Chemical Resistance With Confidence

It is imperative to choose the right materials when working in caustic environments.

DAVE HURLEY  | Asahi/America

A degree of confidence is essential when researching which valve type and material to use in an application. Besides understanding the function of valves, selecting the right material is one of the most critical decisions. Combining the appropriate valve type equipped with body material and elastomeric material that are compatible with the process is key to satisfying any application.

Chemical resistance is defined as the ability of a given material to withstand a chemical attack for a specified period. In valve selection, thermoplastic and elastomeric materials are typically chosen that best satisfy the application, based on lab-performed tests and real-world application testing. When any given material is designated as incompatible for an application, it either did not satisfy the application/performance testing in the lab or a failure occurred while the product was in service. When field failures occur, manufacturers’ material science engineers will try to duplicate a user’s experience in a lab environment. However, it can be challenging to recreate field failures in a laboratory environment. These challenges are typically related to unknown circumstances in the field application, such as pressure or temperature spikes, varied concentration of supplied chemicals or other human factors.

Chemical compatibility ratings can typically be found on online resources from manufacturers. Manufacturers may advise against using general guidance from other resources to select their product. It is always beneficial to consult the manufacturer prior to use of their product in a given application.

Chlorinated polyvinyl chloride (CPVC) type valves and piping resins have different chemical compatibility. Sodium or potassium hydroxide, commonly known as caustic solutions, are chemicals typically used with CPVC piping and valves. However, different CPVC resin manufacturers may have different chemical compatibility results, which reinforces the idea to always check with the manufacturer prior to specification or installation.

For elastomers, fluorocarbon rubber (FKM) seals will fail in caustic applications. Because of the risk of FKM failure, ethylene propylene diene terpolymer (EPDM) is typically supported for these applications with long-term success. EPDM has proven, through application testing in swimming pools, to be moderately resistant to the effects of chlorinated water. In those situations, using high-quality EPDM with a low amount of vulcanizing agents and fillers can be supported.

The first point of attack will be the liner on a butterfly valve, but well-controlled water chemistry (i.e., chlorine that has fully dissolved in water) along with moderate temperature control will maintain an even concentration of chlorine in the water to lessen any effect. However, EPDM is not recommended for chlorine gas or chlorine dioxide introduction commonly used for water treatment. EPDM has proven to be an effective elastomeric
provides good overall control through a
pragm valve. This type of valve

diaphragm dosing of sodium hypochlorite is the
treatment. An engineer-preferred valve
tect water during municipal water
disinf

widespread application primarily used to
valve installation.

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assembly and testing pr

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elastomer
valve requires when using any specialty
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and FKM extreme

eral properties.

the ball on the upstream side of the valve,
the fluid captured in the cavity of the ball
when the valve is closed is maintained
by the positive upstream pressure. As a
result, the cavity remains fluidized. Venting
downstream causes the trapped product to
crystalize as the upstream fluid does not
maintain it.

When selecting a valve for any chemical
application, there is usually more than one
possible solution. During the valve selection
process, it is imperative to give careful
consideration to a material’s chemical
resistance in order to provide the end user
with a robust solution that is ensured to
perform at a high level. It is always advised
to consult your manufacturer when in
doubt to remove the risk of improper
material selection. Manufacturers will be
able to provide material compatibility
recommendations and suggestions on
location, layout and other environmental
considerations, which will enhance the
performance of the pipeline.