relief valve discharge shall be esti-
mated and calculation shall be made to
verify ongoing compliance with the de-
sign and operating requirements of
§§ 60.18 (c)(3) through (c)(6). If more
than one relief valve is discharged si-
multaneously to a single flare, these
calculations shall account for the cu-
mulative effect of all such relief valve
discharges. These calculations shall be
made and reported quarterly for all dis-
charges within the quarter. Failure to
comply with any of the requirements of
this paragraph will be a violation of
§ 61.65(d)(2). Monitoring for the pres-
ence of a flare pilot flame shall be con-
ducted in accordance with § 60.18(f)(2).
If the results of this monitoring or any
other information shows that the pilot
flame is not present 100 percent of the
time during which a relief valve dis-
charge is routed to the flare, the relief
valve discharge is subject to the provi-
sions of § 61.65(a).

(ii) A report describing the flare de-
sign shall be provided to the Adminis-
trator not later than 90 days after the
adoption of this provision or within 30
days of the installation of a flare sys-
tem for control of relief valve dis-
charge whichever is later. The flare de-
sign report shall include calculations
based upon expected relief valve dis-
charge component concentrations and
net heating values (for PVC this cal-
culation shall be based on values ex-
pected if a release occurred at the in-
stant the polymerization starts); and
estimated maximum exit velocities
based upon the design throat capacity
of the gas in the relief valve.

[41 FR 46564, Oct. 21, 1976; 41 FR 53017, Dec. 3,
1976, as amended at 42 FR 29006, June 7, 1977;
51 FR 34910, Sept. 30, 1986; 53 FR 36972, Sept.
23, 1988; 55 FR 28348, July 10, 1990; 65 FR 62151,
Oct. 17, 2000]

§ 61.66 Equivalent equipment and pro-
cedures.

Upon written application from an
owner or operator, the Administrator
may approve use of equipment or pro-
cedures which have been demonstrated
to his satisfaction to be equivalent in
terms of reducing vinyl chloride emis-
sions to the atmosphere to those pre-
scribed for compliance with a specific
paragraph of this subpart.

[51 FR 34912, Sept. 30, 1986]

§ 61.67 Emission tests.

(a) Unless a waiver of emission test-
ing is obtained under § 61.13, the owner
or operator of a source to which this
subpart applies shall test emissions
from the source,

(1) Within 90 days of the effective
date in the case of an existing source
or a new source which has an initial
startup date preceding the effective
date, or

(2) Within 90 days of startup in the
case of a new source, initial startup of
which occurs after the effective date.

(b) The owner or operator shall pro-
vide the Administrator at least 30 days
prior notice of an emission test to af-
ford the Administrator the opportunity
to have an observer present during the
test.

(c) Any emission test is to be con-
ducted while the equipment being test-
ed is operating at the maximum pro-
duction rate at which the equipment
will be operated and under other rel-
evant conditions as may be specified by
the Administrator based on representa-
tive performance of the source.

(d) [Reserved]

(e) When at all possible, each sample
is to be analyzed within 24 hours, but
in no case in excess of 72 hours of sam-
ple collection. Vinyl chloride emissions
are to be determined within 30 days
after the emission test. The owner or
operator shall report the determina-
tions to the Administrator by a reg-
istered letter dispatched before the
close of the next business day following
the determination.

(f) The owner or operator shall retain
at the plant and make available, upon
request, for inspection by the Adminis-
trator, for a minimum of 3 years,
records of emission test results and
other data needed to determine emis-
sions.

(g) Unless otherwise specified, the
owner or operator shall use the test
methods in appendix B to this part for
each test as required by paragraphs
(g)(1), (g)(2), (g)(3), (g)(4), and (g)(5) of
this section, unless an alternative
method has been approved by the Ad-
ministrator. If the Administrator finds

reasonable grounds to dispute the results obtained by an alternative method, he may require the use of a reference method. If the results of the reference and alternative methods do not agree, the results obtained by the reference method prevail, and the Administrator may notify the owner or operator that approval of the method previously considered to be alternative is withdrawn. Whenever Method 107 is specified, and the conditions in Section 1.2, "Applicability" of Method 107A are met, Method 107A may be used.

