



**Minnesota Pollution
Control Agency**

AIR QUALITY
520 LAFAYETTE ROAD
ST. PAUL, MN 55155-4194

PERMIT APPLICATION FORM **EC-14**
**FUGITIVE VOC EMISSIONS
CALCULATION FORM**

6/12/98

- Instructions begin on Page 3.

- If the fugitive sources emit Hazardous Air Pollutants (HAPs), fill out and attach form EC-13A.

- 1) AQ Facility ID No.: _____
- 2) Facility Name: _____
- 3) Fugitive Source Number _____
- 4) Control Equipment ID/description _____
- 5) Calculations Summary for fugitive VOC emissions sources (next page):

5a) Fugitive Source	5b) Emission Factor (lbs/hr)	5c) Quantity	5d) Emission Rate (lbs/hr)	5e) Maximum Uncontrolled Emissions (tons/yr)	5f) Pollution Control Efficiency (%)	5g) Maximum Controlled Emissions (tons/yr)	5h) Limited Controlled Emissions (tons/yr)	5i) Actual Emissions (tons/yr)
Valves (gas)								
Valves (light liquid)								
Valves (heavy liquid)								
Pump Seals (light liquid)								
Pump Seals (heavy liquid)								
Compressor Seals (gas)								
Press. Relief Valves/Seals (gas)								
Connectors/Flanges (all)								
Open-Ended Lines (all)								
Sampling Connections (all)								

6) Operating Limitations, if applicable:

INSTRUCTIONS FOR FILLING OUT AQ FORM
EC-14 Fugitive VOC Emissions

- 1) **AQ Facility ID No.** -- Fill in your Air Quality Facility ID Number as indicated on Form GI-01 or RP-01, item 1a.
- 2) **Facility Name** -- Enter your facility name as indicated on Form GI-01 or RP-01, item 2.
- 3) **Fugitive Source Number** -- Enter the Fugitive Source ID Number from Form GI-05D. If you are using this form for Registration Permit Option D, just provide a description of the fugitive source.
- 4) **Control Equipment ID/Description** - Fill in the control equipment ID number from Form GI-05A. If you are using this form for Registration Permit Option D, provide the description from that form.
- 5) **Calculations Summary Table:**
 - 5a) **Fugitive Source** -- The types of equipment from which fugitive VOCs occur have been listed for you in this column. The information in parentheses () indicates the type of material handled (gas, light liquid, heavy liquid, or all types). If you have additional types of equipment, add those in the extra rows.
 - 5b) **Emission Factor** -- Fill in the Emission Factor from Table EC-14.1, found at the end of this form.
 - 5c) **Quantity** -- Fill in the total number of each type of source. Note that for valves, pumps and compressor seals, there are different emission factors for different types of materials handled, so these must be divided.
 - 5d) **Emission Rate** -- Fill in the Emission Rate. Use this method for calculations.

Uncontrolled Emission Rate [lb / hr]:

$$\begin{aligned} &= \text{Emission Factor} \left[\frac{\text{lb}}{\text{hr}} \right] \times \text{Number of Leaks} \\ &= (\text{item 5b}) \times (\text{item 5c}) \end{aligned}$$

(e.g., for 3 SOCM pump seals in light liquid service, the uncontrolled VOC emissions are $0.0439 \text{ lb/hr} \times 3 = 0.132 \text{ lb/hr}$.)

- 5e) **Maximum Uncontrolled Emissions** -- [Skip this item if using this form for Registration Permit Option D.] Fill in the Maximum Uncontrolled VOC Emissions. Use this method for calculations.

Maximum Uncontrolled Emissions [tons / yr]:

$$\begin{aligned} &= \text{Uncontrolled VOC Emission Rate} \left[\frac{\text{lb}}{\text{hr}} \right] \times 4.38 \left[\frac{\text{hrs}}{\text{yr}} \cdot \frac{\text{tons}}{\text{lb}} \right] \\ &= (\text{item 5d}) \times 4.38 \end{aligned}$$

(e.g., if the uncontrolled VOC Emissions are 0.132 lb/hr ; then the maximum uncontrolled VOC Emissions are $0.132 \text{ [lb/hr]} \times 4.38 \text{ [hrs/yr-tons/lb]} = 0.577 \text{ [ton/yr]}$.)

