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CYONYX - ADVANCED PERFORMANCE PIPE

THE NEED

A highly corrosion-resistant composite pipe able to withstand impact in high-traffic areas. While some lined steel and metal alloy pipe are capable of withstanding critical fluids and providing necessary impact resistance, the cost, weight, and limited life expectancy are prohibitive. CYONYX pipe is derived from a new technology that imparts extremely high corrosion resistance, impact resistance approaching that of steel, low material and installation costs, and life expectancy exceeding lined steel and metal alloys.

THE TECHNOLOGY

A breakthrough in resin technology has resulted in the ability to produce fiberglass pipe made with pure poly dicyclopentadiene (DCPD) resin (the term DCPD refers to the pure polymer, not to "polyester DCPD," which has poor properties) (see Figure 1). The first industrial use of DCPD came in the form of large (nearly 1000 lbs.) unreinforced covers for chlorine producing cells. This extremely aggressive service of hot, wet, chlorine caused other materials such as premium FRP to fail after a relatively short time, while the DCPD covers have been in service for longer than 9 years, and are still functioning. While existing technology is able to make tough parts from DCPD such as the cell covers, snowmobile hoods, golf cart bodies, and tractor fenders via the reaction injection molding process, it has not been possible until now to produce fiber reinforced plastic objects with it.

FIGURE 1 CYONYX PIPE

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Through patented catalyst and process technology, fiberglass pipe made with DCPD resin is finally being produced; this pipe combines the outstanding toughness and corrosion resistance of DCPD with the strength of fiberglass reinforcement.

FIGURE 2 CYONYX PIPE INSTALLATION

It is the ability to achieve a specific level of crosslinking within the polymer structure that allows the toughness of the long flexible polymer to be combined with the corrosion and heat resistance imparted by the crosslinking.

While it can be said that the corrosion resistance of DCPD pipe is generally as good or better than that of vinyl ester resins, there are certain services where it is very much better than any other traditional pipe. These services include:

- Liquid Bromine
- Unstable Sodium Hypochlorite
- Nitric Acid
- 52% Hydrofluoric Acid
- Chlorine
- Phosphoric Acid

Since some of these and other chemicals attack fiberglass reinforcements, a liner of pure DCPD has been added as a barrier between the structural reinforcement and the contained fluid. The thickness of this liner can easily be changed for specific services. Long term corrosion tests, both in the laboratory and in chemical

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plants such as Phosphoric Acid production and Chlor-Alkali plants, are currently being conducted, and will form the basis for comprehensive chemical service recommendations.

The Benefits

Compared to traditional fiberglass piping and lined steel pipe systems, the most important benefit of CYONYX pipe is its outstanding resistance to halogens such as chlorine and bromine. In addition, CYONYX pipe has impact resistance greater than 50 ft.-lbs. as measured by ASTM D2444. With a 100 percent pure DCPD nominal 175 mil liner and structural wall, CYONYX pipe can operate at temperatures up to 225 deg. F at 150 psi. With adhesive bonded joints, the chance of fugitive emissions, compared to lined-steel flanged joints, is greatly reduced. Despite its extremely tough characteristics, CYONYX pipe remains lightweight compared to metallic systems. For example, 4-inch diameter CYONYX pipe weighs 2.1 lbs. per foot compared to 13 lbs. per foot for lined steel.

Status

CYONYX pipe is now commercially available in 2-inch through 8-inch diameter sizes. Larger sizes are being developed. Flanged spools constructed of the "pure" CYONYX system (pipe, flanges, and adhesive) can be provided for applications requiring the chemical resistance of DCPD resin. For less severe applications, CYONYX pipe can be provided with a complete line of CHEM THREAD fittings, including filament-wound sweep fittings. CHEM THREAD fittings are made from premium vinyl ester resin and fiberglass reinforcement. The CYONYX pipe/CHEM THREAD fittings system would be joined using DS-3033 adhesive from Smith Fiberglass Products. It is important to refer to the appropriate chemical resistance manuals and installation instructions for the proper application of the various systems. Molded CYONYX fittings made from DCPD resin and fiberglass reinforcement are currently being developed. The fittings will be available in common configurations such as elbows, tees, flanges, etc.

Barriers

Through innovative resin chemistry and process development, a major obstacle to further acceptance of fiberglass pipe in critical fluid applications has been overcome. Moreover, this fiberglass pipe has unparalleled toughness, coupled with outstanding corrosion resistance, that can safely convey a wide range of corrosive media.

Since gaining acceptance of a radically new material is always difficult, Smith Fiberglass Products Company is now actively soliciting trial installations of this pipe for different services of critical fluids which can benefit from the corrosion and impact properties of this unique material.

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