(1) Method 106 is to be used to determine the vinyl chloride emissions from any source for which an emission limit is prescribed in §61.62(a) or (b), §61.63(a), or §61.64(a)(1), (b), (c), or (d), or from any control system to which reactor emissions are required to be ducted in §61.64(a)(2) or to which fugitive emissions are required to be ducted in §61.65(b)(1)(ii), (b)(2), (b)(5), (b)(6)(ii), or (b)(9)(ii).

(i) For each run, one sample is to be collected. The sampling site is to be at least two stack or duct diameters downstream and one half diameter upstream from any flow disturbance such as a bend, expansion, contraction, or visible flame. For a rectangular cross section, an equivalent diameter is to be determined from the following equation:

Equivalent diameter = 2(length)(width)/(length + width)

The sampling point in the duct is to be at the centroid of the cross section. The sample is to be extracted at a rate proportional to the gas velocity at the sampling point. The sample is to contain a minimum volume of 50 liters (1.8 ft ^{3}) corrected to standard conditions and is to be taken over a period as close to 1 hour as practicable.

(ii) Each emission test is to consist of three runs. For the purpose of determining emissions, the average of results of all runs is to apply. The average is to be computed on a time weighted basis.

(iii) For gas streams containing more that 10 percent oxygen, the concentration of vinyl chloride as determined by Method 106 is to be corrected to 10 percent oxygen (dry basis) for determina-

tion of emissions by using the following equation:

$$C_{b(corrected)} = C_b (10.9)/(20.9 - \text{percent } O_2)$$

Where:

$C_{b(corrected)}$ = The concentration of vinyl chloride in the exhaust gases, corrected to 10 percent oxygen.

C_b = The concentration of vinyl chloride as measured by Method 106.

20.9 = Percent oxygen in the ambient air at standard conditions.

10.9 = Percent oxygen in the ambient air at standard conditions, minus the 10.0 percent oxygen to which the correction is being made.

Percent O_2 = Percent oxygen in the exhaust gas as measured by Method 3 of appendix A of part 60 of this chapter.

(iv) For those emission sources where the emission limit is prescribed in terms of mass rather than concentration, mass emissions are to be determined using the following equation:

$$C_{BX} = \frac{C_b D_{VC} Q K \left(10^{-6}\right)}{Z}$$

Where:

C_{BX} = Vinyl chloride emissions, g/kg (lb/lb) product.

C_b = Concentration of vinyl chloride as measured by Test Method 106, ppmv.

D_{VC} = Density of vinyl chloride at standard conditions, 2.60 kg/m^3 (0.162 lb/ft^3).

Q = Volumetric flow rate as determined by Method 2 of appendix A to part 60 of this chapter, m^3/hr (ft^3/hr).

K = Unit conversion factor, 1,000 g/kg (1 lb/lb).

10^{-6} = Conversion factor for ppm.

Z = Production rate, kg/hr (lb/hr).

(2) Method 107 or Method 601 (incorporated by reference as specified in §61.18) is to be used to determine the concentration of vinyl chloride in each inprocess wastewater stream for which an emission limit is prescribed in §61.65(b)(9)(i).

(3) When a stripping operation is used to attain the emission limits in §61.64(e) and (f), emissions are to be determined using Method 107 as follows:

(i) The number of strippers (or reactors used as strippers) and samples and the types and grades of resin to be sampled are to be determined by the Administrator for each individual plant at the time of the test based on the plant's operation.

(ii) Each sample is to be taken immediately following the stripping operation.

(iii) The corresponding quantity of material processed by each stripper (or reactor used as a stripper) is to be determined on a dry solids basis and by a method submitted to and approved by the Administrator.

(iv) At the prior request of the Administrator, the owner or operator shall provide duplicates of the samples required in paragraph (g)(3)(i) of this section.

(4) Where control technology other than or in addition to a stripping operation is used to attain the emission limit in § 61.64(e), emissions are to be determined as follows:

(i) Method 106 is to be used to determine atmospheric emissions from all of the process equipment simultaneously. The requirements of paragraph (g)(1) of this section are to be met.

(ii) Method 107 is to be used to determine the concentration of vinyl chloride in each inprocess wastewater stream subject to the emission limit prescribed in § 61.64(e). Vinyl chloride mass emissions are to be determined using the following equation:

$$C_{BX} = \frac{C_{rvc} Q_{water} D_{water} Q\,K\left(10^{-6}\right)}{Z}$$

Where:

C_{BX} = Vinyl chloride emissions, g/kg (lb/lb) product in each inprocess wastewater stream.

