred to the EMISSIONS and SUMMARY sheets. Please place any additional data that the air quality reviewer should consider when reviewing your plan in the REMARKS field (such as drilling rig name and type).

Also on the TITLE sheet is a table for Lease Term Pipeline Construction Information. By inputting the first year of the proposed activity in the Lease Term Pipeline Construction Information in field A7, all other years should auto-populate not only on the pipeline table but on the EMISSIONS and SUMMARY sheets. Please input the number of lease term pipelines to be installed each year and the total number of construction days per year. These data should match the description of proposed activities and tentative schedule listed on the OCS Plan Information Form.

FACTORS

The emission factors were compiled from the latest AP-42 references or from industry studies if no AP-42 reference was available. Factors may be revised as more data becomes available. A change to the FACTORS sheet will be automatically changed in the EMISSIONS sheets. A Sulfur Content Source table was added in 1996. A change in this table will automatically revise SO₂ emission factors and the corresponding emission estimates. If your sulfur content is different than the default values in the table, you should change the values in the table to match your actual fuel sulfur content.

The basis for the factors is as follows:

1. NG Turbines Fuel usage scf/hr = HP X 9.524 (10,000 btu/HP-hr / 1050 btu/scf)
2. NG Engines Fuel usage scf/hr = HP X 7.143 (7,500 btu/HP-hr / 1050 btu/scf)
3. Diesel Fuel usage gals/hr = HP X 0.0483 (7,000 btu/HP-hr / 145,000 btu/gal)

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Emissions Factors:

Natural Gas Prime Movers

1. TNMOC refers to total non-methane organic carbon emissions and these can be assumed equivalent to VOC emissions.
2. The sulphur content assumed is 2000 grains /mmscf (3.33 ppm). If your concentration is different, revise the ppm in the Sulphur Content Source table.

Diesel-Fired Prime Movers

1. Diesel sulphur level 0.05% by wt. If your sulphur content is different, change % wt. in the sulphur table.
2. For vessels, use > 600 HP factors based on AP-42 Vol. II, Table II-3-3. Those figures closely match the above values. Include the emissions from all vessels associated with your activities for their time of operation within a 25 mile radius of your facility.
3. For diesel engines <600 HP, VOC emissions equal total HC emissions; for diesel engines >600 HP, VOC emissions equal non-methane HC emissions.

Heaters/Boilers/Firetubes/NG-Fired

1. The assumed NG sulphur content is 2000 gr. per mcf (3.33 ppm). If your concentration is different, revise the sulphur content by changing the ppm in the Sulphur Content Source table.
2. The VOCs emissions are based on total non-methane HCs.

Gas Flares

1. It is assumed that the flare is non-smoking.
2. A heating value of 1050 btu/cu. ft. for NG is assumed.
3. The sulphur content assumed is 2000 grains /mmscf (3.33 ppm). If your concentration is different, revise the ppm in the Sulphur Content Source table, or you may use the following formula:

$$\text{H2S flared (lbs/hr)} = \text{Gas flared (cu ft/hr)} \times \text{ppm H2S} \times 34 / (379 \times 1000000) \quad \text{SOx emis (lbs/hr)} = \text{H2S flared (lbs/hr)} \times 64 / 34$$

Liquid Flares

1. Assumes 1% by wt sulphur maximum in the crude oil. If your concentration is different, revise the percent sulphur in the Sulphur Content Source table.
2. VOCs equal non-methane HCs

3. Particulate emissions assumes Grade 5 oil.

Tanks

1. Tank emissions assumes uncontrolled fixed roof tank.
2. The EPA TANKS model is an acceptable alternative. If you use TANKS you must provide sufficient information for BOEM to verify your results.

Fugitives

1. Fugitives are based on the 1995 Star Environmental Report. It requires that you count or estimate your components. The factor is based on average leak rate for light oil/gas facility.

Glycol Dehydrator Vent

1. The rate of the gas being dehydrated (throughput) in SCF/HR must be entered in the spreadsheet. The emissions factor is from the compilation of the Louisiana Survey and an average emissions per gas rate.

Gas Venting

1. The emission factor is based on venting unburned natural gas of average weight.

EMISSIONS

The emissions estimates should be based on and reflect the activity description and schedule required as part of the plan. The emissions from an operation should be presented for a calendar year (2018, 2019, etc.). The operation may include production only or production in conjunction with other activities such as drilling or construction operations. For additional years, the Emissions Spreadsheet is renamed EMISSIONS2, EMISSIONS3, etc. The different operating parameters for each year should be entered to calculate revised emissions for that year. The spreadsheet will calculate maximum fuel usage (UNIT/HR) using the known horsepower. It will assume maximum fuel usage is equal to actual fuel (UNIT/DAY) usage unless the actual fuel usage is known. If so, insert actual fuel usage in the appropriate column. (Please note that the use of actual fuel might require Mitigation 2.05.) The emissions will be calculated as follows:

Emission rate (lb/hr) = (HP or fuel rate) X Emission Factor (Potential to emit)

Emissions (tpy) = Emission rate (lb/hr) X load factor(Act Fuel/Max Fuel) X hrs X days X ton/2000 lbs (Actual emissions)

To customize the spreadsheet for your application, it is possible to delete lines for non-applicable equipment/activities or copy/insert an entire line if more than one similar type of equipment is present. If you add or delete rows, you should confirm that the correct cells are being referenced from the FACTORS tab. If you used alternate emission factors, you should confirm that the calculation methodology is correct for your alternate factors. If you have multiple sequential years with the same equipment, activity, and emissions, you don't have to fill out the following EMISSIONS sheets (only the first year), as the SUMMARY sheet will take the latest populated emissions amounts and auto-populate the following years.

The production equipment can be customized further by adding the use of the equipment behind the equipment type name. For example, "TURBINE nat gas" could be changed to "TURBINE nat gas – Gas Compressor"; or "BURNER" could be changed to "BURNER - Line Heater".

When you populate the distance from land in miles (field B49) in the EMISSIONS1 sheet, the same distance will auto-populate on future EMISSIONS sheets. For purposes of calculating the emissions exemption level, the distance to shore should be expressed in tenths of a statute mile up to 20 miles, and in whole statute miles for distances beyond 20 miles.

SUMMARY

The SUMMARY sheet is designed to show a proposed estimate of emissions from an activity over a ten year period. The first line (Row 7) of the summary sheet is linked to the yearly totals in the EMISSIONS1 sheet; the second line (Row 8) is linked to the EMISSIONS2 sheet, etc. Once emissions are constant the values are carried to the end of the 10-year period.

The **Paperwork Reduction Act of 1995** (44 U.S.C. 3501 et seq.) requires us to inform you that BOEM collects this information as part of an applicant's DOCD submitted for our approval. We use the information to facilitate our review and data entry for OCS plans. We will protect proprietary data according to the Freedom of Information Act and 30 CFR 250.197. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid Office of Management and Budget (OMB) control number. Responses are mandatory (43 U.S.C. 1334). The reporting burden for this form is included in the burden for preparing DOCDs. We estimate that burden to average 700 hours per response, including the time for reviewing instructions, gathering and maintaining the data, and completing and reviewing the forms associated with subpart B. Direct comments on the burden estimate or any other aspect of this form to the Information Collection Clearance Officer, Bureau of Ocean Energy Management, 45600 Woodland Road, Sterling, Virginia 20166.