By Drew Wolf

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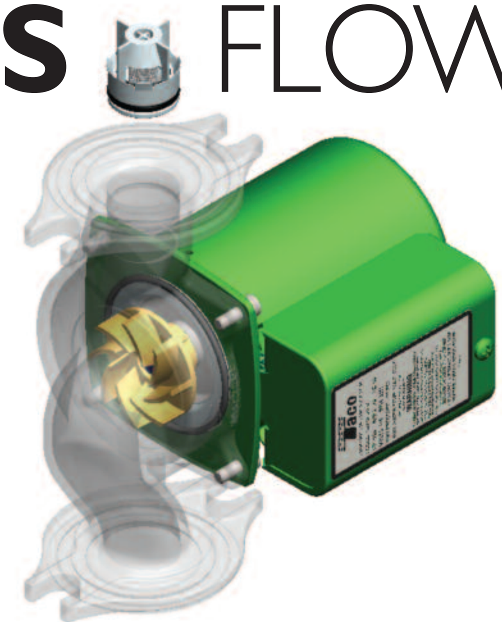
KEEPING THE BTUS FLOWING



A circulator will do only as much work (flow and head) as is dictated by the system, and the circulator can only operate on its pump curve. Furthermore, a centrifugal pump will attempt to supply as much flow as it can against the friction loss of the installed system.

If you were to open the outside faucet at your home, you would have a great deal of water flow. If you attach a 100-foot hose, the water flow decreases. This is due to friction loss. With a long enough hose, it would be possible to have the flow eventually cease.

If a circulator can't overcome the system pressure head (loss) and friction loss, the pump will not produce the desired flow rate or any flow. The impeller will simply spin inside the casing and produce heat, and the pump will eventually fail.

On the other hand, placing a circulator capable of producing 40 gpm – much more than the system calls for – would cause the pump to back up on its curve and attempt to operate at a point detrimental to the life of the circulator.

A circulator that is too large will produce noise that will be heard throughout the piped system, but much worse than that is the increased likelihood of erosion of the internal walls of the piping, which can lead to damage and leakage, perhaps at multiple places.

As such, the velocity or speed of water in a hydronic system must be taken into consideration when selecting a system circulator.

TERMINOLOGY CHECK

A circulator pump is a specific type of pump used to circulate fluid in a closed circuit. They are commonly found circulating water in hydronic heating and cooling systems. Because they only circulate liquid within a closed circuit, they only need to overcome the friction of a piping system (as opposed to lifting a fluid from a point of lower potential energy to a point of higher potential energy).

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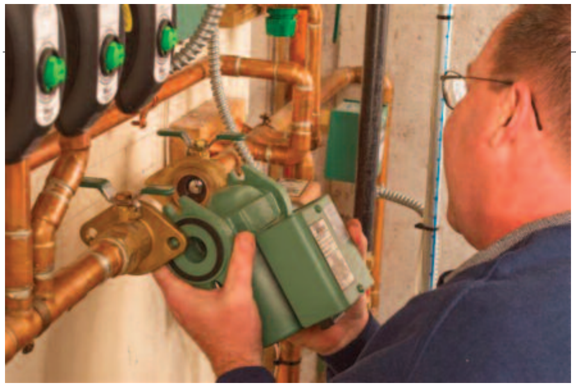

GETTING THE INSTALLATION RIGHT

Most installation errors encountered in the field are simple problems, and are relatively easy to solve. The biggest problems are almost always seen when installations are done without reading instructions or having adequate training on the equipment being installed or the system being built.

Some of the more common problems we see in hydronic systems include improper pump locations, and mounting the pumps incorrectly.

DID YOU KNOW? One can only reasonably expect a flow of 4 to 5 gpm through a 3/4" heating loop.

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PUMP LOCATION

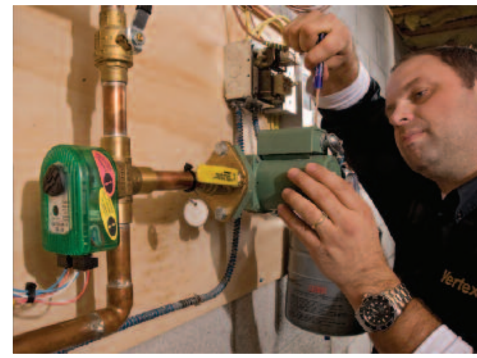
Air in the system is a very common field issue, and it often ties to where a circulator is installed. Air will produce noise in the distribution piping, cause poor heat transfer, and cavitation within the pump casing. Proper pump location will reduce air entrained in the system water – of course, proper air elimination also plays an important role.

