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Severn Trent De Nora Solves Tough Marine and Offshore Water Treatment Problems with Corzan® Piping

High-Performance CPVC Proven to Offer Superior Chemical and Abrasion Resistance in High-Temperature, High-Pressure Applications

The job of cleaning up our global water supply is more challenging today than at any other point in history. Stricter environmental regulations are a reality whether doing business on land or at sea, in the US or abroad. And what seems to be an already difficult challenge in offshore and marine installations will soon get even tougher with the new MEPC.159(55) effluent standards that will apply to all sewage treatment systems installed offshore after January 1, 2010.

No one understands the unique challenges of water treatment in marine applications better than Severn Trent De Nora, a leading international provider of marine and offshore industrial water and wastewater disinfection systems. For nearly 30 years, the company has been recognized for its innovative approach to water treatment utilizing on-site generated sodium hypochlorite produced from seawater. Its novel OMNIPURE™ system is the only marine sewage treatment system that oxidizes sewage in an electrochemical cell, as well as generates sodium hypochlorite for the disinfection of sewage streams. Following up on the global success of its OMNIPURE system, the company recently

introduced its patent-pending BALPURE® system, which provides an effective, economical and high-capacity solution for treating ballast water arriving in ships coming from overseas ports.

Key to Severn Trent De Nora's ability to keep these innovative treatment systems operating efficiently with little or no downtime is the selection of the proper piping system. In most cases, metallic piping has proven to be no match for the harsh, corrosive demands of the offshore environment. That's why for especially challenging applications, the company relies on Corzan® CPVC (chlorinated polyvinyl chloride) pipe and fittings which offers both the necessary corrosion resistance and durability not found in metallic systems.

"We've been using Corzan CPVC pipe and fittings for more than 20 years for a variety of offshore sewage and water treatment applications," said Dana Casbeer, marine and offshore product manager for Severn Trent De Nora. "Sometimes our customers actually specify that we upgrade to CPVC. In other cases, we just know from our own experience

that an application is going to require something more durable. Whenever an application calls for high temperature and corrosion resistance, Corzan CPVC is our material of choice."

With the large number of installations handled by Severn Trent De Nora over the years, the company has had the opportunity to put a variety of other piping materials to the test such as PVC, GRP fiberglass and lined metallic plumbing. But it has found that Corzan CPVC delivers the most consistent, trouble-free performance in the more demanding environments. "Corrosion is a serious threat in all marine and offshore applications," said Casbeer. "Our equipment is



working in a saline atmosphere and pumping raw sewage, seawater and sodium hypochlorite at pressures up to 150 psi in some cases. All of these are highly corrosive, especially given the high levels of chloride found in salt water. Compounding these challenges is the fact that our customers are typically out at sea far away from many of the material and labor resources needed to repair or repipe traditional metallic systems.

Downtime is expensive. Not only is it counter-productive, but our customers are also at risk of incurring substantial fines for not being in

compliance with carefully monitored effluent discharge regulations if their water treatment system is down. It's just not something any of our customers can afford."

Sometimes the decision regarding the piping material to be used is out of the hands of both Severn Trent De Nora and its customers. "In our business, everything we do is regulated," said Rudy Matousek, manager of technology for Severn Trent De Nora. "We have to meet the strictest requirements set forth by the American Bureau of Shipping (ABS), as well as a host of other certifying agencies. It is these agencies that often require materials that exhibit additional properties, such as the higher temperature and pressure rating provided by Corzan pipe and fittings."

CPVC is inherently better equipped to handle high temperatures and pressures that exceed the standard limitations of PVC. Corzan CPVC, in particular, is well-suited for high-temperature, high-pressure applications because of its superior cell class rating. Corzan pipe is



certified to the highest cell classification of 24448 — the highest of any commercially available CPVC as defined by ASTM D1784. Standard CPVC compounds, by comparison, have a 23447 cell classification. Under this classification, Corzan CPVC demonstrates a drop impact strength up to three times that of standard CPVC. In addition, it offers an HDT rating of 239°F (115°C) — the highest of any ASTM D1784-compliant CPVC.

