



Wall Colmonoy Surface Alloys For Steel Industry & Steel Mill Rolls



WALLCOLMONOY

Making Metals Work Harder Since 1938

A Global Organization



WALLCOLMONOY

A Global Materials Engineering Company

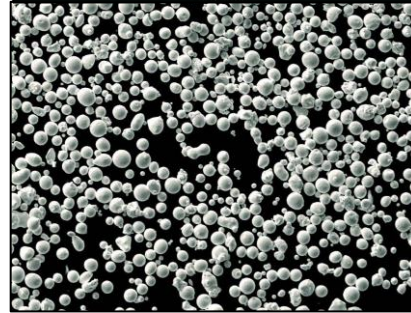
**SURFACING
ALLOYS**



**BRAZING
ALLOYS**



**ADDITIVE
WALLCOLMONOY**



**PRECISION
COMPONENTS**



AEROBRAZE
ENGINEERED TECHNOLOGIES



Franklin Bronze
PRECISION COMPONENTS



We melt, coat, join, cast, print and engineer metals.
We make metals work harder
so our customers' businesses run better.

A Global Organization

★ GLOBAL HEADQUARTERS
★ MANUFACTURING SITES



1938 Detroit, Michigan
5+ Manufacturing Sites
Los Lunas | Cincinnati | Oklahoma City
Franklin | Pontardawe, Wales UK

WORLD HEADQUARTERS
Madison Heights, MI USA

EUROPEAN HEADQUARTERS
Pontardawe, Swansea Wales, UK



Global Customers



ArcelorMittal



TATA STEEL

**SMS
MILLCRAFT**
SMS group



U. S. Steel



**UNIVERSAL
STAINLESS**

20 Years Serving Our Customers



WALLCOLMONOY

Surfacing Alloys



WALLCOLMONOY
SURFACING ALLOYS

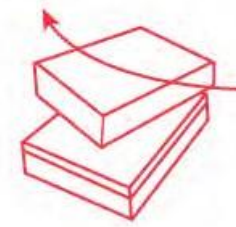
Colmonoy® and Wallex® Surfacing Alloys

Parts protected with Wall Colmonoy's **Colmonoy®** or **Wallex®** Surfacing Alloys last significantly longer

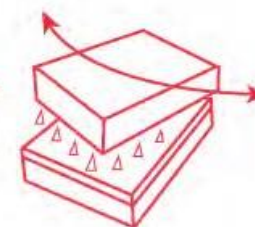


WALLCOLMONOY
SURFACING ALLOYS

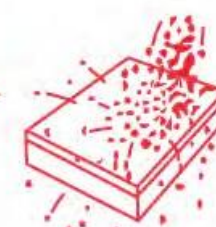
- Fewer replacement parts needed
- Parts run more efficiently
- Less labor required to install
- Minimize downtime



Galling



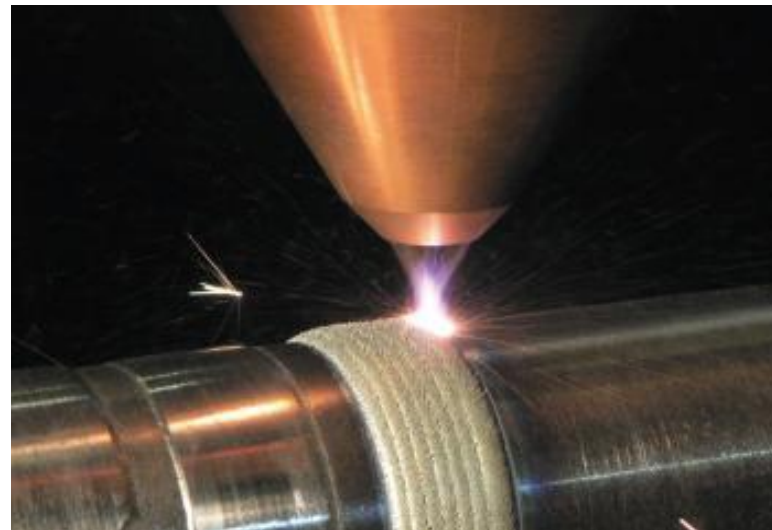
Abrasion



Erosion



Corrosion



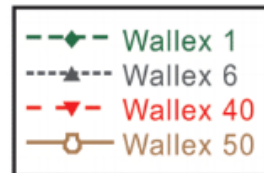
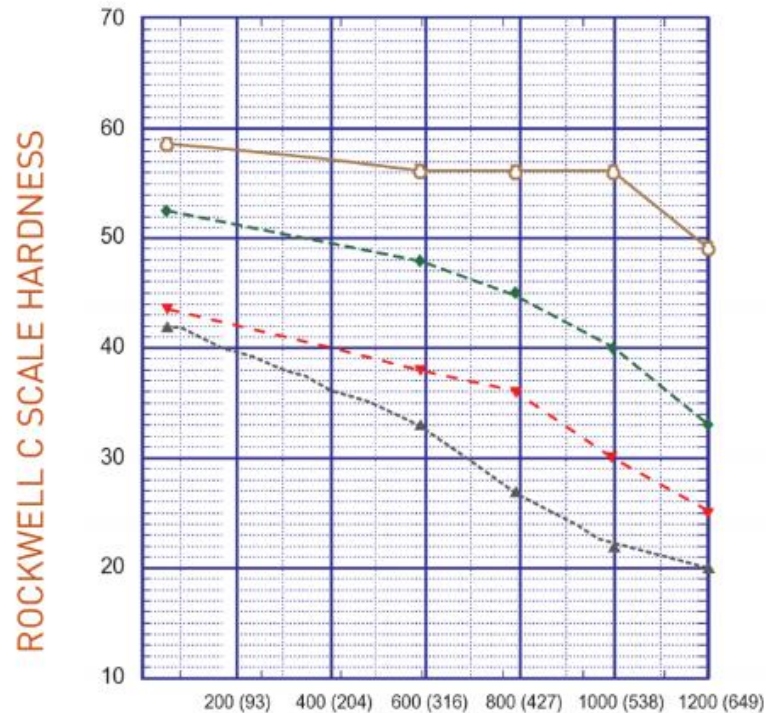
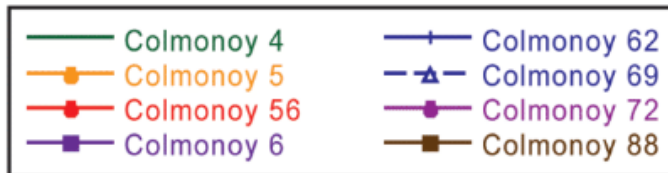
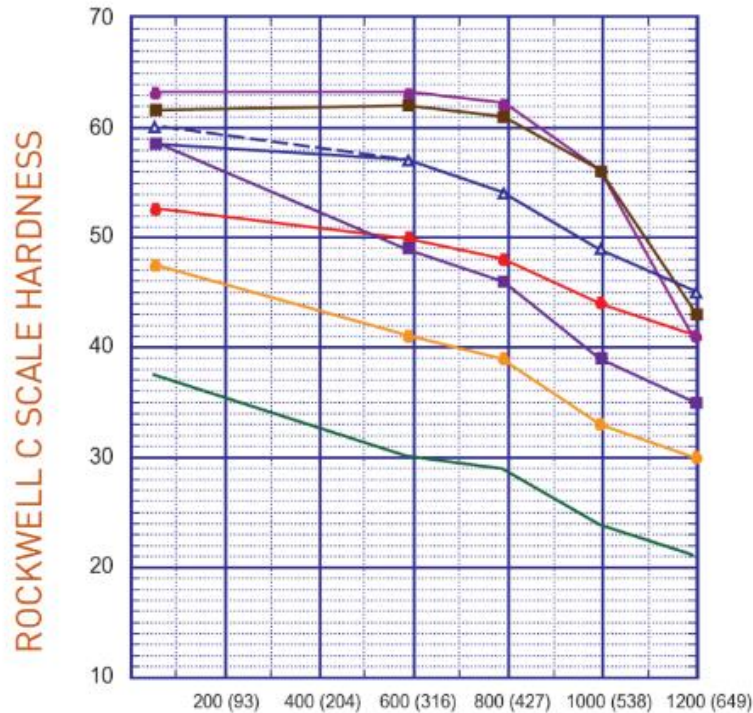
Hot Hardness Chart: Colmonoy and Wallex Coating

Colmonoy®
(nickel-based)

Wallex™
(cobalt-based)



