High-Efficiency Equipment is Here to Stay

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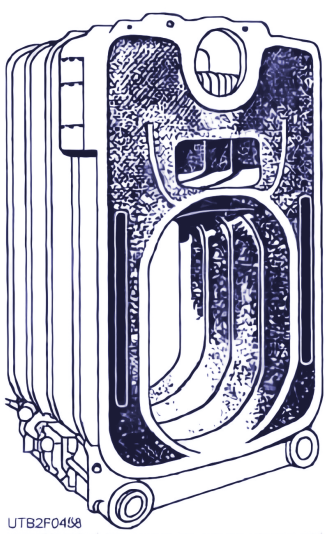
The landscape in the heating industry has drastically changed. Over the years, when you entered a typical boiler room in the Northeast, it was very common to find a sectional cast iron boiler(s) and usually some type of indirect heating appliance for domestic hot water. It could be a side-arm heat exchanger with a storage tank or a storage tank with the heating coil installed directly inside.

Nowadays, it has become quite common to find high-efficiency modulating and condensing gas-fired boilers (either liquefied petroleum [LP] or natural). These boilers are not your average "run of the mill" atmospheric gas boilers, either, because their efficiencies range between 90%–96%. They use a Neg/Reg gas valve and fan assembly, which means the amount of gas that flows into the burner for combustion is *regulated* by the fan assembly's blower speed. The blower speed is controlled by an on-board micro-processor that is performing several internal calculations to determine the appropriate amount of British thermal units (BTUs) needed to satisfy the call. Hence the *modulating* part—it only uses the amount of gas necessary to satisfy whatever load it is currently *seeing*.

Most of the residential models have a "turn down" ratio of 10:1, meaning they can fire down to 10% of their total capacity and, of course, all the way up to 100% of their capacity. It has become quite common in larger residences to install two or more small "mod/con" boilers, that, when combined, can handle the home's total load. However, more importantly during the normal course of the heating season, when the home is operating at "part load," the boiler plant consumes just the amount of energy needed to satisfy the current load that the house is *seeing*.



Cast iron sectional boilers used to be the norm.

The same holds true for commercial applications such as apartment buildings, condominiums, churches and schools. The larger commercial "mod/con" boilers also offer turn down ratios 10:1. That means with a couple of commercial boilers, you can fire down to 5% of the total BTU capacity of the boiler plant. With this type of turn down, building owners are experiencing fuel savings in range of 35%–40% and higher!

Unique features

Another unique feature of these boilers is the venting options. The blower motor is designed to not only bring combustion air into the burner assembly but also vent the residual products out of the building. Most of the "mod/con" boiler manufacturers have approved their boilers to use several different vent materials. They are approved to be vented with PVC, CPVC, polypropylene and stainless steel vent pipe.

Each manufacturer provides very detailed instructions on the *dos* and *don'ts* of how to properly vent their boilers. Following these instructions is critical to allow the boilers to operate efficiently. Of course, all of this piping needs to be sealed tight to meet the venting codes.

These boilers encourage the condensing of their flue products, which is the exact opposite of traditional boilers. Their heat exchangers are designed to withstand the corrosive nature of the condensate that forms when the combustion products are condensed. Of course, this condensing action is where the additional efficiency points are obtained.

Some of the by roducts of this condensing can gather in the boiler's heat exchanger. If allowed to accumulate, they will negatively impact the boiler's efficiency performance, which is why most manufacturers suggest an annual inspection and cleaning of the heat exchanger, if necessary. Also, the venting should be inspected to make sure nothing has changed that could negatively impact the operation of the boiler. This means *every* "mod/con" boiler *needs* to be inspected *every year*.

One of the oilheat industry's shining stars has been its reputation for service and maintenance. The need for these high efficiency boilers to be maintained is a perfect opportunity for a company that has a service department to offer service contracts to homeowners, commercial property owners and management companies. Most of the boiler manufacturers or their local representatives offer classes on servicing these new "mod/con" boilers.

ECM circulators

A new style of "smart" pump has made its way into the

North American hydronics mechanical rooms. These new circulators are ECM pumps. ECM stands for electronically commutated motor and they are very different from the PSC (permanent split capacitor) motors we are accustomed to with wet rotor pumps. The rotor in this ECM motor has permanent magnets instead of wire windings that are separated from the system fluid. The magnets are located inside a stainless steel rotor can and react to the magnetic forces created by electromagnetic poles in the stator.

A microprocessor, which "sits on-board" the pump, reverses the polarity of the stator poles rapidly (within milliseconds), forcing the rotor to be rotated in the proper direction. The faster these poles reverse their polarity, the faster the rotor spins, meaning the faster the impeller spins.

ECM circulators can provide four times more starting torque compared to a PSC wet rotor pump and incorporate a microprocessor that has software on-board, allowing the pump to perform many functions.

For example, one application may call for a constant pressure differential where the building is zoned with zone valves. Normally as valves close, the pump would develop additional head pressure across the remaining open zones, causing an increase in flow rate through these zones. This wastes energy as well as creates potential noise problems due to increased velocity. With this constant differential in pressure capability, as valves close, the pump momentary senses an increase in differential pressure and quickly slows down the pump's speed to eliminate the change in pressure. The result is no change in flow rate through the remaining open zones, no wasted energy and no velocity noise problems.

Another application that the microprocessor can control is called proportional differential pressure. The circulator control is set for a specific design head loss for a system. When the zone valve (or valves) then closes, once the pressure differential starts to climb, the circulator reduces its motor speed. The difference here is proportional control instead of maintaining a set differential. It will lower the speed and thus pressure differential proportionally to the reduction in flow rate. The result is an increased reduction in energy consumption.

The efficiency of these Greener circulators is designed to meet the ever-increasing efficiency standards that have made their way to North America. Their "wire to water" efficiency is higher than the current PSC wet rotor circulators. In addition, their multiple application capabilities with on-board microprocessors, and their reduction in wattage use, make them a compelling alternative to current offerings. Contact me at *gcarey@fiainc.com* or 1-800-423-7187. **ICM**