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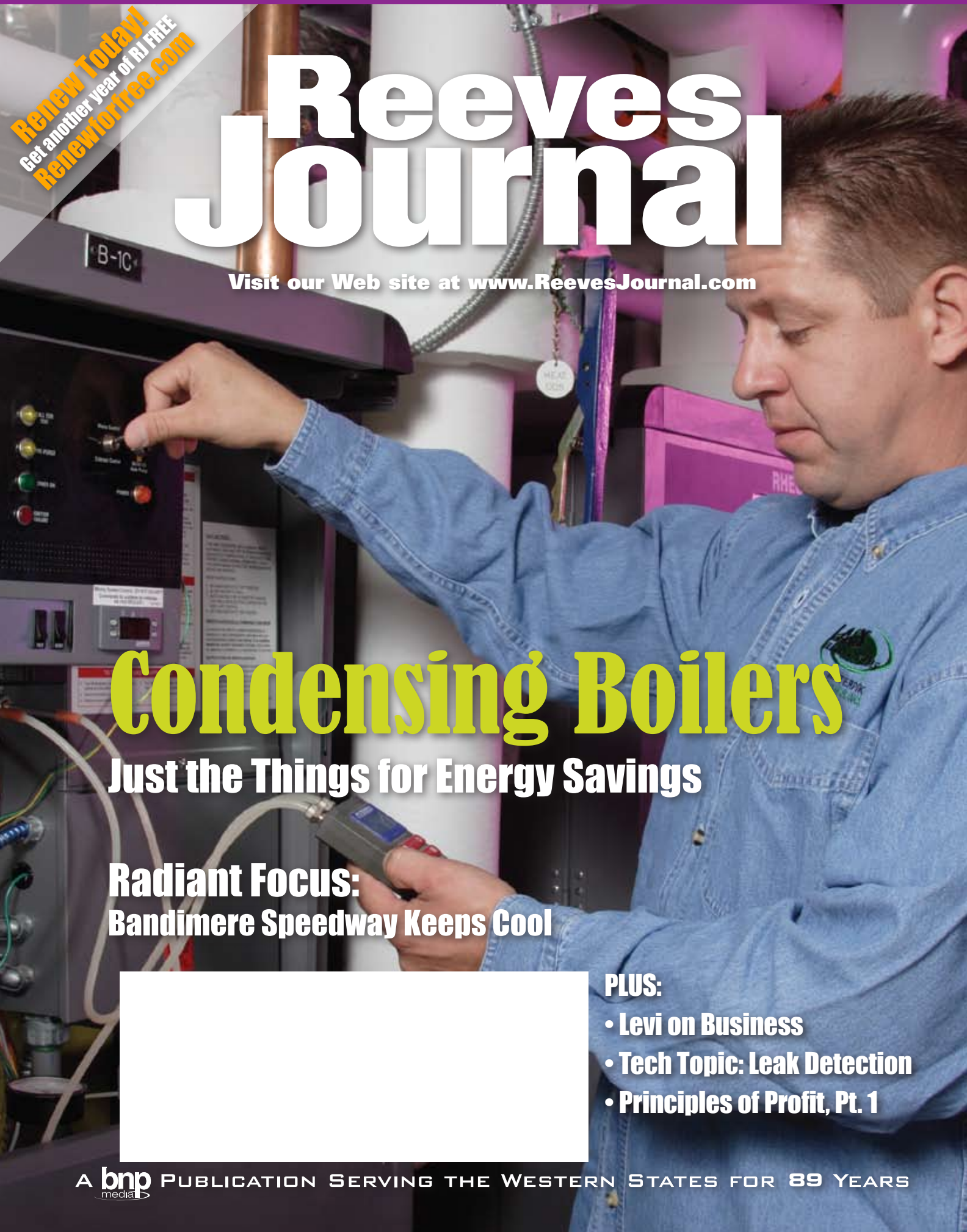

