San Joaquin Valley
Air Pollution Control District

Procedures for Quantifying Fugitive VOC Emissions At Petroleum and SOCMI Facilities

Approved By: *(Signed)* Date: September 15, 2005
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Director of Permit Services

I. Purpose

The purpose of this policy is to:

1. establish the EPA and CAPCOA fugitive VOC emission factors as the generally accepted emission factors for quantifying volatile organic compound (VOC) emissions from fugitive components at petroleum and SOCMI facilities;
2. define what fugitive emissions sources are associated with permitted equipment and therefore subject to new source review accounting pursuant to Rule 2020 – Exemptions Section 6.14; and
3. define emissions unit for the purposes of assessing fugitive VOC emissions.

II. Applicability

This policy is applicable to new and modified emissions units (as defined in Rule 2201) at petroleum and SOCMI facilities that include fugitive VOC emissions sources not exempt from permit pursuant to the provisions of Rule 2020.

As used in this policy, petroleum facilities means light crude oil, heavy crude oil, or gas production operations, gas plants, refineries, or marketing terminals.

The term “component” shall have the same meaning given the term in the EPA document entitled *“Protocol for Equipment Leak Emission Estimates”* (EPA-453/R-95-017) and as further refined in the *“California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities”* (CAPCOA Guideline).

III. Background

Previously, emissions from fugitive components at petroleum and SOCMI facilities were calculated using a variety of methods including, but not limited to:

1. using emission factors in API 4322;
2. using emission factors in District policy SSP-1910 titled "Wellhead Polished Rod Packings VOC Emission Factor";
3. application of vapor control system control efficiency (CARB/KVB method) to a calculated uncontrolled emissions rate.

These methods shall no longer be used.

The approved methods for calculating fugitive emissions are those contained in EPA's "***Protocol for Equipment Leak Emission Estimate***" dated 11/95 (EPA-453/R-95-017) and "***California Implementation Guidelines for Estimating Mass Emissions of Fugitive Hydrocarbon Leaks at Petroleum Facilities***" dated 2/99 (CAPCOA document). The CAPCOA document was developed to provide guidance to California Districts in implementing the emission factors outlined in the EPA document.

The EPA document includes emission factors for four (4) industry types:

1. oil and gas production operations
2. refineries,
3. marketing terminals, and
4. synthetic organic chemical manufacturing (SOCMI).

The emission factors for a given industry type are appropriate for use only for a facility of that same industry type.

For each industry type, there are five tiers of emission factors (listed in increasing refinement and accuracy)

1. average emission factors,
2. screening range emission factors (10,000 ppmv leak definition),
3. equations for average leak rate (ALR) emission factors for various leak definitions,
4. EPA correlation equation emission factors, and
5. unit specific correlation equation emission factors.

Note that although the ALR emission factors were not addressed in the CAPCOA document, because the CAPCOA document does not present emission factors that supercede the ALR emission factors, the ALR emission factors may be employed.

The CAPCOA document provides revisions to two sets of emission factors in the EPA document, as follows:

Table IV-2c “CAPCOA Oil and Gas Production Screening Value Range Emission Factors”

Table IV-3a “CAPCOA Refinery and Marketing Terminal Correlation Equation Emission Factors”

Additionally, a 6/11/97 letter from CAPCOA to WSPA describes the implementation of the EPA and CAPCOA emission factors for Districts in California, as follows:

Refineries and Marketing Terminals
Average emission factors can be used when there is no reliable site-specific data to use with the correlation equations. For the average emission factors, no control efficiency due to I & M will be used. Screening value range emission factors from the EPA document can be used. CAPCOA revised EPA correlation equation emission factors in CAPCOA document Table IV-3a can be used.

Oil and Gas Production Operations (Including Gas Plants)
Average emission factors can be used when there are no reliable site-specific data to use with the correlation equations. For the average emission factors, no control efficiency due to I & M will be used. CAPCOA revised screening value range emission factors in CAPCOA document Table IV-2c can be used.

Note that the concepts outlined in CAPCOA’s 6/11/97 letter were formalized in the February 1999 CAPCOA implementation guideline.

IV. District Approved Fugitive Emission Factors

Emission factors in the CAPCOA document or emission factors in the EPA document shall be used for new or modified emissions units. However, the emission factors in the CAPCOA document will take precedent over emission factors in the EPA document.

The average emission factors, screening range emission factors, equations for average leak rate emission factors for various leak definitions, EPA correlation equation emission factors, and unit-specific correlation equation emission factors may be used. The same emission factors must be used for all components associated with an emissions unit.

Any of the above generally accepted emission factors may be used for an emissions unit subject to a BACT requirement provided permit conditions are included that require periodic inspection, maintenance, and repair of leaking fugitive components.

