WALLCOLMONOY
SURFACING ALLOYS

WALLCOLMONOY
TECHNICAL DATA SHEET

Wallex® Cobalt-Based Alloys

Combating the Combined Effects of Corrosion and Abrasion

Description:

Wallex® is a line of cobalt-based hard-surfacing alloys. Wallex® alloys resist corrosion well but vary in their ability to resist abrasion and impact, and in the way they can be applied. Wallex® alloys are seldom recommended for protection against corrosion alone. In most cases, they are chosen for their ability to fight the twin hazards of corrosion and abrasion. The specific alloy choice depends on a careful analysis of the extent of the problem presented by each hazard.

Wallex® 1 and 6, containing chromium and tungsten, are virtually unaffected by the most commonly used corrosive chemicals, and by atmospheric corrosion.

Wallex® 40 and 50 contain chromium, tungsten, nickel and boron. They are slightly less corrosion-resistant, but have the advantage that they can be produced in powder form for ease and efficiency of application. They are applied using Wall Colmonoy® Spraywelder™ System or Fusewelder™ Torch. Wallex® 50 is perhaps the most likely choice where corrosion and abrasion are considered equally serious problems, but it is less useful against impact than the others.

Wallex® 55 is a combination of Wallex® 50 and ultra-hard tungsten carbide particles. Wallex® 50 sacrifices some corrosion resistance to achieve unsurpassed resistance to abrasion.

Oxidation Resistance:

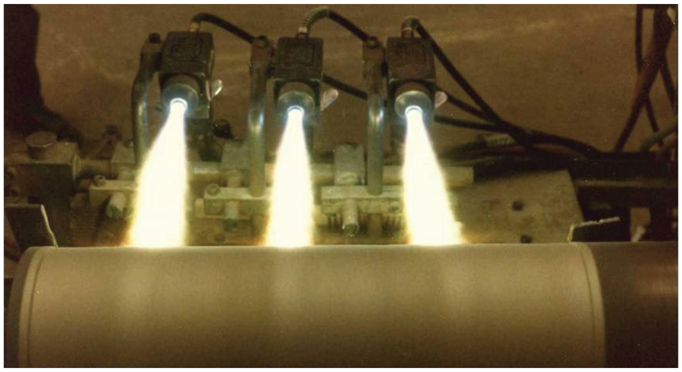
Hard-surface overlays of Wallex® alloys are highly resistant to oxidation. When heated in air, they begin to tarnish at 750°F (400°C), but no perceptible oxidation takes place until temperatures of 1380°F (750°C) are reached. Because a tightly adherent surface scale is formed after the initial heating cycle, subsequent oxidation is negligible up to 1830°F (1000°C). Decarburization is also virtually nil below 1830°F (1000°C).

Above 1000°C (1830°F), oxidation becomes noticeable, but it is not appreciably affected by the presence of moisture. However, solutions of strong acids, alkali carbonates and hydroxides, as well as molten salts become somewhat corrosive, especially if allowed to collect and remain on the surface.

Aqueous solutions that are dilute and contain appreciable amounts of chlorine and hypochlorates may produce surface pitting over an extended period. Even so, in many cases, Wallex® cobalt-based alloys may be preferred to stainless steels because of their superior overall wear resistance.

Applications:

Wallex® cobalt-based alloys have wide application where the combined effects of corrosion and abrasion exist. They are especially useful on pump components where nickel-based self-fluxing alloys cannot be used because of the corrosive character of the media. Also, since Wallex® alloys are less electropositive under conditions of galvanic corrosion than the nickel-based alloys, they can be safely used with pump seals containing copper-based alloys.



Wallex® 50 applied to a valve stem by three Spraywelder™ Systems.

Other areas where Wallex® alloys have proved effective include: automotive starting cams; arbors and machine knives in the brick and clay industry; bucket dumping cams and conveyor pipes in the cement industry; ash plows, leveling arms and pokers in the coke-gas-power field; cable drums and sleeves in dredging. In the iron and steel industry, on barrel-chuck rings, cams, hot-work dies, flying shear blades, heat-treating lead pots, ingot tongs and bits, mold shake-out hooks; in metalworking, hot bending and sizing dies, hot shear blades, lapping gages, and snap gages; skip hoist cable sheaves in mining; chopper blades for scrap plastic; hot oil pump sleeves in the petroleum field; and expeller collars in the food and soap processing industries.

