SECTION 4.5

OIL & GAS PRODUCTION
STEAM DRIVE AND CYCLIC WELLS

(New - November 1986; Updated - June 1990)

EMISSION INVENTORY SOURCE CATEGORY
Petroleum Production and Marketing / Oil and Gas Production

EMISSION INVENTORY CODES (CES CODES) AND DESCRIPTION
310-342-1600-0000 (82032) Tertiary Oil Production - Steam Drive Wells

310-344-1600-0000 (82040) Tertiary Oil Production - Cyclic Wells

METHODS AND SOURCES

The steam drive and cyclic wells were surveyed by the ARB in 1985. The 1987 values for steam drive and cyclic wells will be grown from the 1985 values. The steam is injected in two ways: (1) continuously through an injection well (steam drive) and (2) periodically into the oil production well itself (cyclic injection). Of the two methods, steam drive causes most of the hydrocarbon emissions from such operations.[1]

DEFINITIONS

Production Zone: A formation or group of formations of oil bearing material beneath the surface of the ground through which steam can travel from a steam injection well to an oil production well.

Steam Drive Well: Any crude oil production well that is completed in the same production zone as is a steam injection well, that is either operated by the person injecting the steam or responding to steam injection under a contractual agreement with the operator of the steam injection well, that is within:

1. a 250-foot radius of the steam injection well, if the steam injection well is within a 2-1/2 acre or smaller production well pattern; or

2. a 350-foot radius of the steam injection well, if the steam injection well is within a production well pattern of 5 acres or smaller but larger than 2-1/2 acres; or

3. a 500-foot radius of the steam injection well, if the steam injection is within a production well pattern larger than five acres; or

4. a 1,000-foot radius of the steam injection well, if the production well is not in one of the above specified patterns.[1]

Table I

Uncontrolled Emission Factors for Steam Drive and Cyclic Wells[2]
ROG lbs/well/day

Steam Drive Wells	220.3
Cyclic Wells	3.6

Table II

Controlled Emission Factors for Steam Drive and Cyclic Wells
TOG lbs/well/year

Steam Drive Wells	3,608.70
Cyclic Wells[1]	1,212.89

DISTRIBUTION

The emissions from steam drive wells and cyclic wells are found only in Kern County.

TEMPORAL

Emission factors are based on an average for the year. Temporal changes are accounted for in the average emission factors.

REFERENCES

1. Air Resources Board, A Suggested Control Measure for Emissions of Photochemically Reactive Organic Compounds from Vents of Steam Drive Oil Production Wells, (January 1982).

2. KVB, Inc., Emission Characteristics of Crude Oil Production Operations in California, (January 1983), contract #A8-127-31.

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Table III
1987 Area Source Emissions
Activity: Oil & Gas Extraction
Process: Petroleum & Related
Entrainment: Process Loss
Dimn: Tertiary Operation Fugitive
CES: 82032
Process Rate Unit: Well-Year

AB	County	Process Rate	TOG Emis. (Tons / Year)	CO Emis. (Tons / Year)	NOX Emis. (Tons / Year)	SOX Emis. (Tons / Year)	PM Emis. (Tons / Year)
SJV	KERN	7430	13406.30	0.00	0.00	0.00	0.00
TOTAL		7430	13406.30	0.00	0.00	0.00	0.00

Fraction of Reactive Organic Gases (FROG): .9120
(Reactive Organic Gases (ROG) Emissions = TOG X FROG)
Fraction of PM10 (FRPM10): .6100
(PM10 Emissions = PM X FRPM10)

Table IV
1987 Area Source Emissions
Activity: Oil & Gas Extraction
Process: Petroleum & Related
Entrainment: Process Loss
Dimn: Tertiary Operation Fugitive
CES: 82040
Process Rate Unit: Well-Year

AB	County	Process Rate	TOG Emis. (Tons / Year)	CO Emis. (Tons / Year)	NOX Emis. (Tons / Year)	SOX Emis. (Tons / Year)	PM Emis. (Tons / Year)
SJV	KERN	7524	4562.90	0.00	0.00	0.00	0.00
TOTAL		7524	4562.90	0.00	0.00	0.00	0.00

Fraction of Reactive Organic Gases (FROG): .9120
(Reactive Organic Gases (ROG) Emissions = TOG X FROG)
Fraction of PM10 (FRPM10): .6100
(PM10 Emissions = PM X FRPM10)