

§ 1065.644

40 CFR Ch. I (7-1-08 Edition)

$\dot{n} = 58.173 \text{ mol/s}$

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§ 1065.644 Vacuum-decay leak rate.

This section describes how to calculate the leak rate of a vacuum-decay leak verification, which is described in § 1065.345(e). Use Eq. 1065.644-1 to calculate the leak rate, \dot{n}_{leak} , and compare it to the criterion specified in § 1065.345(e).

$$\dot{n}_{\text{leak}} = \frac{V_{\text{vac}}}{R} \cdot \left(\frac{\frac{p_2}{T_2} - \frac{p_1}{T_1}}{t_2 - t_1} \right) \quad \text{Eq. 1065.644-1}$$

Where:

V_{vac} = geometric volume of the vacuum-side of the sampling system.

R = molar gas constant.

p_2 = Vacuum-side absolute pressure at time t_2 .

T_2 = Vacuum-side absolute temperature at time t_2 .

p_1 = Vacuum-side absolute pressure at time t_1 .

T_1 = Vacuum-side absolute temperature at time t_1 .

t_2 = time at completion of vacuum-decay leak verification test.

t_1 = time at start of vacuum-decay leak verification test.

Example:

$V_{\text{vac}} = 2.0000 \text{ L} = 0.00200 \text{ m}^3$

$R = 8.314472 \text{ J}/(\text{mol} \cdot \text{K})$

$p_2 = 50.600 \text{ kPa} = 50600 \text{ Pa}$

$T_2 = 293.15 \text{ K}$

$p_1 = 25.300 \text{ kPa} = 25300 \text{ Pa}$

$T_1 = 293.15 \text{ K}$

$t_2 = 10:57:35 \text{ AM}$

$t_1 = 10:56:25 \text{ AM}$

$$\dot{n}_{\text{leak}} = \frac{0.0002}{8.314472} \cdot \frac{\left(\frac{50600}{293.15} - \frac{25300}{293.15} \right)}{(10:57:35 - 10:56:25)}$$

$$\dot{n}_{\text{leak}} = \frac{0.00200}{8.314472} \cdot \frac{86.304}{70}$$

$$\dot{n}_{\text{leak}} = 0.00030 \text{ mol/s}$$

[73 FR 37327, June 30, 2008]

EFFECTIVE DATE NOTE: At 73 FR 37327, June 30, 2008, § 1065.644 was added, effective July 7, 2008.

§ 1065.645 Amount of water in an ideal gas.

This section describes how to determine the amount of water in an ideal gas, which you need for various performance verifications and emission calculations. Use the equation for the vapor pressure of water in paragraph (a) of this section or another appropriate equation and, depending on whether you measure dewpoint or relative humidity, perform one of the calculations in paragraph (b) or (c) of this section.

(a) *Vapor pressure of water.* Calculate the vapor pressure of water for a given saturation temperature condition, T_{sat} , as follows, or use good engineering judgment to use a different relationship of the vapor pressure of water to a given saturation temperature condition:

(1) For humidity measurements made at ambient temperatures from (0 to 100) °C, or for humidity measurements made over super-cooled water at ambient temperatures from (-50 to 0) °C, use the following equation: