Ohio Administrative Code

Rule 3745-76-15 Flare requirements.

Effective: October 10, 2006

[Comment: For dates of non-regulatory government publications, publications of recognized organizations and associations, federal rules, and federal statutory provisions referenced in this rule, see the last paragraph of rule 3745-76-01 of the Administrative Code titled "Incorporation by reference."]

(A) General requirements

(1) Flares shall be designed for and operated with no visible emissions as determined by the methods specified in paragraph (D)(1) of this rule, except for periods not to exceed a total of five minutes during any two consecutive hours.

(2) Flares shall be operated with a flame present at all times, as determined by the methods specified in paragraph (D)(2) of this rule.

(3) Flares used to comply with provisions of this chapter shall be operated at all times when emissions may be vented to them.

(4) Flares used to comply with this rule shall be steam-assisted, air-assisted, or nonassisted.

(B) The owner or operator shall either comply with the requirements for the heat content specifications and the maximum tip velocity in paragraphs (B)(1) of this rule or the requirements for nonassisted flares having a hydrogen content of 8.0 per cent or greater in paragraph (B)(2) of this rule:

(1) Heat content and maximum tip velocity specifications

(a) Flares shall be used only with the net heating value of the gas being combusted being 11.2 megajoules per standard cubic meter (three hundred Btu per standard cubic foot) or greater if the

flare is steam-assisted or air-assisted; or with the net heating value of the gas being combusted being 7.45 megajoules per standard cubic meter (two hundred Btu per standard cubic foot) or greater if the flare is nonassisted. The net heating value of the gas being combusted shall be determined by the methods specified in paragraph (D)(3) of this rule.

(b) Steam-assisted and nonassisted flares shall be designed for and operated with an exit velocity less than 18.3 meters per second (sixty feet per second), as determined by the methods specified in paragraph (D)(4) of this rule, except as provided in paragraphs (B)(1)(c) and (B)(1)(d) of this rule.

(c) If the net heating value of the gas being combusted is greater than 37.3 megajoules per standard cubic foot (one thousand Btu per standard cubic foot), steam-assisted and nonassisted flares can be designed for and operated with an exit velocity equal to or greater than 18.3 meters per second (sixty feet per second) but less than one hundred and twenty-two meters per second (four hundred feet per second), as determined by the methods specified in paragraph (D)(4) of this rule.

(d) Steam-assisted and nonassisted flares may be designed for and operated with an exit velocity less than that calculated for the velocity (V_{max}) below and less than one hundred and twenty two meters per second (four hundred feet per second). This maximum permitted velocity shall be calculated as follows:

$$Log_{10} (V_{max}) = (H_T + 28.8)/31.7$$

where:

V_{max} = maximum permitted velocity, meters per second;

28.8 = constant;

31.7 = constant; and

H_T = the net heating value as determined in paragraph (D)(3) of this rule.

The actual exit velocity of the flare shall be determined by the methods specified in paragraph (D)(4)

of this rule.

(e) Air-assisted flares shall be designed and operated with an exit velocity less than the velocity, V_{max}, calculated as follows:

$$V_{max} = 8.706 + 0.7084 (H_T)$$

where:

V_{max} = maximum permitted velocity, meters per second;

8.706 = constant;

0.7084 = constant; and

H_T = the net heating value as determined in paragraph (D)(3) of this rule.

The actual exit velocity of the flare shall be determined by the methods specified in paragraph (D)(4) of this rule.

(2) Nonassisted flares with a hydrogen content of at least eight per cent (by volume)

(a) Nonassisted flares shall be used that have a diameter of three inches or greater, and a hydrogen content of 8.0 per cent (by volume), or greater, and shall be designed for and operated with an exit velocity of less than 37.2 meters per second (one hundred and twenty two feet per second) and less than the velocity, V_{max}, as determined by the following equation:

$$V_{max} = (X_{H2} - K_1) K_2 \text{ Where:}$$

V_{max} = maximum permitted velocity, meters per second;

K_1 = constant, 6.0 volume-per cent hydrogen;

K_2 = constant, 3.9 meters per second per volume-per cent hydrogen; and

X_{H2} = the volume-per cent of hydrogen, on a wet basis, as calculated by using the ASTM D1946-90.

The actual exit velocity of the flare shall be determined by the methods specified in paragraph (D)(4) of this rule.

(C) Owners or operators of flares used to comply with the provisions of this chapter shall monitor these control devices to ensure that they are operated and maintained in conformance with their design. Monitoring and record keeping shall be maintained as required in paragraph (C)(4) of rule 3745-76-13 and paragraph (C) of rule 3745-76-11 of the Administrative Code.

(D) Compliance determination

(1) Reference Method 22 shall be used to determine the compliance of flares with the visible emission provisions of this rule. An observation period of two hours shall be used in accordance with the requirements of Method 22.

(2) The presence of a flare pilot flame shall be monitored using a thermocouple or other equivalent device to detect the presence of a flame.

(3) The net heating value of the gas being combusted in a flare shall be calculated using the following equation:

$$H_T = k \sum_{i=1}^{n} C_i H_i$$

Where:

k = constant, 1.740×10^{-7} (megajoule-gram mole per parts per million-standard cubic meter-kilocalorie), where the standard temperature for (gram mole per standard cubic meter) is twenty degrees Celsius;

H_T = net heating value of the sample, megajoules per standard cubic meter; where the net enthalpy per mole of offgas is based on combustion at twenty five degrees Celsius and seven hundred sixty millimeters of mercury, but the standard temperature for determining the volume corresponding to one mole is twenty degrees Celsius;

C_i = concentration of sample component i in ppm on a wet basis, as measured for organics by Method 18 of Appendix A of 40 CFR Part 60and measured for hydrogen and carbon monoxide by ASTM D1946- 90;

H_i = net heat of combustion of sample component i, kilocalorie per gram mole at twenty five degrees Celsius and seven hundred sixty millimeters of mercury. The heats of combustion may be determined using ASTM D4809-95 if published values are not available or cannot be calculated.

(4) The actual exit velocity of a flare shall be determined by dividing the volumetric flowrate (in units of standard temperature and pressure), as determined by Reference Methods 2, 2A, 2C, or 2D as appropriate; by the unobstructed (free) cross sectional area of the flare tip.