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SURFACING ALLOYS



Rockwell C Scale Hardness of Gas Welded Alloy Deposits

Colmonoy®
(nickel-based)

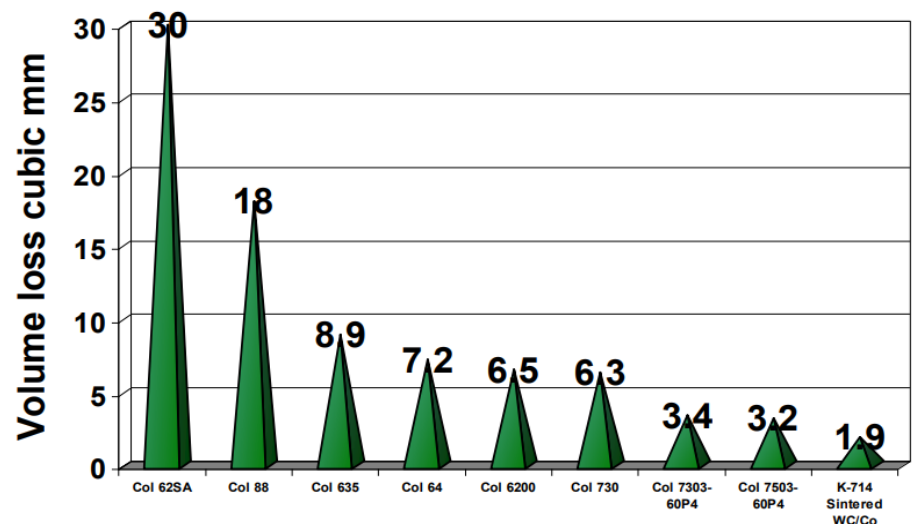
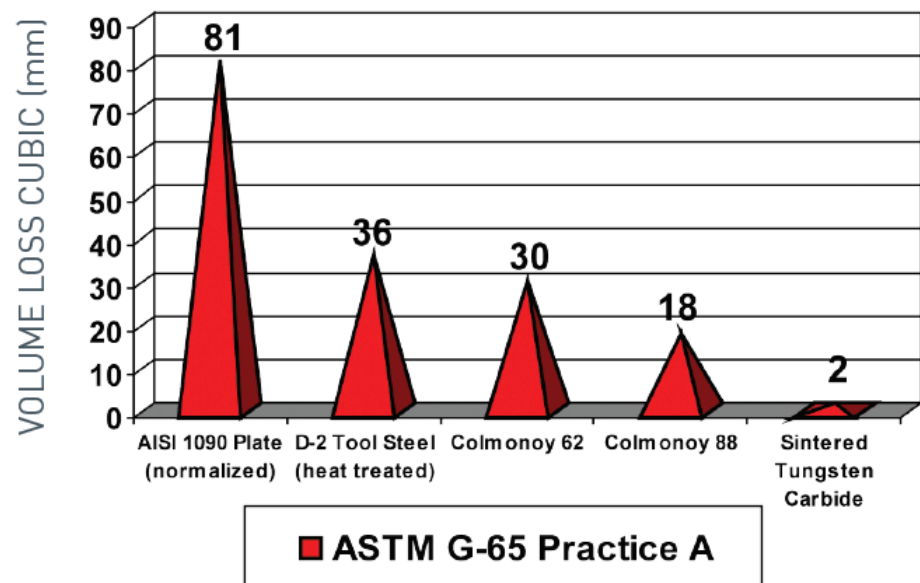
ALLOY	TEMPERATURE				
	70°F (21°C)	600°F (315°C)	800°F (427°C)	1000°F (538°C)	1200°F (650°C)
4	35-40	34	33	29	26
5	45-50	46	45	42	38
6	56-63	55	52	48	44
56	50-55	50	48	44	41
62	56-63	57	54	49	45
69	58-63	57	54	49	45
72	57-62	62	62	56	41
88	59-64	62	61	56	43

WALLEX™
(cobalt-based)

1	50-55	48	45	40	33
6	40-44	33	27	22	20
40	41-46	38	36	30	25
50	56-61	56	56	56	49

G65 Testing Results

G-65 DRY SAND ABRASION TEST



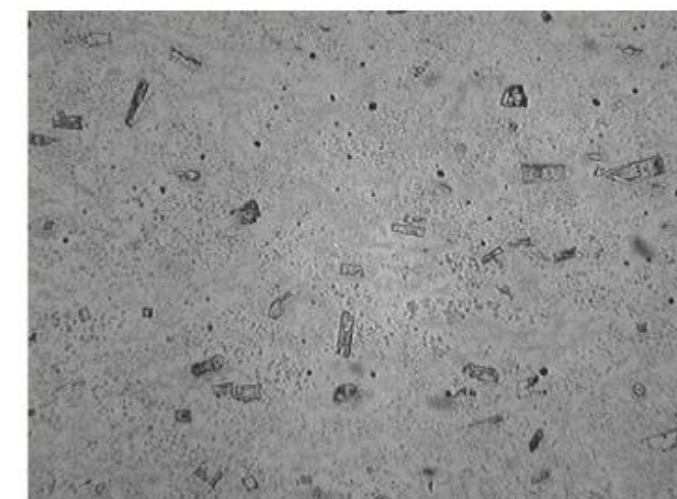
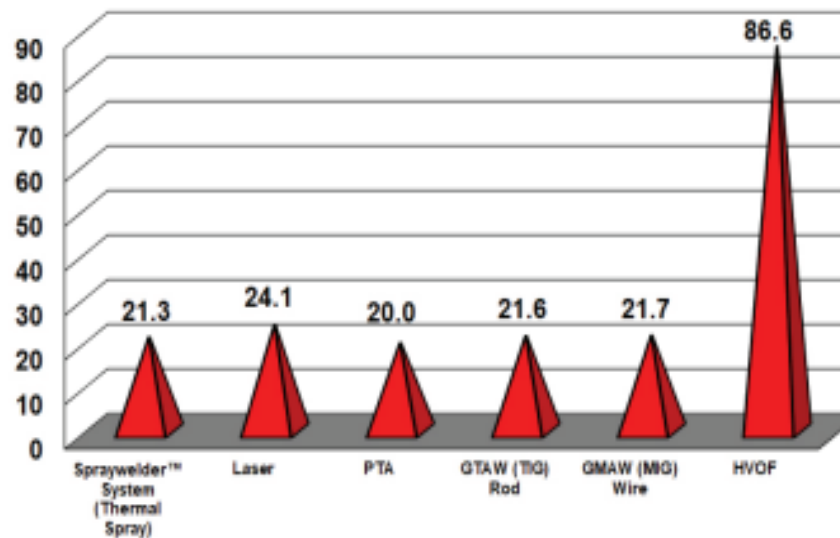
Hardness (Rockwell C)	61	Melting Range:
Density	9.9gm/cc	Solidus 1810°F (987°C)
Apparent Density	4.8gm/cc	Liquidus 2160°F (1182°C)



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SURFACING ALLOYS

Abrasive wear test results of several materials under the same conditions. The relatively low volume loss proves the superiority of Colmonoy® 88 to all but the hardest of materials.

Volume loss (mm³) ASTM G65



Photomicrograph of Colmonoy 88 (original at 200x)

