

HASTELLOY® C-22® Alloy

A Quick Reference to the Ultimate in Corrosion Protection



Acid Rain Abatement (FGD)

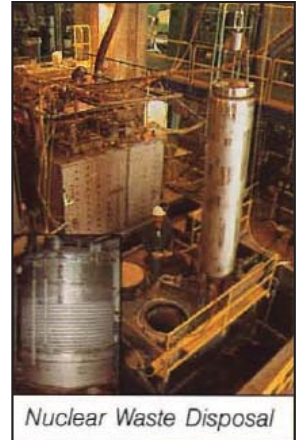


Cryogenic Bellows — Space Shuttle



Pulp and Paper Bleaching

HASTELLOY® C-22® alloy, a nominally 59Ni-22Cr-13Mo-3W-3Fe alloy, provides the best performance of any nickel-base alloy known to-date in both oxidizing and reducing environments. In addition, C-22 alloy demonstrates utmost versatility when evaluated for its resistance to localized (pitting and crevice) corrosion and when tested in the as-welded condition. As a result of its excellent overall corrosion resistance, proven by numerous laboratory and field tests, HASTELLOY C-22 alloy is the material of choice for a broad variety of critical industrial applications. HASTELLOY C-22 alloy has been successfully used as a cost effective measure of corrosion control in a multitude of corrosive services where safety of personnel, reliability of operations and



Nuclear Waste Disposal

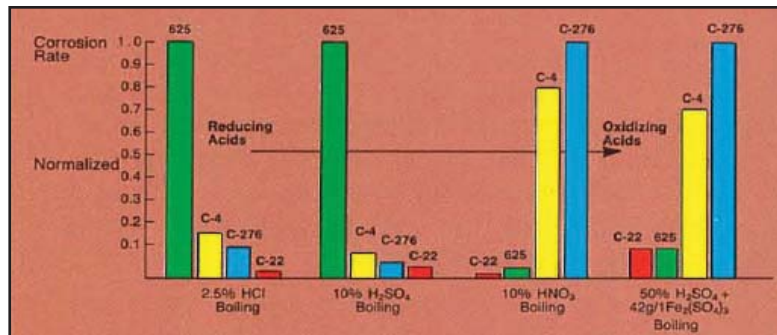


Chemical Waste Disposal

HASTELLOY® C-22® alloy

Uniform Corrosion Resistance

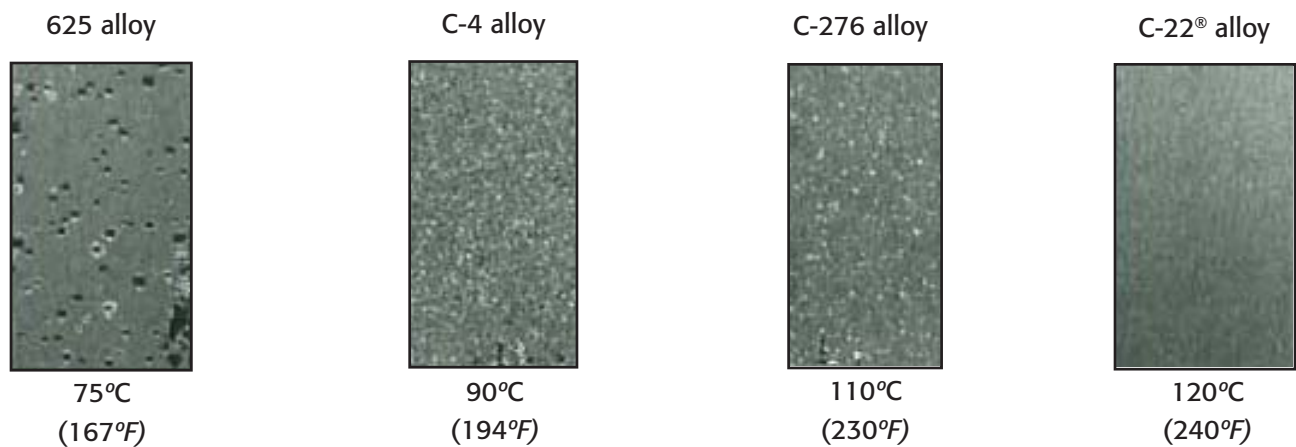
C-22® alloy consistently offers superior uniform corrosion resistance in both reducing and oxidizing environments over many high nickel-base alloys.



