

Stainless Steel Selection Tool For Water Application: Pitting Engineering Diagrams

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Stainless steel is known for its corrosion resistance, especially in chloride environments, making it essential for water-related applications. Its pitting resistance depends on alloy composition and service conditions, with higher alloy levels enhancing resistance. Key factors like chloride concentration, temperature, and oxidation potential influence pitting risk. Guidelines for pitting performance include the Pitting Resistance Equivalent Number (PREN) and Critical Pitting Temperature (CPT). PREN allows for quantitative comparisons of alloys, while ASTM standards and G48, method E, help determine CPT under standard conditions, though they may not predict specific performance accurately.

Stainless steels are widely utilized in water applications across a range of temperatures. To facilitate informed material selection, it is crucial to have comparative data on different grades of stainless steel under uniform environmental conditions. Pitting engineering diagrams serve as valuable tools, incorporating factors such as chloride ion concentration, temperature, and stainless steel grades. These diagrams effectively illustrate the critical conditions that can lead to pitting corrosion in stainless steel. The objective of this study was to develop a reliable method for constructing pitting engineering diagrams and to explore the interrelationships among various electrochemical techniques. Comprehensive electrochemical tests were conducted to deepen our understanding of the factors influencing the corrosion behavior of stainless steel, correlating with the boundaries established in the diagrams. The tests were performed in environments containing chlorides, with concentrations ranging from those typical of potable water to levels found in seawater and beyond. Diagrams were created at two distinct potentials, representing either more or less oxidizing conditions. The results are discussed in relation to existing knowledge regarding the critical levels of key parameters necessary for constructing pitting engineering diagrams.