Application Processes



Laser Cladding



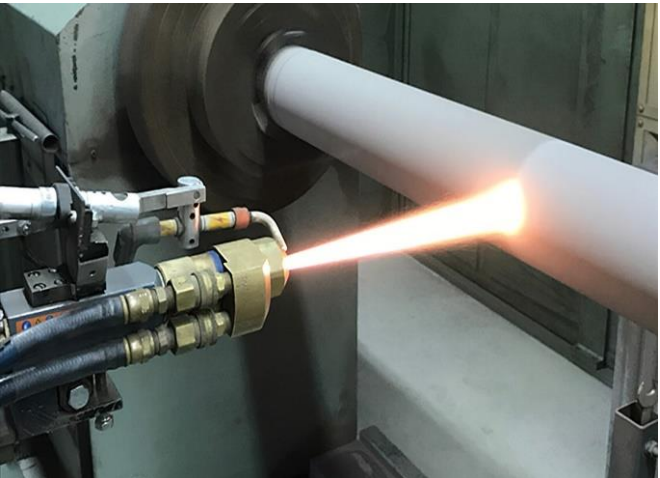
Fusewelder™



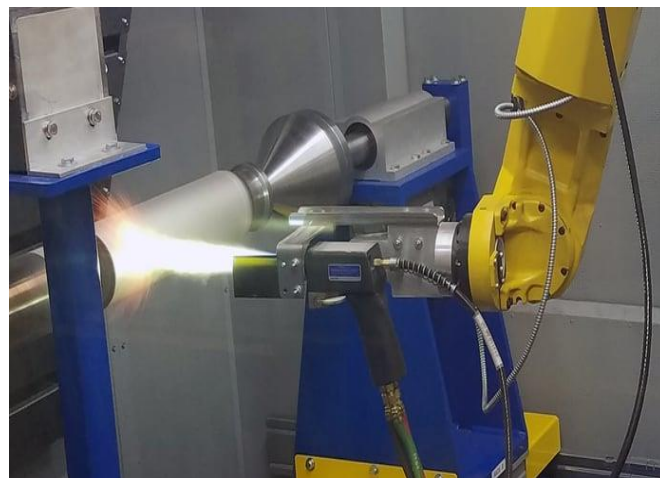
**Oxy-Acetylene
Welding**



TIG Welding



HVOF



Spraywelder™



PTA Welding



MIG Welding

Steel Applications

Raw Material Processing

Bucket Grabs
Ore Reclamation Buckets
Transfer Car Liners
High Temperature Pipeline Liners
Junction Box Chute Liners
Storage Bunker Liners
Sinter/Coke Screens
Wind Boxes
Vibratory Feeder Liners
Flop Gates
Mixer Liners
Cyclones
Industrial Fan Impeller Liners
Industrial Fan Casing Liners
Conveyor Skirts
Screw Conveyors
Coated Tuyeres & Plate Coolers
Injection Lances

Steel Making and Casting

Coated Process & Support Rolls
Coated BOF/EAF Lance Tips
ConCast Guides
Coated Mould Walls
ConCast Scale Chutes



Hot & Cold Rolling

Coated Process & Support Rolls
Forming Rolls
Chock Liners
Reheat Furnace Buttons
Skid Post Coatings
Guide Plates
Impact Plates
Skid Rails



Strip Processing

Coated Process & Support Rolls
Mill Liners
Guide Plates
Trimming Blades
Shear Blades



Strip Coating

Burr Masher Rolls
Galvanising Pot Sleeves
Galvanising Pot Bushes
Doctor Blades
Scraper Blades
Trimming Blades



Colmonoy® & Wallex® superalloys are not limited to the applications show above and will improve applications subject to:

- Increase life cycle
- Enhance wear properties
- Increase corrosion resistance
- Minimize replacement downtime
- Resist slag build-up



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Steel Mill Rollers

Typical steel mill roll degradation mechanisms include combinations of:

- **Thermal fatigue**
- **Mechanical fatigue**
- **General and local corrosion**
 - **Wear**
 - **Heat**
 - **Abrasion**
 - **Adhesion**
 - **Metal/metal erosion**



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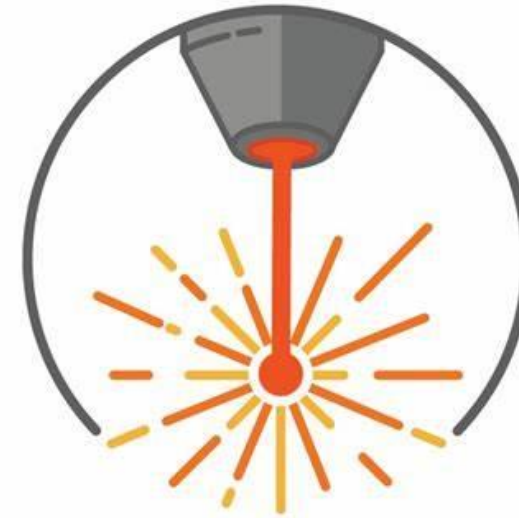
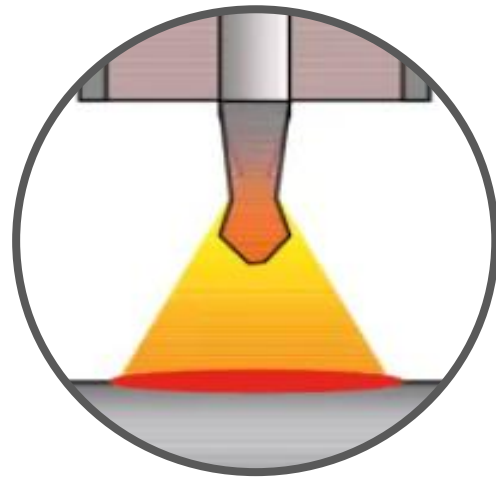
Process & Material Selection

- **Identify the application**
- **What conditions are you trying to protect from or improve on?**
- **Identify best process type**
- **Select best material type**



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PTA and Laser Cladding



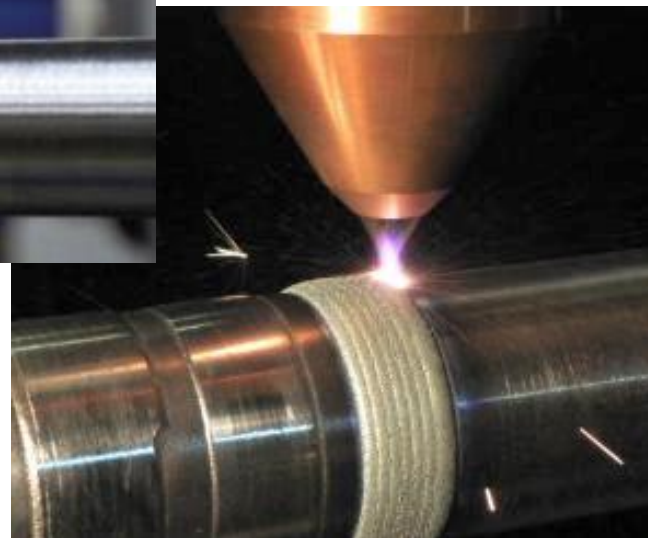
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PTA and Laser Cladding

- Easily Automated / Highly Repeatable Process
- Minimal Heat Affective Zone
- Minimal Dilution
- Deposit Durable and Tough Matrix Materials
- Enhanced material performance in comparison to conventional welding



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Steel Mill Rolls Repair - Wire to PTA or Laser Cladding

