Getting Inside CPVC Piping for Wastewater Treatment Use

CPVC is an attractive alternative for wastewater treatment facilities because of its corrosion resistance, mechanical strength, and life-cycle economics. Here's a real-world look at its strengths and capabilities.

By Donald Townley, PE

Over the past 20 years, disinfection technologies and chemical treatment processes have changed dramatically, making municipal wastewater treatment a more complex process than ever before. Stricter discharge regulations, increased plant flows, tighter budgets, and fewer sludge disposal options challenge the operations and profitability of plants across the country. Yet, there are a number of chemistries and materials available today to help improve the performance of your plant, lower overall treatment costs, and keep your plant in compliance with tighter environmental regulations.

Piping is one area in the plant where a considerable cost savings and increased reliability can result simply by specifying a more compatible material. Traditionally, municipalities have relied largely on steel and other higher alloys for the piping that transports water in their wastewater treatment facilities. Yet, a careful cost-benefit analysis reveals that CPVC can often perform more cost-effectively over a longer period of time to yield an overall lower total installed cost and fewer maintenance concerns for many applications.

No one material is ideal for all applications. All materials, whether metal or thermoplastic, have strengths and weaknesses that make them appropriate and cost-effective for various applications. Through years of R&D testing, as well as actual field performance in a wide variety of industries, CPVC has proven itself to be highly viable in both primary and secondary treatment phases for use in influent and effluent lines, sludge lines, chlorine and sodium lines, fluoride and alum lines, and many other piping lines.

CPVC, in fact, is compatible and cost-effective in use with a wide array of chemicals. Some of the more commonly used chemicals and liquids in wastewater treatment with which CPVC is recommended include ferric chloride, sulphuric acid, an array of caustics, brine solutions, and pressurized high-temperature water &#151 especially applicable in Southern regions where higher ambient air temperatures are prevalent. While CPVC is resistant to a broad range of corrosive environments, it is important to note that not all chemicals are compatible for use with CPVC. The designer should confirm chemical compatibility before selecting CPVC for a particular application.

Benefits Outlined

More specifically, CPVC piping offers the following advantages that have proven beneficial in boosting the bottom line of numerous wastewater treatment plants across the globe.

Corrosion Resistance

Many chemicals routinely used in wastewater treatment aggressively corrode most metal equipment, which may result in process leaks, flow restrictions, and ultimately, premature failure. This leads to decreased service life, interrupted production, and potential environmental issues. But CPVC piping is chemically inert to most mineral acids, bases, and salts as well as aliphatic hydrocarbons. Since the material is non-conductive, it is also immune to galvanic corrosion. CPVC piping has even been buried in alkaline or acidic soils without requiring any paint or special coating. As a result, it has proven itself immune to both internal and external corrosion.

Ease of Installation

Unlike metallic systems, CPVC piping systems do not require welding for installation. A simple solvent cement joining system significantly reduces labor time and requires fewer, less expensive installation tools.

Little or No Maintenance

A properly installed CPVC piping system requires little or no maintenance. It is completely immune to rust, pitting, or scaling. And, external pipe coatings are not necessary because CPVC is not affected by even the most aggressive soil and air conditions.

Light Weight

CPVC piping is approximately one-eighth the weight of metal. This translates into easier maneuvering on site, easier installation even within close quarters, and the elimination of heavy equipment to lift and install the pipe.

Optimum Flow Rates

Since the interior wall of all CPVC pipe has a Hazen Williams C Factor of 150, smaller diameter piping can often be specified, resulting in significant cost savings. In addition, less energy or horsepower is required to transfer fluids.

Superior Mechanical Strength

Many non-metals do not have the tensile strength to meet the pressure requirements of certain wastewater treatment applications, especially at elevated temperatures. However, CPVC piping systems are pressure rated for operation up to 200&#176F, which is nearly 80 degrees higher than what can be handled by standard PVC. In addition, they can be expected to maintain their pressure-bearing capabilities for 50 years and beyond.

Additional Safety

Although CPVC piping can handle extremely high temperatures, it demonstrates low thermal conductivity. This reduces the potential for burn injuries from hot pipes and may diminish the need and expense of installing protective insulation.

Low Flame and Smoke

Third-party testing confirms that CPVC exhibits low flame and smoke characteristics. It will not support combustion, which means it cannot be the source of a fire or cause a fire to spread. Moreover, it will not contribute to flashover.

Long Service Life

With metal systems, it is possible to literally measure corrosion in inches per year as a result of aggressive water and corrosive chemicals. But CPVC is chemically inert to many of these same chemicals to help increase service life.

Lower Total Installed Cost

Strictly from a material cost standpoint, CPVC is less expensive than many high-end alternatives such as stainless steel and titanium. Beyond material costs, however, CPVC yields a lower total installed cost as a result of reduced labor installation

costs, longer service life, lower maintenance costs, and ongoing environmental compliance.

Words of Caution

Despite the many advantages of CPVC piping, it's important to note that not all CPVC performs the same. CPVC products are made with base resins having different molecular weights and varying chlorine contents as well as different compound additives that can affect compatibility and long-term performance. It's important to check with your piping supplier to determine what specific tests the pipe manufacturer has performed on its finished product with regard to minimum burst pressure requirements, dimensional tolerances, residual stress requirements, drop impact requirements, and fusion property testing. In addition, the reputation and longevity of the manufacturer should be taken into consideration as well as the availability of technical support and service.
In conclusion, CPVC is a highly attractive alternative for wastewater treatment facilities because if offers superior corrosion resistance, mechanical strength, and excellent life-cycle economics in a single package. With its longer service life, lower maintenance requirements, and improved process utilization compared with traditional materials, it is a cost-effective material that should definitely be considered for a wide range of treatment applications.
Donald Townley, PE, is a piping system specialist for Corzan Industrial Piping Systems, which is a part of Lubrizol Advanced Materials Inc., Cleveland, OH. He has more than 25 years of engineering experience and has been actively involved in the design, installation, and approval of CPVC piping systems for more than 15 years. More information about CPVC piping is available by contacting him at donald.townley@lubrizol.com or 888-234-2436, ext. 5244.

Source URL (retrieved on *07/28/2014 - 1:14pm*):
http://www.chem.info/articles/2007/07/getting-inside-cpvc-piping-wastewater-treatment-use?qt-recent_content=0