



MINIMISING LEGIONELLA IN THE WATER AT A HUNGARIAN PHARMACEUTICAL PLANT

1. Organisations involved

A Hungarian pharmaceutical and chemical manufacturer

Országos Környezetegészségügyi Intézet (National Institute of Environmental Health)

2. Description of the case

3.1. Introduction

This Hungarian pharmaceutical manufacturer has been in business for decades; it recently became part of a multinational group. The plant concerned carries out research & development and produces chemicals and pharmaceutical products at the same site. The group has its headquarters in France and the company wishes to follow an identical policy around the world based on the French standards. Preventing health problems associated with *Legionella* is a priority in French legislation. Therefore, the company wishes to introduce French standards in all plants, thus exceeding the lower Hungarian legislative requirements in safety and health. This case study describes how the company confronted *Legionella* problems and how the relevant risks were minimised.

3.2. Aims

The company's ambition was to minimise any *Legionella* risk by applying French standards. The plant consisted of a conglomerate of buildings from different time periods, which corresponded to different levels of infrastructure. There were various cooling towers, emergency fire-extinguishing water pipes and internal hot water systems. The pharmaceutical processes in place did not always permit the use of simple chemical disinfection methods for minimising exposure to bacteria. The final goal was to produce high quality products while at the same time operating the facilities with a minimum risk to workers and the surrounding urban environment.

Meanwhile, changes in technology necessitated amendments in the water treatment plants. The company wanted to completely modernise the entire water management procedure. With the help of external consultants, engineers developed a new approach that was accepted by all parties concerned. Although it has the status of a recommendation, it could be considered as a binding document because of its high acceptance.

3.3. What was done, and how?

The company contracted the National Institute of Environmental Health (Országos Környezetegészségügyi Intézet – OKI) to carry out regular *Legionella* tests at specific points of some procedures and systems with a high risk of contamination. The technical services and facilities department of the company together with the Office of the Chief Medical Officer of the Institute inspected the entire water system of the plant and agreed on the sampling points. The company's standard was developed initially for cooling towers and it has been adapted for other water-containing systems. In the case of running water, the sampling points were chosen to be as far away from the water supply entry points as possible.

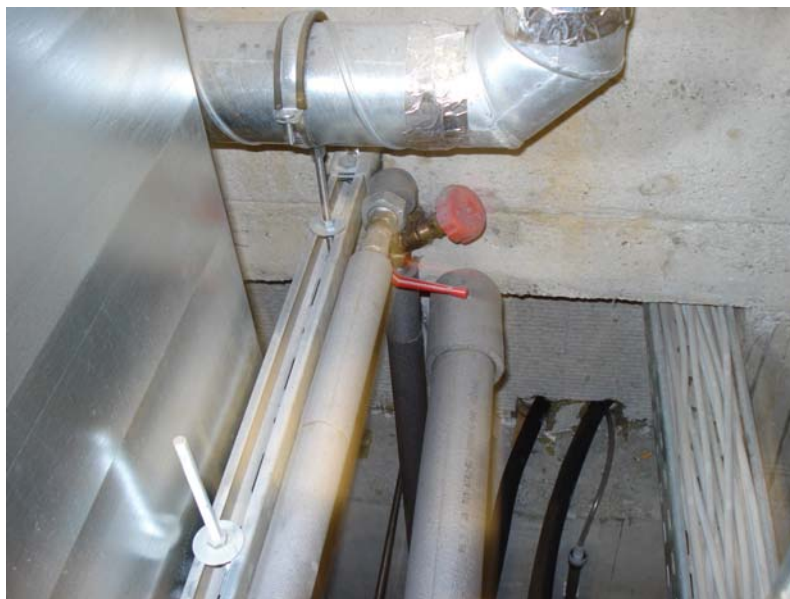
CASE STUDIES

In accordance with international standards, the company decided to monitor *Legionella* quarterly. The limit values were those of the EWGLI guideline. The results were rated in three grades. Under 1,000 CFU/l the system was considered safe and no intervention was needed. Between 1,000 and 100,000 CFU/l the system needed intervention to reduce the presence of bacteria in the form of a systematic overview of structures and processes concerned and a planned modification according to the test results. In this case, the use of workers' hot water showers was immediately prohibited. Beyond 100,000 CFU/l the system was immediately shut down and special measures were taken.