It is preferable, though not required, to have the same calculation basis for all emissions units within a permit unit. It is permissible to have different emission factors for separate emissions units, even within a permit unit, provided the appropriate emission factors for each emissions unit are stated in the ATC/PTO.

If the screening range emission factors or ALR emission factors are used, an allowable leak fraction for an associated component type may be identified by the applicant. However, the leak fraction must comply with all other applicable requirements and the allowable leak fraction must be specified on the permit for each emissions unit.

The emission factors may be adjusted for the site-specific VOC content of the hydrocarbon vapors provided the VOC content is limited by permit conditions and periodic sampling and analysis is required.

VOC emissions are not assessed to the following components.

- Fugitive sources associated with permit exempt equipment (pursuant to Rule 2020 6.12)
- Fugitive emission components operated under vacuum, (i.e. less than atmospheric pressure of 14.7 psia). Permit conditions requiring monitoring and record keeping to verify that the components are operated under a vacuum will be required.
- For oil and gas production operations, components handling produced fluids with an API gravity less than 30^{o}.
- For oil and gas production operations, components in water/oil service (water content greater than or equal to 50%)
- For refineries, components handling liquids with an API gravity less than 30^{o}.
- Piping and components handling fluid streams with a VOC content of 10% or less by weight (i.e. VOCs as a percentage of the entire gas stream). Permit conditions requiring periodic monitoring and record keeping to verify the VOC content is 10% or less by weight will be required. VOC emissions may be assessed to such components if they handle significant quantities of hazard air pollutants (HAPs) as determined by the District. Please note that permittees seeking relief under this provision shall provide the District with written documentation prior to installation of components handling fluid streams with a VOC content of 10% or less by weight.
- Components that are part of field gas production pipelines/gas gathering systems (i.e. produced gas lines discharging to sales gas pipelines or gas processing plants, except for permit units and their fugitive components on such pipelines). Please note that vapor control system piping serving tanks, steam enhanced wells, separators, heater treaters, etc. are not field gas production pipelines.
- Piping and components located between petroleum production operation surface site boundaries utilized to transport material and are otherwise exempt from permit. Emissions units (e.g. IC engine/compressors, etc) that are otherwise required to have a permit are not exempt.
- Other components identified in the CAPCOA document as being not counted in estimating fugitive VOC emissions.

V. Associating fugitive emission sources with permitted emissions units pursuant to Rule 2020 6.14

Rule 2020 section 6.12 and section 6.13 provide permit exemptions for fugitive sources that are associated with emissions units that are exempt from a written permit. Emissions units that are categorically exempt from permit are those specified in Rule 2020, Sections 6.0 through section 7.0.

Rule 2020 section 6.14 states that fugitive emissions sources and pressure vessels that are associated with an emissions unit for which a written permit is required, shall be included as part of such emissions unit. A separate permit for the fugitive source or pressure vessel is not required. In determining if fugitive emissions sources are "associated" with permit exempt emissions units or are associated with emissions units that require a written permit, the following guidelines shall be used.

Please note that pressure vessels that serve as storage equipment, e.g. bullet tanks used to store natural gasoline or condensed petroleum liquids (but not including liquefied gases), require individual permits if their capacity is greater than 100 bbl. If their capacity is less then 100 bbl, they are to be listed on the permit of the associated equipment.

Notwithstanding the following, all fugitive emission sources that are part of a vapor control system, including but not limited to TEOR vapor control systems and tank vapor control systems, and all fugitive emissions sources associated with TEOR wells with closed vents or associated with TEOR well vents that tie into produced liquid piping, are not exempt from permit and are to be included with emission unit for which a written permit is required. Additionally, a source operation that vents to a vapor control system is not exempt from permit.

Note: Vapor control system (VCS) is defined as a collection and control system that collect vapors for delivery to a dedicated VOC destruction or disposal device or delivery to another gas collection system (e.g. field fuel gas system, gas production system, gas plant collection system, refinery fuel gas system, etc.). Piping and components used by a VCS for vapor collection or delivery to a gas collection system are associated with the VCS.

Fugitive emission sources are to be associated with the emissions units they serve. If fugitive emission sources are associated with an emission unit that has separate point source emissions independent of the fugitive emissions (as in the case with a heater treater that is served by a vapor control system) the aggregated fugitive emissions and point source emissions are separate emissions units. NSR requirements are determined separately for such fugitive emissions and point source emissions.

Except as provided above for vapor control systems, if a petroleum production operation surface site includes only emissions units for which a written permit is not

required, then all fugitive emissions sources at that petroleum production operation surface site are exempt from NSR requirements and permits. Conversely, if the petroleum production operation surface site includes one or more emissions units for which a permit is required, the fugitive components shall be included in the permit for the emissions unit with which they are associated.

