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WATER SUPPLY: WHITE WATER & AIR VALVES

White water can be caused by excessive calcium content in the water, but is usually caused by entrained air dissolved in the water. White water due to dissolved air can be verified as a cloud of minute bubbles clearing from the bottom of a standing glass of water, and poses no health threat.

Air occurs naturally dissolved in water, and can be released from solution when either the temperature rises, or when the pressure reduces. More air can be absorbed into colder water, released when the temperature rises, and small air bubbles can be compressed into water at higher pressures, released again when the pressure drops.

Any piped water supply system generates friction loss, naturally reducing the line pressure towards the pipe end / outlet, thus continuously releasing small amounts of air from solution as a normal part of system operation.

Air can get trapped in pipes following pipe breakage repairs, but this usually causes air locks to “spit” out at open taps, along with some white water which usually goes away naturally after flushing (normal usage).

Surge events are mainly caused by sudden changes of flow velocity, such as pumps starting or stopping, or valves opening or closing. These surge events generate high- and low (sub-atmospheric) pressure waves oscillating between particular fittings in the pipe.

During the low pressure surge events, air gets sucked into pipes through pipe flange gaskets, pipe seal joints, valve seals / packings and many similar joints & fittings along a pipe. The air sucked into the pipe through such small openings generates very small air bubbles that can be compressed into solution when pressurised again after this event.

One of the more prominent functions of an air valve is to release entrained air from pipes, and the best practise recommendation is to install air valves at intervals not exceeding 500m along the pipe.
Air valves are usually installed at peaks relative to the hydraulic grade line along the pipe to release air accumulated- and trapped there, but system efficiency starts to deteriorate when air valves are spaced further than 500 to 800m apart because the pressure drops along the pipe due to friction, and the entrained air then released from solution accumulates in growing pockets along the crown of the pipe, throttling the water flow in a way quite similar to a partially closed valve.

The magnitude of surge events can vary from mild, but still contributing to material fatigue over time, to extreme, causing immediate pipe collapse or –burst, and can vary on an event- to event basis, mainly due to sudden change of flow velocity caused by normal system events such as pump stopping/starting or valve opening/closing.

On systems fitted with air valves, the air valve opens on negative (sub-atmospheric) pressure to introduce air into the pipe, breaking the “vacuum”, then discharges the same air again on the returning high pressure “wave”. Specialised air valve models are available for particular cases to dampen the returning high pressure “ wave” either by “non-slam” action or by dynamic (soft) valve closure.

In “100% air tight” systems without any air valve fitted, any low-pressure surge creates a vapour cavity with pressures below vapour pressure causing the water to boil, releasing air from solution. The normal low- and high pressure surge action can however cause immediate – or long term pipe- or fitting collapse or pipe bursts, and will also draw air (and dirt) into the pipe through gaskets, seals etc. in a way similar to chemical injection, immediately dissolving the air into the water, causing “white water”.

Air valves fitted with one-way OUT (bias) devices, may be required to maintain a siphon or pump suction, but results in the same vapour cavity to occur during (normal) low-pressure surges, with similar potential asset vacuum-related damage as in an air tight system.

Please contact us for more information.