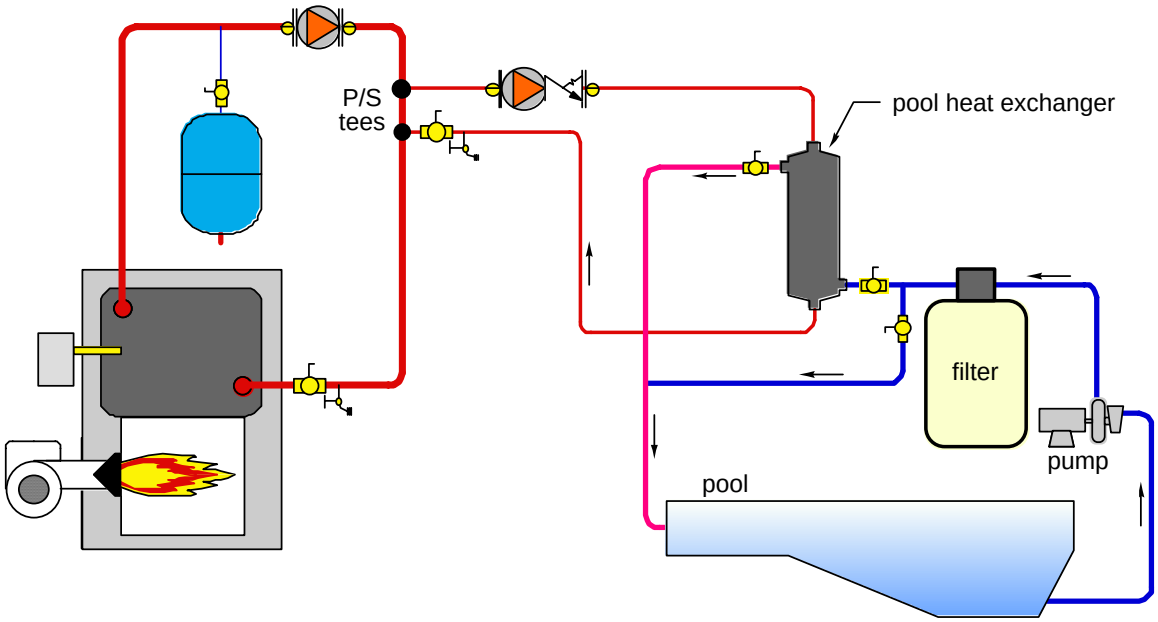
Boiler vs. Pool

The Glitch

The boiler that heats a house in winter can also heat a pool in the backyard during warmer weather. Any reputable hydronics pro knows that this takes more than simply running pool water directly through the boiler (don't laugh; it's been done!). Instead, the pro might set up a "subsystem" to heat a pool using primary/secondary piping and a stainless-steel heat exchanger.

Let's say this is in New England, and that a conventional oil-fired cast-iron boiler will serve as the heat source. Let's further assume this system is capable of maintaining the pool at a nice balmy 85 ºF. Can you spot any problems with this design?



The Fix

Although the piping for this subsystem is fine, there is nothing protecting the boiler from sustained flue gas condensation. When the pool water is cool, the heat exchanger will be operating at very favorable conditions for heat transfer. For example, let's say the boiler limit control is set for 180 ºF and the pool water is at 50 ºF. Some might assume that an approach temperature difference across the heat exchanger is 180 - 50 = 130 ºF under these conditions.

Unfortunately, just because the boiler limit control is set for 180 ºF doesn't mean it will attain that temperature. The boiler temperature will only rise as necessary so the rate of heat transfer to the pool matches the heat output of the boiler (e.g. until thermal equilibrium is established). This might only be 20 to 30 degrees F above the pool water temperature, even less if the heat exchanger is generously oversized. Thus, the boiler will be operating well below the dewpoint of the exhaust gases, even when the pool is up to that balmy 85 ºF temperature. Such conditions will create sustained flue gas condensation whenever the boiler is heating the pool, and must be avoided.

A setpoint-controlled variable speed circulator can provide the required "thermal clutch" between the boiler and the heat exchanger. When powered, it monitors the temperature returning to the boiler and slows down as necessary so this temperature stays at or above a minimum setting (such as 130 ºF) where flue gases will not condense inside the boiler or vent connector. Problem solved.