Selection of Boilers

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For a number of years I have been involved in the selection and engineering of boiler room equipment and I have always thought of the boiler as the heart of the building. You can build the largest and most beautiful building in the world, but it's of no use until it is heated and air conditioned! All too often too little thought is given to the size, type, and location of the boiler and its supporting equipment. So select your boiler room equipment wisely. Your boiler is the most expensive piece of mechanical equipment that you will buy for a greenhouse and, I might add, the most costly to operate!

When selecting your boiler you should consider:

1. Type
2. Size and cost
3. The number of boilers
4. Fuels available
5. Location and pressure requirements

Now let's go back and talk about types.

In all cases I recommend an efficient package boiler-burner unit which has been factory firetested with all of its trim and controls integrated into a well engineered package. Field assembled boilers, burners, and controls usually cost more and are not as satisfactory. I recommend a firetube-firebox for installations up to about 70 horsepower and a firetube Scotch Marine boiler up to 750 boiler horsepower.

Why firetube boilers? Because in a greenhouse, the load changes quickly! On a cold day the sun can go under a cloud and in two minutes every valve in the range is calling for heat. A greenhouse boiler is subjected to quick load changes, unlike the slow changes experienced in conventional building heating systems. The firetube boiler has a large steam storage space to provide the steam required at once. This large steam space also provides ample surface for the steam to break on the surface thereby giving high quality, high temperature steam. In a modern watertube boiler you do not have the reserve steam space. Also the steam nozzle is too close to the water surface and on a sudden load change, water may leave the boiler through the steam line, causing a shutdown at the most critical time.

All modern day boiler-burner units are guaranteed to be 80% efficient! If this is the case, then why are there 2-3 and 4 pass boilers? Most all boilers are rated with 5 square feet of heating surface per boiler horsepower. There are two kinds of heating surface; primary and secondary. Primary surface is in the combustion chamber and the secondary surface is in the tubes. The primary surface heat transfer rate is many times more efficient than the secondary surface upon which the fire shines. The large combustion chambers, which are common in 2-pass Scotch boilers as compared to 3 and 4-pass boilers with their small combustion chambers, have more primary surface and thereby absorb more of the heat without working the boiler as hard. What it boils down to is you have more steel to fire and the 2-pass boiler will not burnout as quickly as the boiler with the small primary surface. If you want quality, longevity, and reliability, buy the boiler with the most primary surface and furnace volume.

The next step in selecting a boiler is the size. In order to do so we must know how large and what configuration the house will be. Heat loss calculations for a greenhouse take a 15 miles per hour wind into consideration. I am sure many of you have noticed that on a dry, windy, 0° night it is harder to hold the temperature than on a —15° night. This is because your house is not sealed over with ice and heat is escaping through the cracks in the glass. We normally figure that this glazing takes place at —10°, so we use this for our outside design conditions. On several occasions, our servicemen have advised owners to glaze the outside of their houses to conserve heat until the boilers were going again. Back to the size of and number of boilers. As an example, we find from our calculations you have 75,000 square feet of glass and you want to maintain 55° inside when it is —10° outside. You would need 200 boiler horsepower at a cost of $13,000.00. If you want standby, that would be two 200 horsepower boilers for $26,000.00. Now, if you could stand a temperature of 40° for a short time on a —10° night, you could get by with one 150 horsepower boiler at $11,000.00, or $22,000.00 for 2 boilers, a $4,000 savings. Of course, two 200 horsepower boilers is ideal, but is it worth the extra $4,000.00? You have to be the judge.

The next thing to consider is fuel. Naturally, gas is the prime fuel in our area so contact your area Public Service Company representative and find out if a dump rate is available to you if you have oil standby. Most important, advise him what your existing load is and what it might be in 5 years so he can plan the gas loads and main sizes, which you may have to help pay for; otherwise in 5 years you may end up paying for another main. If after talking with the gas company you wish to use oil, please use No. 2 oil, as No. 6 is dirty, is costly to use, and needs to be pumped the year round; furthermore at one time last winter, there was only enough No. 6 oil for the hospitals in Denver. I am advised that this winter you'll be on oil twice as much as last winter.

Next, where do we locate the boiler? Put it in the most centralized and lowest area possible. If you are planning a greenhouse where the steam main has to run more than 300 feet in any one direction, a high pressure boiler should be considered, but please note, one 200 horsepower high pressure boiler costs $4,000.00 more than a 200 horsepower, 15 pound steam boiler. If your boiler is in a low area, you can drain most, if not all, of your condensate by gravity to your boiler feed system and thereby eliminate the need to pump the water twice. If your feed system is in a pit, install a high water alarm, put a curb around the pit, a sump pump in it, and make sure the overflow vent connection drains outside the pit, because if the pit is flooded, you are in serious trouble.

Now that you have made the proper boiler selection, PLEASE take care of it. Keep it clean, give it water treatment, blow it down, check the low water cutoff, observe the fire pattern and your gas bill, and have it adjusted to its peak of efficiency; keep the oil tank full and check the oil fire at least twice a month.