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Copper and Silver Water Treatment

Case Study

Cooling Tower Treatment at the European Space Agency (ESTEC), Noordwijk, Holland

Controlling Legionella in a GN Chiller System and a KA Cooling Tower with the Copper and Silver Ionisation System

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Background

Cooling systems can provide an environment for the growth of many microorganisms, including *Legionella* bacteria which can spread widely via water spray (aerosol) and cause Legionnaires' disease in humans. These bacteria, therefore, are by law required to be controlled and all cooling systems should be subject to a well-planned and managed control system.

The European Space Agency (ESA) has been using an Orca copper and silver ionisation (CSI) system for treating the water supply to their GN chiller for the control of *Legionella* since 2004.

Previously the Nalco 2510 biocidal chemical was occasionally added manually to the cooling towers. Aquazur CW-434 biocidal chemical was als1o occasionally manually dosed. Dosing with chemicals was stopped in June 2008.

Installation of the Orca System

ProEconomy pre-fabricated the 18-pod KB3 CSI system off site for assembly on site, while the Estates staff/independent contractors prepared the site for the installation by pre-installing flanges and Keraflo valves.

The installation was followed by a monitoring and cleaning programme by ProEconomy which is still in place.

Results

Table 1 shows silver, copper, *Legionella* and TVC results for the Barracuda CSI system before installation and for the first year and a half after installation.

Table 1. Analysis Results for Silver, Copper, TVCs and *Legionella pneumophila* Dec 2003-May 2005 - ESA Cooling Tower

Date	*Silver (ppb)*	*Copper (ppb)*	*TVC 37 (cfu/L)*	*TVC 22 (cfu/L)*	*Legionella (cfu/L)*
Dec 2003	0	349	675	434	5756
Feb 2004	28	588	1021	1715	ND
May 2004	36	545	212	107	ND
Jan 2005	13	275	43	97	ND
Feb 2005	11	931	153	176	ND
Mar 2005	15	255	14	8	ND
Apr 2005	14	284	312	123	ND
May 2005	17	365	967	47	ND

ND = none detected

The results show that *L. pneumophila* counts (5756 cfu/L) were high pre-installation of the CSI system. The counts were down to non-detected (ND) after installation of the CSI system.

The results also show that TVC counts were high pre-installation with a mean value of 675 (37 degrees) and 434 (22 degrees).

It can be noted that 2 months after installation of the CSI system, TVC counts increased (Feb 2004). This was expected because the copper and silver ions will dislodge the biofilms in the system, which in turn will temporarily result in an increase in TVC counts because biofilms were broken up and allowed bacteria to be released into the water. However, the copper and silver ions will find and destroy the bacteria.

As shown in table 1, five months after the system installation (May 2004), TVC counts were lower than pre-installation and the downward trend continued.

The summary results from 2013 to 2017 shows that there were no *Legionella* positives during the period (Table 2).

Table 2. *Legionella pneumophila*, ESA Cooling Tower, 2013-2017

Year	*Total samples taken*	*Total positives*
2013	13	0
2014	34	0
2015	32	0
2016	35	0
2017	43	0