The hot water circulation system

Testing of water samples from the running hot water system showed higher *Legionella* counts than expected. The community protection manager organised an on-site supervision together with the mechanical engineer of the technical services and facilities department. They carried with them the original plans of the buildings and compared the existing hot water system with the plan. The most important incompatibilities were loops isolated from the main circulation (see picture 1) thus accumulating stagnant water and decreasing temperature, which favoured *Legionella*. During the assessment process it was proved that the water system was scarcely used because workers did not use the showers after their work. The company did not want to use chemicals for disinfection, because of a possible contamination of the laboratory environment.

Picture 1: Hidden closed loop in hot water circulation system that provided room for *Legionella* growth



Source: Company, 2009

The first stage of the intervention was to eradicate *Legionella* from the water system. The company decided to practise heat-shock treatment. Closed loops were opened and the mechanical engineer proposed the use of a higher capacity pump for the circulation of water. Higher turnover resulted in higher average temperatures within the hot water system that inhibited *Legionella* growth. Workers were informed about the infection risks and during the heat-shock treatment signs were also placed at the taps warning about the risk of scalding. The *Legionella* sampling rates decreased and the company regularly applied heat-shock to minimise *Legionella*. These heat-shocks involved increasing the water temperature to 80 °C



and circulating it for 60 minutes. This process heated the entire system. After completion, taps were opened to wash out the outlets. Operators wore breathing protection apparatus. In order to minimise the risk of scalding, the laboratory personnel carried out the regular heat-shock treatments during weekends when the system was not in use. However, warning signs were still retained at all tap outlets.

Cooling towers and water management

A protocol was drawn up for cleaning cooling towers. Although most of the cooling towers cannot easily develop *Legionella* because of their type and construction, and despite a regular cleaning and disinfection procedure, the water sample of one tower exhibited high *Legionella* counts on one occasion. The investigation revealed that the chemical disinfectant had lost its capacity to disinfect. The introduction of fresh potassium-hypochlorite (bleach) reduced *Legionella* counts to below normal values. In addition, the shutters of the cooling tower opening directly to the road were closed, and a wall that was built to decrease noise levels also provided protection by preventing the spread of vapour.

A new cooling water management plan was drawn up with the help of external consultants. After the initial assessment, the consultants proposed a cleaning step to remove scale and rust from the pipes. Cleaning was done with chemicals capable of removing biofilms, grease and rust from the pipes, and killing harmful microbes (biocide chemicals). The engineers developed an automated system of chemical injection and sludge removal from the system. Monitoring of cooling tower water was also part of the quarterly *Legionella* risk assessment process. Daily checks of active halogen content (the indicator of biocide efficacy) became a routine.

3.4. What was achieved?

- High-risk situations were eliminated with a sustainable system that satisfies standards higher than those stipulated by Hungarian legislation.
- The monitoring system for the entire plan ran on a yearly budget of about around €2,500. The purchase of the new pump and related costs to the hot water system were negligible.
- No *Legionella*-related diseases were recorded at the plant..

3.5. Success factors

Management was committed to introducing stricter company standards than those stipulated by the obligatory legislation. Good cooperation with the National Institute of Environmental Health enhanced the exchange of information and led to a reliable partnership for the fulfilment of the common goal; that is, the elimination of *Legionella*.

3.6. Further information

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3.7. Transferability

The approach can be introduced at companies operating water systems that may be subject to *Legionella* risk.

3.8. Abstract

This Hungarian pharmaceutical plant was part of a worldwide pharmaceutical group. In France, where the group has its headquarters, *Legionella* issues are regulated by a national legislation with provisions stricter than those in Hungary. The company decided to apply the French provisions regarding *Legionella* in Hungary as well. *Legionella* monitoring revealed high-risk spots in the hot water circulation system. The company cleaned the piping and introduced regular heat-shock treatment. It also set up a new company water management plan, including cooling water. The standard company approach helped to tackle *Legionella* risk and has prevented diseases so far.

4. References, resources:

- Information provided by the company and the institute for the Topic Centre Occupational Safety and Health consortium.