

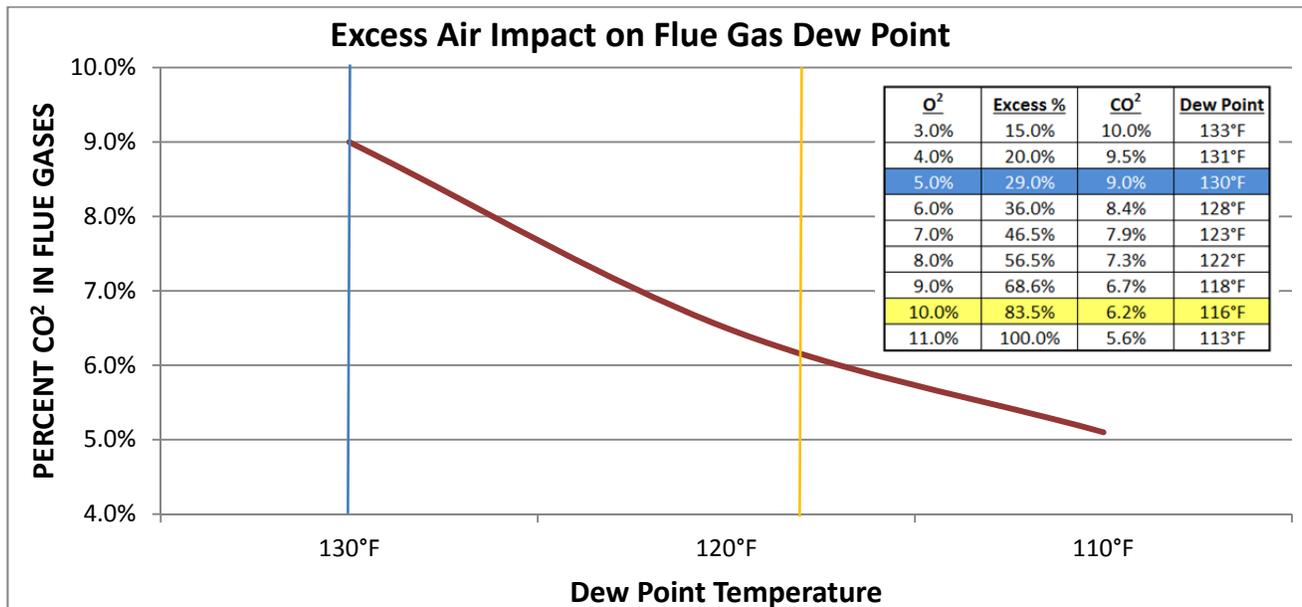
High Turndown Condensing Boilers- Is Yours Condensing in Low Load Conditions?

Industry consensus is we need return water temperatures in the low 130's to condense and improve efficiency by capturing the latent heat of flue gas inherent with this process. This is the highest temperature under normal conditions in which condensing occurs, further lowering system return temperatures from this point greatly increases condensing and efficiency. The lower you go, the more you benefit from this technology.

Have you noticed more condensing boilers on the market with higher turndowns? 10,15, even 25:1, meaning a 2,000 MBH boiler can fire as low as 80,000 btu's with 25:1 turndown. For engineers with systems with large differences in load conditions throughout the year this sure sounds good. "I can turndown this unit to 1/25th of its output to match the load requirement and really take advantage of this in the "shoulder" seasons (months with low heating load requirements)." These are ideal conditions to condense as calculated supply water temperatures will be lowered and subsequent return temperatures will be cooler as well, often hitting the "condensing zone" in the low 130's. Simply put, this is the optimal time for most systems to utilize condensing boilers technology. It is commonly believed these condensing boilers with high turndown will be ultra-efficient at these low inputs and temperatures. It's barely firing, and it's condensing..... it has to be efficient...Right??

The answer surrounding efficiency is in the O² setting and the amount of turndown is related to ignition reliability sought by the manufacturer. Wait to you see what they have done and more importantly what you're getting vs. the advertisement..... What??

The chart below shows the inverse relationship between excess air (O² settings) and dew point (the temperature at which we can condense the flue gases). As excess air (O²) increases, the dew point decreases and you must return colder water to condense the flue gases. Most condensing boilers have an O² setting of 5-7%; at 5% you see a dew point of 130°F, the proverbial sweet-spot. Now if we increase the O² setting just 5% to 10%, the dew point falls to 116°F. This means you need the return water below 116 degrees to condense, much below the perceived sweet-spot in the low 130's. Ask yourself how often will your system return below 130°F and then what are the chances below 116°F?



If you use boilers marketing high turndown, be sure to ask for the O² levels at low fire, you will find some are off the charts, I found one approaching 20% O²! So you have this boiler with great firing range to match various load conditions, but certainly questionable condensing performance in the low range, perhaps the very reason you wanted this type of unit or specify this type of boiler. How much turndown is too much and why are the settings for low fire so different than high fire? You may want to consider modular boilers with proven turndown. If you really have a small load - use a small boiler in season that runs efficiently in its low firing range.

The other issue is ignition reliability at high turndown. As gas valve settings are made at low and high fire, a burner's modulation curve is plotted and manufacturers have to decide where their unit will reliably light on this curve and begin modulation. In other words, how close to the bottom of the low end do you want to go? A major hurdle of reliable ignition at high turndown is simply the performance of the blower, they can only go so low. Remember the blower has to function at maximum rate with a set vent length or pressure and certain combustion characteristics that play a vital role in blower size and selection- the top end determines the bottom end. Are there new fans out there or do we all use the same ones? We feel some manufacturers are pushing the limits of a major component and sacrificing reliability for "marketability." Ignition is the cornerstone of reliability and will never be compromised at Thermal Solutions.

The illusion of high turndown boilers providing trouble-free reliability and efficient operation in low load conditions has been exposed. Don't be marketed into a solution, design one.

TS Marketing Department