

Nominee: Aqua Cooling Solutions Limited

Nomination title: Aqua Leak Prevention System (LPS)

The patented Leak Prevention System (LPS), which uses a simple scientific principle for the first time commercially in its field offers continuous and guaranteed leak free operation. In 2015, the Aqua LPS product was awarded a Queen's Award for Enterprise: Innovation.

Unlike traditional systems, Aqua's LPS not only detects but also completely prevents leaks — a clear advantage for sites such as data centres and server rooms that are particularly vulnerable to the potential devastation caused by water damage.

By incorporating LPS into new and existing equipment, Aqua Cooling Solutions are able to offer clients the benefits of guaranteed leak-free water cooling systems that can be safely positioned close to sensitive IT equipment.

In the past, clients were often reluctant to take up any products involving water cooling – whether rear doors, CRAC or in-row units – because of the proximity of water to their expensive and highly sensitive computer equipment. Previous efforts to use valves to stop the water flow should a leak occur, were unsuccessful as this action also stopped the cooling and therefore effectively rendered the equipment redundant. Other patented negative pressure products, which had been used on small scale computer chips or silicone manufacture, could not be up-scaled to encompass a data centre with megawatts of cooling.

With these issues in mind, we designed our Leak Prevention System, have patented it worldwide, and continue to develop the system for use in other highly critical industry sectors. Aqua's solution was to use the basic scientific fact that water under negative pressure cannot escape through a hole or breach in pipework, hose or joint. The LPS works on the scientific principle of negative pressure that has been used over the last hundred years for transferring aggressive fluids or powders within factories, but the research development we undertook before being able to launch the LPS as a commercial product was substantial.

The solution to overcoming previous disadvantages was the venturi tube, made scalable to suit any size of data centre. While using a venturi tube was a simple idea, developing it and the associated components and equipment to make a system that was completely leak proof took us a year to perfect through researching, designing, trialing and making it suitable for commercial manufacture.

Any kind of breach will draw air into a closed water system – when in negative pressure, air is up to four times larger in volume than at atmospheric pressure. Our major concern was anticipating how our leak prevention system could cover all types and layouts of data centres – and the design of their piping system to carry water around the building – and return both the water and the enlarged air volume to the LPS while maintaining continuous operation in a fault condition.

We spent many hours trailing pipework designs and sizes to ensure we had sufficient velocity for the air to be carried back to the air separator in the LPS unit while not increasing the pressure drop and, therefore, decreasing the flow rate and negative pressure available. An enlarged volume of trapped air also introduces noise when returning to a positive pressure within the venturi tube. This collapsing of air is known as ‘cavitation’ – it can be extremely noisy and creates considerable vibration within a mechanical system. We therefore spent time with venturi designers in Germany and the UK to evaluate the correct pressure-to-flow ratios within the system to overcome this issue completely.

An established market perception that water is a high-risk coolant when employed around sensitive electronic equipment has been ultimately erased by the product’s leak-free guarantee. This in itself illustrates the truly revolutionary qualities of Aqua’s Leak Prevention System.

Water-cooled systems are energy-efficient, cheaper to operate, and up to 95% environmentally-friendlier than alternative systems such as air-conditioning. The LPS’s completely leak-free operation empowers customers to choose water as their coolant of choice.

As electronics become increasingly sophisticated and powerful — and their environments warmer — air-conditioning cooling methods will become increasingly less effective, which in turn will increase the demand for LPS as a reliable and effective water-cooled alternative.

The LPS technology has facilitated Aqua’s move into the data centre industry overseas, becoming an international exporter, distributing to an expanding marketplace that now includes Africa, Europe, the Middle East, the USA and China. This has enabled employee numbers to grow as demand for the LPS has increased.

The versatility of LPS technology has enabled its use in data centre across various commercial sectors including several British universities, a South African telecommunications provider and a bank in Bahrain.

Leak detection systems rely on water leaking, running off pipework or spraying from a burst to activate the necessary alarms and shut the system down, potentially after the water has come into contact with the servers – by which time damage would have already occurred. Remedies include leak detection tape, which adds to the expense of the system and must be regularly checked and maintained, and while detection systems can alert staff to a leak, these must be set to a level which will detect genuine increases in moisture levels to avoid false alarms. Such systems are expensive and not entirely foolproof.

The Aqua LPS guarantees leak free operation – the only product within the market place to do so.

Why nominee should win

- Truly innovative data centre technology – acknowledged by HM The Queen in the award of a Queen’s Award for Excellence: Innovation.
- Has changed perceptions of the deployment of water cooled technology within the market place
- Green IT – achieves highly efficient data centre environments with less than 1.2 PUE figures
- Modular and scalable, to suite any size or density of data centre from 23kW to 10MW and can work with high or low flow rates and water temperatures
- LPS installations have achieved CEEDA Gold accreditation