Development of Super Austenitic Stainless Steels

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Since the start of stainless steel production more than 100 years ago, many different steel grades have been development. To meet the increasing demand for more corrosion resistant materials many super austenitic stainless steel grades have been developed over the years. The first 6% molybdenum grade UNS S31254 (Ultra 254 SMO) was introduced in 1970. The high molybdenum content together with increased levels of chromium (20%) and nitrogen (0.20%) gave this grade excellent corrosion resistance and improved mechanical properties. Since then, the process conditions in many industries have become more demanding. The general trends today are: new industrial process, new products, high economical effect and sustainable development. Based on the high environmental requirement, most industrial waste, flue gases or even byproducts must be handled inside the plants by closed systems or by incineration before they are discharged. The number of potential application areas requiring the use of high-performance super-austenitic stainless steels has increased. This has led to the introduction of the second generation of super austenitic stainless steel. Ultra 654 SMO (UNS S32654) grade, which has a unique combination of high strength and outstanding resistance to corrosion, is one typical example. Due to the high contents of Cr, Ni and Mo (24Cr, 22Ni, 7.3Mo, 3Mn, 0.5N), it has very high corrosion resistances. In high chloride containing environmental such as seawater, it's corrosion resistances are much better than all other stainless steels, but close to nickel base alloys. The paper presents the results of corrosion tests in chloride environments, including pitting and crevice corrosion in standardized laboratory tests as well as in natural seawater environments. The impacts of welding process, carried out under very harsh environment, and effect of different post weld cleaning methods on pitting corrosion resistance are also covered. Some typical application examples of Ultra 654 SMO are also given.

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