Increase component service life and decrease the overall cost

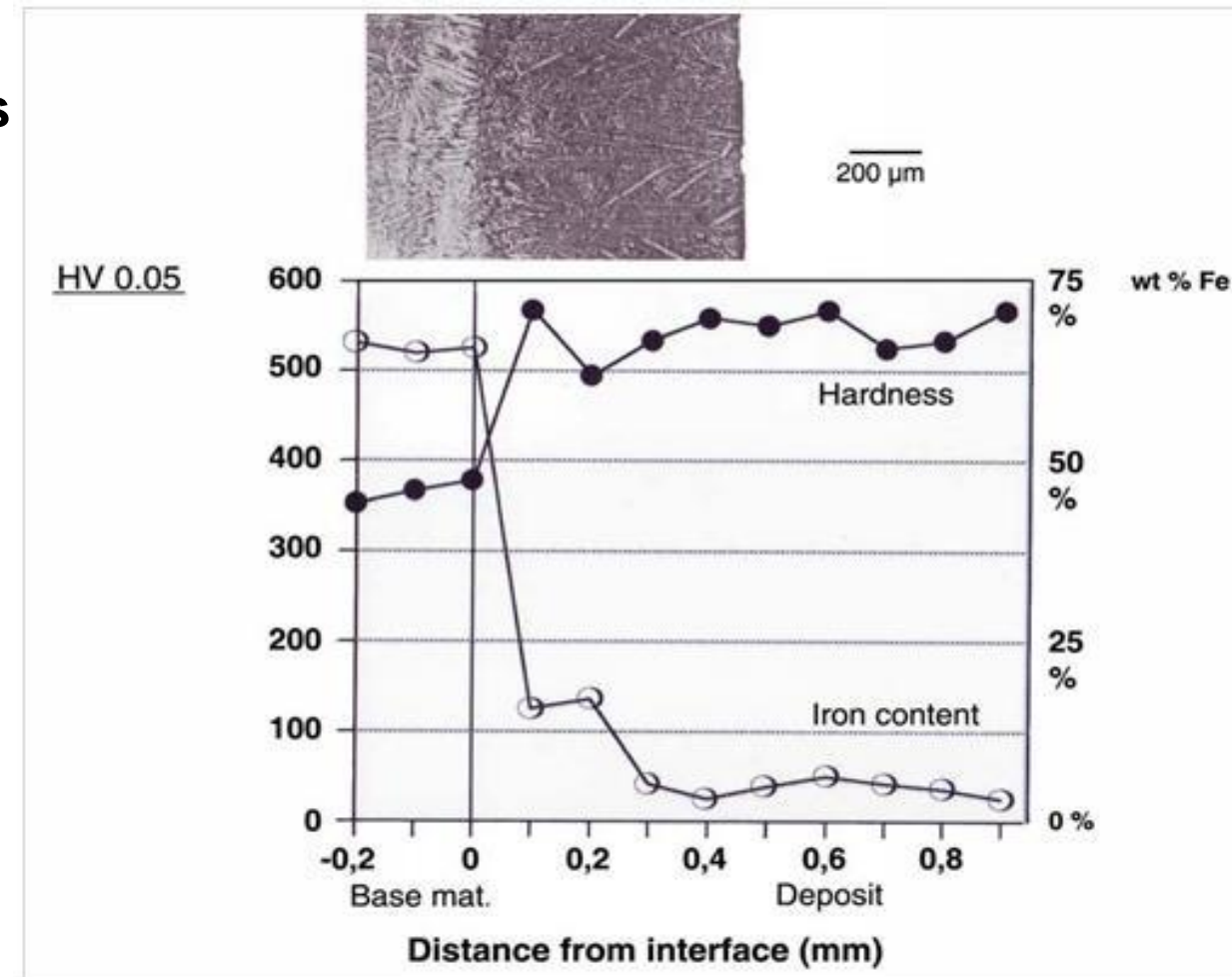


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Common wire welding applications can be replaced (or completed) by powder welding (PTA or LASER)

Why?

- Because you can use the right powder for the right service conditions.
- Coatings made with powder welding can be thinner.
- Full metallurgical bond with minimal dilution.



Hardness and iron content of a PTA deposit with Co based alloy on a substrate of alloyed steel illustrates the effect of dilution in relation to the distance from the interface

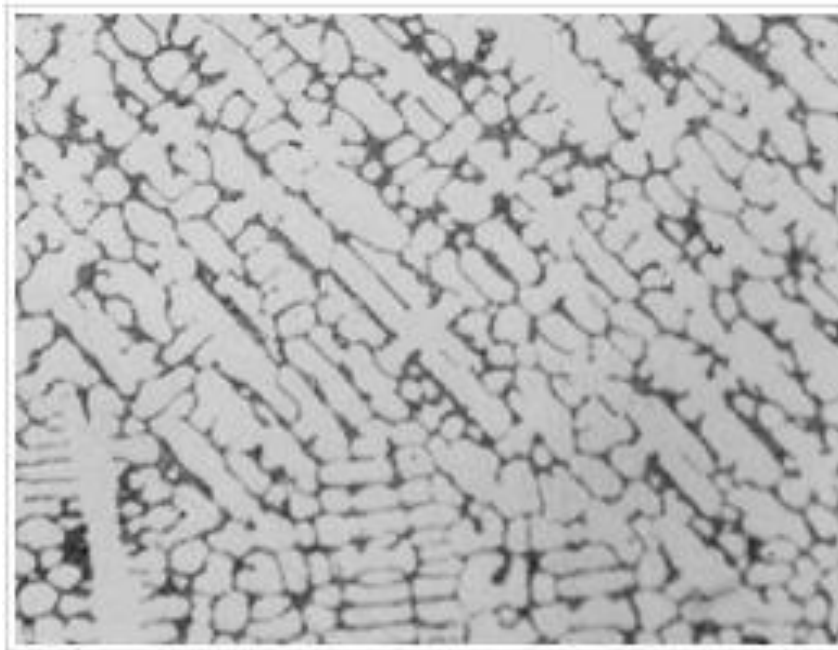
Steel Mill Rolls Repair - Wire to PTA or Laser Cladding

Why PTA or Laser?

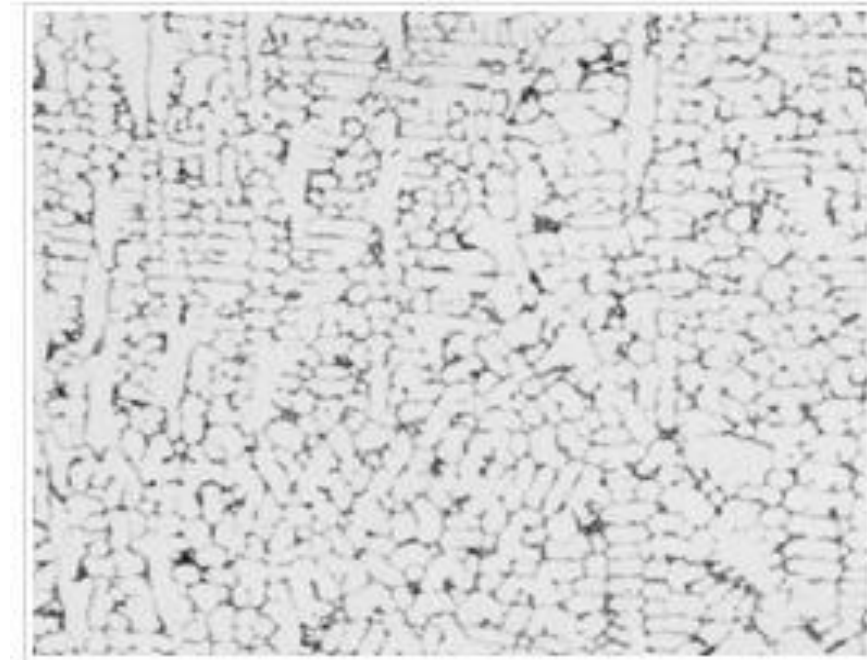
Because smaller, denser microstructures vs wire welding.



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MIG welded deposit with a cobalt based alloy indicating a coarse microstructure.



A finer microstructure is achieved after using PTA deposit of the same cobalt based alloy.

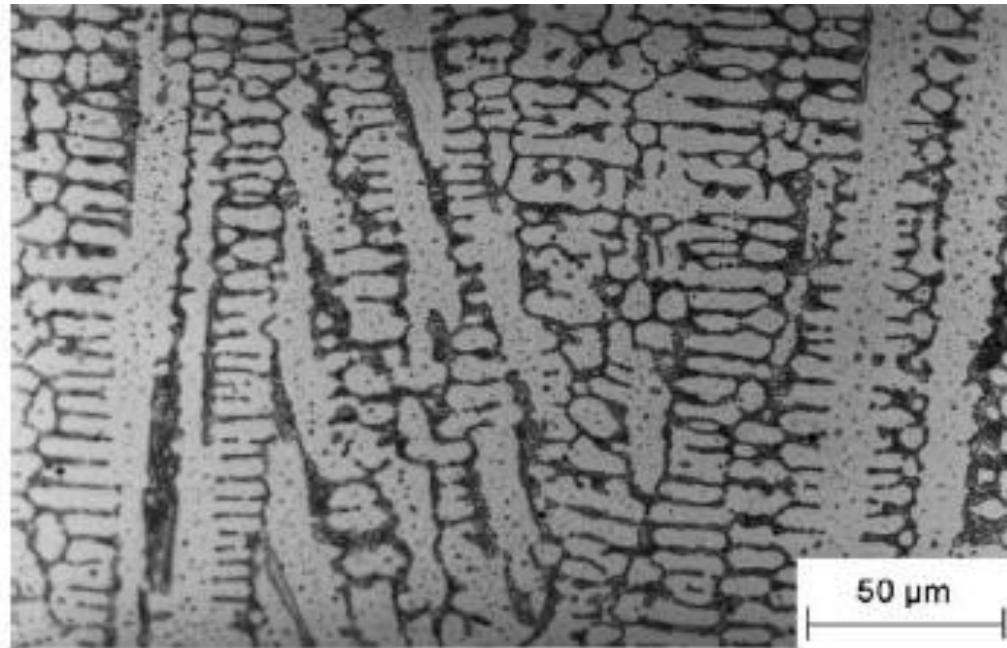
Note: on a like for like magnification scale