Note: Petroleum production operation surface site means any graded pad site, gravel pad site, foundation, platform, or area where a group of equipment is installed. Petroleum production operation surface sites connected by a road, piping, or a powerline are not part of the same petroleum production operation surface site.

When an emissions unit requiring a written permit is physically removed from service or permanently disabled, the fugitive sources shall no longer be associated with that emissions unit and shall be deemed permit exempt, provided they are not associated with any other emissions unit requiring a written permit at the same petroleum production operation surface site, or are components for which VOC emissions are not assessed (as described above).

For convenience, associated fugitive emissions may be listed on the lowest numbered permit unit.

All fugitive emissions sources, including those exempt from permit, must comply with all applicable Regulation IV requirements.

Examples:

<u>Heavy oil TEOR production operations</u>

Produced fluid piping and components are exempt from permit as the API gravity is less than 30^{o}.

When several wells are assigned to one permit, new wells may be added provided that the previously authorized well count is not exceeded in accordance with the Oilfield Permitting Policy.

For TEOR operations with a vapor control system, the entire vapor control system is one emissions unit – the well vent vapor control system emissions unit. This emissions unit includes the maximum number of wells authorized by valid ATC or PTO to be connected to the vapor control system. If the permitted well count is increased, NSR requirements shall only apply to the fugitive emissions components associated with the new wells.

For TEOR operations with closed casing vents, all wells authorized by one permit are one emissions unit. For such operations, fugitive emissions sources not on the well head are exempt from permit. For well heads designed so that

the casing annulus terminates before reaching the surface, there are no fugitive components on the well head.

If the maximum number of permitted wells is increased, NSR requirements shall only apply to the increase in permitted well count and not to the pre-addition wells.

For TEOR operations with casing vents tied into the produced fluid line, all wells authorized by one permit are one emissions unit. For such operations, fugitive components on liquid line(s) downstream of where the casing vent ties into the produced liquid line are exempt from permit.

In TEOR operations where the liquid flow line enters a vessel and the vessel discharges gas into a vapor control system (as opposed to a gas gathering system), then the vessel, (if $\leq$ 100 bbl capacity) and components are associated with the vapor control system permit. If the vessel has a capacity > 100 bbl, it requires a separate permit.

If the produced liquids are piped to a production separator and the produced gas goes to a gas gathering system (not a vapor control system), such production separator and gas gathering system piping is exempt from permit unless it is associated with an emissions unit at the same petroleum production operation surface site requiring a written permit.

Separators and piping that return the vapors immediately back to the produced liquid flow line do not require a permit.

Light oil and gas production operations

Produced liquid piping fugitive emissions components are subject to permit if the API gravity of the produced petroleum is greater than or equal to 30^{o} and such components are associated with an emissions unit requiring a written permit at the same petroleum production operation surface site.

If the produced liquids are piped to a production separator and the produced gas goes to a gas gathering system (not a vapor control system), such production separator and gas gathering system piping is exempt from permit unless it is associated with an emissions unit requiring a written permit at the same petroleum production operation surface site.

VI. Utilizing Revised Emission Factors

Use of revised emission factors is limited to only new or modified emissions units and as allowed by District policy APR 1110. See District Policy APR 1110 Use of Revised Generally Accepted Emission Factors.

If Rule 2201 is applicable due to a modification of an emissions unit due to adding fugitive components, Rule 2201 requirements apply only to the new components. If Rule 2201 is applicable due to a modification of an emissions unit by adding to or changing the fluid handled such that permit conditions limiting the VOC content of fluid handled can no longer be met, all components handling such fluid are subject to Rule 2201 requirements.

VII. Permitting Issues

Definition of emissions unit for purposes of this policy

The following definition does not supersede the definition of emissions unit in Rule 2201. An emissions unit is an operation that results in the liberation of VOCs from process fluids, e.g. permanent separation of VOCs from process streams, including any vapor control piping up to where it connects to a shared vapor control system (which is another emissions unit). Examples include, but are not limited to, tanks, free water knockouts, production separator vessels that vent to a vapor control system, etc.

All components of a shared vapor control system downstream of the last permit unit to where the vapors are controlled by a dedicated control device, such as a flare or waste gas disposal well, are considered part of the shared vapor control system emissions unit. Should the vapors be distributed to other permitted equipment for incineration, as in the case of fuel burning equipment, or further treatment, as in the case of a natural gas processing plant, vapor control system emissions units terminate where the vapor control system piping leaves the petroleum production operation surface site. All fugitive emissions sources, including those exempt from permit, must comply with all applicable Regulation IV requirements.

Addition and/or removal of fugitive components

Addition and/or removal of fugitive emissions sources can be made without an ATC provided such change does not constitute installation of a previously unauthorized emissions unit or modification of an existing emissions unit, provided the existing daily emission limit (as calculated using current generally accepted emission factors) can continue to be complied with.

