

COLWEAR PLATES

HARD, SMOOTH, LIGHTWEIGHT



WALLCOLMONOY

EXTEND COMPONENT SERVICE LIFE BY PROTECTING AGAINST ABRASION AND EROSION

REDUCE OPERATIONAL EXPENSE AND PLANT DOWNTIME

ColWear Plates are smooth, crack free, lightweight, have minimal dilution and provide hardness down to the fusion line.

Wall Colmonoy's range of vacuum powder fused ColWear Plates offer a unique solution to the most aggressive wear problems in wet or dry, hot or cold and corrosive environments.

As a world leading manufacturer of hard-surfacing alloys, Wall Colmonoy materials have been extending the service life of industrial parts for nearly 90 years. ColWear Plates protected with Colmonoy® (nickel), Colferoloy™ (iron), or Wallex® (cobalt) hardfacing alloys – last significantly longer than unprotected parts in aggressive service environments – reducing costs, maintenance and downtime.

ColWear Plates coated with Colmonoy® NiCrBSi, Wallex® CoCrNiW, or Colferoloy™ CoCrMo powder matrix, with or without Tungsten Carbide (WC):

- Provide a dense, tough surface resistant to abrasion, erosion and impact
- Extend equipment service life
- Reduce downtime, increase uptime

ColWear Plates' lightweight, thin construction from a weldable mild steel or stainless steel backing plate enables ease of handling, forming and fabrication, and can be used in a wide range of industries and applications.

ColWear Plates provide a dense, tough surface which is resistant to abrasion, erosion and impact with excellent ASTM G65 test results (see *G65 Abrasion Resistance results*).



Unlike bulk weld overlay wear plates, ColWear Plates do not suffer from surface cracking, coarse surface finish or base plate metal dilution.

Advantages

- Superior hardness (55-64 HRC), retained down to the fusion line with minimum dilution of base material
- Excellent abrasion performance
- Inherent corrosion resistance
- Good impact and erosion resistance
- Lightweight and thin - easy to handle, form and fabricate
- Retained high temperature hot hardness in matrix (45 HRC) - working temperature range up to 650°C
- Smooth, flat surface, crack free
- Fully dense pore-free coating
- Able to precision cut by water jet or laser
- Weldable back plate
- Repairable in service (Fusewelder™ Torch)
- Cost advantage over WC (tungsten carbide) application via HVOF or cloth based cladding

COLWEAR PLATES

ColWear 62

Corrosion resistant hard matrix with excellent wear characteristics. Very smooth surface finish. Suitable for high impact energy applications and environments.

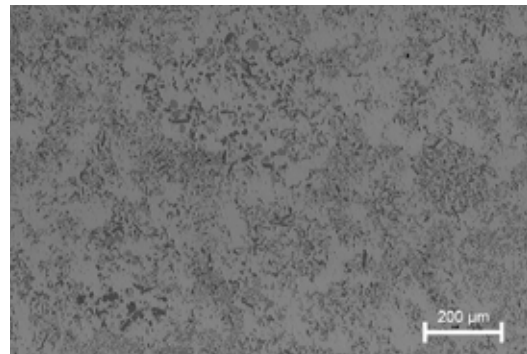
Structure: Colmonoy® 62 alloy matrix on steel plate

Matrix Hardness (HRC): 55 - 64

Wear Resistance: Excellent abrasion resistance

Formability: Formable to a 150mm radius tube

Surface Finish: Very smooth nominal Ra = 3-4µm



Scanning Electron Micrograph (SEM) (original at 500x magnification) of ColWear 62 coating morphology showing different precipitated phases to produce a matrix hardness (55-64).

ColWear 62-1

Corrosion resistant hard matrix with excellent wear characteristics. Textured surface finish. Suitable for highly aggressive wear applications and environments.