Advantages of PTA and Laser Cladding



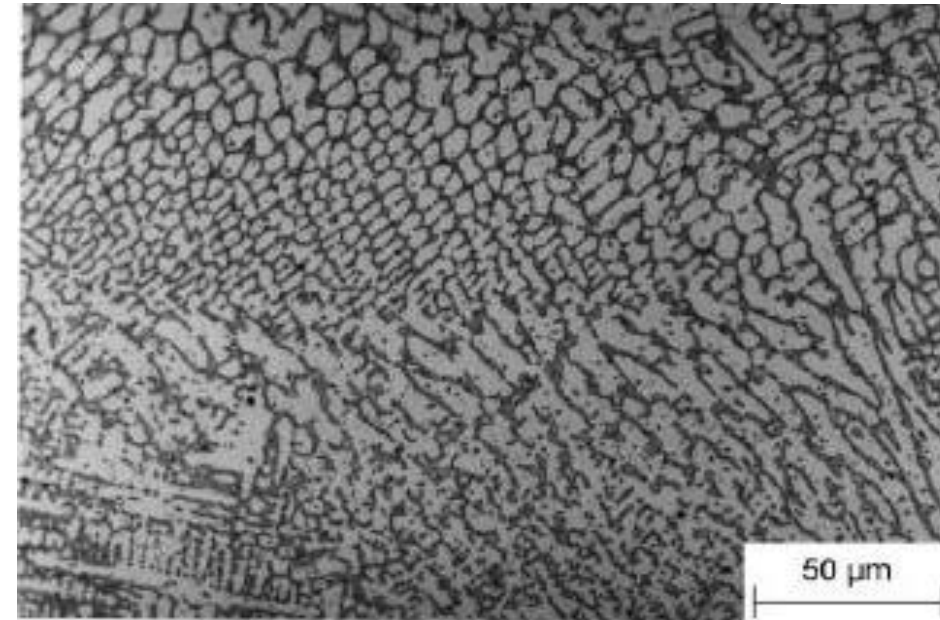
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Grade 6 Cobalt (Wallex 6)



PTA

Photomicrograph of a typical example of standard PTA Structure overlay. The dark areas indicating hard grain boundary zones. The lighter areas show the softer dendritic matrix.



Laser Cladding

Under the same magnification, Laser Cladding shows a finer grain structure compared to PTA. A much greater density of hard grain boundary zones.

Steel Mill – Hot Mill Rolls

Laser Cladding for Hot Mill Rolls

- Hot Mill rolls operate in a high temperature environment with heavy loading and frequent impacts
- The laser clad coating must have excellent high temperature strength and toughness
- A cobalt chromium tungsten alloy offer an excellent combination of strength and ductility at high temperatures which is perfect for this application



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Cladding Process

1. The rolls are pre-machined to a size about 2 mm smaller than the finished diameter
2. The entire surface of the roll is laser clad with a cobalt based super-alloy
3. The rolls are then stress relieved to reduce tensile residual stresses
4. The rolls are then finish ground to the required dimensions

Why Laser?

- Laser cladding allows the cost effective application of high performance expensive alloys, which outperform lower cost iron based materials in terms of wear.
- The coating is metallurgically bonded to the roll so provides excellent strength in impact

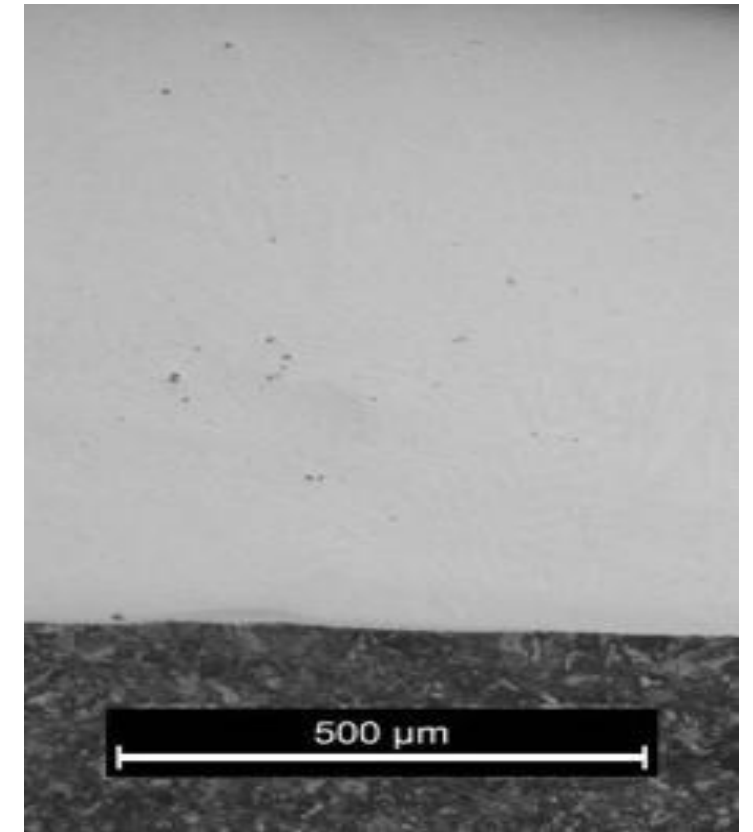
© Information Courtesy of LASE Ltd

Steel Mill – Hot Mill Rolls

Application: Hot Mill Rolls

Product: Cobalt Chromium Tungsten Alloys

Application Method: Laser Cladding



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© Images Courtesy of LASE Ltd

Steel Mill – Continuous Cast Rolls

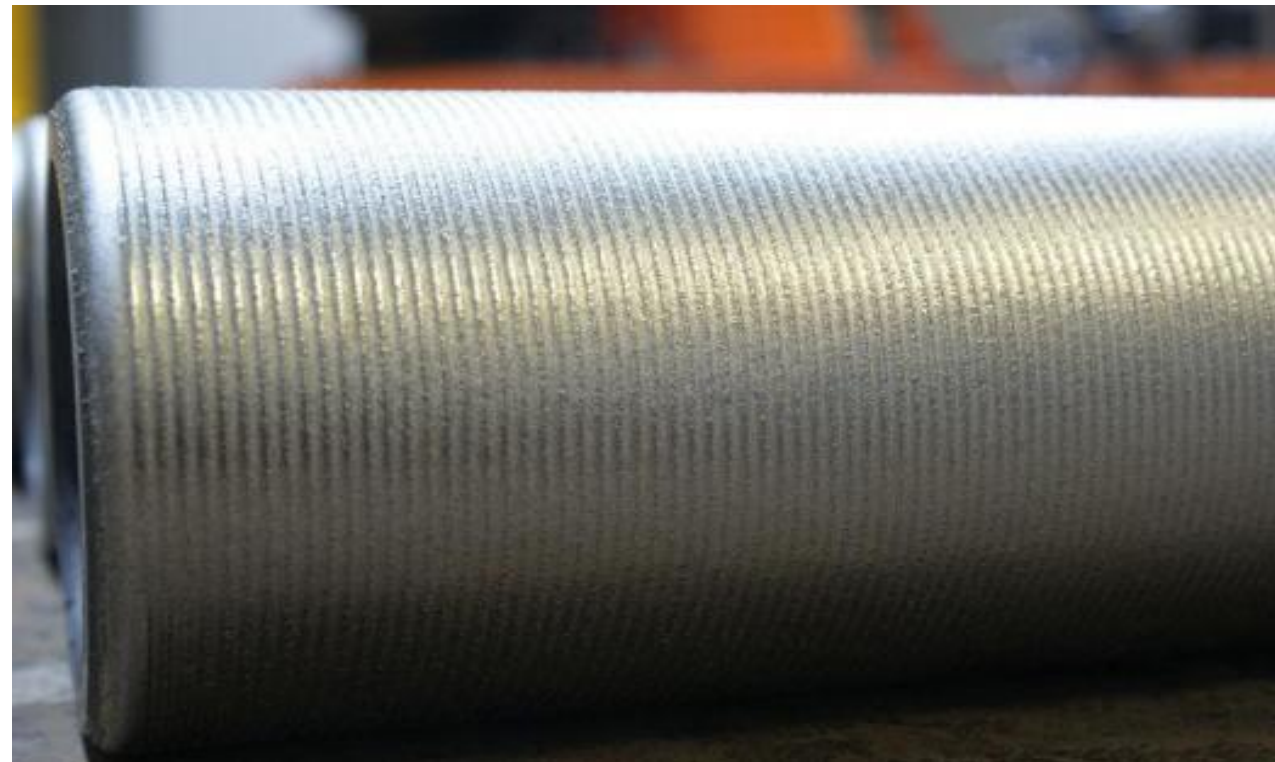


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Application: Continuous Cast Roll

