HASTELLOY® C-22HS® alloy

Principal Features

A high strength C-type alloy for the Oil and Gas Industries

HASTELLOY® C-22HS® alloy is the premier nickel-chromium-molybdenum, corrosion-resistant material for oil and gas industry use. Cold working of the alloy at levels between 30 and 65% result in high room temperature yield strengths. It exhibits exceptional resistance to sour gas environments and is NACE/ISO approved.

Product Forms

C-22HS® alloy is available in the form of plate, sheet, strip, billet, bar, wire, pipe, and tube. Round products in the form of solid bars are available up to 10" with various amounts of cold work to achieve high strength and toughness by simultaneously retaining the excellent corrosion resistance of the alloy.

Oil & Gas Applications

The data in this document is believed to be useful for applications in the oil & gas industry, or other industries which may require an alloy with excellent corrosion resistance and strength levels higher than “standard” HASTELLOY® C-22HS® alloy. Additional information on C-22HS® alloy may be found in the alloy brochure H-3180.

Available in Three Very High-Strength Conditions

Early testing of C-22HS® alloy was focused on material in the annealed + age-hardened condition where the material was annealed at 1975°F (1079°C) and age-hardened at 1300°F (704°C)/16h/Furnace cool (FC) to 1125°F (607°C)/32h/Air-cool (AC.) In this “standard condition” C-22HS® alloy will typically have strengths around 100 ksi (690 MPa). While this strength level is almost double of “C-type” alloys in the annealed condition, many oil and gas applications require even greater strength. For this reason, a considerable development effort has been generated on C-22HS® alloy in three other “very high strength” conditions:

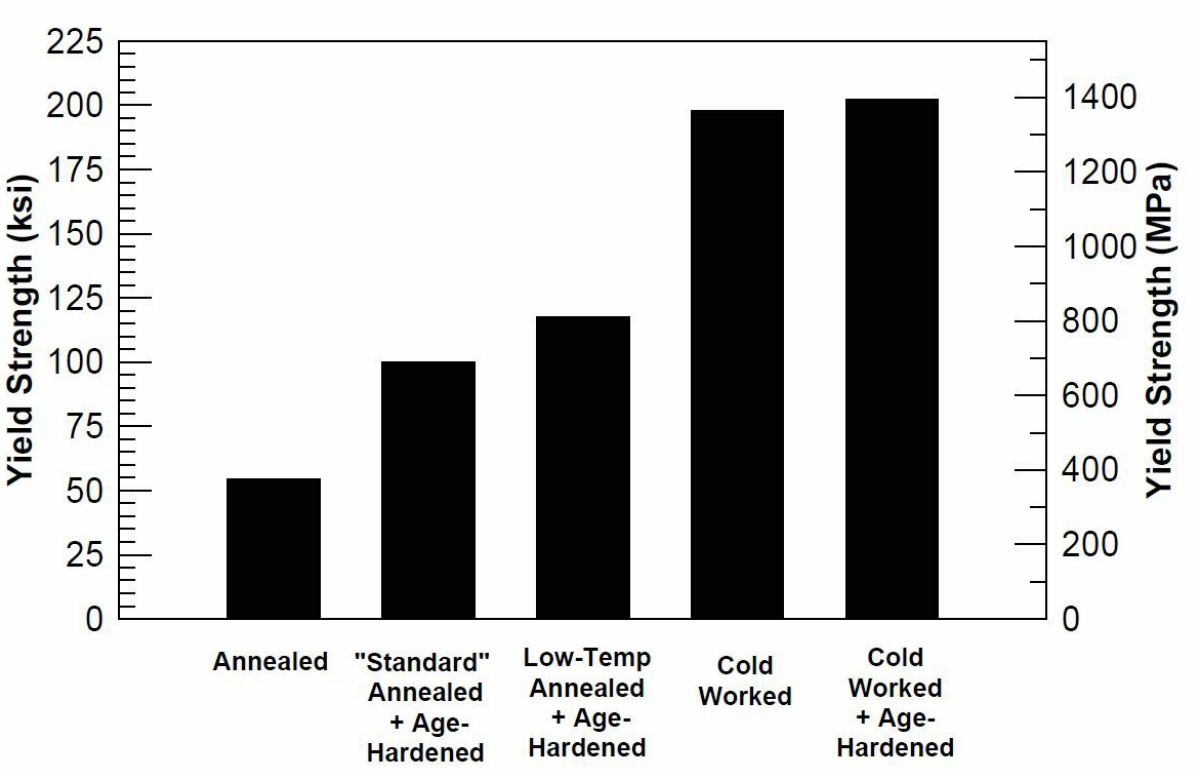
1) Cold Worked

2) Cold Worked + Age-Hardened[A]

3) Low Temperature (LT) Annealed[B] + Age-Hardened[C]

[A]1125°F (607°C)/10h/AC [B]1850°F (1010°C) [C]1300°F (704°C)/16h/FC to 1125°F (607°C)/32h/AC

A comparison of yield strengths for the three very high strength conditions is shown below along with that of the annealed and “standard” conditions. Haynes does not recommend use of highly cold worked and aged material because the increase in yield strengths is minimal and the susceptibility to hydrogen embrittlement in severe oil well conditions is increased.


Yield Strength (ksi)
225
200
175
150
125
100
75
50
25
0
Yield Strength (MPa)
1400
1200
1000
800
600
400
200
0
Annealed
"Standard" Annealed + Age-Hardened
Low-Temp Annealed + Age-Hardened
Cold Worked
Cold Worked + Age-Hardened