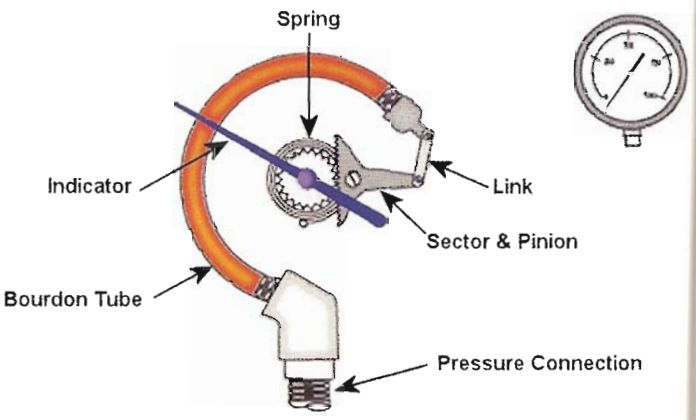
Can You Believe That

Using a gauge provides us with a measure of pressure in the system. Generally, we expect to see a steady reading, but what does the gauge with a pointer that is unsteady mean? The unsteady or flickering needle shows that the system is seeing rapid changes in pressure. These rapid pressure changes, over time, can lead to failure of the pipes, fittings, or other components.



A constant flicker of the needle shows the chance of short, but high-pressure surges. Pipes and fittings can withstand a few of these pressure surges, but if allowed to continue, the fittings will most often be the first to break or leak. Repeated rapid movement of the pressure gauge needle announces that system problems are in the future.

Let us use the example of bending a paper clip until it breaks. If the angle of the bend is small, and is bent once a day, a long time will pass before the wire breaks. Make the bend a large angle or make repeated bends in a short time, and the break happens more quickly. Frequent pressure spikes affect piping parts comparably to the large bends over a short time.

Largely, if the needle in the gauge shows a rare flicker, it may be ignored or overlooked. However, high activity of the pointer calls for further investigation. Systems are designed and intended to run with a steady working pressure. An unstable needle reflects the presence of destructive changes in the system pressure.

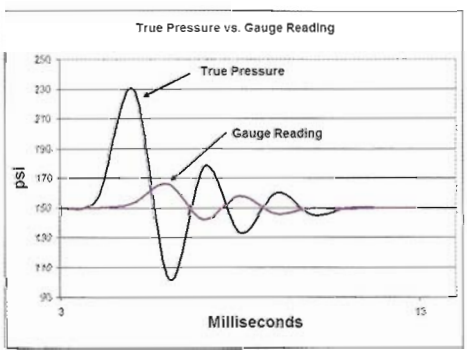
When a valve closes quickly in a pipe system, the water momentum creates a pressure wave that reflects back upstream. When a small stream of water is quickly stopped, with a dam, a reflected wave is observed traveling

Gauge?

BY LARRY WORKMAN

upstream. This reflected pressure surge, water hammer or wave is the result of the water being forced to stop quickly. Because of the nature of water, this pressure surge or wave can travel throughout the piping system for long distances. Pipes and fittings that are damaged by frequent surges are not always close to the quick-closing valve that created the surge.

It is vital to understand that the reaction of the gauge is delayed, and lower, than what the system suffered. This is because of the



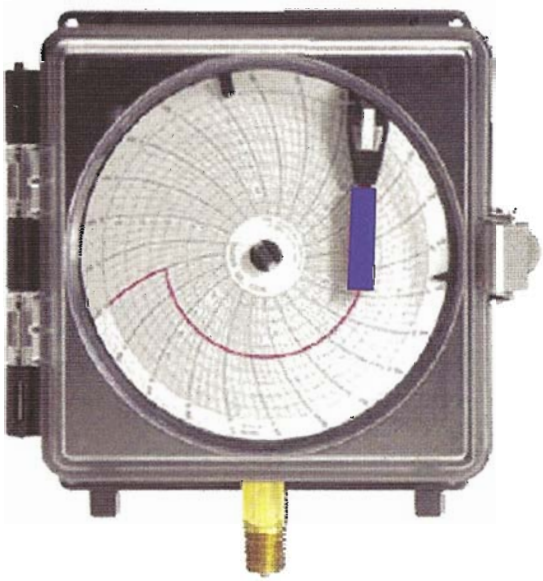
reaction time of the gauge, and the speed of the surge as it travels through the system. The reflected surge wave will travel through a PVC system at between 800 and 1100 miles per hour. This wave may double or triple the system pressure briefly. If the pipe and fittings continue to receive many of these surges, then it will fail just as the paper clip did!

Because of its high speed, the surge wave is present at the gauge only for a very short time, about 10-one-thousandths of a second. This incredibly short time is less than is needed for the gauge mechanism to react fully. As the wave comes toward the pressure gauge, the needle starts to rise. Yet, before the needle can reach that peak pressure, the wave has passed and the pointer begins showing downward to a lower pressure value. Because of this, the gauge did not echo the true surge pressure the system felt.

Testing has shown that a gauge can only reflect about 20 percent of the peak pressure of a surge wave. Clearly, oil-filled gauges or a pressure "snubber" will further hide any harmful short-lived pressure surges within a system.

A snubber acts like a shock absorber and is a device used to dampen the needle activity of gauges. Yet, the rest of the system components are unprotected. Because pressure surges produce quick high pressures, their damaging affects to the piping components will shorten the system life. Ignoring, or masking, the evidence of surges is an invitation to system failure.

A common suggestion is to attach a pressure recorder to the system. Yet, only high-tech electronic recording equipment, including a quick response pressure transducer, is capable of showing the true values of any surge waves or pressure spikes. However, a 24-hour clock pressure recorder can be useful to define the time of day and how often surge activity occurs. The results of the recorder with the activity peaks can then be used as a rough indicator of their true enormity. The recorded surge pressure, when multiplied by four, can provide a conservative idea of the true peak.



This is not to say that pressure gauges are not important; they are. Yet, their response time limits their ability to reflect the exact scale of a water hammer, reflected wave or pressure surge. Any system with a high frequency of pressure surges is bound for failure, it is only a matter of time.

Studies and history have shown that if the combination of surge pressure and working pressure do not exceed the pressure rating of the pipe, the system's longevity will be realized.

EDITOR'S NOTE: *Larry Workman has been in the plastics business for more than 30 years. His firm, Expert4PVC Consulting, works on solving PVC problems. Check out his website at www.expert4pvc.com.*