

System design

Water hammer



When the flow rate of a fluid in a pipe is changed, the velocity changes, causing a pressure surge. Such surges take place wherever there is a change of direction in the pipe, but potentially more seriously, they may be generated by any of the following:

- Pump start-up or shut-down
- Trapped air in the system
- Opening or closing a valve

The longer the pipeline and the faster the velocity, the greater the potential shock load will be. Commonly known as 'water hammer', the shock load can be of sufficient force to cause a failure in pipe, fitting or valve, and due consideration must be given to it when designing a system.

It is important to note that the amount of the pressure surge must be considered in addition to the existing static pressure in the pipe, and this combined total must be within the pressure handling capabilities of the chosen system.

A number of steps can be taken to reduce the incidence of water hammer in a system:

- Reduce flow velocities wherever possible, on discharge piping do not exceed 3 m/s, but preferably no more than 1 m/s.
- Avoid large, single step reductions in pipe diameter, instead use tapered reductions rather than bushes.
- Design the system to eliminate all air from the system at start-up, and include devices to prevent air accumulating during system operation.
- Eliminate the use of fast closing or opening valves.