In agriculture, they have been highly effective on cornplanter runners, expeller collars, hay-chopper knives, and spike-harrow teeth. They are used on all kinds of cutting and chopping tools, where the material to be cut is both corrosive and abrasive.

As this partial list indicates, the potential uses of Wallex® alloys cover a broad and varied area.

Valve Seat - a typical application of Wallex® 40.

Problems:

Sodium salts, if allowed to accumulate and fuse in boilers and water superheaters, will usually have a deleterious effect on valves hard-surfaced with Wallex® overlays.

Because of the cobalt content in Wallex® alloys, they are subject to radioactive poisoning. They are, none the less, used in some nuclear primary water systems, where the design of the reactor is such that this problem would not arise.

It is always important to determine if galvanic conditions exist, caused by the presence of certain other metals in the operating system. Metals cathodic to Wallex® cobalt-based alloys may be protected at the expense of the hard-surface alloy. In which case it would appear that the Wallex® was not resistant to the corrosive media. In applications requiring seals to prevent galvanic action at the mating surfaces, it is important that non-carbon seals be used.

Wallex® cobalt-based hard-surfacing alloys should always be considered to be in the “active” state galvanically, in as much as their surfaces are always being subjected to rubbing or wearing action, which removes “passive” films. In the electromotive series (for common metals in fresh water), they fall between Monel and nickel (in the “passive” state).

The information provided herein is given as a guideline to follow. It is the responsibility of the end user to establish the process information most suitable for their specific application(s). Wall Colmonoy assumes no responsibility for failure due to misuse or improper application of this product, or for any incidental damages arising out of the use of this material.

updated October 2025

Corrosion Resistance of Wallex® Alloys in Various Media

Corrosive Media	Concentration	Temp.	Penetration Rate: Mils per year		
			Wallex® 1	Wallex® 6	Wallex® 40 & 50
Acetic Acid	10%	RT	Nil	Nil	Nil
	10%	Boil	Nil	Nil	Nil
	50%	RT	0.2	0.2	NR
	50%	150°F	0.2	0.2	1.0
	50%	Boil	2.0	0.4	NR
Chromic Acid	10%	RT	Nil	Nil	Nil
	10%	150°F	1.0	28.0	NR
	10%	Boil	High	High	NR
Chlorinated Water	Sat.	RT	Nil	High	NR
Cupric Chloride	2%	RT	2.0	0.7	Nil
	10%	RT	0.5	0.5	NR
	10%	Boil	High	High	NR
Ferric Chloride	2%	RT	3.0	2.0	Nil
	10%	RT	1.0	6.0	NR
	10%	Boil	High	High	NR
Ferric Sulphate	10%	RT	Nil	0.5	Nil
	10%	Boil	Nil	1.0	NR
Hydrochloric Acid	2%	RT	9.0	0.1	39.0
	2%	150°F	169.0	120.0	NR
	10%	RT	10.0	9.0	NR
	10%	Boil	High	High	NR
	20%	RT	26.0	16.0	NR
	Conc.	Boil	High	High	NR
Nitric Acid	10%	RT	Nil	Nil	3.0
	10%	Boil	0.1	Nil	NR
	40%	RT	0.1	Nil	NR
	Conc.	RT	0.2	0.1	NR
	Conc.	Boil	High	High	NR
Phosphoric Acid	10%	RT	Nil	Nil	Nil
	10%	150°F	0.2	Nil	Nil
	10%	Boil	0.6	Nil	63.0
	40%	Boil	High	0.1	NR
Sodium Hydroxide	5%	Boil	0.5	Nil	Nil
	10%	Boil	High	2.0	NR
Sulfuric Acid	2%	RT	0.1	0.1	157.0
	2%	150°F	23.0	Nil	NR
	10%	RT	Nil	Nil	NR
	10%	Boil	High	High	NR
	50%	RT	0.2	0.1	NR
	90%	RT	0.3	Nil	NR

NOTES: NR means either Not Recommended or Not Rated (i.e. unknown). RT means Room Temperature. Generally, a corrosion rate greater than 3.0 mils per year should call for caution. Whenever possible, it is advisable to make individual tests on specific applications.