Why specify plastic valves?

by David A. Chasis

Nothing irks us plastic piping zealots more than seeing residential, commercial and industrial plastic piping system installations with metal valves. Many engineers, it seems, do not even know that plastic valves exist. They specify plastic piping for its proven durability, ease and safety of installation, environmental soundness and cost-effectiveness, but opt for metal valves. It is estimated that at least 70 percent of pipe and valve applications meet thermoplastics usage conditions of service (not exceeding 250°F/121°C or 230 psi). Engineers are missing a multitude of opportunities by not specifying plastic valves.

A valve, by definition, is a device that regulates the flow of a fluid (including gases, slurries and liquids) in a precise manner. There are more than a dozen valve types. An engineer should select that valve which offers the best performance at the lowest cost (this is where plastic valves enter the picture, but more about that later). Similar to metal valves, plastic valves are also available for either manual or automatic operation. Table 1 lists the more common valves, most of which are available in the usual thermoplastic piping materials and size ranges shown (due to the dynamic nature of the plastic valve industry, material and diameter sizes often change).

What would motivate an engineer to change from being a valve "metal-head" to a "plastic-head?" Durability comes to mind. By heat fusing, solvent cementing or flanging plastic valves in a plastic piping system, joint integrity is enhanced and galvanic and electrolytic corrosion is eliminated. There is not a chance, as with some metal valves, of dezincification (removal of zinc from a metal alloy — usually brass — caused by corrosion from aggressive fluids), which could lead to valve failure. In addition, when a transported fluid has wetted contact with a system comprised of only one piping material (plastic), there are no concerns about chemical incompatibility, as there would be with a system that has additional piping materials (metal, for example). Other features that foster system durability in plastic valves are increased abrasion resistance, greater permeability resistance of transported fluids, and no pitting, rusting or scaling.

CPVC ball, butterfly and solenoid valves

Engineers might be not as concerned as installers about the labor-saving benefits of installing plastic valves. These benefits are real, and make for a safer and easier installation. The lighter weight of plastic valves (an average of 1/16th the weight of a metal valve) reduces or eliminates the need for heavy moving equipment and bulky, costly valve supports. When installing smaller diameter valves, many installers will use threaded or flanged connections to join metal fittings and valves to plastic. The expansion and contraction differences of dissimilar materi-

Vinyl valves in chemical processing lines

TABLE 1
COMMONLY USED PLASTIC VALVE AVAILABILITY

Type	Materials & Size Range (in.)			
	CPVC	PP	PVC	PVDF
Angle	¼ - ½	¼ - ½	¼ - 2	¼
Ball	½ - 6	½ - 6	½ - 6	½ - 6
Butterfly	1-½ - 24	1-½ - 24	1-½ - 24	1-½ - 24
Check	½ - 12	½ - 8	½ - 12	½ - 8
Diaphragm	½ - 6	½ - 10	½ - 10	½ - 10
Float	N/A	1/4 - 1	N/A	¼ - 1
Foot	½ - 4	½ - 4	½ - 4	½ - 4
Gate	½ - 8	½ - 14	½ - 14	N/A
Globe	N/A	½ - 4	½ - 4	½ - 4
Goose Neck	¼ - ½	¼ - ½	¼ - ½	¼ - ½
Laboratory	¼ - 3/8	N/A	¼ - 3/8	N/A
Multiport	½ - 6	½ - 6	½ - 6	½ - 6
Needle	¼ - ½	¼ - ½	¼ - ½	¼ - ½
Pressure Relief	½ - 4	½ - 4	½ - 4	½ - 4
Pressure Regulator	N/A	½ - 3	½ - 3	½ - 3
Solenoid	½ - 3	½ - 3	½ - 3	½ - 3

N/A = not available

als could contribute to leaks. In addition, over tightening metal threads or flanges could produce cracking of plastic surfaces. For maximum joint integrity of any plastic piping system, solvent cementing or heat fusion is the preferred method of joining.

Environmental considerations

What about the environmental soundness of plastic valves compared to that of metal? First, there's the lead issue. Lead is not present in plastic valves. Many metal valves, especially those used in residential applications, are supplied by offshore manufacturers who might not monitor diligently the acceptable lead levels of their product for the North American market.

Second, plastic valves, because of their smooth walls and lack of corrosive buildup, reduce friction loss, thereby reducing the energy required to transport fluids.

Another environmental benefit of plastic valves is based on preliminary life cycle assessments (a scientific method used by many environmental building-rating agencies to determine the environmental impact of a product from cradle to grave). These findings indicate that plastic piping products seem to have a more favorable impact on the planet than those of other materials.

A sensible method to determine the cost effectiveness of any piping system is to examine in detail the total costs, not only the initial product purchase price, but also costs of installation and maintenance. For example, a metal plumbing valve might be half the price of an injection molded plastic one. When you consider, however, joint integrity, the ease of joining and lack of short- and long-term maintenance, the total cost savings of using plastic valves are tough to beat.

In chemically aggressive industrial applications, added cost savings accrue from using plastic valves because exotic alloy metal valves are normally much more expensive and require delivery times in weeks compared to the off-the-shelf availability of plastic valves.

Without the proper valve selections, no piping system will provide durable and cost-effective performance. The next time you witness metal valves in a plastic piping system, make a point to educate the project's engineer and end-user about the many features and benefits of plastic valves. ■

Photos courtesy of the Plastic Pipe & Fittings Association.

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PVDF ball, diaphragm and pressure relief valves