CONDENSING TANKLESS WATER HEATERS

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 Tankless water heaters are available in:
- Electric
- Natural gas
- Propane fired models

How do they work?
A term that should be avoided is “instantaneous”. Tankless water heaters are not instantaneous!

It takes time to get the water to the fixture(s)
CAUTIOUS ADVERTISING AND REPRESENTATION

Hot Water Delivery
- Time Lag/Distance
- Flow Rate
- Recirc/Non-Recirc
**WHY TANKLESS?**

**Performance**
- Endless supply of hot water
- Steady temperature
- Energy efficient

**Savings**
- Saves money
- Saves space
- Saves energy
- Saves the environment

**For Contractors**
- Better margins
- Differentiation
- Lighter install
- A solution when space is limited
SAVING THE ENVIRONMENT

Condensing tankless water heaters reduces up to 964 lbs. of CO2 per year compared to a conventional gas tank water heater, and up to 324 lbs. of CO2 compared to a standard gas tankless water heater.
ENERGY SAVINGS

Why are they energy Efficient?

+ .80 to .98% efficient
+ No Storage or standby loss
+ Modulating Burner
+ Heater placement
Current LEED program allows:

- Maximum 2 points for “Instantaneous” water heater with an EF ≥ 0.80
- Maximum 2 points for “closed combustion” (Sealed supply air & exhaust ducting)
- Maximum 2 points for a “energy efficient water distribution system”
But be careful of the consumer downside:

- If you have a family of 6 that has never had enough hot water with a 50 gallon tank heater, your bill might just go up because now your family will not be taking cold showers or have to shorten them.
Another reason that builders like tankless water heaters is that they are able to provide hot water to today's popular large tubs.
1. A tank type heater has to be very large to do all of these things without running out.

2. Tankless are only limited to the flow rate our tankless unit(s) can provide.
Today’s tankless water heaters provide more than enough capacity to meet any hot water need from a one-bathroom house to a hotel.
Limitations & knowledge

Most homes only have a $\frac{3}{4}$" hot water main and most are now in PEX or CPVC materials.
Builders like the tankless water heaters for several reasons, not the least of which is space savings.
Standard tanks in a two-story home, this means more framing, drywall and paint to enclose it.

Tankless options:
1. Wall Mounting
2. Garage
3. Attics
4. Outside (good idea?)
## Tank Versus Tankless

<table>
<thead>
<tr>
<th>Gas Water Tanks (30-50 Gal, 40 MBTUH)</th>
<th>Tankless Water Heaters (199,000 BTU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 250-420 lbs. filled</td>
<td>• 85-95 lbs. filled</td>
</tr>
<tr>
<td>• 6-10 year warranty</td>
<td>• 12-15 year warranty</td>
</tr>
<tr>
<td>• 40 GPH@ 90° rise (40 G)</td>
<td>• 195 GPH @ 90° rise</td>
</tr>
<tr>
<td>• 78 Gal 1st Hour delivery</td>
<td>• 1st hour and every hour delivery remains the same</td>
</tr>
<tr>
<td>Water Inlet Temp (°F)</td>
<td>Required Fixture Temp (°F)</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>60</td>
<td>120</td>
</tr>
</tbody>
</table>

**98% Condensing Heater**

<table>
<thead>
<tr>
<th>Water Inlet Temp (°F)</th>
<th>Required Fixture Temp (°F)</th>
<th>Temp Rise (°F)</th>
<th>Weight of Gal of Water</th>
<th>Gallons per Day Heated</th>
<th>BTU Required</th>
<th>Cost per Therm</th>
<th>BTU Content 1ft3 N/G</th>
<th>Energy Factor</th>
<th>Operating Cost Per Day</th>
<th>Operating Cost Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>120</td>
<td>60</td>
<td>8.34</td>
<td>100</td>
<td>50,040</td>
<td>$0.98003</td>
<td>1000</td>
<td>0.95</td>
<td>$0.52</td>
<td>$188.42</td>
</tr>
</tbody>
</table>

**Inputs (Fill-in these below only)**

<table>
<thead>
<tr>
<th>Source</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incoming Water Temp - °F (60)</td>
<td>60</td>
</tr>
<tr>
<td>Desired Water Temp - °F (120)</td>
<td>120</td>
</tr>
<tr>
<td>Gallons per Day Required @Setpoint (20)*</td>
<td>100</td>
</tr>
<tr>
<td>Natural Gas Cost per CCF $ (0.98)</td>
<td>0.98003</td>
</tr>
<tr>
<td>Energy Factor - N/Gas Heater 1 (.96)</td>
<td>0.59</td>
</tr>
<tr>
<td>Energy Factor - N/Gas Heater 2 (.82)</td>
<td>0.95</td>
</tr>
</tbody>
</table>

*Factoring required for mixed temp use

**Energy Factor (EF) Examples**

- Navien tankless ranges from .94 to .96
- Standard tankless ranges from .81 to .83.
- Residential tank heaters range from .57 to .62

**Operating Cost**

<table>
<thead>
<tr>
<th>Source</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difference per Day</td>
<td>$0.31</td>
</tr>
<tr>
<td>Difference per Year</td>
<td>$114.97</td>
</tr>
</tbody>
</table>
ELECTRIC VS. GAS