C_{rvc} = Concentration of vinyl chloride in wastewater, as measured by Method 107, ppmw.

D_{water} = Density of wastewater, 1.0 kg/m³ (0.0624 lb/ft³).

Q_{water} = Wastewater flow rate, determined in accordance with a method which has been submitted to and approved by the Administrator, m³/hr (ft³/hr).

K = Unit conversion factor, 1,000 g/kg (1 lb/lb).

10^{-6} = Conversion factor for ppm.

Z = Production rate, kg/hr (lb/hr), determined in accordance with a method which has been submitted to and approved by the Administrator.

(5) The reactor opening loss for which an emission limit is prescribed in § 61.64(a)(2) is to be determined. The number of reactors for which the determination is to be made is to be specified by the Administrator for each individual plant at the time of the determination based on the plant's operation.

(i) Except as provided in paragraph (g)(5)(ii) of this section, the reactor opening loss is to be determined using the following equation:

$$C_{BX} = C_b \frac{V_R D_{VC} Q\,K\left(10^{-6}\right)}{Z}$$

Where:

C_{BX} = Vinyl chloride emissions, g/kg (lb/lb) product.

C_b = Concentration of vinyl chloride, in ppmv, as determined by Method 106 or a portable hydrocarbon detector which measures hydrocarbons with a sensitivity of at least 10 ppmv.

V_R = Capacity of the reactor, m³ (ft³).

D_{VC} = Density of vinyl chloride at standard conditions, 2.60 kg/m³ (0.162 lb/ft³).

K = Unit conversion factor, 1,000 g/kg (1 lb/lb).

10^{-6} = Conversion factor for ppm.

Z = Production rate, kg/hr (lb/hr).

(A) If Method 106 is used to determine the concentration of vinyl chloride (C_b), the sample is to be withdrawn at a constant rate with a probe of sufficient length to reach the vessel bottom from the manhole. Samples are to be taken for 5 minutes within 6 inches of the vessel bottom, 5 minutes near the vessel center, and 5 minutes near the vessel top.

(B) If a portable hydrocarbon detector is used to determine the concentration of vinyl chloride (C_b), a probe of sufficient length to reach the vessel bottom from the manhole is to be used to make the measurements. One measurement will be made within 6 inches of the vessel bottom, one near the vessel center and one near the vessel top. Measurements are to be made at each location until the reading is stabilized. All hydrocarbons measured are to be assumed to be vinyl chloride.

(C) The production rate of polyvinyl chloride (Z), which is the product of the average batch weight and the number of batches produced since the reactor was last opened to the atmosphere, is to be determined by a method submitted to and approved by the Administrator.

(ii) A calculation based on the number of evacuations, the vacuum involved, and the volume of gas in the reactor is hereby approved by the Administrator as an alternative method for determining reactor opening loss for postpolymerization reactors in the manufacture of bulk resins. Calculation methods based on techniques other than repeated evacuation of the reactor may be approved by the Administrator for determining reactor opening loss for postpolymerization reactors in the manufacture of bulk resins.

(6) For a reactor that is used as a stripper, the emissions of vinyl chloride from reactor opening loss and all sources following the reactor used as a stripper for which an emission limit is prescribed in §61.64(f) are to be determined. The number of reactors for which the determination is to be made

is to be specified by the Administrator for each individual plant at the time of the determination based on the plant's operation.

(i) For each batch stripped in the reactor, the following measurements are to be made:

(A) The concentration of vinyl chloride in resin after stripping, measured according to paragraph (g)(3) of this section;

(B) The reactor vacuum at end of strip from plant instrument; and

(C) The reactor temperature at the end of strip from plant instrument.

(ii) For each batch stripped in the reactor, the following information is to be determined:

(A) The vapor pressure of water in the reactor at the end of strip from the following table:

METRIC UNITS

Reactor vapor temperature (°C)	H_2O vapor pressure (mm Hg)	Reactor vapor temperature (°C)	H_2O vapor pressure (mm Hg)	Reactor vapor temperature (°C)	H_2O vapor pressure (mm Hg)
40	55.3	62	163.8	84	416.8
41	58.3	63	171.4	85	433.6
42	61.5	64	179.3	86	450.9
43	64.8	65	187.5	87	468.7
44	68.3	66	196.1	88	487.1
45	71.9	67	205.0	89	506.1
46	75.6	68	214.2	90	525.8
47	79.6	69	223.7	91	546.0
48	83.7	70	233.7	92	567.0
49	88.0	71	243.9	93	588.6
50	92.5	72	254.6	94	610.9
51	97.2	73	265.7	95	633.9
52	102.1	74	277.2	96	657.6
53	107.2	75	289.1	97	682.1
54	112.5	76	301.4	98	707.3
55	118.0	77	314.1	99	733.2
56	123.8	78	327.3	100	760.0
57	129.8	79	341.0		
58	136.1	80	355.1		
59	142.6	81	369.7		
60	149.4	82	384.9		
61	156.4	83	400.6		

ENGLISH UNITS

Reactor vapor temperature (°F)	H_2O vapor pressure (psia)	Reactor vapor temperature (°F)	H_2O vapor pressure (psia)	Reactor vapor temperature (°F)	H_2O vapor pressure (psia)
104	1.07	144	3.167	183	8.060
106	1.13	145	3.314	185	8.384
108	1.19	147	3.467	187	8.719
109	1.25	149	3.626	189	9.063
111	1.32	151	3.792	190	9.419
113	1.39	153	3.964	192	9.786
115	1.46	154	4.142	194	10.17
117	1.54	156	4.326	196	10.56
118	1.62	158	4.519	198	10.96
120	1.70	160	4.716	199	11.38

ENGLISH UNITS—Continued

Reactor vapor temperature (°F)	H₂O vapor pressure (psia)	Reactor vapor temperature (°F)	H₂O vapor pressure (psia)	Reactor vapor temperature (°F)	H₂O vapor pressure (psia)
122	1.79	162	4.923	201	11.81
124	1.88	163	5.138	203	12.26
126	1.974	165	5.360	205	12.72
127	2.073	167	5.590	207	13.19
129	2.175	169	5.828	208	13.68
131	2.282	170	6.074	210	14.18
133	2.394	172	6.329	212	14.70
135	2.510	174	6.594		
136	2.632	176	6.866		
138	2.757	178	7.149		
140	2.889	180	7.443		
142	3.024	181	7.746		

(B) The partial pressure of vinyl chloride in reactor at end of strip from the following equation:

$$PP_{VC} = P_{ATM} - P_{RV} - P_W$$

Where:

PP_{VC} = Partial pressure of vinyl chloride, mm Hg (psia)

P_{ATM} = Atmospheric pressure at 0 °C (32 °F), 760 mm Hg (14.7 psia)

P_{RV} = Absolute pressure of reactor vacuum, mm Hg (psia)

P_W = Vapor pressure of water, mm Hg (psia)

(C) The reactor vapor space volume at the end of the strip from the following equation:

$$C_{BX} = K_1 \left(PPM_{VC}\right) + \frac{\left(PP_{VC}\right)\left(V_{RVS}\right)\left(R_{VC}\right)}{\left(M_{VC}\right)\left(T_R + K_T\right)}$$

Where:

C_{BX} = Vinyl chloride emissions, g/kg (lb/lb) product.

PPM_{VC} = Concentration of vinyl chloride in resin after stripping, ppmw

K_1 = Conversion factor from ppmw to units of emission standard, 0.001 (metric units) = 0.002 (English units)

PP_{VC} = Partial pressure of vinyl chloride determined according to paragraph (g)(6)(ii)(B) of this section, mm Hg (psia)

V_{RVS} = Reactor vapor space volume determined according to paragraph (g)(6)(ii)(C) of this section, m³ (ft³)

R_{VC} = Ideal gas constant for vinyl chloride, 1,002 g-°K/(mm Hg-m³) [5.825 lb-°R/(psia-ft³)]

$$V_{RVS} = V_R - V_W - \frac{W_{PVC}}{D_{PVC}}$$

Where:

V_{RVS} = Reactor vapor space volume, m³ (ft³)

V_R = Reactor capacity, m³ (ft³)

V_W = Volume of water in reactor from recipe, m³ (ft³)

W_{PVC} = Dry weight of polyvinyl chloride in reactor from recipe, kg (lb)

D_{PVC} = Typical density of polyvinyl chloride, 1,400 kg/m³ (87.4 lb/ft³)

(iii) For each batch stripped in the reactor, the combined reactor opening loss and emissions from all sources following the reactor used as a stripper is to be determined using the following equation:

