PRIMARY FLOW SIGNAL, INC.

THE LEADER IN RELIABLE FLOW MEASUREMENT

ISO 9001 QMI REGISTERED QUALITY SYSTEM

Technical Information Brief

Definitions of SCFM and ACFM for use with gas flow metering applications.

SCFM versus ACFM

As with all measurement, the proper use and understanding of units of measure is vital to the accurate measurement of flow in the gas phase. Two of the most common units of measure are frequently confused, an may result in massive errors on flow measurement, if not correctly interpreted and applied. The following provides succinct definitions for each, and examples to follow for clarity.

STANDARD CUBIC FEET PER MINUTE(SCFM)

An expression of gas flow in ***standard cubic feet*** is an expression of the amount of matter present in a given cubic foot under "standard" conditions. For air and other gases, the standard conditions most often defined are ***14.7 psia, 60°F, and 60% relative humidity***. Depending upon the application, country of practice, prevailing custom or preference of the indigenous technical communities, other "standards" may be in effect, such as, 14.7 psia, 60°F, and 36% relative humidity, or 1 bar, 0°C, and 0% relative humidity. It is essential to make sure all parties agree on the "standard" to be utilized in a given application.

The flow unit SCFM is simply an indication of the flow rate ***at standard conditions*** and is independent of the actual line conditions.

ACTUAL CUBIC FEET PER MINUTE(ACFM)

An expression of gas flow using ACFM (actual cubic feet per minute) is a direct indication of the flow rate at "line" conditions.

Therefore, converting flow units from SCFM to ACFM is as follows:

ACFM = Indicated SCFM (Density at Standard Line Conditions/Density at Actual Line Conditions)

EXAMPLE 1 GIVEN:

A 6" HVT-PI, Halmi Plastic Insert Venturi produces 8.431 inches wc differential pressure at 500 SCFM, 20.7 psia, 150°F, and 0% relative humidity(dry air flow.) Therefore:

$$\text{ACFM} = \text{SCFM}\left\{\frac{\rho_S}{\rho_L}\right\} = 500\left\{\frac{0.076045}{0.091639}\right\} = 415 \text{ ACFM}$$

Equation #1.

To calculate the density of dry air at line conditions, the following equation applies:

$$\rho_L = \frac{2.6991\ (\text{PSIA})}{(^\circ\text{F} + 459.69)}$$

Equation #2.

EXAMPLE 2 GIVEN:

Using the same information as provided in *Example 1 Given* above, except the air is now 34.7 PSIA(20 PSIG) and 210°F, the air density becomes:

$$\rho_L = \frac{2.6991\ (34.7)}{(210 + 459.69)} = 0.139854 \text{ lb/ft3}$$

Equation #3.

Therefore, at 500 SCFM the following obtains:

$$\text{ACFM} = \text{SCFM}\left\{\frac{\rho_S}{\rho_L}\right\} = 500\left\{\frac{0.076045}{0.139854}\right\} = 272 \text{ ACFM}$$

Equation #4.

End of Examples.

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