Product: Colmonoy 125, 133L, 133L – W2C

Application Method: Laser Cladding



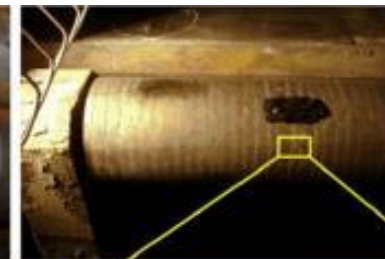
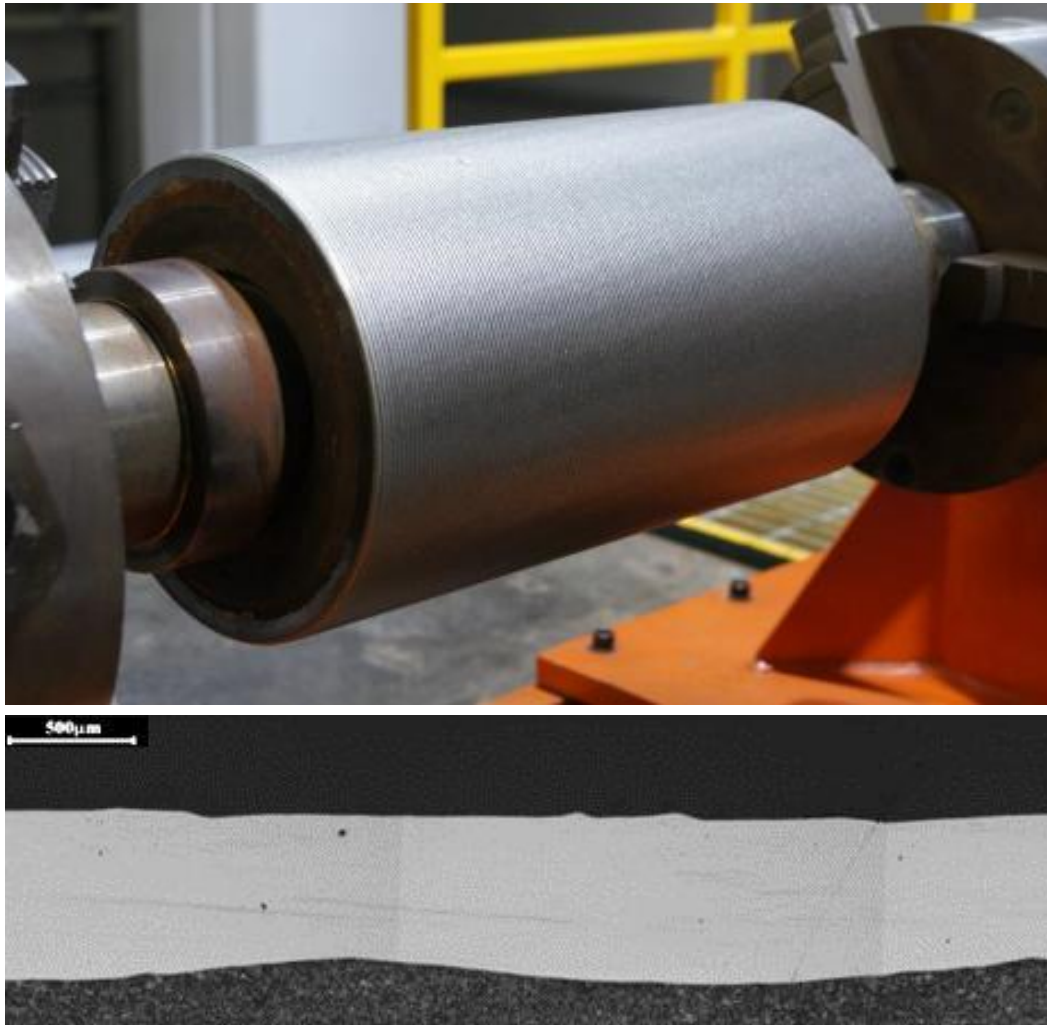
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Steel Mill – Continuous Cast Rolls

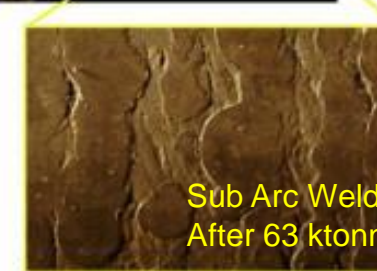
Application: Continuous Cast Rolls

Product: Nickel Based Super Alloys

Application Method: Laser Cladding



Laser Clad
After 118 ktonnes



Sub Arc Welded
After 63 ktonnes



WALLCOLMONOY

© Images Courtesy of LASE Ltd

Steel Mill – “C” Section Roller



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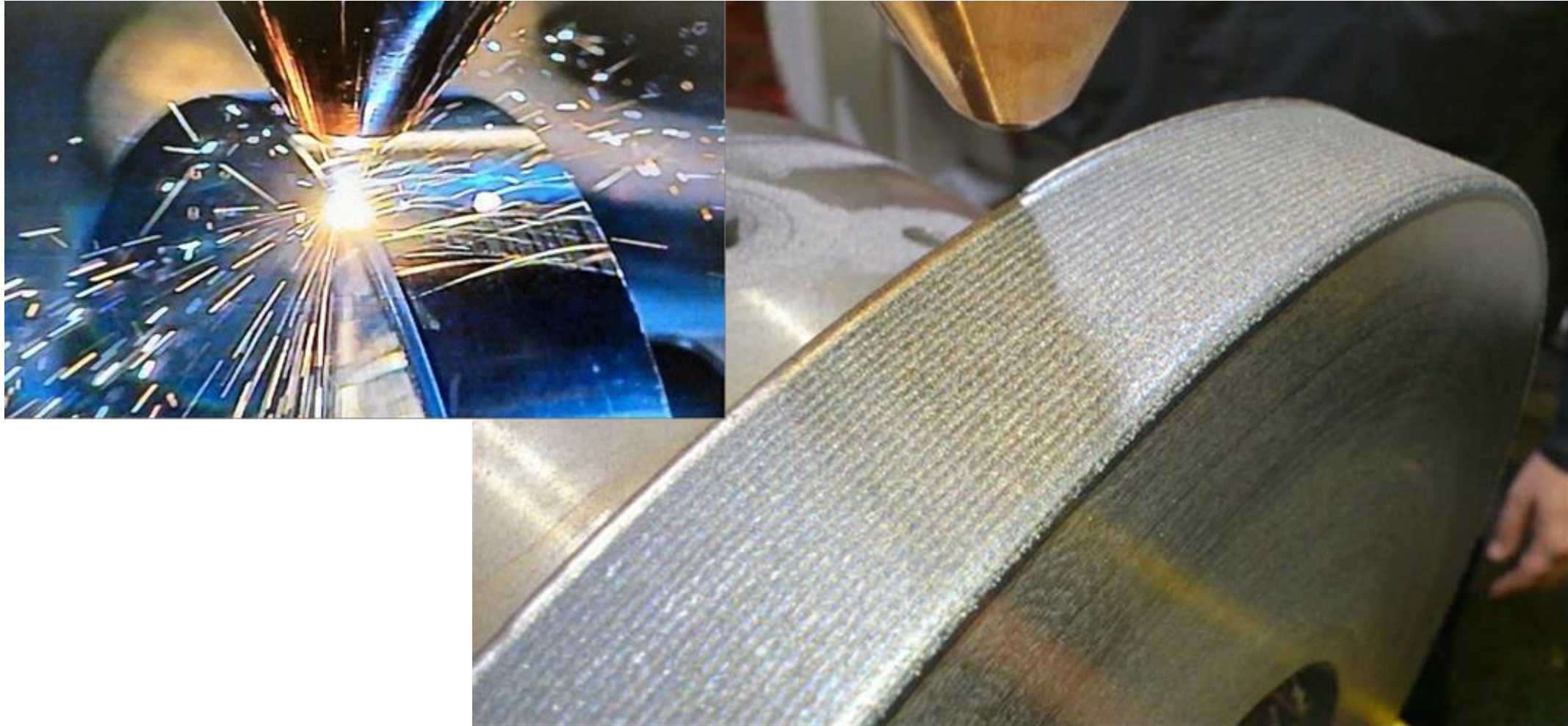