M_{PVC} = Dry weight of polyvinyl chloride in reactor from recipe, kg (lb)

T_R = Reactor temperature, °C (°F)

K_T = Temperature conversion factor for °C to °K, 273 (°F to °R, 460)

(h)(1) Each piece of equipment within a process unit that can reasonably contain equipment in vinyl chloride service is presumed to be in vinyl chloride service unless an owner or operator demonstrates that the piece of equipment is not in vinyl chloride service. For a piece of equipment to be considered not in vinyl chloride service, it must be determined that the percent

vinyl chloride content can be reasonably expected not to exceed 10 percent by weight for liquid streams or contained liquid volumes and 10 percent by volume for gas streams or contained gas volumes, which also includes gas volumes above liquid streams or contained liquid volumes. For purposes of determining the percent vinyl chloride content of the process fluid that is contained in or contacts equipment, procedures that conform to the methods described in ASTM D2267–68, 78, or 88 or D4420–94 (incorporated by reference as specified in § 61.18) shall be used.

(2)(i) An owner or operator may use engineering judgment rather than the procedures in paragraph (h)(1) of this section to demonstrate that the percent vinyl chloride content does not exceed 10 percent by weight for liquid streams and 10 percent by volume for gas streams, provided that the engineering judgment demonstrates that the vinyl chloride content clearly does not exceed 10 percent. When an owner or operator and the Administrator do not agree on whether a piece of equipment is not in vinyl chloride service, however, the procedures in paragraph (h)(1) of this section shall be used to resolve the disagreement.

(ii) If an owner or operator determines that a piece of equipment is in vinyl chloride service, the determination can be revised only after following the procedures in paragraph (h)(1) of this section.

(3) Samples used in determining the percent vinyl chloride content shall be representative of the process fluid that is contained in or contacts the equipment.

[41 FR 46564, Oct. 21, 1976, as amended at 42 FR 29007, June 7, 1977; 47 FR 39486, Sept. 8, 1982; 50 FR 46295, Nov. 7, 1985; 51 FR 34912, Sept. 30, 1986; 65 FR 62152, Oct. 17, 2000]

§ 61.68 Emission monitoring.

(a) A vinyl chloride monitoring system is to be used to monitor on a continuous basis the emissions from the sources for which emission limits are prescribed in §§ 61.62 (a) and (b), 61.63(a), and 61.64 (a)(1), (b), (c), and (d), and for any control system to which reactor emissions are required to be ducted in § 61.64(a)(2) or to which fugitive emissions are required to be ducted in § 61.65

(b)(1)(ii), and (b)(2), (b)(5), (b)(6) (ii), and (b)(9)(ii).

(b) The vinyl chloride monitoring system(s) used to meet the requirement in paragraph (a) of this section is to be a device which obtains representative samples from one or more applicable emission points on a continuous sequential basis and analyzes the samples with gas chromatography or, if the owner or operator assumes that all hydrocarbons measured are vinyl chloride, with infrared spectrophotometry, flame ion detection, or an alternative method. The vinyl chloride monitoring system used to meet the requirements in § 61.65(b)(8)(i) may be used to meet the requirements of this section.

(c) A daily span check is to be conducted for each vinyl chloride monitoring system used. For all of the emission sources listed in paragraph (a) of this section, except the one for which an emission limit is prescribed in § 61.62(b), the daily span check is to be conducted with a concentration of vinyl chloride equal to 10 ppm. For the emission source for which an emission limit is prescribed in § 61.62(b), the daily span check is to be conducted with a concentration of vinyl chloride which is determined to be equivalent to the emission limit for that source based on the emission test required by § 61.67. The calibration is to be done with either:

(1) A calibration gas mixture prepared from the gases specified in Sections 7.2.1 and 7.2.2 of Method 106 and in accordance with Section 10.1 of Method 106, or

(2) A calibration gas cylinder standard containing the appropriate concentration of vinyl chloride. The gas composition of the calibration gas cylinder standard is to have been certified by the manufacturer. The manufacturer must have recommended a maximum shelf life for each cylinder so that the concentration does not change greater than ±5 percent from the certified value. The date of gas cylinder preparation, certified vinyl chloride concentration and recommended maximum shelf life must have been affixed to the cylinder before shipment from the manufacturer to the buyer. If a gas chromatograph is used as the vinyl chloride monitoring system, these gas