Tech Tip
Calculating CFM in the Field

CFM is the term that relates to the **C**ubic **F**eet per **M**inute of air being distributed through an HVAC system or in essence, the total "Volume of air".

Rick was explaining to a young technician the importance of having the proper CFM on higher efficiency equipment.

Rick uses a variety of tools to calculate CFM ranging from velometers and manometers, to flow hoods. The tech has not invested in the more advanced meters yet so Rick has the opportunity to educate him on CFM from temperature rise.

By using the formula **CFM = Volts x Amps x 3.413 / TD x 1.08** Rick said he can determine the CFM from an electric heater, or a heat pump with electric auxiliary strips.

Setup

- Make sure the motor is set for the speed you would like to check CFM.(Cooling speed and heating speed may need to be reversed)
- Turn the electric heat on or turn the heat pump to the emergency heat position.
- Measure the voltage of the incoming line.
- Measure the total amperage of the air handler.
- Measure the Temp Difference between the Supply air and Return air.

Example

Voltage measured is 235 volts
Total amperage of strips and blower motor is 49 amps
Return air temperature reads 70 degrees
Supply air temperature reads 100 degrees
The TD (Temp Difference) from return to supply is 30 degrees
Rick then plugged the information into the formula and got out his trusty calculator.

$$CFM = \frac{235 \times 49 \times 3.413}{30 \times 1.08} = \frac{39{,}300}{32.4} = 1{,}212 \text{ CFM}$$

The number 1.08 is a mathematical constant for standard air that is typically used when you calculate CFM using this formula. This number does not change like voltage, amperage, or temperature difference. It will change slightly due to altitude, air density, etc. The number 3.413 is how many BTUs there are in every watt. Example: 10,000 Watts X 3.413 = 34,130 BTUs.

Rick explained that this unit is moving enough air for a nominal 3-ton unit; a typical unit produces approximately 400 CFM per ton. (1,212 / 3 tons = 404 CFM per ton)

The young tech then asked if this could be done on a gas or oil furnace and Rick replied "yes". He explained that the Volts x Amps x 3.413 formula is really output BTUs, so if the tech knows what output his furnace is producing then it is easy to plug that number in at the top of the formula.
A combustion gas analyzer is one tool that can be used to determine accurately what the furnace BTU output actually is and Rick said he will teach him how to "Clock the Meter" this Fall to determine gas furnace output.