Temperature is a major factor when considering that a large percentage of offshore platforms are located in the Middle East, where it's not uncommon for the ambient air temperature to go above 110°F. An important consideration is that PVC is not pressure rated above 140°F. Although the ambient air and operating temperatures might not often be above this limit on their own, the radiant effects of sunlight should also be considered. Recent ASTM D4803-97-compliant testing proved that radiant heat from the sun can increase pipe surface temperatures significantly, even if the pipe is painted a lighter color. In fact, temperature increases in excess of 50°F were documented. That means that on a day with temperatures between 85-90°F, the effects of radiant heat buildup could easily push the pipe surface temperature beyond the 140°F pressure rating for PVC. Since Corzan CPVC pipe is pressure rated up to 200°F, it can still safely be used (even considering radiant heat buildup) in extreme cases of 120°F-plus outdoor conditions.

"In some cases, the temperature starts to push the limits of PVC," said Matousek. "We enjoy the extra level of flexibility afforded by the Corzan CPVC pipe, because it gives us a cushion. Our BALPURE system is often installed in engine rooms. Between the outside temperature and the heat generated in a confined space filled with heavy equipment, that cushion becomes critical. For applications where our OMNIPURE equipment is installed outside on a platform in hot regions like the Middle East, we also need to consider the superior UV resistance of CPVC."

In addition, Matousek and his team also need a piping product that meets the strict smoke requirements of both ABS and the US Coast Guard. "Due to the chlorination process used to create CPVC, Corzan CPVC offers a smoke advantage over PVC when it's burned," said Matousek.

Abrasion resistance is another critical factor, especially considering that the contents of seawater are often highly abrasive and can cause attrition of the pipe, thereby shortening its life. Seawater, largely as a result of its hardness level, has a comparatively high degree of particulates than can rub up against the interior of the pipe. This creates an elevated concern for ships or platforms located in shallow water, where it is common to process silt from the bottom of the seafloor, shale fragments, and even marine life with shells.

More so than land-based water treatment operations, marine vessels and offshore structures must also take into account the weight of products that are installed on board. Plastic pipe is one-sixth to one-eighth the weight of comparably sized metal pipe in larger-dimension systems typically installed in many marine and offshore applications. Heavier materials create not only economic problems, but also logistical challenges.

Time is money and no place is this truer than in offshore applications. The benefit of using plastic pipe in offshore applications is that it is easy to cut and join on site. As a result, the need for a certified welder is eliminated, directly and positively impacting the bottom line. Severn Trent De Nora customers realize significant time and cost savings if they can complete repairs offshore rather than coming into port to utilize the skills of a certified welder.

"With plastic, our customers are down for minutes to complete maintenance routines or repairs, instead of days," said Casbeer.

With its unique combination of benefits — including reliable performance, superior abrasion, chemical and temperature resistance, as well as fast, easy installations — it's little wonder that Corzan CPVC is used for some of Severn Trent De Nora's largest and most visible water treatment installations. That includes the OMNIPURE system currently in operation on BP's Thunder Horse oil and gas field, the largest offshore installation of its kind in the world. Located approximately 240 km southeast of New Orleans, the Thunder Horse has garnered international attention for its grand-scale production capabilities. Its production-drilling-quarters (PDQ) processing facilities are designed to handle incoming HP/HT well fluids and export 250,000 bpd of oil, 5.6 million m³ per day of natural gas, treat 140,000 bpd of produced water and inject up to 300,000 bpd of mixed produced water



and seawater into the reservoir for pressure maintenance. Despite these massive demands, the Thunder Horse's OMNIPURE system, installed in 2005, has been performing reliably, without problems or downtime thanks, in part, to the reliability of the Corzan CPVC piping system.

Severn Trent De Nora takes its job of protecting the global water supply very seriously. The company's philosophy, "Clean water, clear conscience," says volumes about that commitment.

"We need products that are sound, offer good mechanical integrity and provide ease of manufacturing," said Matousek. "Corzan CPVC pipe and fittings satisfy all of these requirements. Some of our customers actually specify Corzan pipe by name. It has that type of reputation for quality in the industry. That's why we actually inventory so much of it. In all the years that we have used the product, it has never let us down."

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