5f) Pollution Control Efficiency-- Fill in the control efficiency. This information can be obtained from Form GI-05A or RP-D2. In general, the control methods for fugitive VOC consist of leak detection and repair programs, known as LDAR, and double containment. Both of these reduce the amount of fugitive VOC but do not eliminate it. Note that the emission factors in Table EC-14.1 do not depend on whether a LDAR program is being done or not, and the factors are independent of the operating pressure. Therefore, ***control efficiency will not generally apply to fugitive VOC***. In this case, enter “0” as the control efficiency.

5g) Maximum Controlled Emissions -- [Skip this item if using this form for Registration Permit Option D.] Fill in the Maximum Controlled Emission in tons/yr. Use this method for calculation.

Maximum Controlled Emissions [tons / yr]:

$$\begin{aligned} &= \text{Max. Uncontrolled Emissions} \left[\frac{\text{tons}}{\text{yr}} \right] \times \left(\frac{100 - \text{Pollution Control Efficiency}}{100} \right) \\ &= (\text{item 5e}) \times \left(\frac{100 - (\text{item 5f})}{100} \right) \end{aligned}$$

5h) Limited Controlled Emissions -- [Skip this item if using this form for Registration Permit Option D.] Limited Controlled Emissions take into account other limitations the source proposes such as limits on hours of operation or VOC content of raw materials. Because the emission factors for valves, for instance, do not depend on the pressure of the fluid in the valve or whether the fluid is moving or not, these type of limitations usually do not apply to fugitive leaks. If you have extensive downtime during which pipeline are drained and flushed with water or air, you may be able to propose this as an operational limitation for fugitive VOC. Enter this in item 6 and on Form CD-01.

If an emission unit is subject to an emission limitation specified in 40 CFR pt. 60, 40 CFR pt. 61, 40 CFR pt. 63, or Minn. Rules Ch. 7011, you must show this requirement in the calculation of Limited Controlled Emissions and take this into account in calculating the Limited Controlled Emissions. If you choose to propose to comply with more a stringent limit, you should state this clearly and show the resulting allowed emissions in this calculation. Include the proposed limit and proposed compliance demonstration methods in item 6 and on Form CD-01.

5i) Actual Emissions -- If this is an existing unit and historical records exist, calculate actual emissions using the average of the previous two calendar years of operating data, or average the previous two emission inventory reports if an inventory was submitted. If this is a new unit or no records exist, use a reasonable estimate of how many hours the equipment will be down for cleaning/draining. In general, because the emission factors for valves (for instance) do not depend on the pressure of the fluid in the valve or whether the fluid is moving or not, only the times of downtime during which pipelines are drained and flushed with water or air count as times when fugitive VOC emissions are not occurring. Otherwise, actual emissions will be the same as maximum controlled emissions. If significant downtime due to draining and flushing did occur, calculate the actual emissions as follows:

Actual Emissions [tons / yr]:

$$= \text{Uncontrolled VOC} \left[\frac{\text{lb}}{\text{hr}} \right] \times \left[\frac{1 \text{ ton}}{2000 \text{ lb}} \right] \times \text{Actual Hrs [hours]} \times \left(\frac{100 - \text{Pollution Control Efficiency}}{100} \right)$$

$$= (\text{item 5d}) \times \frac{1}{2000} \times \text{Operating Hours} \times \left(\frac{100 - \text{item 5f}}{100} \right)$$

Report actual emissions in tons/year.

- 6) **Operating Limitations** -- Refer to item 5h above. [Skip this item if using this form for Registration Permit Option D.]

TABLE EC-14.1 AVERAGE EMISSION FACTORS FOR FUGITIVE EMISSIONS

(Reference: Protocol for Equipment Leak Emission Estimates, EPA-453/R-95-017, November 1995, Tables 2-1 and 2-2)

Equipment	Service	SOCMI Emission Factor^a (lb/hr)	Refinery Emission Factor^b (lb/hr)
Valves	Gas	0.0132	0.0591
	Light Liquid	0.0089	0.024
	Heavy Liquid	0.00051	0.00051
Pump Seals ^c	Light Liquid	0.0439	0.2573
	Heavy Liquid	0.019	0.0463
Compressor Seals	Gas	0.5027	1.4021
Pressure Relief Valves	Gas	0.2293	0.3527
Connectors/Flanges	All	0.004	0.00055
Open-Ended Lines	All	0.0037	0.0051
Sampling Connections	All	0.0331	0.0331

^a These factors are for total organic compound emission rates in the Synthetic Organic Chemical Manufacturing Industry (SOCMI).

^b These factors are for non-methane organic compound emission rates at petroleum refineries.

^c The light liquid pump seal factor can be used to estimate the leak rate from agitator seals.