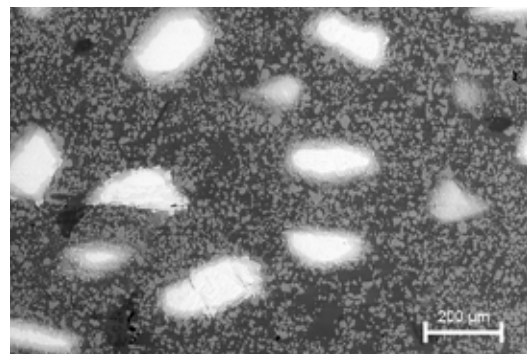
Structure: Colmonoy® 62 alloy matrix + Tungsten Carbide (WC) on steel plate

Matrix Hardness (HRC): 55 - 64

Wear Resistance: Excellent abrasion resistance

Formability: Formable to a 150mm radius tube

Surface Finish: Textured nominal Ra = 16-17µm



Scanning Electron Micrograph (SEM) (original at 500x magnification) of ColWear 62-1 coating morphology showing homogeneous dispersion of large and discrete tungsten carbide particles and precipitated phases to produce a matrix hardness (55-64) and regions of ultra-high hardness.

ColWear Fe

Corrosion resistant hard matrix with excellent wear characteristics. Textured surface finish. Suitable for highly aggressive, high temperature wear applications and environments.

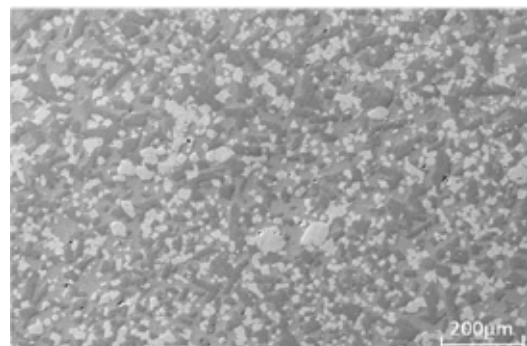
Structure: Multiple phase complex chemistry

Matrix Hardness (HRC): 55 - 65

Wear Resistance: Excellent resistance to fine particle abrasion, erosion and metal on metal friction

Formability: Formable to a 150mm radius tube

Surface Finish: Smooth nominal Ra = 3-4µm



Scanning Electron Micrograph (SEM) (original at 500x magnification) of ColWear Fe showing molybdenum chromium and chromium rich angular hard phases within an iron rich matrix (55-65).

Additional ColWear Plates available to suit your specific application.

Controlled Process

ColWear Plates are produced by the closely controlled process of vacuum fusing the matrix coating to the baseplate, resulting in a homogeneous coating and consistent micro structure, offering matrix hardness in the range of 55 – 64 HRC (*other hardness ranges available*).

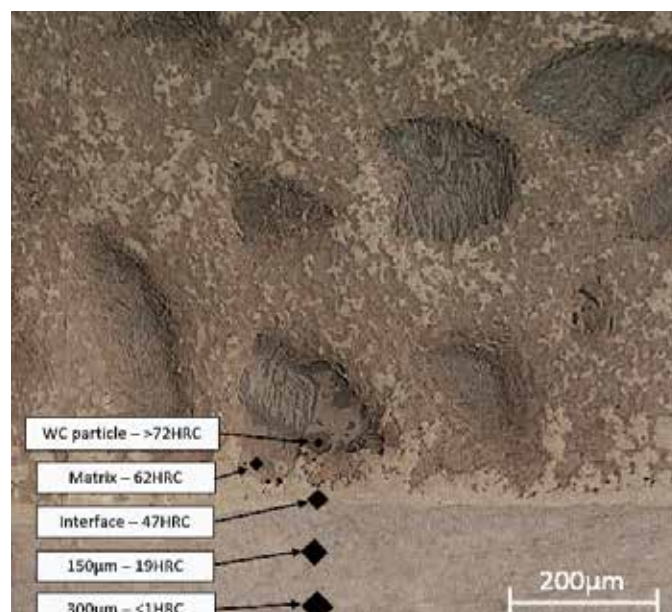
ColWear Plates provide excellent corrosion resistance for both aqueous and hot gas corrosion environments (like in waste to energy applications) due to the chemistry of the super alloy matrix.

ColWear Plates can also be manufactured using stainless steel and exotic nickel super alloy base plates for further extension of high temperature capability in corrosive environments.



