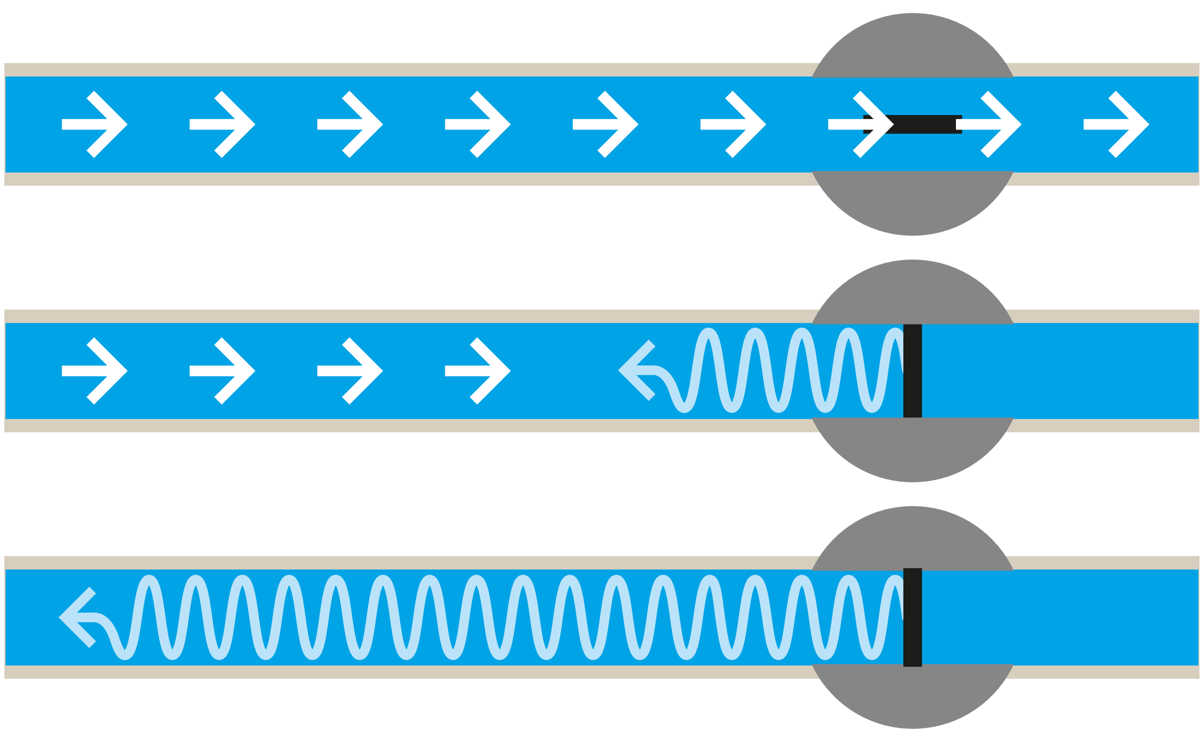
Why do zone valves sometimes bang when the little high-speed circulator shuts down? Why does the sudden closing of a zone valve make unpleasant noise as if someone was pounding on your water pipes with a hammer?

Mechanism
The reason becomes apparent if you can imagine the water flowing through the valve. As the valve disk swings into the onrushing flow from the high-speed circulator, the velocity across the valve increases. Then, just before the disk seats, the velocity from the circulator peaks and the valve bangs shut. The bang is caused by the high pressure water that suddenly has the brakes put on it. Water is incompressible; when a valve is suddenly closed to stop the ongoing water flow, the flowing water crashes into the closed valve much like a train crashing into a concrete wall, bouncing back and crashing into the wall again and again. Water pressure surges for a brief moment. With all of the pressure, something has got to give!

Consequence
How much the pressure spikes (momentum), depends on how long the train is (mass), and how fast the locomotive is going (velocity)—or how much water is flowing, how fast it is going, and what kind of pressure is pushing behind it. The spike could be high enough to exceed the maximum ratings of fixtures and devices (such as: pressure regulating and pressure relief valves, and check valves), causing water heaters, joints, seals and connections to fail prematurely, and increase customer complaints about workmanship and the hydronic system itself.