Application: “C” Section Roller

Product: Wallex 6

Application Method: Laser Cladding

Steel Mill – Cladding of Side Trimmer Blade



Application: Cladding of Side Trimmer Blade

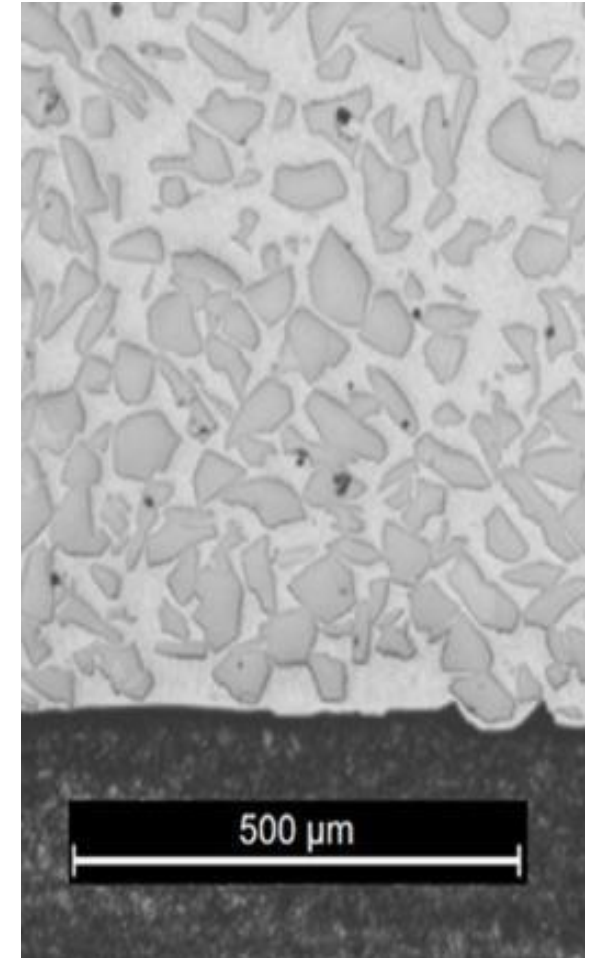
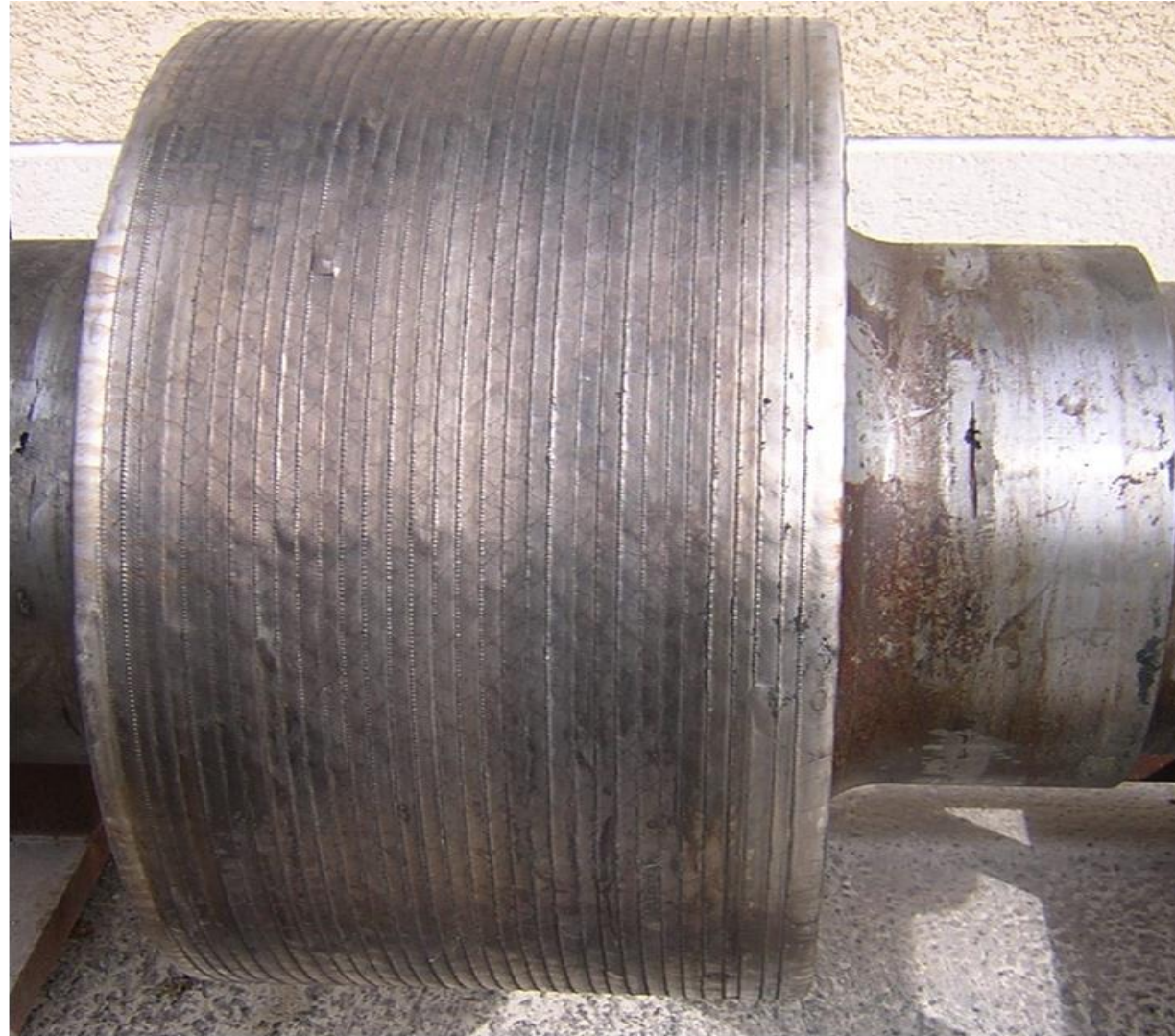
Product: Wallex 6

Application Method: Laser Cladding



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Steel Mill – Roller Press PTA Coating for Wear Protection



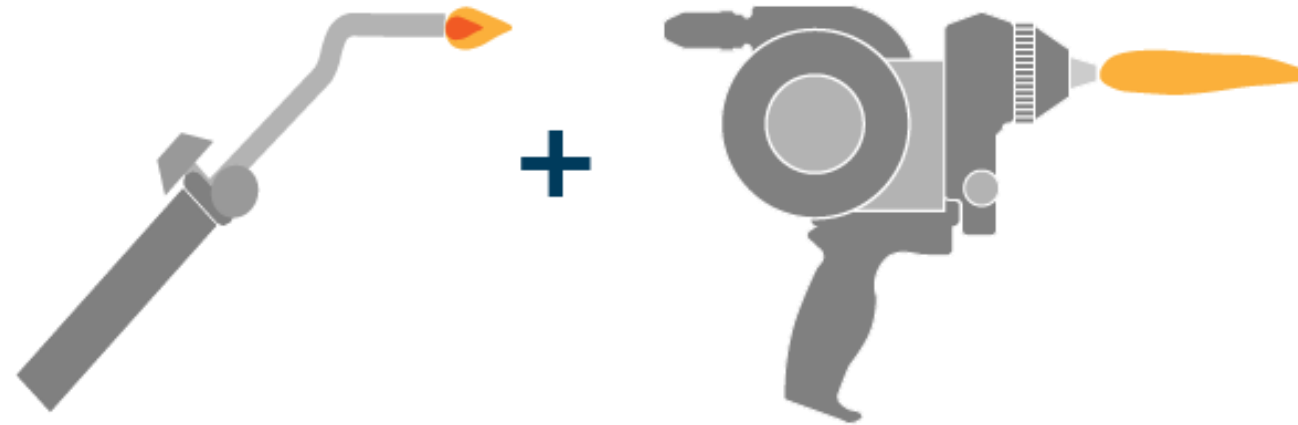
Application: Roller Press
Product: Colmonoy 7303-60P4 (60% WC)
Application Method: PTA



