

Effective Use of High-Alloy Stainless Steels vs. Nickel-Based Alloys to Prevent Corrosion in the Process Industry

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Nickel-based alloys such as Alloy 825 or Alloy 625 are commonly used for many applications in chemical and refining industry due to their reliable performance under severe conditions. However, heavy process equipment for example large process vessels or pipelines, the impact of material cost on the total cost increases significantly with higher nickel content in the alloy. In addition, their mechanical strength is not remarkably high. Thus, predominately lined, or clad solution using a relatively thin layer of the corrosion resistant alloy are used to reduce the total cost as much as possible.

High-alloy stainless steel such as duplex stainless grades (e.g., 2205 and 2507) can often provide more cost-effective solutions for larger storage tanks and pressure vessels due to their high mechanical strength and high corrosion resistance, which can reduce the total material weight using solid plate solutions without lining or any coating. Their lower nickel content reduces the alloying cost but also limits their usability to some extent.

A middle way could be to opt for the high-alloy austenitic grades such as 6-7% Mo grades for instance 254 SMO (S031254), 6XN (N08367), and for the toughest conditions 654 SMO (S032654) or the recently developed Sanicro® 35 (N08935). The latter, performance-wise, can challenge alloy 625 in many environments despite its a leaner alloying composition.

This presentation will address pros and cons with the different material solutions supported by experimental test data and case studies related to their applications.