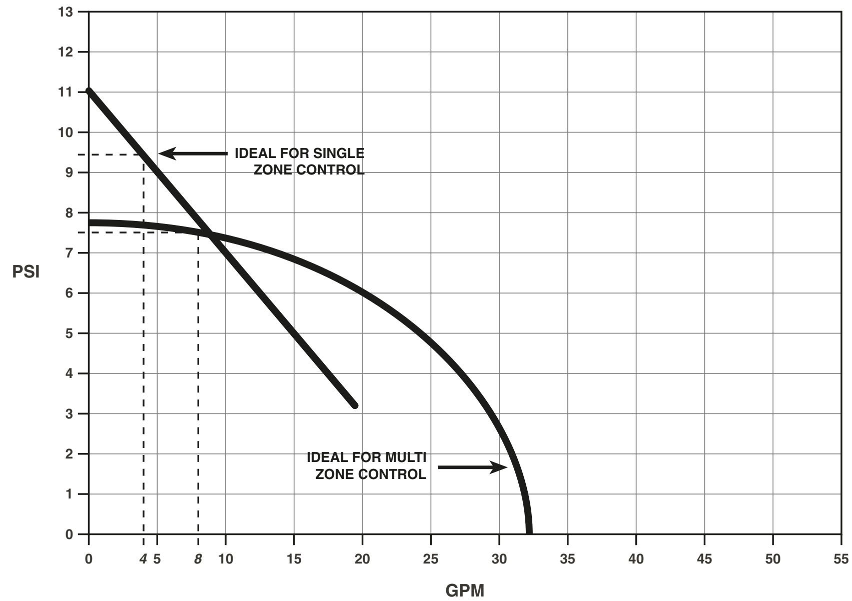
Recommendation
Stay away from using high head circulators on zone valve systems. Whenever a zone valve closes, the system curve goes steeper, and its intersection with the pump curve moves higher towards the pump's shut-in head. Differential pressure across the circulator increases. The "steeper" the pump curve, the greater the incremental rise in pressure as each zone valve closes. A high head circulator with a steep curve can create a high velocity flow in the piping when only one or two of the many zones are operating. The high ΔP can even lift the plugs of zone valves that are meant to be closed, causing ghost heat input into zones that are not calling for heat.



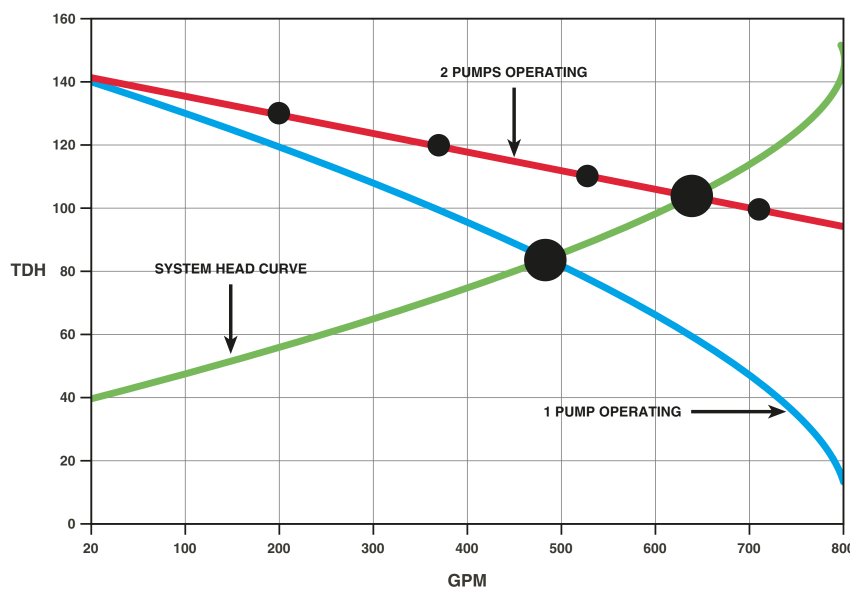
A Closer Look

For a hydronic system with two 3/4" zone valves on, we have about 8 gpm moving out to the two heating zones. We can safely say this because a 3/4" pipe main can handle a maximum of about 4 gpm without making a whistling, velocity noise.

Knowing this, we say that wet circulators are operating at a point of 7.5 psi on its performance curve. See the graph to the right and the difference in the pump curves. Look at the 23% as opposed to only 4% rise in pressure (from 7.5 psi to 9.2 psi on the steep curve and to 7.8 psi on the flat curve) that the little water circulator must go through to get back to 4 gpm. This extreme pressure spike (the circulator with steep pump curve) is usually what causes the zone valve to bang as it shuts.



Circulators of steep pump curves are preferred for single-zone duty. However, when it comes to systems zoned with several valves, circulators of relatively flat pump curves are ideal.



For hydronic systems utilizing many zone valves:

- Consider circulators with relatively flat pump curves.
- If you are unable to find a circulator with a suitable pump curve, consider pairing up a couple of small circulators in parallel. The curve representing the net performance of parallel circulators becomes increasingly flat as more circulators are paired. See the figure to the right.
- Consider the alternative of using a variable speed drive (VSD) circulator.

Heat Link Canada
Manufactured & Distributed by HeatLink Group Inc.
Head Office:
4603E - 13th Street NE
Calgary, AB, T2E 6M3
Toll Free: 1-800-661-5332 Phone: (403) 250-3432
Fax: 1-866-450-1155
Mississauga Office:
1555 Bonhill Road, Unit #7
Mississauga, ON, L5T 1Y5
Toll Free: 1-800-661-5332 Phone: (905) 795-8289
Fax: 1-866-450-1155

Heat Link China
Distributed by Cathy-Links International
Phone: 852-25693213
Fax: 852-25359271

Heat Link Ireland
Distributed by Jamoni Ltd.
Phone: 057 - 932 4062
Fax: 057 - 932 4063
Free Phone: 1800-311338

Heat Link Mexico
Distributed by Distributora Caisa S.A. de C.V.
Phone: (52) 3300-4400
Fax: (52) 3300-4406

Heat Link USA
Distributed by HeatLink Group Inc.
Toll Free: 1-800-661-5332
Fax: 1-800-869-6098

www.heatlinkgroup.com