Bell & Gossett®

CounterPoint™

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System Syzer® - The Installer's Best Friend

Have you ever wondered if the pipe you are using in that hydronic heating system is the right size for a specific flow rate or how you calculate the GPM for that heat loss? You can use math formulas that were established years ago, or look up charts relating to flow rate in gallons per minute and pressure drop based upon pipe sizes... or you can use Bell & Gossett's System Syzer calculator.

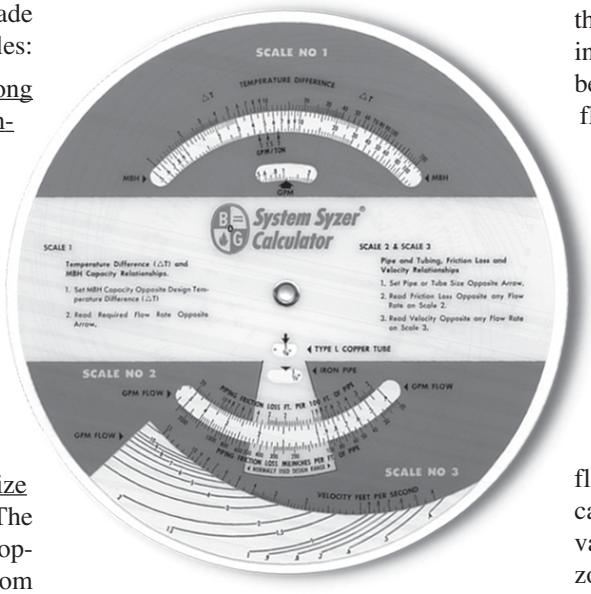
The System Syzer was developed by Bell & Gossett to provide an easier way to get the information needed to design or troubleshoot hot water heating systems. The two-sided wheel (shown at right) is made of durable plastic and features five scales:

Scale #1 shows the relationship among flow rate in GPM, BTU load and temperature difference. If you know two of the three, the wheel can give you the third instantly. For example, if you know the BTU load and the desired temperature drop, by looking at the small window on Scale #1, the necessary flow rate in GPM is shown. Scale #1 is very useful because it helps you establish GPM (the required flow rate) easily.

Scale #2 is used to select the proper size pipe to handle your GPM flow rate. The scale lists two types of pipe: type L copper and schedule 40 iron in sizes from 3/8" to 3", and gives the friction loss in feet of head per 100' as well as in millinches. Scale #2 can also be very helpful when you are in a boiler room trying to select a new pump. If the tags from the boiler and original pump are missing, you can use the existing main hot water pipe as a guide. Based on its size, look on Scale #2 and determine the maximum or minimum flow that that particular pipe can handle.

Scale #3 confirms the proper pipe selection from scale #2 by checking the velocity of the water. Though subtle, there is a difference between friction loss in head energy versus the velocity in feet per second of the water moving through a given pipe size. Scale #3 makes sure that the pipe you select will not be noisy due to the water moving too fast. The last thing a homeowner wants to hear when the thermostat calls for heat is a whistling noise as the water screams through the baseboard piping. When you select a certain size pipe to handle the GPM, always glance down at Scale #3 to be sure it falls within industry standards.

Scale #4 tells you the total pressure drop



for a particular loop, zone or even the total system. From Scale #2, you selected a certain size pipe and the scale listed out the unit pressure drop per 100' of piping. When using Scale #4, you plug in this unit pressure drop per 100' figure against the total length of piping and read the total pressure drop. This is helpful information when selecting a circulator.

Scale #5 is the most useful scale because it is based on the fact that the head loss in a hydronic system will vary approximately as the square of the change in flow rate.

Scale #5:

- Determines unknown pressure drops.
- Establishes system curves.
- Selects control valves based upon their Cv ratings.

Sometimes circulators are purchased based on the "inventory method", that is, whatever is available! When this happens, the circulator may be a little too large or a little too small. By using Scale #5, you can build a system curve right on the pump curve, determining exactly where the circulator will operate. Obviously if the circulator is too large, it will be pumping more GPM than required which might be acceptable as long as the increased flow rate does not exceed the pipe's maximum velocity. If the circulator is too small, it will be pumping fewer GPM than required, but this isn't necessarily bad, as long as the increased temperature drop does not reduce the output of the radiation.

Scale #5 can be used to select control valves based upon their Cv ratings, a valve coefficient that states the necessary amount of flow in GPM that must flow through the valve's seat opening to cause a 1 pound pressure drop across the valve. For example, a residential 3/4" zone valve has a Cv rating of 3.5. This means when 3.5 GPM of water passes through the valve, the valve will cause a 1 pound pressure drop, and it will use up one pound of energy head. Another way of expressing this: one pound of pressure drop is equal to 2.31' of head loss. So if the zone valve has a Cv rating of 3.5 and you pump 3.5 GPM through the valve, the valve itself will create 2.3' of head loss.

To obtain your own System Syzer calculator, contact your Bell & Gossett Representative. An electronic version of System Syzer may be downloaded from the B&G website at www.bellgossett.com