Changes for which an ATC is not required

(1) A TEOR vapor control system has a PTO that expresses the fugitive VOC emission limit using current generally accepted emission factors. Emissions from existing components are less than the DEL established at a level to provide operation flexibility. The permittee proposes to install a new fin fan cooler in the vapor control system, including several new fugitive components. The increase in fugitive emissions can be accommodated in the existing DEL. As this change does

not constitute a change in the method of operation of the TEOR vapor control system or include the installation of new emissions units, it can be made without an ATC provided the record of the count of components actually installed is maintained current.

(2) The operation of several wells included in the authorized well count are discontinued resulting in several empty “well slots”. The well slots may be filled with other wells provided the total well count is not exceeded.

(3) A vapor control system has a PTO. The operator proposes in an ATC application to add a permit condition limiting the VOC content of the vapor in the vapor collection system to less than 10% by weight with requirements for periodic sampling. After the ATC is issued and converted to a PTO the operator may add, remove, or replace components on the vapor control system without obtaining an ATC provided the record of the count of components actually installed is maintained current.

Changes for which an ATC is required

(1) A TEOR vapor control system has a PTO that does not specify the fugitive VOC emission limit using current generally accepted emission factors. The permittee proposes to install a new fin fan cooler in the vapor control system, including several new fugitive components. Because the existing PTO does not establish a DEL based on generally accepted emission factors, the permittee must provide an estimate of the number and type of existing fugitive components to establish the pre-project DEL. As the addition of the new fugitive components will result in an increase in emissions assessed to the emissions unit, an ATC is required. Such an ATC is subject to New Source Review.

(2) Installing a new tank > 100 bbl capacity and connecting it to an existing vapor control system. The new tank is a new emissions unit and an ATC is required. Such an ATC is subject to New Source Review. The existing vapor control system permit must be revised to indicate that it now serves the new tank, therefore an ATC is required. Provided there are no changes required to the vapor control system that will result in a change to the method of operation and there is no physical change to the vapor control system or disposal device(s) other than the connection of the new tank vapor control piping to the vapor control system, the ATC to modify the VCS permit unit is not subject to NSR.

Establishing fugitive components to provide operational flexibility

In order to provide for construction uncertainties and/or addition or removal of fugitive emission sources (provided such change does not include a new emissions unit or modify, as defined in Rule 2201, an existing emissions unit) a permittee may establish a fugitive emission limit at up to 120% of expected fugitive emissions. Notwithstanding this provision to provide for construction/operational flexibility, only

the emissions calculated on the fugitive components actually installed may be considered when a permitting action involves reducing fugitive emissions.

Subsequent addition or removal of fugitive emissions sources (provided such change does not include a new emissions unit or modify, as defined in Rule 2201, an existing emissions unit) may be made without an ATC. The permittee shall be required to maintain accurate records of the number, type, and calculated emissions for the components actually installed and update such records when new fugitive emission sources are installed, removed, or replaced. All fugitive components shall be subject to all permit requirements, including inspection, maintenance, and record keeping.

Any permit or rule requirements that limit the percentage of leaking components shall be based on the total number of components actually installed, not on the number of permitted components.

Petroleum facility tanks

Each tank connected to vapor control is a separate emissions unit.

Steam-enhanced and in-situ combustion wells

When implementing Policy APR 1110, Use of Revised Generally Accepted Emission Factors, the pre-project emissions for the wells are to be based on the maximum number of fugitive components associated with the wells actually installed plus the number of fugitive components associated with the additional wells authorized by any valid ATC.

Throughput and true vapor pressure of liquids stored in tanks

Regardless of the method used to ascertain the emission rate from tanks with vapor control, when applications to modify organic liquid storage tanks are submitted the District may require information on the service, throughput, and true vapor pressure of liquids stored in tanks. While this information generally will not be specified on the permit, it may be used to determine when proposed changes at a stationary source result in a NSR Modification due a change in the method of operation.

Expression of a daily emission limit (DEL) for emissions from fugitive components on ATCs/PTOs

The DEL for an emissions unit may be expressed directly as a lb/day limit or indirectly as a combination of a component count for each component type, emission factors for each component type, and a maximum number of leaking components.

For components for which VOC emissions are not assessed (as described above) the permit must contain conditions that enforce the basis for excluding the components from emission calculations. A DEL of 0.0 lb/day shall not be included for such components.

Emissions from some or all of the emissions units within a permit unit may be expressed as one or more DEL(s). However, in some cases, a DEL for each new or modified emissions unit may be required.

Each permit must contain one or more DEL(s) that limit the NSR authorized emissions from that permit unit.