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Copper and Silver Water Treatment

Copper and Silver Ionisation

What is copper and silver ionisation?

Copper and silver ionisation is a relatively new modality for the control of Legionella, Pseudomonas and other pathogens in water systems. The use of copper and silver ionisation was first recorded in the USA in 1990 (Lin et al., 2011), although it was pioneered by NASA in the 1960s (Albright et al., 1967). The ProEconomy copper and silver ionisation system is known by its trade name of Orca.

How does copper and silver ionisation work?

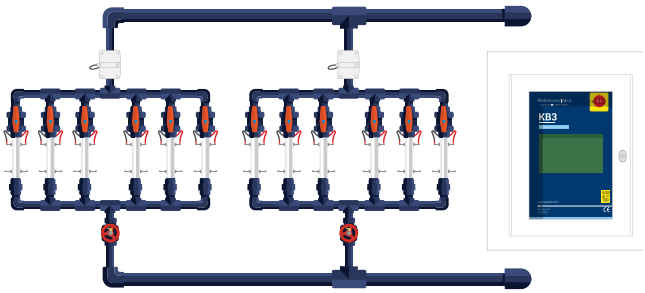
Copper and silver ionisation involves the generation of copper and silver ions in water by water flowing through a turbine of a flow sensor. This sends a signal to the control unit, which then passes a low DC current between two copper and two silver electrodes located in an electrode chamber. The current causes ionisation, i.e. the release of copper and silver ions into the flowing water. Being electrically charged the copper and silver ions seek opposite polarity and find this in the negatively charged sites on cell wall of bacteria, such as Legionella, Pseudomonas and E.coli. The ions distort and weaken the cell wall and then damage the cell by binding at specific sites to DNA, RNA, cellular protein and respiratory enzymes denying all life support systems to the cell, causing death.

Is copper and silver ionisation easy to install and operate?

The Orca Legionella control system is easily fitted into an existing water system and can readily be included in a new-build application. The Orca is assembled off-site so as to minimise disruption when it is connected to the water system, and is continually updated with the latest technology to ensure ease of use (see the 5th generation Orca system for latest developments).

Is copper and silver ionisation corrosive?

Unlike most chemical water treatments such as chlorine dioxide, the copper and silver ions are not corrosive to metal pipes including copper, PVC, galvanized steel and aluminium piping. In fact, the copper ions from the Orca water treatment system can help plate and rejuvenate piping.



Does copper and silver ionisation provide good distribution?

Unlike UV, ultrasound and filtration, which only treat the water at the place of contact, the Orca distributes active copper and silver ions throughout the water system and into the biofilm, thereby treating the whole water system. Legionella control, therefore, occurs even in areas with poor water flow such as deadlegs.

Does copper and silver ionisation provide residual efficacy?

The copper and silver ions remain active until they are consumed, thereby maintaining a residual treatment effect throughout the water system. The Orca Legionella control system also destroys the underlying problems that cause Legionella contamination, such as biofilm. Unlike chemical water treatments, such as chlorine and chlorine dioxide for example, copper and silver ions do not decay or 'gas off' over distance and the required concentrations at outlets are maintained. Efficacy is not affected by high water temperatures, unlike with chlorine dioxide and UV light systems.

A study by Liu et al. (1998) evaluated copper-silver ionisation systems installed onto the hot water recirculation lines of two

hospital buildings colonised with Legionella pneumophilla s1 and compared with a control also colonised with L. pneumophilla s1. Four weeks after activation of the system, distal site positivity for Legionella in the first test building dropped to zero. After operating for 16 weeks the system was disconnected and installed onto the second test building. Twelve weeks of disinfection reduced the distal site positivity for Legionella in the second test building to zero. Legionella recolonisation did not occur in the first test building for 6-12 weeks and in the second test building for 8-12 weeks after inactivation of the system.

Does copper and silver ionisation control biofilm?

The Orca water treatment system controls biofilm formation, reducing maintenance on tanks, taps, mixing valves, shower heads and other water bearing equipment. A study by Liu et al. (1998) found that a significantly higher copper concentration was found in the biofilm taken from a sampling device than was in the surrounding water. This was believed be the reason for the copper-silver ionisation system's residual effect and prevention of early re-colonisation.

Does copper and silver ionisation require maintenance?

All the required maintenance of the Orca system itself is carried out by ProEconomy. As the Orca water treatment system controls biofilm formation, it reduces maintenance on tanks, taps, mixing valves, shower heads and other equipment in contact with water. Expensive mixing valves can be removed, which negates the need to maintain them.

Is copper and silver ionisation safe?

The copper and silver levels found at outlets are completely safe to consume. There are no harmful effects to humans, the environment or animals. The Orca water treatment system conforms to the maximum allowed values for copper and silver in drinking water as prescribed in the UK Water Supply (Water Quality) Regulations 1989, and the UK Water Supply (Water Quality) regulations 2000.

Is copper and silver ionisation chemical free?

The Orca water ionisation system requires only copper and silver to control Legionella. Harmful chemical by-products are not produced. There are no issues with COSHH regulations when handling, storing or transporting copper and silver.

Can copper and silver induce resistance?

Research suggests that because the Legionella bacteria are killed by the copper and silver ions rather than merely being suppressed, development of resistance, which is seen with the temperature control regime and chemical treatments, is less likely. Since 1993 the Orca control system has been successfully controlling Legionella, Pseudomonas and other pathogens in hundreds of water systems, and the development of resistance has never been an issue.

Stout and Yu (2003) pointed out that in a study performed in Germany the failure of copper-silver ionisation to control Legionella was attributed by the authors to the emergence of Legionella resistant to copper and silver ions. Careful analysis of the article by Stout and Yu, however, argued that resistance to copper or silver ions was never demonstrated for any Legionella strains isolated following copper-silver disinfection. The apparent failure to control Legionella was more likely due to the use of inadequate ion levels rather than the development of resistance.

Is copper and silver ionisation tested and approved?

The UK Approved Code of Practice ACOP (L8) from the HSE supports copper and silver ionisation as an effective method of Legionella control in hot and cold water systems (HMSO ISBN 0-7176-1772-6).

The UK HTM04-01 guidance for NHS trusts also supports copper and silver water ionisation as an effective method of Legionella control in water systems.

The ProEconomy Orca water treatment system conforms to the maximum allowed values for copper and silver in drinking water as prescribed in the UK Water Supply (Water Quality) Regulations 1989, and the UK Water Supply (Water Quality) regulations 2000.

The Orca system has been fully tested and approved under the UK Water Regulations Advisory Scheme (WRAS).

All electrical components of the Orca water ionisation system have been tested and qualified for electromagnetic compatibility (EMC).

All design, manufacture, installation and maintenance of the Orca system is carried out in accordance with the terms of ProEconomy's registration under ISO 9001.

How many Orca systems are there?

There are four models of the Orca systems that fit different flow rates and water capacities. The Orca copper and silver ionisation systems manifolds are tailor-made to suit each individual site. The Orca water treatment system will treat waters from wherever it is supplied to the site e.g. a mains' feed, borehole, from storage tanks or directly fed to the site. The Orca Legionella control system will effectively treat softened, raw, hot and cold water.

References

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