Independent Guide

Closed water systems – How do I deal with a Pseudomonas contamination?

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Introduction

Microbiological contamination (sometimes referred to as "biofouling") of closed water systems can be caused by a number of different micro-organisms including Pseudomonas. This can cause a range of issues such as; blockages preventing water circulation and the failure of equipment in the system such as pumps and valves. It can also lead to poor efficiency, increased energy consumption and increased running costs, including higher maintenance costs.

When properties change hands it can lead to disputes over responsibility for the cause of contamination and the fees to eradicate it from affected systems. This is especially significant to Pseudomonas contaminations as they can be difficult and costly to remove; the profuse biofilm produced by the micro-organism must be dealt with effectively. This guidance will give you a methodical approach that should be considered as part of the overall water treatment regime if biocidal treatment is to be successful.

1. Preparation

When Pseudomonas contamination is confirmed in a closed water system it is important to prepare your approach properly before commencing a water treatment regime to deal with the problem. There is published guidance available to help you:

- CSA GN4-2019 "Bacteria within Closed Circuit Pipework Systems"
- BSRIA BG29-2021 "Pre-commissioning Cleaning of Pipework Systems"
- BS 8552-2012 "Sampling and monitoring of water from building services closed systems. Code of Practice.
- BISRIA BG50-2021 "Water Treatment for Closed Heating and Cooling Systems"

The Water Management Society are also offering a "Management and Control of Closed Hot, Cold & Chilled Water Systems" (Accredited Module) training course.

Is a clean source of water available to provide the necessary flushing and refilling requirements?

A water source free from Pseudomonas contamination is essential; otherwise recontamination of the closed water system will keep occurring. A mains water supply with a relatively short run of pipework from the point of curtilage should provide water free from detectable Pseudomonas. Where possible, the supply water should be sampled to confirm this is the case.

Is the layout of the closed water system pipe work and equipment clearly understood by you and the people you will use to assist you?

Closed water systems can be simple in layout but are often complex and include long runs of pipework and allied equipment. For a water treatment regime to be wholly effective, the chemicals must be able to reach all parts of the system. Deadlegs, blind ends, inadequate pumps and inoperative valves can all prevent water circulation and consequently hinder chemical treatment. A schematic drawing should be available to provide the confidence that the system is understood and that the correct volumes and concentrations of water treatment chemicals are added. You should also know what the materials of construction are for the closed system as the choice of chemicals to be used will be determined by the nature of the materials.

Is the water treatment specialist competent to do the task?

Water treatment is a specialist building service and checking the competency and capability of the organisation selected to deal with a Pseudomonas contamination problem is vital. Membership of recognised trade bodies is helpful, such as membership of the Water Management Society or Closed System Control Association, but the best evidence comes from success in similar situations and systems. References or testimonials can help with your decision on which competent specialist to use.

2. Pre-treatment

After the correct preparation has taken place, the next step is pre-treatment. This involves creating a situation where the system is brought to a condition where the biocidal water treatment can be most effective. The amount of pre-treatment required will depend on the level of contamination present, and whether this is a systemic issue, or localised to stagnant parts of the system which have been returned to operation.

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Has the slime in the system been fully flushed out?
Pseudomonas organisms produce a slime layer that is not easily washed away. This slime layer causes the biofilm and the problems that can lead to blockages etc. in the closed water system. The slime layer also serves to protect the micro-organism from the effects of biocidal chemical agents and can result in residual Pseudomonas surviving in the closed water system, even after treatment. If this slime is not adequately cleared, the subsequent biocidal water treatment will not work, and the contamination will keep recurring. To achieve this aim, a significant volume of water for flushing may be required but this stage should not be underestimated or compromised. The cost of water treatment in the long run will be lower if this stage is carried out effectively.

3. Decontamination
When the system is judged to be clear of slime an effective biocidal agent should be used to kill any residual Pseudomonas.

Has the right biocide been selected?
The choice of biocidal agent should be based on its effectiveness against Pseudomonas specifically and field trial test data should provide the evidence required. The correct concentrations and contact times must be achieved for successful decontamination. Your water treatment specialist should be able to provide you with this information.

4. Refilling
When the biocidal treatment is completed the closed water system will need to be refilled using the correct chemical agents. A source of water clear of Pseudomonas contamination should be used for refilling the system to prevent recontamination.

Have the correct water treatment chemicals been added?
Closed water systems should never be filled with untreated water, or, after filling with treated water, be left stagnant for long periods of time. The advice of a competent water treatment specialist should be followed, and the correct water treatment chemical added for the specific type of system in place and the nature of the materials of construction of the system and its components.

The chemical treatment regime, which will usually include corrosion inhibitors and a biocidal agent, reduces the chances of recurring Pseudomonas contamination. Sampling and testing will confirm that the concentrations of the chemicals have been achieved, after circulating the water throughout the system. This should be confirmed at the outset to provide a satisfactory "baseline" position and on a regular basis from then on.

By their very nature, closed water systems are regarded as "tight", so water loss, and consequently chemical loss, from the system should be minimal. The frequency for sampling and testing of chemical levels and bacterial activity should reflect this fact. Quarterly sampling and testing is best practice for most systems, but whatever frequency you settle on must be based on the level of control, usage, complexity and condition of the system itself.

This document provides general guidance only. As an independent consultancy, Assurity Consulting cannot recommend specific products or services. The advice and help of a suitably qualified and accredited water treatment specialist should also be considered alongside this guidance.

This guide is of a general nature; specific advice can be obtained from Assurity Consulting. Assurity Consulting is the UK's leading independent compliance consultancy specialising in workplace health, safety and environmental solutions. We have over 35 years' experience of helping customers of all sizes, from across all sectors, manage their compliance responsibilities, making sure that their organisation is compliant, their employees are safe, their processes are cost effective and their management team is in control.

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