Microstructure Advantages

- Discrete interface with no dilution or heat affected zone
- Minimal porosity within coating
- High matrix hardness with no relief cracking
- Function material embedded into matrix



Optical micrograph (original at 500x magnification). Measured hardness (HRC) of a ColWear 62-1 Plate across interface. Cross section indicates a clean interface, with no dilution of the base plate and regions of ultra high hardness due to homogeneous dispersion of tungsten carbide.

Case Studies

Industrial Fans

[ColWear for Demanding Industrial Fan Applications](#)

ColWear allows industrial fans to withstand higher temperatures and therefore higher rotational speeds, so that fan performance is enhanced.



Steel

[ColWear Plates for Steel Manufacture](#)

ColWear Plates offer a unique solution for steel applications where aggressive wear is prominent.

[ColWear Plates Offer Solution to Sinter Screening Abrasion in Steel Plant](#)

ColWear address a problem in a plant that produces sinter for the steel-making process.



Mining / Excavation

[ColWear Fan Blade Outlasts an AR500 Plate by 5 Times at a Stone Mining Quarry](#)

ColWear Fan Blades extend the lifetime of the classifier due to the improved abrasion resistance.



Waste-to-Energy

[ColWear 62-1 Outlasts Chrome Carbide Plate by 8 times at a Waste To Energy Plant](#)

ColWear Plates offer resource, cost, and usability benefits due to their reduced energy usage, easier handling, transport, and storage.

[ColWear 62-1 Replaces AR400 Plates as Feed Chute Liners in Waste to Energy Plant](#)

ColWear 62-1 Plates have a dense, tough surface that can combat the challenging wear conditions.



APPLICATIONS IN GLOBAL INDUSTRIES



Waste-to-Energy

Chutes, Bunkers, Slides, Feed Hoppers, Guides, Stacked Layers, Helical Feed Screws



Mining / Excavation

Stacked Layers, Conveyors, Mining, Quarrying, Aggregate Handling Systems



Cement & Concrete / Construction

Side Liners, Skip Car, Bin Liners, Skip Curtains, Aggregate Handling Systems



Agriculture & Sugar

Stacked Layers, Helical Feed Screws



Oil & Gas

Stacked Layers, Slurry Pumping Pipelines



Steel & Sinter Plants

Sizing Screens, Sinter Plant Equipment, Material Screening and Separation, Orifice Plates



Material Handling & Conveyance

Stacked Layers, Material Screening, Handling, Classification and Conveyance



Industrial Fans & Rotors

Fan Castings, Fume, Dust Extraction Systems, Ducting, Baffles Plates *(Photo courtesy of Daniels Fans, A Cincinnati Fan Company)*

COLWEAR PLATES

ColWear Plates offer a unique combination of key properties that suit a wide range of applications due to the inherent properties of the fused coating.

ColWear Plates Performance

Performance	ColWear 62	ColWear 62-1	ColWear Fe
Wear Resistance¹	Excellent	Excellent	Excellent
Corrosion			Moderate
Formability		Very Good	Very Good
Impact Resistance²			
Bond Strength³			

ColWear Plates are available in a variety of standard and customised plate sizes, plate thickness and coating thickness combinations.

Standard Plate Sizes*

Plate Size (mm)	Coated Area (mm)
1250 x 850	1200 x 800
1450 x 950	1400 x 900

*Non-standard plate sizes & coating thickness can be accommodated upon request. Max plate size may be limited by total plate weight (100kg).



Example Plate thickness of 6+4mm (bottom) and 4+2mm (top).

Plate Size and Coating Thickness Combinations*

Plate Thickness (mm)	Coating Thickness (mm)
2, 4, 5, 6, 8, 10, 12	1
4, 5, 6, 8, 10, 12	2
4, 5, 6, 8, 10, 12	3
4, 5, 6, 8, 10, 12	4
4, 6, 8, 10, 12	5
4, 6, 8, 10, 12	6
4, 6, 8, 10, 12	8

ColWear Plates are provided on mild steel for the above combinations. Stainless Steel plates can be offered on 2mm base + 1mm coating and 4mm base + 2mm coating.