Condensing Boilers

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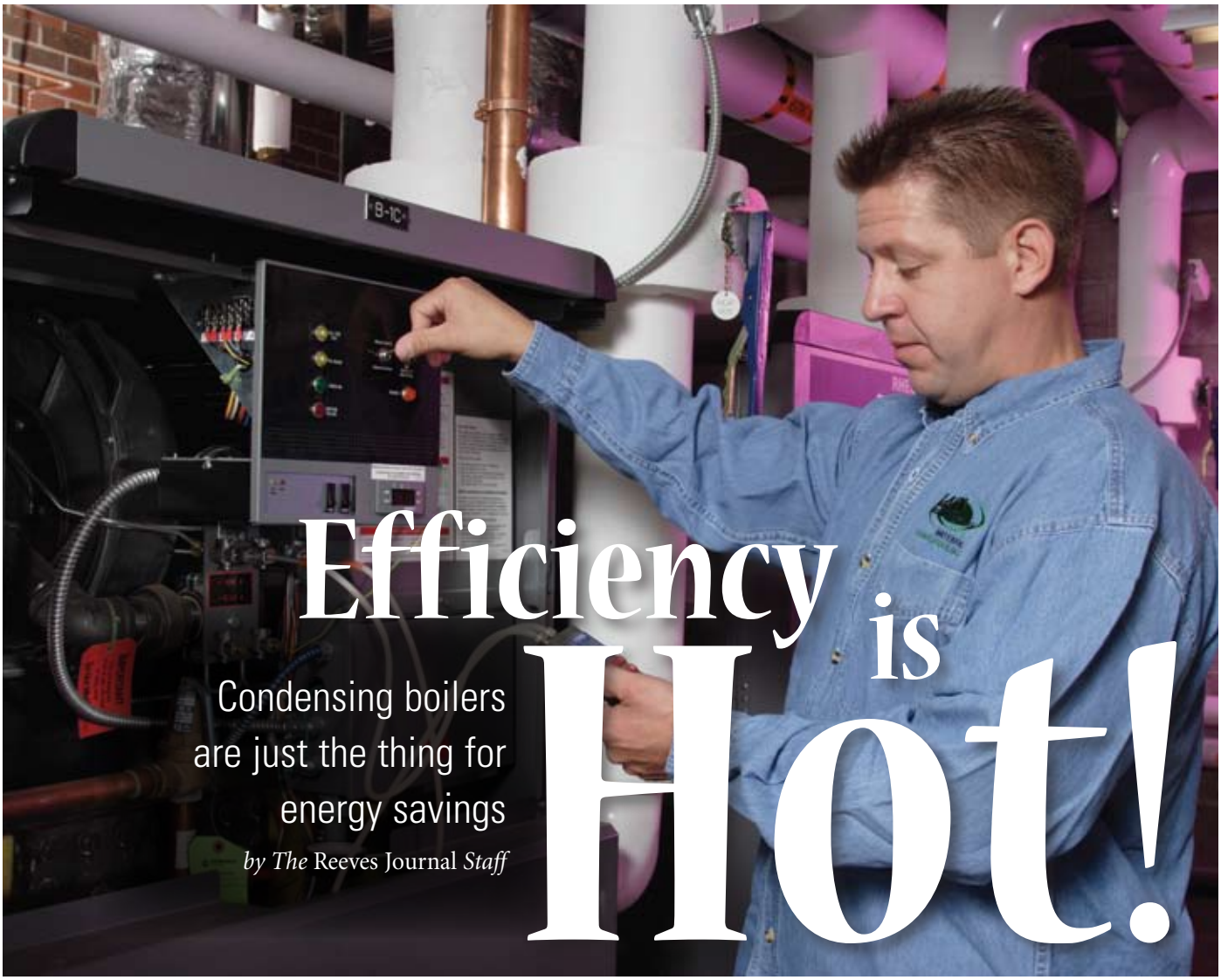

Efficiency is Hot!