Natural Gas *
EF .95 (High Efficiency N/G Tankless x $0.98 ($ per therm/CCF) = $154.50 Annual yearly cost

Electric *
EF .92 (High Efficiency Electric tank/52 Gal) x $0.12 ($ per KWH) = $572.70 Annual yearly cost

* Based on DOE guidelines – Family of 4 using 50 gallons per day
CHOOSING THE RIGHT SIZED UNIT

Tankless, including multiples are sized by peak GPM

- The first thing we need to do is establish the peak hot water demand for the job.
- In a home this is usually the number of showerheads, \( X \) the flow rate \( X \) 80%.
- Example: 3 showers @ 2.5 GPM each = 7.5GPM \( X \) 80% = 6 GPM peak demand.
A high school has a locker room with 24 showers. They have a 10 year old 400 gallon tank water heaters that is “always on” 24/7/365 and it has begun to leak needing replacement probably due to sediment build up caused by constantly heating and reheating water that is not moving.

5-6 Tankless Units would do the Trick!
To lose heat (Energy) and change from a vapor into a liquid, or make a vapor change to a liquid.
# INPUT VERSUS OUTPUT COMPARISON

<table>
<thead>
<tr>
<th>Combustion Efficiency</th>
<th>82% Tankless</th>
<th>84% Tankless</th>
<th>93% Tankless</th>
<th>94% Tankless</th>
<th>Navien NR-180 98%</th>
<th>Navien NR-210 98%</th>
<th>Navien NR/NP-240 98%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input BTU</td>
<td>199,000</td>
<td>199,000</td>
<td>199,900</td>
<td>199,000</td>
<td>150,000</td>
<td>180,000</td>
<td>199,000</td>
</tr>
<tr>
<td>Output BTU To Water @ % eff</td>
<td>163,180</td>
<td>167,160</td>
<td>185,907</td>
<td>187,060</td>
<td>147,000</td>
<td>176,400</td>
<td>195,020</td>
</tr>
<tr>
<td>GPM @ 70 Degree Rise</td>
<td>4.66</td>
<td>4.77</td>
<td>5.31</td>
<td>5.34</td>
<td>4.20</td>
<td>5.03</td>
<td>5.57</td>
</tr>
</tbody>
</table>

Net BTUH (above) / 70 Degree Rise / 8.343 (weight of 1 Gal @ 60 deg) / 60 GPM =
Benefits

- 7 out of 8 manufacturers 90%+ units are vented with Sch 40 PVC-DWV
- Resulting in lower installation costs
- Vent installation ease
- No need to relocate unit for ease of venting, resulting in required gas & water line rerouting or extending
CONCERNS ABOUT CONDENSING AND THE CORROSIVE CONDENSATE PRODUCED (WHEN IT’S NOT SUPPOSED TO):

1. Heat exchanger
2. Efficiency reduction
3. Controls
4. Maintenance
RESULT OF CONDENSATION DAMAGE
#436 Stainless Steel Primary and Condensing (Secondary) Heat Exchangers

How one manufacturer (Navien) deals with Condensing

Type 436 has columbium added for corrosion and heat resistance

400 series Ferritic grades have been developed to provide a group of stainless steel to resist corrosion and oxidation, while being highly resistant to stress corrosion cracking
KD Premixing burner design

Blower
Air
Mixture
Sol. Valve
Fuel Nozzle
Manifold
Gas
Slope
Perforate Plate
Down-Fired Burner
Perforated slots for fuel

Flat Plate Slot

Collision Plate Slot

Full Burner
Benefits of Navien’s Integrated Recirculation System

- The recirculation system will minimize the “cold water sandwich”
- A recirculation system is estimated to reduce water consumption by 20%-33% by eliminating wait times when using hot water

Which install makes more sense?
Navien
“A”- Model
• Built in pump
• Built in Buffer Tank

NR-10DU
Remote controller
VENTING OPTIONS – PVC VENTED TANKLESS
DEALING WITH CORROSIVE CONDENSATE

Some applications and installations may require a condensate neutralizer.
Typical Residential Tank Replacement (Garage Closet)
With the recent advent of condensing, high efficiency, ease of venting, and probably most important, sealed combustion we are installing tankless in the commercial and restaurant applications.
Tankless Water Heater Users
Drago’s a 300-seat seafood restaurant used to get its hot water the conventional way, and never had enough.

They had a 150-gallon tank that heated and stored water. When Drago’s embarked on a $3 million renovation of the restaurant, they switched to Tankless Water Heaters.
A desire for space savings was the reason behind Einstein Noah Restaurant Group’s decision to replace conventional hot-water heaters with tankless units.

Unlike conventional water heaters, tankless models don’t take up valuable floor space. The units, which measure approximately 3 feet high, 16-18 inches wide and 11 to 14 inches deep, can be wall-mounted high off the floor and out of the way.
ADDITIONAL BENEFITS OF CONDENSING TANKLESS

Sealed combustion
- Minimal concerns of negative pressure caused by exhausts
- 2-pipe systems solve combustion air issues

Off the floor, unaffected by housekeeping
Long life expectancy
Better warranties
Eliminates the need for overheating water to kill Legionella
Navien Cascaded Units with Common Venting
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Thank You!