Resource, Cost and Usability Benefits

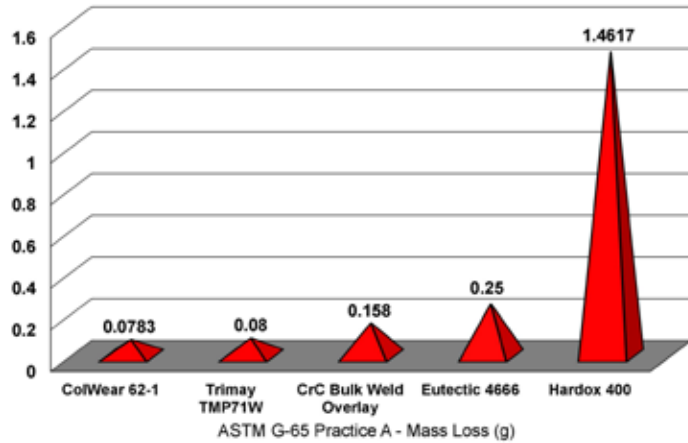
Due to the thin, lightweight, plate design, made from a weldable mild steel or stainless steel backing plate, ColWear Plates provide resource, costs and usability benefits:

- Reduced Energy Usage
- Easier Handling, Transport and Storage
- Ease of Use, Installation & In-Service Maintenance

Abrasion Resistance

ColWear Plates offer significantly improved abrasion resistance versus common industrial alternatives of wear plate. Relative abrasion resistance will increase with temperature and other failure modes within the application.

G65 Abrasion Resistance¹ - Material Loss



ColWear Plates exhibit lowest ASTM G-65 Practise A mass loss verse the competition.

Lifetime Comparisons

Wear Product	Density g/cm ³	ASTM G65	G65 comparison	
			Versus Fe	Versus 62-1
ColWear Fe (2mm coating)	7.43	0.038		
ColWear 62-1 (2mm coating)	8.4568	0.098		
Hardox 400 (6mm)	7.85	1.4617	38.47	14.92
Hardox 400 (10mm)	7.85	1.4617	38.47	14.92
Hardox 500 (6mm)	7.85	1.0542	27.74	10.76
Hardox 500 (10mm)	7.85	1.0542	27.74	10.76

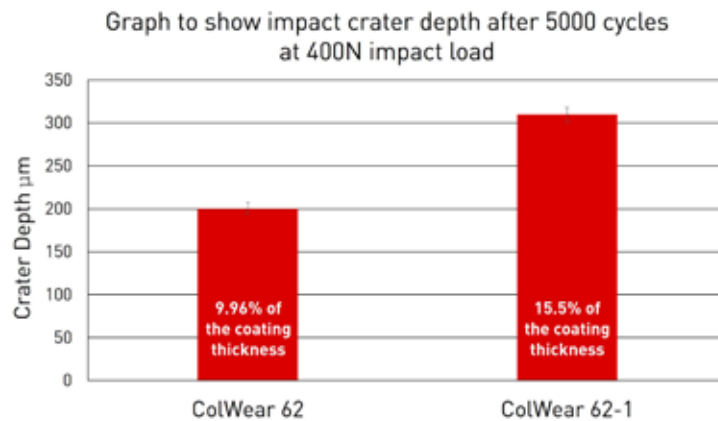
Wear Product	Weight of 1cm ³ width of coating	Time take to wear through	Lifetime comparison	
			Versus Fe	Versus 62-1
ColWear Fe (2mm coating)	1.486	39.11		
ColWear 62-1 (2mm coating)	1.69336	17.28		
Hardox 400 (6mm)	3.297	2.26	17.34	7.66
Hardox 400 (10mm)	5.495	3.76	10.40	4.60
Hardox 500 (6mm)	3.297	3.13	12.50	5.52
Hardox 500 (10mm)	5.495	5.21	7.50	3.31

Material lifetime comparisons versus different Hardox grades show significant extension of lifetime with 2mm coating.

Impact Resistance

ColWear Plates are an excellent solution to repeatable high energy impact applications. ColWear 62 exhibits the best repetitive impact performance with less than 10% coating degradation after 5000 impact cycles.

Repetitive²



Results show high repetition impact of a 6mm diameter Tungsten Carbide ball on the ColWear Plate.

