RA330® Alloy Plate Selected to Resist Cracking in Laundry Chemicals Processing

Specifications

UNS: N08330 **W. Nr./EN:** 1.4886, 10095 **AMS:** 5592, 5716 **ASTM:** B 536, B 511, B 512, B 535, B 546, B 710, B 739
ASME: SB-536, SB-511, SB-535, SB-710

Chemical Composition, %

	Cr	Ni	Mn	Si	Cu	P	S	C	Fe
MIN	18.0	34.0	–	1.0	–	–	–	0.04	–
MAX	20.0	37.0	2.0	1.5	1.0	0.03	0.03	0.08	balance

Case History

Consumer and commercial laundry fabric softeners are often corrosive to steels and stainless steels and contain a sufficient level of chloride ions to cause chloride stress corrosion cracking in fabricated 300 series stainless steels. The potential, of these chemicals, for causing chloride stress corrosion cracking is enhanced at the elevated temperatures required in their manufacture and processing.

Recently, a major Midwestern producer of laundry chemicals found cracks appearing in several processing tanks which were constructed of type 316 stainless steel. In order to select the best replacement alloy, this company authorized a testing program and supplied the specific process chemicals so that mechanically stressed alloy samples could be evaluated for their resistance to cracking.

Although some well known, conventional, corrosion resistant alloys were included in the test program, the alloy selected was the extremely cost effective heat-resistant RA330 alloy. This alloy has, for 30 years, been the alloy of choice in resisting creep, oxidation and stress rupture in the high temperature range!

Alternatives to RA330 would have been the more costly alloys containing approximately the same content of nickel and chromium, but also alloyed with molybdenum. Such alloys are excellent in applications where either pitting, crevice corrosion or under-deposit corrosion are involved. RA330 was the choice here because simple stress corrosion cracking was the mode of failure.

Case History, Continued

RA330 tanks were fabricated to API-650 standards (modified as to alloy and customer preferences) using both SMAW and GMAW procedures. To achieve maximum corrosion resistance, RA333 matching filler metal was used as the welding consumable inside the tank. The passes on the outside of the tank were made with the conventional RA330-04 matching filler metal. This filler was more economical and yet provided 100% of the strength and ductility required in the finished tanks.

The six larger tanks approximately 12 feet in diameter, were fabricated with 0.0250" sheet and 0.1875" thick plate. Half the tanks were fabricated with conical tops and bottoms for drainage. When asked what may have been difficult about the actual fabrication, John McFadden, Imperial Tank's President, happily reported "Nothing! The fabrication went smoothly without any special procedures or problems."

RA330 alloy is a high nickel (typically 35%), medium chromium (typically 19%) austenitic stainless steel which exhibits excellent carburization and oxidation resistance up to 2100°F and good general corrosion resistance at ambient and elevated temperatures.

Highly resistant to chloride stress corrosion cracking, RA330 is a cost-effective engineering choice for applications requiring SCC resistance. Forming, machining and/or welding are similar to other austenitic alloys. RA330 forms like the 300 series stainless steels or nickel-chromium alloys.

Forming is best done at room temperature whenever possible. Heat treatment is not normally required after most forming or welding operations. When required, however, a full anneal should be given at 1950-2050°F followed by a rapid air or water quench.

Welding is best accomplished with RA330-04 weld fillers of matching composition. However, on this particular project welding on the inside of the tank was accomplished with RA333 matching filler to enhance the weldments resistance to intergranular corrosion in the heat affected zone.

RA330 is an austenitic alloy, containing high nickel, which will handle a wide variety of chloride containing process chemicals without cracking; even at elevated temperatures and after the metal has been formed and fabricated.

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