

The right way... *indirectly speaking*



By George Carey
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I can't tell you how many times over the years I have heard, "I just received a call from my customer and he isn't happy! YOUR indirect water heater is running out of hot water. I promised the customer these indirects CAN'T run out...they will give you all the hot water you could ever want. There must be something wrong with your tank...when can you get out to the job and fix it?"

Most of the time, after asking a few questions about the job, you find out that the indirect water heater was being tasked with more than what it is capable of providing—someone didn't really know all the factors that will influence whether the indirect heater will be successful or not!

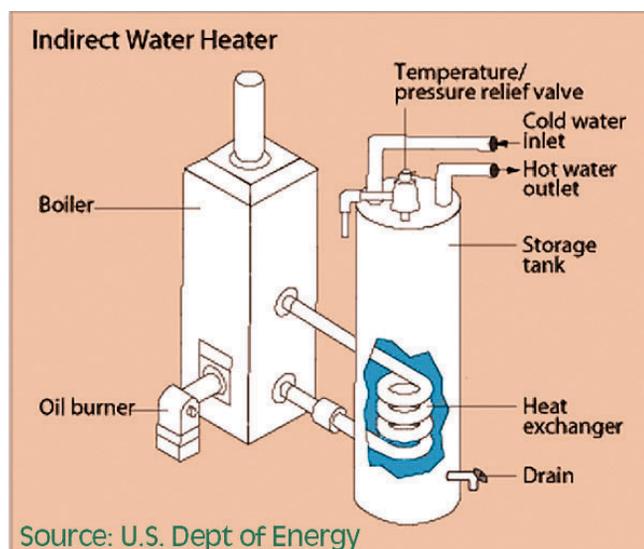
Factors such as:

- What is the BTU/H rating of the boiler?
- How many showers, tubs, etc. are there?
- What is the gallon per minute rating of the showers?
- Are the showers used simultaneously?
- How long is the average shower?
- Is the boiler prioritized for the domestic water call?
- Is the indirect water heater piped with a zone valve or zone pump?
- What is the temperature of the stored water?

The answers to all these questions are key to selecting and installing an indirect water heater. If the installing contractor takes them into account, he will ensure that his customer has plenty of hot water.

The Indirect Basics...

Indirect water heaters are a very popular and common source for generating hot water in both residential and



commercial applications.

Basically, an indirect water heater takes the older tankless coil out of the boiler and places it inside a storage tank. But with an indirect heater, the boiler water circulates through the coil and the domestic water surrounds the coil in the storage tank.

The term indirect comes from the fact that we are not placing a flame beneath the tank to heat the water directly. Instead we are circulating hot water from a boiler through a coil that is surrounded by cold water. It is treated just like another heating zone, except this is heating your domestic water and not the air surrounding your baseboard.

Based on one of nature's laws, "Heat goes to cold," the hot boiler water in the coil gives up some of its heat/energy to the surrounding cooler water. How much heat, how fast and for how long are sometimes the source of confusion and problem jobs.

Everyone knows you have to add heat (BTUs) to the domestic water to raise its temperature. Knowing how much heat is required can help you avoid calls from angry customers.

The definition of a BTU (British Thermal Unit) is the amount of energy required to raise one pound/pint of 62°F water to 63°F. One gallon of water, which is the term we use to quantify water, weighs 8.33 pounds. So to raise one gallon of water one degree Fahrenheit, you need 8.33 BTUs.

The industry has traditionally rated water heater capacities based upon a 100°F temperature rise (40°F EWT to 140°F LWT*). So to raise one gallon of water 100°F it will require 833 BTUs.

To put that gallon of water in terms of time (the standard is gallons per minute), multiply 833 BTUs per gallon times 60 minutes, which equals 49,980 BTU/H. This tells us that to raise one gallon per minute of water 100°F we need a boiler rated at 50,000 BTUs/H output.

Most people aren't going to shower with 140°F water. But they will shower with 105°F water, and that means with a shower head rated at three gallons per minute (GPM), you need 97,461 BTUs to heat 40°F water to 105°F temperature. Now try running two showers, rated at 3 GPM each, at the same time. You will need 194,922 BTUs/H output from the boiler.

Can you see why flow restrictors are so popular? Or why in some cases you can't run two showers at the same time? An indirect water heater offers many advantages over bottom fired tanks and tankless coils, but you have to understand how it "does what it does."

Real Life Real Problem...

A Service manager shared this recent experience with me. A salesman for the company was selling a replacement hot water boiler for a customer who also happened to have an older oil-fired water heater. The salesman

made the “pitch” of upgrading the bottom fired water heater to an indirect heater with all of its advantages, such as life-time warranties, increased capacities, etc. The homeowner liked the idea, so it became part of the package.

The homeowner mentioned that it was not uncommon for both his wife and daughter to take showers for 30-35 minutes simultaneously in their own bathrooms. He said they never had any problems meeting this demand and didn’t want any with the new indirect. That’s when the salesman contacted the service manager looking for his help in performing the necessary calculations to ensure the new indirect was going to work.

The service manager brought a five gallon bucket out to the house, performed the “bucket test” and determined that both shower heads were rated at 3 GPM and the oil fired water heater was firing at .85 GPH. It was quickly determined that there was NO WAY this water heater could supply six gallons per minute of 105°F water for 30-35 minutes!

A nozzle firing at .85 GPH with 100 psi oil pump has a BTU/H input of 119,000. With an efficiency of 85%, the output would be 101,150 BTU/H. After the initial stored water had been used up, the tank would only recover at a flow rate of 3.1 gallons per minute of 105°F water (assuming 40°F EWT—105°F).

THE SOLUTION...

Instead getting into a confrontation with the customer (who, it turns out, is a lawyer!), the service manager just

wanted to make sure the new DHW system would perform.

The BTU/H capacity of the new hot water boiler was 119,000. Even with priority on a DHW call, the indirect could not supply six gallons per minute of 105°F for 30 minutes. Because of the boiler’s limited BTUs (relative to the necessary flow rate conditions), there was no sense in providing anything bigger than a 40 gallon indirect. In fact a 40 gallon indirect water heater will handle most residential applications, because people usually take showers one at a time for 10-15 minutes. Additionally with more and more people aware of conservation as well as rising water bills, most shower heads are rated as low as 1.5 –2 gallons per minute. Between the stored volume of hot water and the BTU/H capacity of most residential boilers, a 40 gallon indirect has sufficient capacity to handle such demands.

Because of the unique demands of this particular customer, it was suggested to add a 50 gallon storage tank and bronze pump and recirculating line to the 40 gallon indirect water heater. It was also suggested to store the water at 140°F and use a tempering/mixing valve to “knock” the water down to 105°F. Between the additional storage and elevated temperatures, the service manager felt comfortable in handling his customer’s unique request.

If you have any questions or comments please call me at 1-800-423-7187 or email me at gcarey@fiainc.com

*EWT=Entering Water Temperature; LWT=Leaving Water Temperature (return water)—Editor