

RULE OF THUMB - MATERIALS

TURBOMACHINERY

By Neal Wikert

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 deg. 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.

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 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.

S. S. Type 347

The material will generally need to be stress relieved to accomplish dimensional stability. For the scroll application, the entire scroll will be stress relieved and this will eliminate the need for the intermediate stress relief.

Babbitt

Is ASTM B23 grade (or Alloy) 2. This is tin based with some copper and antimony. For journal bearings in

high-speed industrial-sized machinery, we use 7 mils thick babbitt on bronze back pads (for increased fatigue strength) and 25 mils on copper thrust pads. We normally use 1/16th inch babbitt thickness on steel pads (journal and thrust)

Inconel 718

Has some limitations from a corrosion-cracking standpoint above 400 degrees 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 deg. F properties of yield 125, tensile 145, elongation of 12%, and a R of A of 15%.

A516 Grade 70

Material has been successfully used in expansion joint piping up to 1300 degrees F.

S.S. 403

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 degrees F.

For more information:

Email: RMS@rotatingmachinery.com

Tel: 484-821-0702

Headquarters

2760 Baglyos Cir.
Bethlehem, PA 18020

Houston Office

16676 Northchase Dr., Ste 400
Houston, TX 77060

rotatingmachinery.com

Tel: 484-821-0702

Parts: rms@rotatingmachinery.com



Rotating Machinery Services, Inc. | 2760 Baglyos Circle, Bethlehem, PA 18020 | Tel: 484-821-0702

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