



Tech Tip Two-Stage Gas Furnaces

Two-stage gas furnace equipment has become more prevalent over the past few years and this Tech Tip is being written to dispel some of the misconceptions about these units.

Efficiency

Gas heating is rated with 2 separate measurements, the first being **AFUE**. This rating is Annual Fuel Utilization Efficiency which is based on the entire year's fuel consumption for this product. It factors in the total amount of fuel being used by the appliance for the year and how much of that fuel purchased is being converted to useable heat for the home.

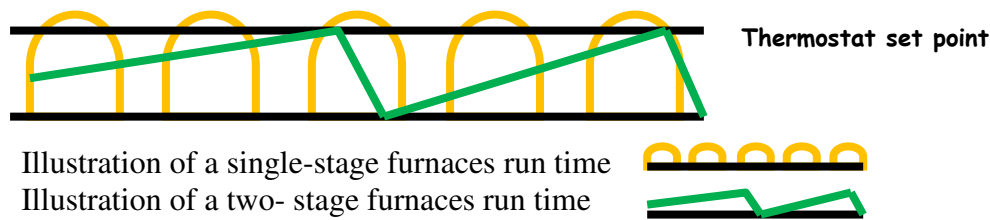
For example on a 60% efficient furnace will convert \$60 of every \$100 of purchased fuel into useable heat for the home, this leaves \$40 of that \$100 going up the flue every year.

The second measurement is called **Combustion Efficiency**. This is how efficient the fuel is being burned **after** the system has been running for a while (approx 15 min) and the system has warmed up and is operating at "steady state".

This is a little confusing because a 60% AFUE furnace, after reaching steady state, will typically operate at 80% Combustion Efficiency. So while the system is up and running, it is 80% combustion efficient, but over the entire year of starts and stops and pilots being burned the AFUE is 60%. You may see this on an old 60% standing pilot system's data plate stating the input of 100,000 BTUH input and 80,000 BTUH output or Bonnet Capacity.

Having said all of this, there is a misconception that an 80% two stage furnace is more efficient than an 80% single stage furnace. This is not true. These systems are both 80% AFUE and can only be improved if the customer will upgrade to a system like a 90% or a 90+%.

The benefit of staging to the customer is not efficiency, but comfort. Instead of heating the home up quickly and allowing for it to cool, then heating it up quickly again, the 1st stage allows low fire to warm the home over a longer period of time keeping a more constant level of heat.



Staging

Staging a gas furnace can be achieved in a couple of ways; typically it is done with a two-stage thermostat using W1 for first or low stage and W2 for high or second stage. This method is the most desirable method for most applications. This way the only time second stage is used is when the thermostat calls for it to come on.

The second method is to use a single stage heating thermostat and set up the furnace control board to time the second stage on. On a call for heat, this method will allow the furnace to begin in low or first stage. After approximately 8 to 12 min, if the thermostat has not satisfied, the second or high stage will come on and finish the call for heat.

Note: This method is desirable when the thermostat is on the first floor with a large opening to the second floor because low fire may not warm the first floor area fast enough allowing all of the heat to rise and overheat the second story.

