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PVC Coated Conduit and Fittings

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Corrosion Protection, Maintenance, and Economic Considerations for Wastewater Treatment Plant Equipment

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Wastewater treatment plants process and handle some of the most corrosive solids and liquids throughout process engineering, often causing damage after prolonged operation to pipes, tanks, pumps, and electrical conduit systems, among others. Even instrumentation panels or meters that measure flow, level, pressure, temperature, and other parameters conducive to proper facilitation are subjected to corrosion and gas exposures, causing substantial, expensive damage. A wastewater treatment plant is a complex, sophisticated system with a high-level of standards for the entire plant, including technical installations. The materials needed to construct a WWTP must be able to withstand the wide range of corrosive conditions.

Cracks in the wastewater treatment tanks, leaks from the storage tanks, and leaching of contaminants from sludge in on-site storage areas can lead to corrosion in a WWTP. These contaminations can ruin the surrounding ecological environment. Hydrogen sulfide, methane, ammonia, oxygen, carbon dioxide, and nitrogen are found dissolved in wastewater, with anaerobic decomposition of such gases producing other odorous compounds, amines, and fatty acids that lead to unforeseen corrosion threats. The interaction of primary components of sewage producing secondary chemicals can create even more toxic or corrosive properties in existing wastewater, leading to faster, and more destructive, system failures in a plant.

A wastewater treatment plant contains just about the greatest possible potential for steel pipe and tank damage caused by microbiologically influenced corrosion (MIC). Odor control systems do not completely solve the corrosion problem in WWTP, for odor control systems themselves are not free of damaging exposures. Sodium hypochlorite and sodium hydroxide are odor control chemicals used to precipitate out H2S and SO2. Those two chemicals actually hydrolyze, forming sulfuric acid. Bleach and chlorine are commonly used disinfection chemicals, but they themselves are also highly corrosive. Odor control ventilation systems pull

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dirty air over surfaces that are already wet and inhabited with oxidizing bacteria, with the fresh air carrying the oxygen necessary for aerobic reproduction and expansion of bacteria. In some instances, the de-chlorination chemicals used to neutralize the disinfection chemicals before the water is released into waterways are also corrosive. Ductwork and other ventilation areas must be constructed from materials resistant to corrosion. The acidity of wastewaters may also be raised so that they become more corrosive if condensates containing dissolved sulfur dioxide are generated, forming sulfurous acid.

There is often a presence of harmful metal ions in wastewater. Copper, lead, mercury and nickel are the most common. Harmful ions present in low levels in natural and wastewater can cause harmful effects. Galvanic coupling, also known as two-metal corrosion, to more noble metals—such as carbon steel, stainless steel or copper can cause further corrosion. Aluminum is anodic to all common metals except zinc and magnesium, so special steps should be taken to ensure it does not inadvertently end up cathodically protecting other metal components. In some cases, the reinforcing steel in concrete structures can form a new cathode.

The most effective way to reduce the environmental exposures facing wastewater treatment plants is through the integration of the preceding loss control techniques into a comprehensive loss control program. Corrosion is a major concern wherever galvanized carbon steel or aluminum is used within a wastewater treatment plant. Ongoing evaluations provide a method for continuous improvement of economics and allow the introduction of new wastewater treatment plant technology. Many waste related treatment tanks and piping systems are coated to protect against such corrosive environments. Wastewater treatment plants making use of extensive fabrication in PVC-coated aluminum offer a solution to the infrastructure corrosion

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problem. Corrosion rates of carbon steel and iron in wastewater can be accelerated 5 to 10 fold by local acidic conditions produced by microbiological action. Furthermore, pipes and other structure made from carbon steel and ductile iron can be externally corroded by the surrounding soil. This demonstrates why unprotected carbon steel and ductile iron are not suitable for long-term wastewater service. PVC and polyurethane corrosion resistant coatings will not provide the intended protection without proper preparation of the conduit galvanized zinc surfaces. It has often been stated that 80% to 90% of premature coating failures are caused by improper or inadequate surface cleaning and preparation. Most premature coating failures are caused by contaminants left on the surface when the coating is applied.

