



Why Multiple Boilers Make \$ense

Whether you are faced with replacing an old, large hot water boiler, or when designing a new hydronic heating system, you must decide whether to install one large hot water boiler or multiple smaller boilers. Although most systems are designed around one large boiler, when you think about how most heating systems operate, multiple smaller boilers can make a lot of sense.

First, you want to perform a heat loss calculation. By establishing the true load on the building, the replacement boiler or boilers will not be oversized. However, the conditions we use to establish the heat loss of the building are assumed to be at *design* conditions, which means the coldest day of the year. If you want this capability, then you need to size the boiler or boilers for this maximum load. If not, there are other considerations.

The pitfalls of over-sizing

Remember that the typical design conditions exist for less than 5% of the heating season. If you choose to use one large boiler, it will be oversized for 95% of the heating season. Oversized boilers generally do not operate very efficiently because of frequent off/on cycling. Boiler manufacturers provide efficiency ratings that indicate how efficiently their boilers use a therm of gas or a gallon of oil. When testing for these efficiencies, the boiler is running at full capacity in a “steady state”. However, in the “real world”, the boiler rarely operates at a steady state, and therefore it never realizes its rated efficiency.

With multiple smaller boilers, when the load on the building is light, only one of

the boilers may be required to heat the space. This smaller boiler will operate for a long “run cycle”, increasing its operating efficiency while the other boilers remain “off,” keeping the building owner happy because he is not wasting fuel.

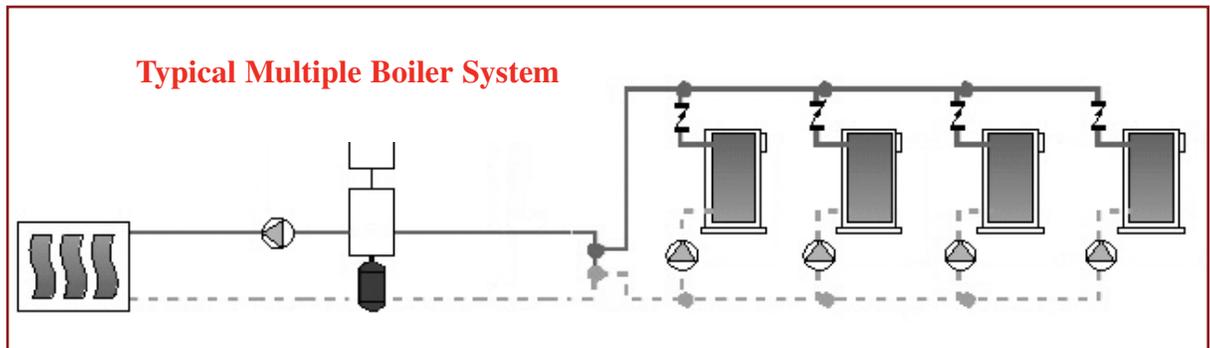
Primary/secondary pumping

When using multiple boilers to achieve all the potential efficiency gains, you must prevent water from flowing through the “off” boilers. The reason: whenever you have hot water flowing through an off boiler, the boiler becomes a radiator, wasting energy in the process.

conditions typically exist for only 3-5% of the heating season, if one of the smaller, multiple boilers goes down, the remaining boilers will meet the building’s heating load.

Off-the-shelf high efficiency boilers can be used to satisfy the heat load in light commercial applications. The boiler plant operates at higher efficiencies and replacement parts are easily accessible.

Smaller packaged residential boilers may be used in some commercial buildings, instead of constructing the boiler in place using commercial sections.



Typical Multiple Boiler System

There are several methods available to prevent this unwanted flow from occurring through the off boilers, but the best method is to pipe them by using the technique called primary/secondary pumping whereby each boiler has its own circulator which is sized just for the flow rate and pressure drop of its boiler.

The boilers are piped into a manifold, which is connected to the primary loop through a set of closely-spaced tees. Piped this way, the primary loop circulator will not create flow through any of the boilers. The circulator on the individual boiler will cause the only flow that occurs.

Owner benefits

A multiple boiler system gives the building owner these features and benefits:

Built-in redundancy. Because design

Large domestic hot water loads in commercial and large residential applications can be met with multiple boilers. The staging control will fire the appropriate number of boilers to satisfy both the heating and domestic load and then shut them off as the domestic load is satisfied.

Summer operation efficiencies can be realized in some commercial applications where the only load is domestic hot water. Here, a staging control will fire only the appropriate number of boilers to satisfy the domestic water load, no matter how heavy or light.

If you have any questions or need help designing that next multiple boiler job, call your local Bell & Gossett Representative. They are more than willing to help!