

Secondary Disinfection System In Critical Care Hospital

Background

ChemTreat manages the cooling water treatment program for a healthcare facility located in the Eastern U.S. In March 2008, the Director of Engineering asked if ChemTreat was able to perform a quick Legionella test on their cooling towers. We recommended a new Phigenics Validation Test and also suggested testing the potable water systems. The director ordered 25 PVT tests to randomly test the systems. Bone marrow transplants are performed at this hospital, so these are exceptionally high-risk patients because of their immune-compromised condition. Because of the critical need to provide high-quality water to these areas, we started our PVT testing there.



Initial Pathogen Testing

On April 3, 2008, ChemTreat performed the first round of pathogen testing. A new, patent-pending method known as the Phigenics Validation Test (PVT) was employed. This test methodology provides a biological profile assessment of the water. Total heterotrophic bacteria and Legionella serotypes 1-14 are delineated in approximately two to three business days. The initial test results indicated microbe levels in some potable water samples were higher than those in the cooling towers. Hospital personnel were shocked and expressed a desire to deploy ChemTreat's resources to mitigate the problem. A team was drafted including personnel from administration, infection control, microbiology, legal council, engineering, ChemTreat, and Phigenics. An action plan was established to address this noncompliance. Concurrent with this internal action, publicity relating to this issue abounded.

The first action item was to resample the systems. During the second round of testing, normal water samples were also sent to a second Legionella lab for verification. These samples came back negative with low levels of microbes present. The world-renowned microbiologist on staff backed the PVT test methodology and stated this was the best method to use for accuracy and speed. It was discovered in the spring the municipality switched from chloramines to chlorine and flushed the lines and mains. This can result in biomatter resuspending and being conveyed to the end user. Suspecting this was occurring, ChemTreat resampled the hospital water for biological

enumeration and free chlorine. When samples showed higher than normal levels of microbes present in the incoming water to the hospital, the municipal water authority was notified and they increased their free chlorine levels. (Chlorine is more reactive than chloramines and as such, will impact sessile bacteria.)

Results

ChemTreat was asked to formulate a plan of action to address the issue. We proposed our proprietary ICA-50S sachet technology along with our ability to monitor with ChemTreat's alliance partner, Hach. It was decided to treat the domestic water in three separate locations. The purchase order was issued and the equipment was ordered. The hospital wanted to have its contractor install the equipment, so we consulted with them on the location of the injection points, and the location of the chemical solution tanks and monitors.

Next Page





The hospital was very concerned with chlorine dioxide exposure in the mechanical spaces and asked us to provide an air monitoring device with audible and visible alarm capabilities. Industrial Scientific ClO₂ monitoring and alarm systems were purchased. These were also installed by the hospital's mechanical contractor. During this time, the BMT (bone marrow transplant) ward was put on bottled water and the rest of the hospital was advised not to drink or use the water. Facilities engineering personnel would go room to room and flush each sink/shower and water fountain until there was a free chlorine residual.

We initially found there was a good free chlorine residual entering the hospital, but no free chlorine residual on the top floor of the hospital. At the beginning, it took over five minutes of flushing to obtain a free chlorine residual in the water on the top floor. These were flushed every few hours until a free chlorine residual was the rule, not the exception. This was accomplished concurrent with the equipment being installed. The ChemTreat ClO₂ system was started up in June 2008. It was decided by all that we would slowly begin feeding the chlorine dioxide to the two mains so the biofilm would not slough off in mass (black ice). We would increase the levels slowly each week until a free chlorine dioxide residual was obtained. This was done throughout the summer months and as of August, testing of both mains showed free chlorine dioxide residuals of 0.2–0.4 mg/L.

On the BMT skid, an emergency disinfection was in order and we were asked to provide high levels of free chlorine dioxide while the system was offline to eradicate the microbes and bio-film. Facilities engineering personnel would manually flush the sinks/shower heads and water fountains every few hours while the ClO₂ was being fed. After several weeks of feeding the ClO₂, the system was retested and the mains were found to be clean. ChemTreat was concerned about the pretreatment for the BMT water. It consisted of a set of carbon filters, water softeners, ozonator, deozonator, carbon filters, 5 micron filters, UV light, and a 0.2-micron filter. We suspected these areas could be locations providing a growth environment for bacteria. Testing revealed the water entering the BMT pretreatment system was lower in microbes than the water coming out. Our suspicions were confirmed. The pretreatment skid was providing an area where bacteria could grow and proliferate, the rule of unintended consequences.

After additional PVT testing was performed, it was decided by the hospital to by-pass the BMT skid and apply the sachet chemistry to attain free ClO₂ residuals of 0.2–0.3 ppm. After several weeks of maintaining a 0.2–0.3 ppm chlorine dioxide residual, more PVT testing was commissioned. The results showed the microbiological levels were reduced significantly and well below any area of concern. The water system was put back into operation and the BMT floor taken off bottled water.

At present, the BMT equipment is still by-passed and the ChemTreat ClO₂ sachet feed system is functioning well, yielding the BMT ward with good quality potable water.

The hospital wanted a turn-key solution to a critical problem. ChemTreat and its alliance partners stepped up to the plate and solved a serious problem with the potential to impact patients.

