

SECTION 4.6

OIL & GAS PRODUCTION GAS STRIPPING

(New - November 1986; Updated - August 1990)

EMISSION INVENTORY SOURCE CATEGORY

Petroleum Production and Marketing / Oil and Gas Production

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION

310-352-0100-0000 (83451) Wet Gas Stripping - Field Separator Fugitive Losses

310-354-0100-0000 (83469) Dry Gas Stripping - Field Separator Fugitive Losses

310-995-0100-0000 (46441) Other

METHODS AND SOURCES

These categories are used to inventory the hydrocarbon emissions associated with natural gas processing.

Natural gas obtained from gas wells contains impurities such as water, carbon dioxide, and sulfur compounds. The natural gas is processed to remove impurities. Leaks in compressor seals, pump seals, valves, and fittings are the sources of fugitive emissions during natural gas processing.

The emission factor for natural gas processing was obtained from an EPA report, "Revision of Evaporative Hydrocarbon Emission Factors."¹ The EPA report relates the emissions to the amount of natural gas processed. The TOG emission factor is 150 pounds per million cubic feet of gas for both wet and dry gas stripping.

The amounts of natural gas produced by counties in California were obtained from a California Division of Oil and Gas (DOG) report, "73rd Annual Report of the State Oil and Gas Supervisor, 1987."² The emissions were then estimated by multiplying the DOG data by the EPA emission factor. (See Sample Calculations.)

ASSUMPTIONS

1. The emission factor in the EPA report is representative of the emissions from natural gas processing plants in California.

COMMENTS AND RECOMMENDATIONS

The emission factor listed in reference 1 may not be representative of natural gas processing plants in California, but better data are not available at this time. Emissions from gas production vary significantly from one location to another. Size, age, and maintenance procedures play important roles in determining the actual emissions. The wet and dry gas should be in separate categories.

DIFFERENCES BETWEEN THE 1983 AND 1987 EMISSION ESTIMATES

The 1987 emissions are greater than the 1983 emissions. The change in emissions is due to the increase in gas production in 1987.

TEMPORAL ACTIVITY

The annual, weekly and daily activities for gas production are uniform throughout the year, seven days a week, and twenty-four hours a day.

SAMPLE CALCULATIONS

Emission estimates for Kern County in 1987 from natural gas processing:

$$\begin{aligned} \text{Emissions} &= (\text{Amount of N/G processed in Kern County in 1987}) \times (\text{Emission Factor}) \\ &= (164,649 \text{ million cubic feet})(150 \text{ lbs TOG/million cubic feet})/2000 \text{ lbs/ton} \\ &= 12,348.7 \text{ tons/yr} \end{aligned}$$

REFERENCES

1. U.S. Environmental Protection Agency, Revision of Evaporative Hydrocarbon Emission Factors, EPA-450-13-76-039, August 1976.
2. California Division of Oil and Gas, 73rd Annual Report of the State Oil and Gas Supervisor, 1987, No. PROG.

PREPARED BY

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Table I
 1987 Area Source Emissions
 Activity: Oil & Gas Extraction
 Process: Petroleum & Related
 Entrainment: Process Loss
 Dimm: Gas Stripping Fugitive
 CES: 46441
 Process Rate Unit: Million Cu Ft Processed

| AB | County | Process Rate | TOG Emis. (Tons / Year) | CO Emis. (Tons / Year) | NOX Emis. (Tons / Year) | SOX Emis. (Tons / Year) | PM Emis. (Tons / Year) |
|-------|-----------------|--------------|----------------------------|---------------------------|----------------------------|----------------------------|---------------------------|
| NC | HUMBOLDT | 3085 | 231.40 | 0.00 | 0.00 | 0.00 | 0.00 |
| NCC | MONTEREY | 1 | .00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | SAN BENITO | 1 | .10 | 0.00 | 0.00 | 0.00 | 0.00 |
| SC | LOS ANGELES | 21327 | 1599.50 | 0.00 | 0.00 | 0.00 | 0.00 |
| | ORANGE | 5256 | 394.20 | 0.00 | 0.00 | 0.00 | 0.00 |
| | RIVERSIDE | 7 | .50 | 0.00 | 0.00 | 0.00 | 0.00 |
| | SAN BERNARDINO | 3 | .20 | 0.00 | 0.00 | 0.00 | 0.00 |
| SCC | SAN LUIS OBISPO | 944 | 70.70 | 0.00 | 0.00 | 0.00 | 0.00 |
| | SANTA BARBARA | 12121 | 909.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | VENTURA | 15303 | 823.30 | 0.00 | 0.00 | 0.00 | 0.00 |
| SF | CONTRA COSTA | 3742830 | 250.75 | 0.00 | 0.00 | 0.00 | 0.00 |
| | SOLANO | 4409136 | 295.28 | 0.00 | 0.00 | 0.00 | 0.00 |
| | SONOMA | 70744 | 4.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| SJV | FRESNO | 3619 | 271.40 | 0.00 | 0.00 | 0.00 | 0.00 |
| | KERN | 164649 | 12348.70 | 0.00 | 0.00 | 0.00 | 0.00 |
| | KINGS | 1642 | 123.10 | 0.00 | 0.00 | 0.00 | 0.00 |
| | MADERA | 1171 | 87.80 | 0.00 | 0.00 | 0.00 | 0.00 |
| | MERCED | 84 | 6.30 | 0.00 | 0.00 | 0.00 | 0.00 |
| | SAN JOAQUIN | 23312 | 1748.40 | 0.00 | 0.00 | 0.00 | 0.00 |
| | TULARE | 14 | 1.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| SV | BUTTE | 639 | 47.90 | 0.00 | 0.00 | 0.00 | 0.00 |
| | COLUSA | 23225 | 1741.90 | 0.00 | 0.00 | 0.00 | 0.00 |
| | GLENN | 12434 | 932.60 | 0.00 | 0.00 | 0.00 | 0.00 |
| | SACRAMENTO | 14048 | 1053.60 | 0.00 | 0.00 | 0.00 | 0.00 |
| | SOLANO | 36725 | 2754.30 | 0.00 | 0.00 | 0.00 | 0.00 |
| | SUTTER | 21590 | 1619.20 | 0.00 | 0.00 | 0.00 | 0.00 |
| | TEHAMA | 3447 | 258.50 | 0.00 | 0.00 | 0.00 | 0.00 |
| | YOLO | 13291 | 996.80 | 0.00 | 0.00 | 0.00 | 0.00 |
| TOTAL | | 8600648 | 28571.17 | 0.00 | 0.00 | 0.00 | 0.00 |

Fraction of Reactive Organic Gases (FROG): .2700
 (Reactive Organic Gases (ROG) Emissions = TOG X FROG)
 Fraction of PM10 (FRPM10): .6100
 (PM10 Emissions = PM X FRPM10)