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June 29th 2009 ~ Monday Morning Minutes:

Turndown Ratios in Condensing Boilers and Water Heaters



Early hydronic boilers started with on-off control, moved into staging, and many now use modulating control. Each one of these steps has enabled us to increase the seasonal efficiency of boiler plants by reducing the amount on-off cycles. The reason we see these savings is that the pre-purge cycle and post-purge cycle of boilers result in drastically reduced efficiencies. As we reduce the number of on-off cycles, we remove those inefficient periods of operation and let the boiler run.

So, what is turndown ratio and how can it help me save money? Turndown ratio is the ratio of the maximum fuel input rate to the minimum fuel input rate of a modulating burner. They are used to help the engineer determine how low a boiler/burner can modulate before it turns off. The Laars Rheos+ boiler has a 5:1 turndown ratio. This means that the boiler can modulate down to 20% of full-fire before it will turn off ($100\% \div 5 = 20\%$). This turndown ratio provides a great advantage in the single heat exchanger boiler such as the [Laars Neotherm](#), as well as in the dual heat exchanger (copper/stainless steel) such as the [Laars Rheos+](#).

The larger the turndown ratio, the more we can modulate down. This keeps the boiler running longer at lower modulation, which saves the owner money due to reduced on-off cycles. Great examples of this are [Aerco Benchmark Boilers](#) and [Aerco KC100 Water Heaters](#). These boilers/water heaters have a turndown ratio of 20:1. That means that they can modulate down to 5% of full-fire. This results in drastic operational savings.

Be sure to know the turndown ratio of your boiler and what the effect of that turndown ratio can have on the lifetime operating costs of your system.

In next week's issue, we will discuss how to handle the condensate created by condensing boilers and water heaters.

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