

ASSESSING CORROSION RESISTANCE AND COST SAVINGS



Atkore[™]
Calbrite

Threat Protection against corrosion and corrosive substances is the primary concern of plant managers and operations personnel in a variety of applications.

According to a NACE Corrosion Costs Study published in 2011, corrosion costs in the United States will exceed one trillion dollars in 2013, due to unscheduled plant and/or pipeline shutdowns, inefficient or lost production, high maintenance repair costs, and imposed fines. It has been estimated that 25 to 30% of annual corrosion costs in the U.S. could be saved if optimum corrosion management practices were employed. In addition to controlling these costs, human safety is often at risk in environments where corrosion is rampant.

Programs with a focus on integrating corrosion-resistant alloys, such as stainless steel, should be implemented when one is designing equipment, selecting proper on-line corrosion monitoring techniques, or implementing maintenance programs in these environments to avert or minimize this risk. It is important to note that the proper alloy selection depends on the application and process. Implementing on-line corrosion monitoring will provide an indication of the corrosion severity of the environment.

Stainless Steel is Naturally Anti-Corrosive

Due to its nickel content, which acts as a natural corrosion resistor, stainless steel conduit systems slow entropy, making it the best choice of material in environments with exposure to salt, acids, various chemicals and moisture interactions. Stainless steel is the safest and most economical conduit material for yearly dependability. It is the best option in environments where corrosive materials are processed and where maintenance or “wash-down” procedures require damaging heat and/or harsh chemicals. The lifespan of stainless steel is often parallel to the lifespan of the facility, and the need for replacement is rare. Type 304L stainless is manufactured with approximately 18% chromium and 8% nickel, allowing for use in a wide range of atmospheric environments. Type 316L stainless is manufactured with approximately 16% chromium, 12% nickel, and 3% Molybdenum. Type 316L's Molybdenum and increased nickel content enhance the resistance to many industrial chemicals and solvents with specific resistance to chloride pitting.

Though no metal, aside from gold and platinum, is completely corrosion proof, stainless steel is the most widely used and economical option. The basic resistance of stainless steel occurs because of its ability to form a protective coating on the metal surface. This coating is a “passive” film that resists further oxidation or rusting. The formation of this film is instantaneous in an oxidizing atmosphere such as air, water, or other fluids that contain oxygen.

Regulatory Standards

There are three applicable standards for stainless steel conduit that govern its design and performance: UL6A, NEMA 4X, and ANSI C80.1. Underwriters Laboratories (UL) is a global independent safety science company that certifies, validates, tests, inspects, audits, and advises— providing knowledge and expertise regarding compliance and regulatory issues. The UL6A requirement covers electrical stainless steel rigid metal conduit steel elbows, couplings, and nipples for use as a metal raceway for the installation of wires and cables.

The National Electrical Manufacturers Association (NEMA) is the association of electrical equipment and medical imaging manufacturers. NEMA ensures technical standards that are in the best interests of both industry and end users, advocating policy and legislative matters. The 4X standard ensures protection against corrosion, wind-blown dust, and rain, splashing water, hose-directed water and damage from external ice formation in indoor or outdoor environments.

The American National Standards Institute (ANSI) is the primary United States standards and conformity assessment system, strengthening the market position within the global economy while assuring the safety and health of consumers and the environment. ANSI C80.1 standard covers the requirement for electrical rigid conduit



for use as an electrical wire and cable raceway. A quality assurance program that fully supports and complies with the industry standards, as established by UL, ANSI and NEMA 4X is strongly recommended. Calbrite® produces various options that satisfy all three regulatory requirements while maintaining cost effectiveness.

Practical for Health in Food Processing

In food processing applications, corrosion poses a palpable threat to health, making it imperative that plant managers consider possible corrosive contact between materials and products well before production begins. Stainless steel is the most popular choice for equipment used in food processing because of its resistance to moderate/high levels of chlorides and sulfating agents, in addition to being easy to keep clean. The food processing industry accounts for approximately 14% of all manufacturing output in the United States and the industry's value to the economy exceeds even the farm sector in both production and trade.

In order to satisfy consumers, food-processing companies often renovate facilities to improve operating efficiency. Naturally anti-corrosive stainless steel components are used throughout manufacturing plants instead of other sub-par options that require additional corrosion resistant coatings that could contaminate products. Equipment is chosen based on its life expectancy and low failure rate since the food processing business focuses on product quality and mass production. Plastics and other metals may be used at certain stages, but they are more likely to impart toxic substances into foods than stainless steel.

Easy to Install

Stainless steel is often recognized as the premium material for a wide range of applications to be used for its excellent corrosion resistance, aesthetic appearance, strength, and ease of installation. Due to its high ductility, stainless steel can be bent to equally small bend radii as galvanized steel. Dies should be given a high polish and must be free from all surface blemishes to prevent marring the finish of the stainless steel parts. All metal has a certain amount of spring-back, also known as elastic recovery and 300 series stainless conduit has approximately 5% more than its galvanized steel counterparts. Minimal amounts of cutting and threading stainless conduit in the field with standard field equipment will suffice on smaller to moderate-sized jobs or modifications. For larger applications, it is recommended to purchase stainless steel threading dies and threading oil for better results and to reduce the chance of possible machinery malfunctions. The corrosion resistance of stainless steel even improves with routine maintenance.

Planned maintenance of plant equipment to avoid failure by corrosion is essential. Planned maintenance consists of scheduled shutdown periods in order to inspect all equipment, and refurbish or replace equipment that has failed due to corrosion or other failure mechanisms. Other materials, such as aluminum and galvanized steel, require more frequent intervals of equipment testing for corrosion.

Companies that use reliable stainless steel throughout their facilities are able to “plan ahead” for scheduled maintenance closures and sustain consistent financial returns despite the periods of inactive production.