Condensing boilers are just the thing for energy savings

by The Reeves Journal *Staff*

When one is talking about green plumbing products, it doesn't take too long for the discussion to land on the methods used to make hot water.

There are quite a number of ways to get water hot for domestic consumption. But, according to the U.S. Department of Energy, water heating currently represents up to 17 percent of national residential energy consumption, making it the third-largest energy user in homes, behind heating and cooling, and kitchen appliances.

Couple that with rising fuel costs, a heightened awareness among your customers of all things green and their desire to reduce their "carbon footprint," means they're longing for an efficient and environmentally sensitive way to get their water hot.

One of the most efficient ways to make hot water, with fuel efficiency ratings of up to 95 percent or better, the condensing boiler is sure to make anyone's short list of "green" upgrades.

A 95 percent thermal efficiency rating, for example, means that 95 percent of the energy used by the appliance is actually converted to heat, while the remaining 5 percent goes out the exhaust. Conventional, non-condensing boilers typically have efficiency ratings hovering in the 70- to 80 percent range.

How Does it Work?

In a conventional boiler, the burning fuel is used to heat the water in a heat exchanger. The problem is the exhaust gases are still quite hot when they're vented—a lot of heat is actually wasted, a virtual bankroll going out the vent stack each and every month.

Ed Sullivan, North American director of training for Bosch, Londonderry, N.H.-based maker of Bosch and Buderus-branded condensing equipment, said the secret to condensing boilers' efficiency numbers is the condensing.

"Simply put, normal flue gas temperatures are around 350 degrees Fahrenheit. This may seem high; however, years ago it was between 600- and 700 F," Sullivan said. "Today with condensing technology, we take that still very hot flue gas and extract the heat from it until it cools down to about 131 F."

At this point the flue gases start to condense, but that condensation and remaining flue gases are still hot compared to the inlet water temperature, so the heat transfer continues to until the flue gas and condensate have exited the unit.

"Hence, 'condensing technology'," Sullivan said.

Once it gives up its heat, the acidic condensate liquid must be drained away from the heat exchanger according to manufacturer's specifications or local codes, if applicable, or it will hamper performance.

In simple terms, the efficiency of a condensing appliance is higher simply because more heat is transferred into the water than would otherwise leave the appliance through the vent stack, according to Stirling Boston, marketing director for Lochinvar Corp., in Lebanon, Tenn. The simple difference between condensing and non-condensing designs, Boston said, is that one is designed to condense at all times and the

other is not.

"At the point of condensing, the flue gas is a much cooler gas than in a non-condensing mode and changes state to an acidic liquid which is commonly called condensate," Boston said. "Condensation in a water heater or boiler is a good sign that the efficiency of the unit is high (usually 87 percent or greater). The main consideration is that the boiler or water heater is designed to handle these cooler flue gases and acidic condensate properly. Any appliance can and will condense if the return water temperatures are cool enough, but not all units are designed to operate this way under normal work loads or for extended periods of time."

And there's another of the condensing boiler's secrets—generally speaking, they tend to like it when a system's return water temperature is lower than about 140 degrees Fahrenheit. That's what it takes to convince the flue gasses to condense, and that's why condensing boilers are most commonly a first choice for low-temperature systems like radiant floor heating, snowmelt, swimming and other such applications, according to Morgan Muir, president of JTG/Muir, a regional manufacturers' representative firm in Oakland that represents Heat Transfer Products, Inc. in California and Nevada.

"Different products have better efficiencies at higher temperatures. In general the lower the temperature of your return water, the higher the efficiency," Muir said, adding it's more of a guideline than a hard-and-fast rule. "That's where people and engineers make their mistake. They think it has to be a cold-water return because that makes sense, but it's not always true. Generally you will have a better efficiency but [not having the cooler return water] doesn't discount using a condensing boiler. But you will have a better yield [with cooler return water.]"

