



Root Cause of Gasket Failure in a Water Valve

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Executive Summary:

Disassembled water/icemaker valve parts were submitted for analysis. Two valve seats were analyzed. One seat is from the icemaker side of the valve assembly, the other is from the “water-in-the-door” side of the valve (referred to as “icemaker” and “water” valve seats).

Fourier transform infrared spectroscopy, (FTIR) and optical and scanning electron microscopy with energy dispersive X-ray spectroscopy, (SEM-EDS) were used to analyze the valve seats. FTIR analysis indicates that the valve seats are made of a polybutadiene (PBD) based rubber that has been attacked by chlorine in the water. SEM-EDS shows the presence of chlorine on the degraded surface indicating that chlorine in the water was responsible for degradation of the rubber. Cracks and etching are also present on the “water” side of the valve but the affect does not appear as severe. It is well known that PBD rubber has poor chemical resistance is not stable in chlorinated water. Rubber gaskets and seals used in equipment designed for use in handling municipal water supply should be constructed of materials that are resistant to tap water containing oxidizing chemicals (i.e., chlorine and cloramines) added to the water to inhibit microbial growth.

It is well known to those in the scientific community that PBD rubber is not stable toward strongly oxidizing environments (e.g., chlorinated municipal water). Since icemakers are intended for use with municipal water supply, it is obvious that PBD rubber gaskets are NOT the correct gaskets to use for manufacture of icemakers. Therefore the icemaker was defective in its engineering/design. Several elastomeric gasket materials are commercially available that are much more chemically resistant than PBD. For example, ethylene-propylene-diene-modified (EPDM) and silicone rubber gaskets are often used in applications requiring resistance to oxidizing materials.