

Germ reduction by using the multi-barrier system with hygiene technology

Task Hygienic stabilisation of the drinking water systems of two multi-storey residential buildings

Initial situation

The affected property consists of two multi-storey residential buildings with approximately 100 apartments each. Both buildings are supplied with drinking water via a joint supply line. The apartments are used by owners and tenants and, to a not inconsiderable extent, by students. In the course of the required microbiological analyses, high germ loads of legionella were detected at several tapping points and an analysis of the drinking water system was then commissioned. After the risk assessment had been carried out by an external expert, the idea of completely dismantling the existing drinking water system initially was in the air. As this would have been extremely expensive, an alternative plan of measures was developed by the specialist installation company and then consistently implemented in agreement with the owner/operating company and with the approval of the local health authority.

Goal/Approach

1. In a first step, the water treatment was completely revised. The scale and anti-corrosion dosing existing on site, which was only used for treating cold water, was replaced by a central Grünbeck water softener Delta-p with subsequent dosing of mineral substances (Grünbeck EXADOS grün).
2. In order to prevent stagnation, automatic flushing devices were installed on the riser pipes to ensure a regular exchange of water. At the same time, the installer dismantled existing dead legs.
3. To disinfect the already contaminated system and as an immediate measure to protect the residents, a chlorine dioxide generation system GENO-Baktox MRX was implemented for temporary continuous dosing in order to add the disinfectant chlorine dioxide to the cold and hot water.
4. Following the successful disinfection, a safeliQ:EA100 with two hygiene elements and a peak flow of 10 m³/h was installed on each of the two cold water inlets. This prevents possibly contaminated water from getting into the system at the POE.
5. In each of the two hot water circulation systems, a hygiene system safeliQ:CA70 with frequency-controlled circulation pump and hygiene element was installed. This system is used to reduce the germs in the circulation return and prevents the regrowth of legionella bacteria in the circulation system.

Hygiene system safeliQ:EA100

Application:	Drinking water
Water type:	Public drinking water
Point of application:	Entry to the house (point of entry) and hot water circulation (point of circulation)
Kind of water:	Cold and hot water
Flow rate:	up to 7 m ³ /h cold water and up to 4 m ³ /h hot water
Consumption per day:	approx. 6 – 10 m ³ (cold water, POE)



BUILDING 1

Microbiologic sampling for *Pseudomonas aeruginosa* at the point of entry (safeliQ:EA100)

Pseudomonas aeruginosa colony count [CFU/100 ml]		
Sampling point	Sampling valve upstream of hygiene system	Sampling valve downstream of hygiene system
19/10/2017	71	0
22/11/2017	80	0

Conclusion: The *Pseudomonas aeruginosa* bacteria introduced via the point of entry were retained.

Microbiologic sampling for *Legionella pneumophila* at the point of entry (safeliQ:EA100)

Legionella pneumophila colony count [CFU/100 ml]		
Sampling point	Sampling valve upstream of hygiene system	Sampling valve downstream of hygiene system
07/11/2017	< 100	0
21/11/2017	< 100	0
26/04/2018	0	0

Conclusion: The *Legionella* bacteria introduced via the point of entry were retained.

Microbiologic sampling for *Legionella pneumophila* bacteria in the hot water circulation (safeliQ:CA70)

Sampling point	Legionella pneumophila colony count [CFU/100 ml]		Temperature at sampling [°C]	
	Sampling valve upstream of hygiene system	Sampling valve downstream of hygiene system	Sampling valve upstream of hygiene system	Sampling valve downstream of hygiene system
09/02/2017 ¹	900		56.0 °C	
04/04/2018	0	0	65.2 °C	64.3 °C
26/04/2018	0	0	60.4 °C	60.4 °C

¹ Sampling took place in the circulation return and prior to the installation of the hygiene system

Result (cold water)

- By installing the two hygiene systems in the cold water (POE), germs introduced via the water's point of entry could be retained and the water was treated hygienically.
- In addition, the deviation from the planning values could be shown by means of measuring sensors (temperature and flow measurement). With approx. 3 m³/h, the flow was considerably less than could have been expected in an installation of this size (DN 50).
- Furthermore, cold water temperatures of more than 20 °C were regularly measured at the point of entry. From a normative point of view, this temperature is still acceptable, but from a hygienic point of view it is undesirably high and indicates the need for a protective measure.

Result (hot water)

- Despite compliance with the required water temperatures (60 °C/55 °C), legionella bacteria were detected in the hot water prior to the installation of the hygiene technology (refer to analysis dated 02/2017).
By installing the two hygiene systems safeliQ:CA70 in the hot water circulation, it was possible to reduce the germ count.
- Despite the temperature being in accordance with the standards and despite structural measures, isolated legionella bacteria could still be measured in the circulation return.
Thanks to the germ retention of the hygiene system, these bacteria are physically removed from the water. The hygiene system thus reduces germs and removes still emerging legionella bacteria from the hot water.

BUILDING 2

Microbiologic sampling for *Pseudomonas aeruginosa* at the point of entry (safeliQ:EA100)

Pseudomonas aeruginosa colony count [CFU/100 ml]		
Sampling point	Sampling valve upstream of hygiene system	Sampling valve downstream of hygiene system
19/10/2017	0	0
22/11/2017	0	0

Microbiologic sampling for *Legionella pneumophila* at the point of entry (safeliQ:EA100)

Legionella pneumophila colony count [CFU/100 ml]		
Sampling point	Sampling valve upstream of hygiene system	Sampling valve downstream of hygiene system
07/11/2017	0	0
26/04/2018	0	0

Microbiologic sampling for *Legionella pneumophila* bacteria in the hot water circulation (safeliQ:CA70)

Sampling point	Legionella pneumophila colony count [CFU/100 ml]		Temperature at sampling [°C]	
	Sampling valve upstream of hygiene system	Sampling valve downstream of hygiene system	Sampling valve upstream of hygiene system	Sampling valve downstream of hygiene system
09/02/2017 ²	7		54.0	
04/04/2018	3	0	62.7	62.4
26/04/2018	0	0	62.7	62.7

² Sampling took place in the circulation return and prior to the installation of the hygiene system

Conclusion

The installation of the hygiene systems safeliQ:EA100 results in protecting the two drinking water supply pipes and ensures hygienically safe drinking water in accordance with the German Drinking Water Ordinance. Although the two existing hot water systems met the applicable regulations, e.g. with regard to the standard-compliant temperatures of the hot water circuit, these systems had not been hygienically safe prior to the implementation of the set of measures described above. Thanks to the germ reduction in the water heating by means of the hygiene systems safeliQ:CA70, the circulation system could be sustainably stabilised from a hygienic point of view. Apart from the stabilisation of the hot water circulation, hygiene in the riser pipes and branch lines was also improved. The evaluation of the tapping points illustrates this by the improved legionella values in the hot water directly at the consumer.