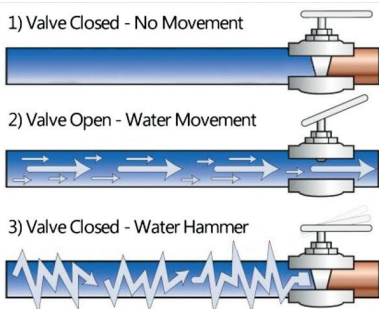


Addressing water-hammer events on equipment and concrete flooring infrastructure



A global bio-pharmaceutical company has reported high impact events known as water-hammers throughout pipework associated with their manufacturing and cleaning processes.

When a liquid flowing through an extended length pipe is suddenly brought to a stop by closing a valve at the end of the pipe, a large amount of pressure is produced behind the valve.



Graph of vibration frequency

This large amount of pressure has the effect of 'hammering' the walls of the pipe, this type of event is known as a 'water-hammer'.

These events have a detrimental effect on equipment used directly in the manufacturing process and concrete floor infrastructure as shown by the cracks in the floor where the extended pipework connects to equipment on another level.

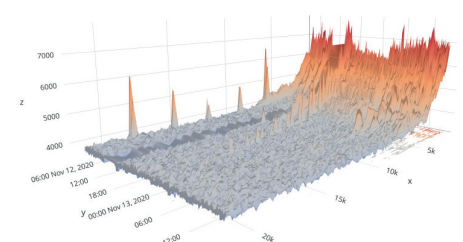
ThingWave proposed that IoT Devices & Advanced analytics be leveraged to detect the presence of these water-hammer events. The data provided by these devices are then to be used as justification to modify automation sequence parameters, thus correcting, and eliminating the high impact water-hammer events.



Wireless IoT acoustic sensors were used to monitor an entire processing area for water-hammer events. By detecting high amplitude events and characterising the acoustic profile by its frequency and acoustic pattern, it allowed for water-hammer events to be detected while ignoring other 'loud' events that can be attributed to normal operating procedures.

ThingWave IoT vibration sensors were then installed as required on suspected pipework to give a precise confirmation as to the exact pipework experiencing the water-hammer impact and the exact timing of these events.

The baseline vibration data indicative of water-hammer was measured (see below), collected, and plotted against the manufacturing's operational sequence timestamps (Unix timestamps) using ThingWave's in-house programs. By engaging with the client's Automation team, the data timestamps and SME, individual equipment (valves/pumps/etc) engaged at that point in which the water hammer was observed were identified.



Vibrational figure print of water-hammer impact events

The client has since updated the parameters within the identified automated sequences responsible for each of the water-hammer events, thus eliminating all future events and on-going damage to the facilities equipment and floor infrastructure.