Ballistic³

ColWear Plates provide excellent protection against single high velocity impact, where bullets have been destroyed by the coating with no penetration.



ColWear Product	BS EN 1063	STANAG 4569
ColWear 62 (10+3)	Level 5 & 6	Level 1
ColWear 62-1 (10+3)	Level 5 & 6	Level 1

Slurry Erosion Resistance - Material Loss

ColWear Plates protect against high pressure slurry erosion with maximum impingement - achieving reduced mass loss.



ColWear Product	Mass Loss (mg)
ColWear 69-1	18

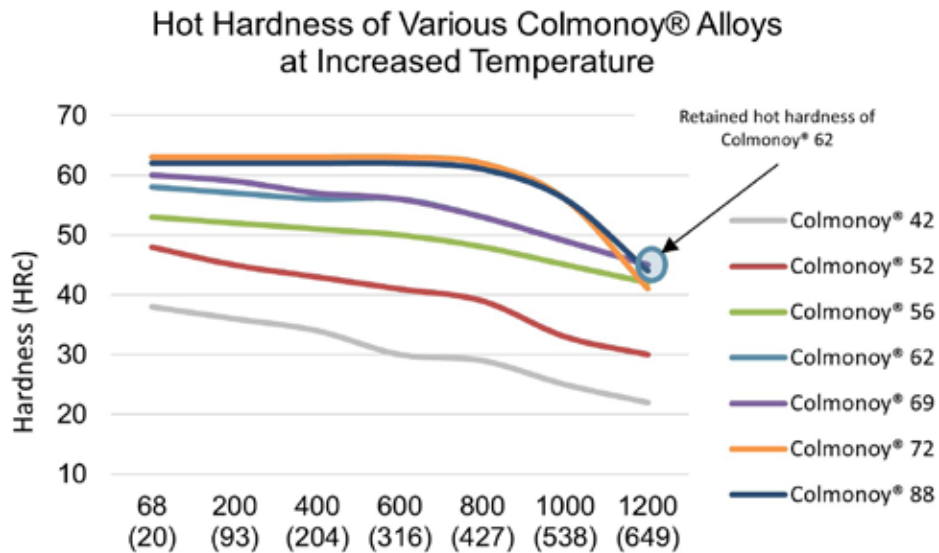
Corrosion Resistance

ColWear strips are installed along a lifeboat ramp that is daily submerged in seawater. After one year, ColWear remains intact and relatively unaffected.



Hot Hardness

Tungsten Carbide has retained hardness at high temperatures. ColWear 62 matrix has particle erosion resistance to 815°C.



Retention of hot hardness within the ColWear matrix up to high temperature 45HRc at 650°C.

Coating Adhesion⁴

ColWear Plates maintain excellent coating adhesion characteristics, where the coating has outlasted the base plate at high tensile stress.



Cutting and Forming

ColWear can be cut with a variety of different techniques including: Water Jet, Laser or Plasma with water table. ColWear can also be cut with intricate design features including countersinks, tapered screening holes, weld tapers or formed or rolled into a pipe.



Installation

There are a variety of different methods for installing ColWear Plates:

- Weldable base plate with studs / green edges
- Cut through / countersunk holes
- Coated countersunk bolts / nuts



References

1. Wear resistance performance based on test standard ASTM G65 Method A - where typical volume loss -10mm³ or 0.08 - 0.018g
2. Impact resistance based on test method from Cassar et al, "Impact wear resistance of plasma diffusion treated and duplex treated PVD-coated Ti-6Al-4V alloy", Surf. Coat. Tech. 206 (2012) 2645-2654
3. Ballistics protection based on test standard BS EN 1063 (level 5 & 6) & STANAG 4569 (level 1) where ColWear Plate was resistant to 7.62mm NATO bullet from a distance of 10m and impact velocity of 950ms⁻¹
4. Bond strength performance based on test derived from standard ISO 4587 - typical bond strength ColWear 62 >820MPa

Repairability

ColWear Plates can be repaired rather than replaced by Fusewelder™ Torch application.



ColWear 62-1 coating gouged to produce significant defects and then repaired using Fusewelder™ Torch & Colmony® 62 powder.

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WALLCOLMONOY

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