So, designing piping systems that send the coldest possible water back to the boiler is a must, according to Joan Mishou, manager of applications engineering with Laars Heating Systems in Rochester, N.H.

"Also, designing systems that can satisfy the load with the lowest possible water temperature is also huge. If you don't need 180- to 200-degree water in the system to heat the space, then don't use it. Outdoor and indoor air reset controls change the system water temperature depending on what is actually needed to match the heat loss of the structure.

In systems with heating and domestic water indirect combined, there's no reason to keep the water temperature high in the heating system just because the indirect domestic water heater needs that, she said, noting domestic water temperatures need temperatures in excess of 140 F in order to kill the *Legionella* bacteria. And today's modern control systems are more than capable of handling multiple temperature systems.

"So actually boiler (space heating) systems are where you'll get the most bang for your buck in the condensing appliance realm, in my opinion," she said. "Once over 140 degrees, condensing appliances are more efficient than conventional, but the difference may not be dramatic enough to warrant the extra up-front cost of the condensing unit."

Payback

And these days, upfront costs can be off-putting to some customers, even if they're well aware of the hyper-efficiency of the new condensing unit he or she is considering. A contractor could use a simple Excel spreadsheet on a laptop computer to run some numbers and show how long it will take for the condensing unit to pay for itself in energy savings. There are online options, too.

"Lochinvar offers a payback calculator that gives contractors this exact information based on the specifics of the job they're working on," Boston said, noting it can be found by typing *http://shield.lochinvar.com/Contractor/Calculator.aspx* into your browser. "I worked on an analysis this week for a contractor that showed a 1.14-year payback for a 200,000 BTU/Hr condensing water heater design over a traditional 200,000 BTU/Hr non-condensing unit."

Steve Bagshaw, a spokesman for Navien America Inc., in Tustin, Calif., said the savings realized by using a condensing tankless water heater, for example, over a regular, non-condensing tankless unit would be about $45 annually: "Payback based energy savings and MSRP using DOE standard usage calculations and energy rates for 2008, the payback is two years," he said.

Muir said the determining factor in payback time is the load—the higher the better the return on investment: "If you don't have a big load and you buy a piece of equipment, is return or payback is a function of that load," he said. "You're using more energy and the equipment is amortizing itself—it's making economic sense. The more hours they're in use, the lower the payback time. Two years sounds reasonable, given 1,500 hours of commercial use per year. In residential your load profile is pretty small unless you're doing space heating and water heating. Now you're covering two loads and now you're talking."

Muir said he's seeing the biggest interest in condensing appliances in the spec. market, where he said the engineers are, "looking out for the end-user." And that's a way for a contractor to set its business apart from the pack.

"They're looking at the return on investment over three or five or more years into the future. Contractors are looking at macro issues with the exception of the enlightened, green-type plumber, who's actually looking at the end-user's interests and will make sure they are aware of the option," Muir said.

Contractors and end-users alike need to realize that condensing boilers aren't like old water heaters. Almost all condensing boilers are built with the idea of periodic service in mind. They're not an "install it and forget it" proposition, Muir said.

"If you think that's what's going on with them you're not doing your customer a service," he said. "They were designed for somebody to come back periodically and maintain them. It's a great business opportunity that brings a lot more value to your company in the long run if you can, in the future, sell them based upon service contracts or service relationships. It's a huge thing for plumbers.

But nothing sells itself. Contractors also need to seek out training to learn about the latest in condensing boiler technology. Check out your local supply houses, PHCC chapters and manufacturers' reps to watch for training classes, and then make the time to attend.

"Under the recent federal stimulus package, there's a $1,500 tax rebate and there are state and local incentives and some utilities are offering rebates," Sullivan said. "Those are for the homeowner, the contractor who knows these rebates and/or offers and uses them can stay busy while others are waiting for the phone to ring during slow times." ■