

RULES OF THUMB - MATERIALS

By Neal Wikert

High Temperature Alloys

Incoloy 800 - 30% Nickel, 20% Chrome material that offers good corrosion resistance, has high strength and resists oxidation, carburization and other harmful effects from high temperature exposure. The chromium imparts the resistance to oxidation and corrosion. The nickel maintains an austenitic structure so that the alloy is ductile. The nickel also contributes resistance to scaling, general corrosion and stress-corrosion cracking.

Inconel 718 Inconel 718 has some limitations from a corrosion-cracking standpoint above 400° F. in certain environments namely salts and chlorides.

Inconel 718 for use as pins in steam turbines should be ordered to AMS 5663H, which calls for a RT minimum yield of 150 ksi, 185 tensile and 12% elongation, 15% R of A, and 1200° F properties of yield 125, tensile 145, elongation of 12%, and an R of A of 15%.

Inconel 600 Inconel 600 can be used in the as-welded condition. There is no requirement for a PWHT to get mechanical properties. However, a stress relief would be required if the part is subject to stress corrosion cracking or for dimensional stability. Inconel 600 is non magnetic at room temperature.

AISI 347 SS The material will generally need to be stress relieved to accomplish dimensional stability.

Moderate Temperature Alloys

AISI 403 SS The difference between 403 and 410 stainless steel is the amount of Silicon.

403 SS (.5 max) 410 SS (1.0 max)

The silicon content is what forms the delta ferrite in the steel. At higher silicon content, the delta ferrite becomes extensive and networked. The delta ferrite is what causes stringers in the material.

403 Stainless steel has a propensity to embrittle at temperatures above 900° F.

AISI 310 SS - 25% Chrome - 20 % Nickel grade is known to embrittle in high temperature service and is rarely selected for turbine applications. Above 800° F. the precipitation of carbides at grain boundaries reduces corrosion resistance by promoting inter-granular attack. This phenomenon is known as "**sensitization**". 300 series stainless steels are also subject to stress corrosion cracking, particularly in the presence of chlorides.

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