Localized Corrosion Resistance

The Best Ni-Based Alloy for Localized Corrosion Protection

Critical temp. above which pitting is observed in 11.5% H₂SO₄ + 1.2% HCl + 1% FeCl₃ + 1% CuCl₂, 24-hour exposure



Even in hot wall crevice corrosion testing, such as that observed in heat transfer applications, superior resistance is achieved with C-22® alloy. Boiling 11.5% H₂SO₄ + 1.2% HCl + 1% FeCl₃ + 1% CuCl₂ 24-hour exposure

Excellent Uniform Corrosion Resistance in Mixed Acid Media with Chlorides and Fluorides.

Uniform Corrosion Rate (mils/year)					
Corrosive Media	Temp.	C-22® alloy	C-276 alloy	C-4 alloy	625 alloy
6% HF + 5% HNO ₃	60°C (140°F)	67	207	204	73
1% HCl + 5% HNO ₃	boiling	0.5	8	11	1
25% H ₂ SO ₄ + 5% HNO ₃ + 4% NaCl	boiling	12	64	97	713
23% H ₂ SO ₄ + 1.2% HCl + 1% FeCl ₃ + 1% CuCl ₂	boiling	7	55	2294	3847

HASTELLOY® C-22® alloy

Superior Uniform Corrosion Resistance Over C-276 Alloy in Nitric Acid Environments Verified by Outside Testing Laboratory.

Uniform Corrosion Rate (mils/year)*			
Corrosive Media	Temp.	C-22® alloy	C-276 alloy
20% HNO ₃	104°C (219°F)	4	20
65% HNO ₃	66°C (151°F)	3	11
65% HNO ₃	121°C (250°F)	87	709
20% HNO ₃ + 5% HCl	105°C (221°F)	29	201
20% HNO ₃ + 28% HCl	109°C (79°F)	79	670
15% HNO ₃ + 1% HF	104°C (219°F)	4	20
10% HNO ₃ + 3% HF	70°C (158°F)	126	213

*R.A. Corbett and S.W. Morrison, NACE-Corrosion/88, paper 316

Others Verify C-22® Alloy's Superior Crevice Corrosion Resistance

Critical Temp (°C) above which crevice corrosion is observed in 6% FeCl ₃ , 24-hr. exposure*		
Alloy	MTI Test	Modified Test
317LM	2.5; 2.5	2.5; 2.5
904L	2.5; 5.0	2.5; 2.5
825	0; 0	2.5; 2.5
G-3	25; 25	20; 20
C-4	37.5; 37.5	20; 20
625	35; 40	30; 30
ALLCORR®	52.5; 52.5	40, 42.5
C-276 (5 heats)	55 to 65	42.5 to 50
C-22®	70; 70	52.5; 55

*E.L. Hibner (INCO) Materials Performance, March 1987

HASTELLOY® C-22® alloy

Universal Weld Corrosion Resistance Offered by C-22® Alloy

C-22® filler metal stops corrosion of weldments of various stainless steels



317L
35°C (95°F)
9% FeCl₃



AL-6XN®
60°C (140°F)
6% FeCl₃



Alloy 940L Filler Metal



Alloy 625 Filler Metal



C-22® alloy Filler Metal

Alloy 904L Base Metal: 120 hours
in 9% FeCl₃ at 35°C (95°F)

Excellent weld and HAZ corrosion resistance verified in the field



C-276 alloy



C-22® alloy

Degradation of weldments in oxidizing hot chloride solution (Mitsubishi Metals Corp. - Japan)

Fabricated Components of C-22® Alloy Show Better Performance

Localized corrosive attack on finned tubes



C-276 alloy



C-22® alloy

11.5% H₂SO₄ + 1.2% HCl + 1% FeCl₃ + 1% CuCl₂
24 hours at 125°C (257°F)

C-22® alloy bellows at the Space Shuttle Launch Site, Kennedy Space Center



Out of a 19-alloy test program as stated by NASA, "The HASTELLOY C-22 alloy has displayed superior corrosion resistance during all the testing." (MacDowell, Ontiveros & Springfield, John F. Kennedy Space Center, Document No. MTB-325-87A, Aug. 23, 1988.

One of the first applications of C-22® alloy was the replacement of corroded alloy C-276 welds for a pulp

