

## **HYDRONIC HEATING DISTRIBUTION – “The Energy Hog”**

Hydronic Heating Distribution is that necessary discipline of transmitting created energy via a boiler into useful heating via radiation. The base biometric physical phenomena and attribute is the natural convective effect of heating water whether in an open pot or in a closed loop piping system.

A century ago the Gravity Hot Water Heating System executed distribution while needing absolutely NO DISTRIBUTION ENERGY, by employing natural hydronic convection. So what happened? Well, a gravity heating system necessitated a relatively large boiler, large convective piping and radiation, and was functionally a rigid system. America's desire for system design flexibility and adaptability at a reduced installation cost was initially met with the introduction of the electrical circulator (pump) about 1930. So now we have economically viable, extreme heating application flexibility despite accompanying complication, or do we?

The hydronic heating industry has since evolved into a plethora of independent component suppliers with no designated or defined process regulatory authority and consequently no process optimization potential. We have therefore cynically and specifically coined hydronic heating distribution as “The Plumber's Playground©” i.e., “over piped, over pumped and over powered”!

The industry provided generic “Boiler Piping Diagram” is, from this Process Development Engineer's prospective, merely a suggested sequential component placement diagram with no process optimization potential. This is evidenced by the variance of installation practices with minimal documented aftereffects. Not to say that these sequential placement recommendations are not without some merit, but that the based assumptions or premises may not be meritorious.

Our contention is that contemporary hydronic distribution practices have become an energy hog, in materials, labor and electrical power over system life. This is predicated upon three factors:

1. The energy alleviating distribution advantage of natural (gravity) convection is wholly dismissed and/or negated in contemporary practice.
2. The technical advantage of dedicated Delta-T ECM Hydronic Circulation Management is being unrecognized and hence misapplied by practice.
3. The innate natural convection contribution to selective fail mode heating extension is not being considered nor applied.

The immediate and evidential consequence of all this is electrical energy consumption. From the electric-free gravity heating system of a century past to the contemporary practiced energy hog has been a gradual but now dominant

progression. “Over piping, over pumping and over powering” now rears its ugly head, and how! The past, casual comments of “my electric bill goes up when I turn my heat on” have culminated into this current, personal example: Speaking to my cousin in Northern Vermont recently who always boasted of her “Net Zero Energy Home”, she interrupted me to “put more wood in the stove”. “What”, I asked? “We had to turn off our geothermal heating when the electric bill went out of sight.” O.K. – so much for that premise.

Much touted “green and renewable” energy programs have compromised our power grid baseline energy maintenance capabilities. Evidence our current and subsequent future power outages. So to now moderate your power bill “sticker shock”, consider these potential heating economies:

1. Heating & circulating hot water (hydronics) is innately the most efficient method, bar none! Conversely, Forced Hot Air and HVAC Systems are both inherently less efficient, requiring markedly greater air circulation energy.
2. Consider a dedicated Hydronic Delta-T ECM Circulator (Taco VT2218) with Taco Zone Sentry Valves as your primary hydronic distribution method. Our Gravity-Enhanced  $\Delta T$  Appliance Technology delivers to radiation at 8 to 13 watts consumption, a 90%+ reduction over any contemporary system.
3. As a matter of course, substitute a Taco 007e for Taco 007 or equivalent circulators whenever possible. They consume 1/4 the energy and despite the additional cost will pay themselves back in about 1-1/2 years with both energy performance and future longevity, per Taco.
4. If you have a Domestic Hot Water Coil within your current boiler, consider coupling it to an Indirect Hot Water Heater to optimize DHW generation efficiency while also reducing fuel consumption.
5. Select your heating fuel carefully! By our calculations, a top performance heating appliance firing #2 Heating Oil purchased through a Fuel Co-Op can top them all, including Natural Gas. Analyze your regional options.

The proven energy solution is our patented “Neo-Gravity Hydronic Heating Appliance™”, providing optimal hydronic efficiency potential. Optionally fired with Oil, NatGas or Propane Burners, using #2 Oil, procured as prior detailed is best in our experience. BTW - We have issued a “come one, come all” challenge to beat our now US & Canada Patented “Beast”, with no responses yet.

Outdoor Wood Boilers also deserve particular attention as to their horrible hydronic distribution efficiencies. They are 24/7 powered by larger circulators in operation, typically in the 200 Watt continuous consumption range. They light up your electric bill too. We have noted that they are excessively hydronically delivering in most applications. Our fix is as follows:

1. Swap out the very pricey Taco 0011 or so Circulator with a Taco 007e ECM Circulator. It reduces consumption to 20 to 25 Watts vs. 200. Note that it is a  $\Delta P$  head pressure (10 Feet) limited, much lower delivery rate circulator.
2. If still under-delivering for your application, add a second Taco 007e on the return line for push-pull operation. This will usually work except in extreme delivery rate applications, but run your actual demand numbers prior.
3. The Taco 007e is an “Indoor Use Only” Circulator (doesn’t like cold temps). Install in series a “Make-On-Rise” Honeywell 4000/6000 Series Aquastat in an additional 3/4” Spud Well and set up to around 125°F. The boiler cabinet will now pre-warm the circulators and make them “comfortable”.  
Note: This “fix” has worked well on a friend’s unit for several years now, but eye your results.

Our prior comment on the electrical operating cost impact to geothermal systems must be extended to other heating technologies as well. Heat Pumps and any variants utilizing in particular hot air delivery are significantly more power intensive and also deserve scrutiny.

Whereas the electrical power consumption of a heating system has not been historically considered, the current and projected electric energy pictures now demand it. Ignore system power consumption at your peril!

Despite a large, regional predominance of HVAC Systems, their inherent inefficiencies must now be qualified. The case for separating and applying basic hydronic perimeter baseboard loops under Delta-T ECM heating management is technically evident in the Northern Temperate Zone. Cooling is a true “energy hog”, but it appears there are new and significant application technologies on the horizon. Separating the two where practical has now become common sense.

Summarizing:

1. Define or determine the electrical energy consumption profile of your heating (and cooling?) system(s). It will likely surprise you.
2. Utilize hydronic convection with a “highest energy density” heating fuel (oil) whenever possible. Move to a single energy fuel strategy for DHW.
3. Apply “Enhanced Convection, Differential Temperature Managed Hydronic Heating Appliance” Technology (USPTO 10,690,356, Canada 2,964,131) to your application, wherever possible. [www.BoilersOnDemand.com](http://www.BoilersOnDemand.com)
4. Explore heating fuel and energy procurement options such as Co-Ops.
5. Solicit heating appliance selection performance histories, when possible.

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