Cupronickel 90/10 for seawater applications

Copper-Nickel alloy or cupronickel 90/10 contains 90% copper and 10% nickel with nominal magnitudes of iron and manganese that improve the total strength and corrosion resistance of this alloy.

Conventionally, this grade has been utilized in the sea water conditions as it provides outstanding resistance to bio-fouling, corrosion in seawater and brackish water and crevice corrosion and stress corrosion. It is also resistant to hydrogen embrittlement and retains its mechanical properties from high to ambient temperatures below -300oF.

Generally, although designers look up the main properties of 90/10 grade such as high ductility, toughness and coloration to use this alloy in architectural and industrial operations. Curponickel 90/10 is preferably used in the variety of applications just not because of above stated properties, it also offers great production and forming properties, as it permits machining, bending, blanking, drawing, forming, punching, stamping and shearing. It can also be conveniently welded by soldering, brazing and gas shielded arc and resistance welding.

90/10 copper-nickel alloy offers outstanding antimicrobial characteristics. It can kill 99.9 % of various organisms within 120 minutes. Therefore it is commonly used in hygienic and sanitary applications in hospitals, kitchens, nursing homes and other healthcare applications.

The common grades of 90/10 copper-nickel alloy are CN102/ C70600 and CW352H in Europe and USA and these are formed in wire, sheet, tube, sheet, bar, rod, pipe, mesh, round rod, plate and strip forms.

Common uses of 90/10 copper-nickel alloy

Construction and building: Due to its pleasant silver coloration and formability, it is an artistically attractive and ideal replacement for various stainless steels in kick plates, door, cabinet handles, work surfaces, balustrades, handrails, sculptures, plaques and decorative metalwork.

Seawater/offshore: Corrosion resistance properties of 90/10 copper-nickel alloy make it suitable for use in marine applications such as seawater hardware, salt water pipes, fittings, heat exchangers, cooling units, hot water containers, salt water baffles, valve and pump parts, flanges, propeller sleeves, crankshafts and hulls of operational boats.

Technical Data

Chemical Composition

arbon	Copper	Iron	Lead	Manganese	Nickel	Phosphorous	Sulfur	Zinc
0.050 %	85.6 to 90 %	1 to 1.8 %	< 0.020 %	< 1 %	9 to 11 %	< 0.020 %	< 0.020 %	< 0.50 %

High temperature mechanical properties

Short term tensile Characteristics

Form	Temper	temperature		Tensile strength			Proof stress		Elongation	
		oC	oF	Kg/mm2	Ton/ in2	psi	Kg/mm2	Ton/ in2	%	Gauge length
1.25 inch outer dia, 0.08 inch wall	Cold drawn 40 %	20	68	51	32.4	72500	-	27.4	6	2 inch
		149	300	48	38.5	68500	-	25.9	5	2 inch
		177	351	46.5	29.4	66000	-	25	5	2 inch
		204	399	45	28.6	64000	-	24.7	6	2 inch
		232	450	45	28.5	54000	-	24.7	5	2 inch
		260	500	44	28	62500	-	24.4	5	2 inch
		315	599	43	27.3	61000	-	23.5	5	2 inch
		400	752	35.5	22.4	50000	-	18.7	6	2 inch

Creeping Strength

Form	Temper	Temp		Stress			Time	Elongation	Intercept	Creeping rate
		oC	of	Kg/mm2	Ton/in2	Psi	Hours	%	%	% per 1000 hours
3 mm dia, 0.125 inch	Cold processed 21 %	149 oC	300 of	14.1	8.9	20,050 Psi	6,000 Hours	0.139 %	0.018 %	Below 0.0001
		149 oC	300 of	21.1	13.4	30,000 Psi	6000 Hours	0.199 %	0.014 %	0.0002
				28.2	17.9	40,050 Psi	6000 Hours	0.277 %	0.027 %	0.0014
				31.6	20.1	45,000 Psi	6000 Hours	0.410 %	0.061 %	0.0024
				36.2	22.3	50,000 Psi	6000 Hours	0.635 %	0.164 %	0.0035
		204 oC	400 of	10.7	6.8	15,150 Psi	6000 Hours	0.110 %	0.010 %	0.0002
				17.7	11.2	25,150 Psi	6000 Hours	0.184 %	0.028 %	0.0010
				24.7	15.7	35,100 Psi	6000 Hours	0.308 %	0.062 %	0.0029
				28.1	17.8	40,000 Psi	6000 Hours	0.411 %	0.111 %	0.0063
				31.7	20.1	45,100 Psi	6000 Hours	0.709 %	0.413 %	0.0366
		260 oC	500 of	14.3	9.1	20,3000 Psi	6,000 Hours	0.198 %	0.057 %	0.0022
				21.2	13.5	35,500 Psi	6,000 Hours	0.442 %	0.169 %	0.00136
				25	15.9	35,500 Psi	4,320 Hours	0.607 %	0.189 %	0.044
				25	15.9	35,500 Psi	6,000 Hours	0.700 %	0.102 %	0.0617
Rod	Annealed	316 oC	600 of	2.8	1.8	4,000 Psi	1,175 Hours	0.039 %	0.028 %	0.009
				4.2	2.7	6,000 Psi	1,525 Hours	0.056 %	0.046 %	0.00066
				5.6	3.6	8,000 Psi	1,525 Hours	0.08 %	0.07 %	0.00066
				8.4	5.4	12,000 Psi	945 Hours	0.136 %	0.10 %	0.037
				12	7.6	17,000 Psi	1,125 Hours	0.254 %	0.185 %	0.061

Conclusion

Due to outstanding performance of Copper Nickel alloy 90/10 in seawater conditions, it is widely used in ship building applications.