PVC coated conduit systems, like those from Calbond, can be integrated within a system and protect the workings of the WWTP from corrosive damage. Pulling compound is recommended for ease of installation. Fittings are provided with a flexible sleeve on the conduit side and a sealing sleeve on both the box side and the mating part of the gland. For additional corrosion protection, Calbond PVC coated conduit bodies feature a minimum thickness of 0.002” urethane on the interior and exterior of the fitting, and are then coated again on the exterior with a 40 mil PVC coating on top of the urethane, providing an additional layer of protection against accidental nicks and/or cuts from improper assembly tools during installation. The conduit comes standard with a 40 mil PVC coating over the outside of the conduit and a 2 mil urethane coating on the interior of the conduit and on the threads. The PVC coated conduit is UL listed and NEMA RN-1 compliant, with no exceptions, and is UL6 listed with both the zinc coating and PVC coating as primary protection against corrosion. These same industry standards reference the appropriate American Society for Testing and Materials (ASTM) test methods, including ASTM D2247-11, the standard practice for testing water resistance of coatings is 100% relative humidity, and ASTM D1308-02, the standard test method for effect of household chemicals on clear and pigmented organic finishes. Easy fabrication while maintaining a light

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weight to ease transport and installation improves efficiency, reduces maintenance, and provides the most cost-effective and comprehensive solution for WWTP's. Successful bonding of PVC and polyurethane coatings have excellent chemical resistance to acids and other chemicals that attack the galvanized zinc coating. As long as the PVC and polyurethane coating adhesion remains, the conduit will provide years of reliable service in many of the most severe environments.

According to the American Waterworks Association (AWWA) industry database, there are approximately 876,000 miles of municipal water piping in the United States, while the sewer system consists of 16,400 publicly owned treatment facilities that release 41 billion gallons of wastewater per day. The total annual direct cost of corrosion for drinking water and sewer systems is $36 billion, which includes the costs of replacing aging infrastructure, lost water, leaks, corrosion inhibitors, internal mortar linings, external coatings due to sun or heat exposure, and cathodic protection.

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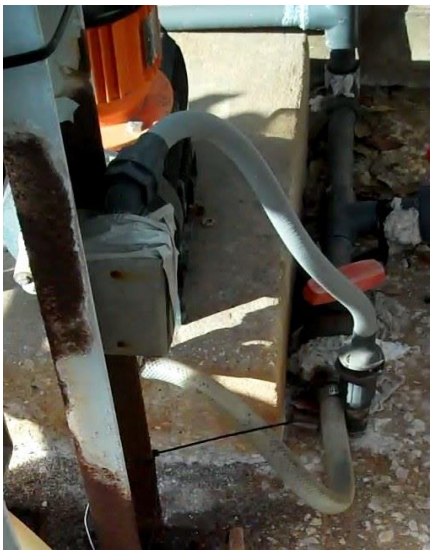
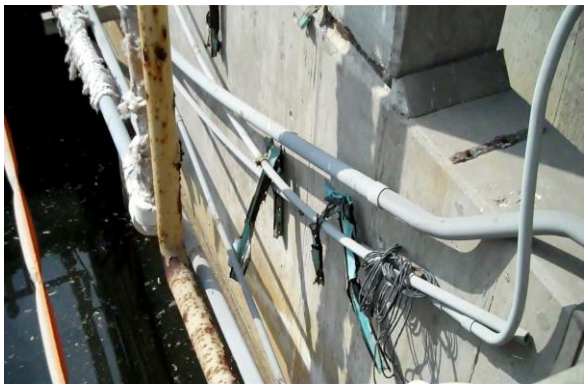
Sealtite Connector Failure



Sealtite Connector Failure



Plastic Coated Framing Member Failure

PVC coating failure, also, note condition of once coated framing member and straps.