Ashtabula Rubber Co.

Chloramine in Potable Water Systems Causes Rapid Elastomer Deterioration

With many of our clients directly involved in the potable water industry, the rubber components we supply must meet strict EPA regulations. For years, the potable water industry has used disinfectants like chlorine to kill bacteria. However, these disinfectants were producing disinfectant by-products (DBP's). Because high levels of DBP's may cause cancer, the EPA now limits the amount of DBP's found in potable water.

In response to the new regulations, water treatment facilities began seeking alternatives to chlorine. Chloramine was the natural choice because it produced fewer by-products. Although this solved the problem of DBP's, chloramines can affect other materials that were found within a potable water system, elastomers being one of them.

To determine exactly how chloramine would affect rubber components, the American Water Works Association Research Foundation studied seven basic elastomer formulations (Natural Rubber, Nitrile, SBR, Neoprene, EPDM, Silicone, and Fluorocarbon) and subjected them to a series of tests to examine their life cycle when exposed to chloramine. The results were surprising.

The rubber reaction to chloramine exposure consisted of cracking, severe swelling, rapid loss of elasticity, and loss of tensile strength. The AWWARF found chloramines attack the polymers, resulting in significant degradation of the physical properties that rubber components are designed to possess. The study also found that rate of decay increased as the temperature increased. These results spelled disaster for the potable water industry and the call for a chloramine resistant elastomer was made.

In the field, the severity of the effect of chloramine exposure has varied widely. Tests have shown that the degree of deterioration depends on the material formulation used, the amount of chloramine present in the system, and the temperature of the operating environment. In some cases, the breakdown of the elastomer can be rapid. For example, in Austin, Texas, a portion of the water system in the city was converted from chlorine to chloramine. Less than 12 months after the new system was installed, residents reported seeing small black flakes (rubber that had corroded away) in their water. Although these cases were rare, they demonstrate the rapid decay of certain rubber compounds within a water system using chloramine.

So how prevalent is this problem? Rubber components and water containing chloramine can be found in kitchen fixtures, bathroom shower heads and faucets, bathroom toilets, drinking fountains, irrigation systems, ice makers, fire suppression systems, sprinklers, water pipes, and water meters. The AWWARF study went on to suggest that standard formulations of Natural Rubber, Nitrile, SBR, Neoprene, and EPDM deteriorate quickly when in contact with chloramine. However, Silicone and Fluorocarbon performed very well in the tests.

Unfortunately, Silicone and Fluorocarbon are significantly more expensive materials. The good news is Ashtabula Rubber Co. and other rubber manufacturers have developed custom EPDM and Nitrile formulations that are chloramine resistant. Many of our custom formulations are in use by our clients in the potable water industry.

If you need assistance with chloramine resistant components, or have any other questions related to rubber component design, geometry, or material selection, please contact our Engineering Manager, Aaron Hall at 440-813-5848 or e-mail him at ahall@ashtabularubber.com