In a closed system, circulators create pressure differential to move water. When the pump is positioned to pump away from the compression tank, the circulator's pressure will be added to the system pressure and air removal becomes much more efficient.

If the circulator is pumping toward the compression tank, the discharge pressure will not show as an increase. The suction side of the pump will see a pressure decrease, which will release the air that has been dissolved into the water. This will cause noise and, most likely, cavitation of the circulator.

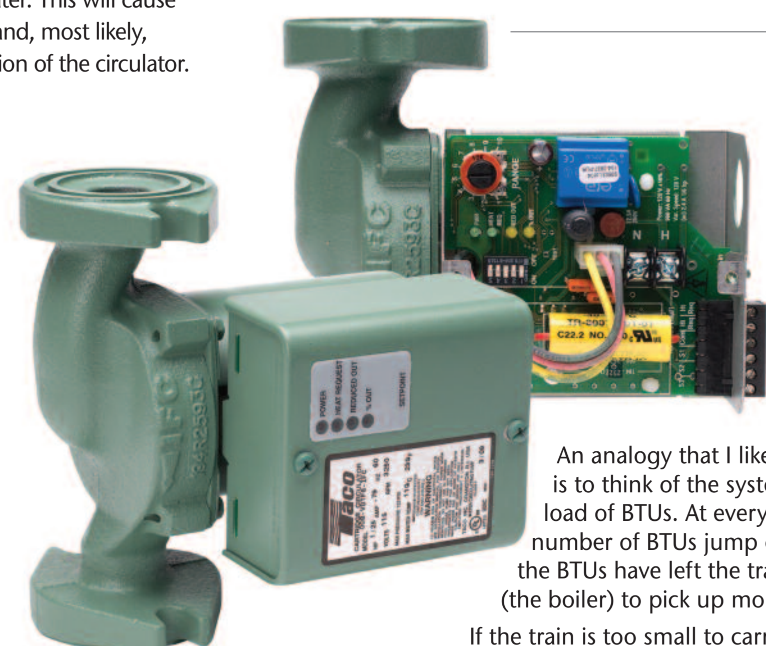
IMPROPER MOUNTING

The mounting configuration of the pump must be taken into consideration when designing a system. Water-lubricated circulators must be mounted in the horizontal position (parallel to the floor). This position will ensure sufficient lubrication of the rotor bearings.



Three-piece pumps that consist of a motor, bearing assembly and casing should always be mounted in the same horizontal position as water-lubricated pumps. They are designed to be unsupported. Pipe hangers should not be used to support the motor.

Pumps with a close-coupled design have the impeller directly mounted to the motor shaft and directly bolted to the pump casing. These pumps can be mounted in the vertical position. They can be mounted horizontally as well, but are limited in this configuration by the horsepower rating of the motor.



CATCH THE TRAIN

As you know, in a heating system, the circulator is the device that moves hot water produced by the boiler out to the building's heat emitters, be they baseboards, fan coil units, radiant loops or even towel warmers.

If the circulator isn't properly sized to provide the correct flow in the system, the necessary amount of heat – or BTUs – cannot be transferred into the building.

An analogy that I like to use, especially when talking with homeowners, is to think of the system being serviced by a hot train that's hauling a load of BTUs. At every train station (radiator or radiant loop, etc.) a number of BTUs jump off. The train continues through each station until all the BTUs have left the train, at which point the train returns to the station (the boiler) to pick up more BTUs and repeat the trip.

If the train is too small to carry all the BTUs needed at the radiators, less heat will be available, comfort will be compromised, and that could lead to other problems within the heating system.

GET IN THE FLOW

The flow, or gallons per minute (gpm), that a pump produces is dependent on the head produced by the pump. The system resistance is the controlling factor in determining the flow produced by the pump.

As the flow increases in a piping system the resistance, or pressure drop, rises at a rate equal to the square of the ratio of the flow. The point where the system resistance curve and the pump curve intersect is the maximum flow that the pump will produce in that piping system.