DeZURIK

APPLICATION SOLUTION
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COOLING WATER INTAKE VALVES SUCCEED IN MICROBIOLOGICALLY INFLUENCED CORROSION (MIC) ENVIRONMENT

Challenge

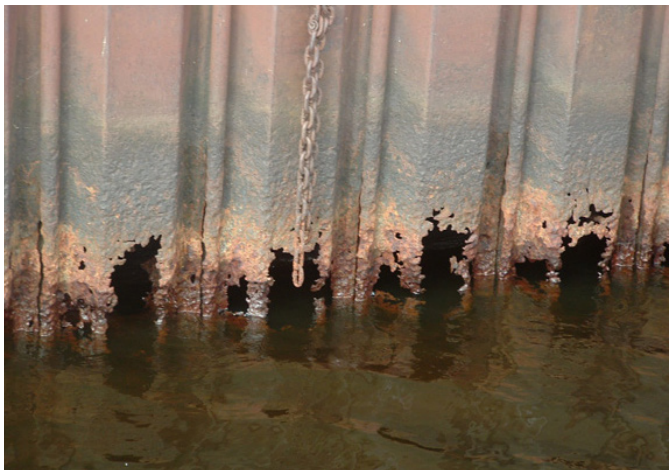
A process plant draws large volumes of water from the Delaware River that is fed from the Atlantic or Eastern Seaboard and directs the water to other parts of the cooling water system. The intake water is brackish and harbors microbes that severely corrode stainless steel materials by microbiologically influenced corrosion (MIC).

Microbiologically Influenced Corrosion

MIC is corrosion caused by the presence and activities of microorganisms including bacteria, fungi, and microalgae in water. Microorganisms do not consume the materials they adhere to but can change the environment significantly to result in corrosion. The bacteria can develop into a colony called a biofilm and adhere to metal and nonmetal surfaces like elastomers. Biofilms are impacted by pH, temperature, velocity and surface finish. They grow well at moderate pH levels, ambient temperatures, slow velocity or stagnant water, and on rough surfaces. Under these conditions biofilms can be an issue for many industries such as power plants, refineries, steel mills, paper mills, and marine environments making them prone to MIC.

Field Experience and Lab Testing

There are options to treat MIC susceptible valves and pipelines such as applying biocides to kill the bacteria in the water or pigging which removes the biofilms with a mechanical cleaning tool. There's also been recent research in specialized enzymes that are added to metal coatings that reduces the amount of biofilm produced. The best way to address MIC concerns is by choosing the best materials to handle the process environment. Field experience and lab testing indicate 300 series austenitic stainless steels and duplex austenitic-ferritic stainless steels are susceptible to MIC. The most corrosion resistant metals used in MIC environments are higher chromium content materials such as super austenitic stainless steels, titanium and Monel 400.



Canadian Northern dock in Duluth Superior Harbor showing corrosion of freshwater MIC

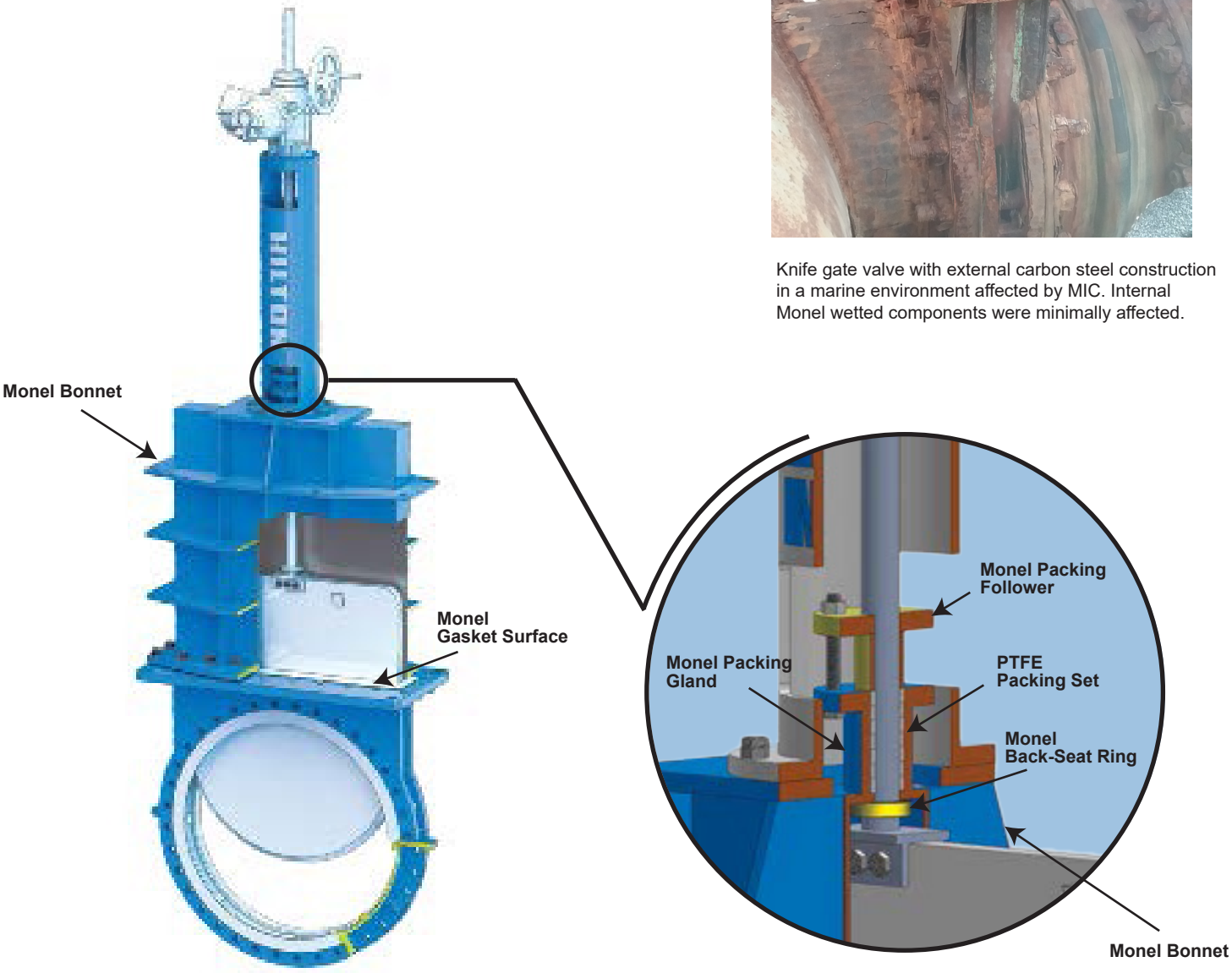
Canadian Northern dock in Duluth Superior Harbor - close up of MIC

Image credits: Wisconsin Sea Grant

Solution

Super austenitic stainless steels, titanium and Monel 400 equipment is cost prohibitive for customers. One way to lower costs is by using special alloy materials only on wetted parts like the process plant with the brackish intake water. Using the special alloy material as liner components rather than complete equipment saved the customer 50-75% of the original cost and also extended the valve service life from a few years to 20 years.

Knife gate valve with external carbon steel construction in a marine environment affected by MIC. Internal Monel wetted components were minimally affected.



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