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Flame Spray – Spray & Fuse

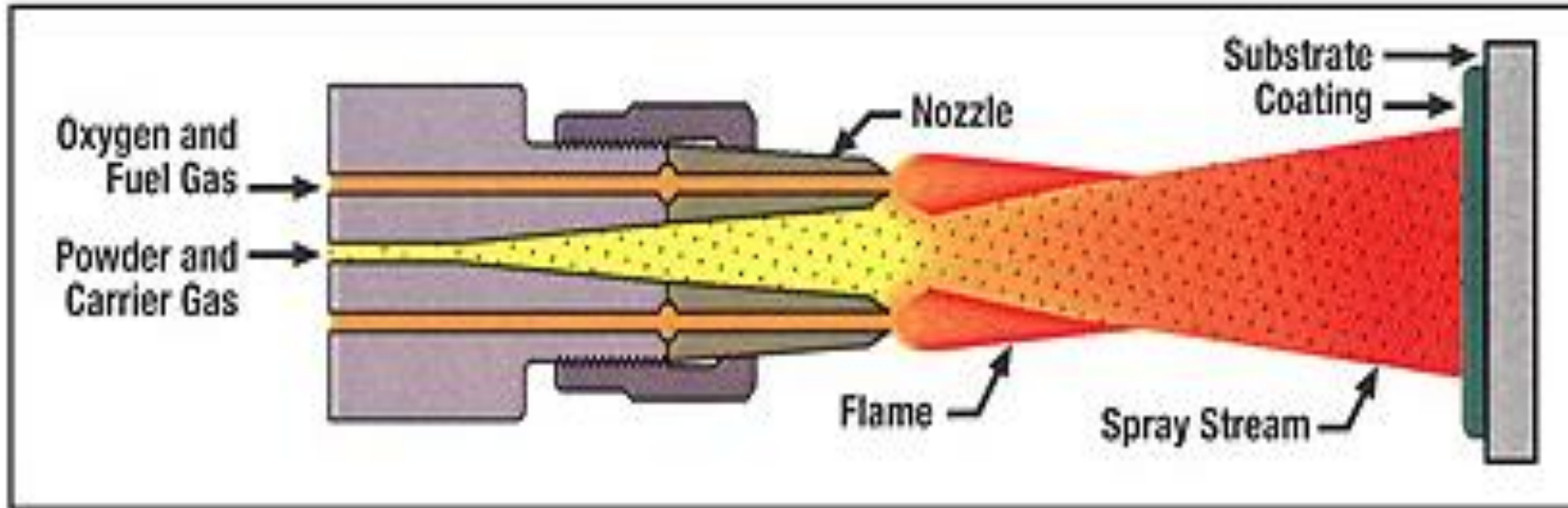


Flame Spray Process



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SURFACING ALLOYS

- COMPLETELY DENSE DEPOSIT
- METALLURGICAL BOND
- TAILORED WEAR PROPERTIES



Characteristics

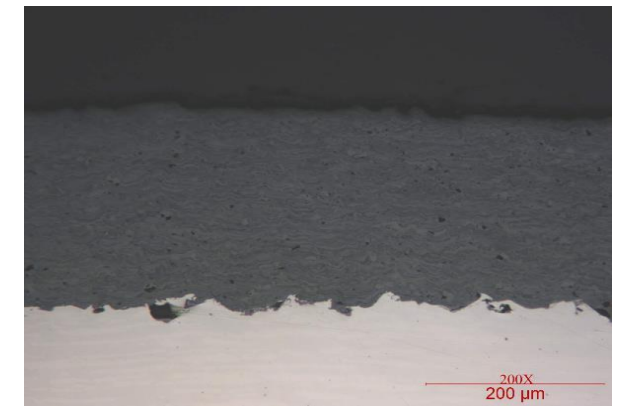
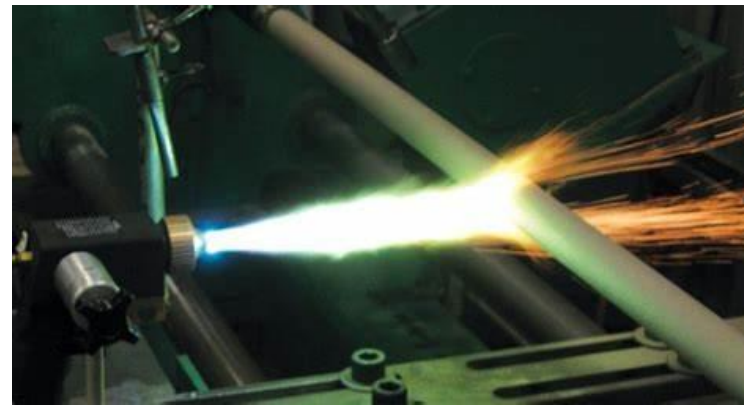
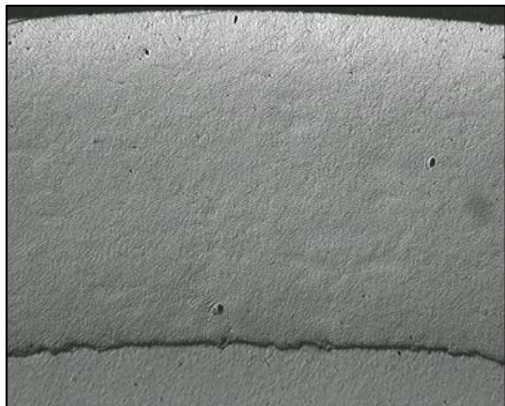
Flame Temperature:

Oxy-Acetylene, 5,600°F (3,100°C)

Oxy-Hydrogen, 4,900°F (2,700°C)

Particle Speed:

200 - 800 ft/s (60-240 m/s)

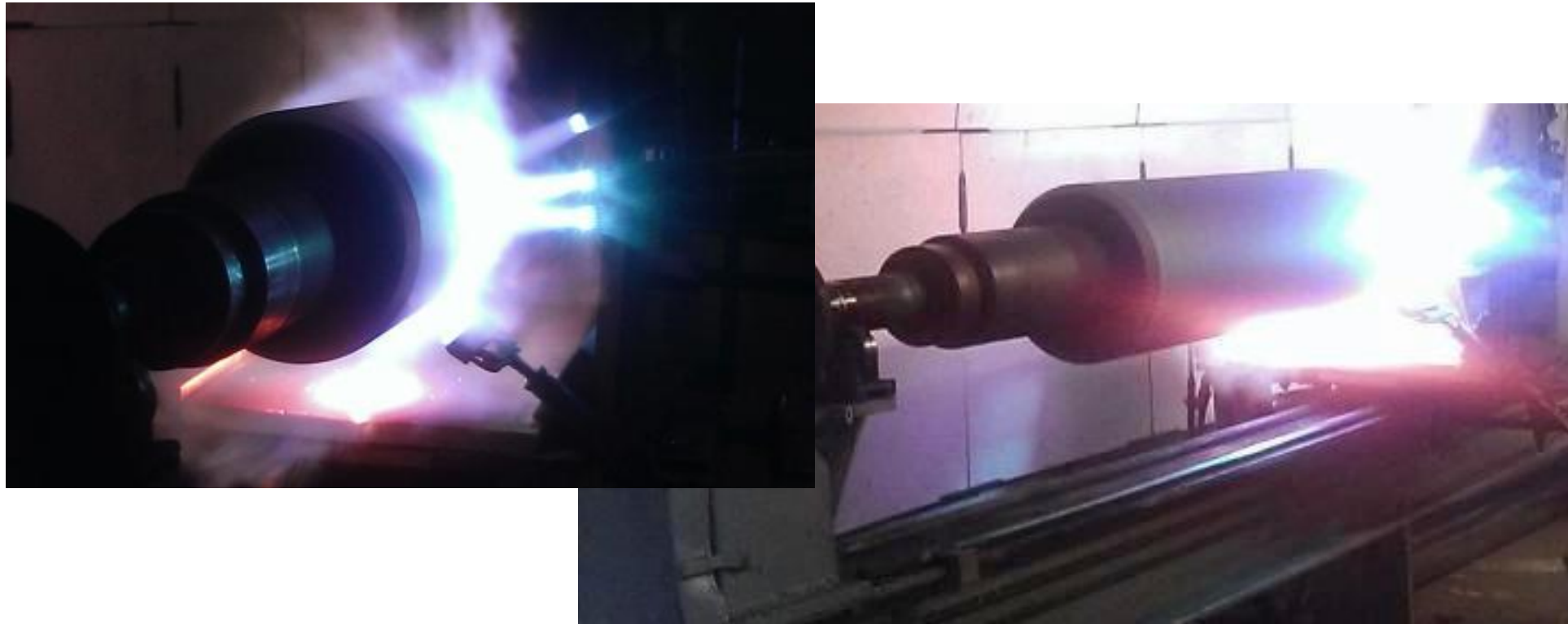


Steel Mill - Roll Coating for Wear Protection

Application: Coating Solid or Hollow Table or Concast Rolls

Product: Colmonoy 6, 62SA or 6001

Application Method: Spray & Fuse



*“You are our preferred supplier for **nickel-based alloys** for our **run out table rolls, looper rolls** and **wrapper rolls** for the steel producing industry, especially for hot rolling mills”*

– Alexander Wiegard, Managing Director, Gustav Wiegard MASCHINENFABRIK



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Steel Mill – Rolls



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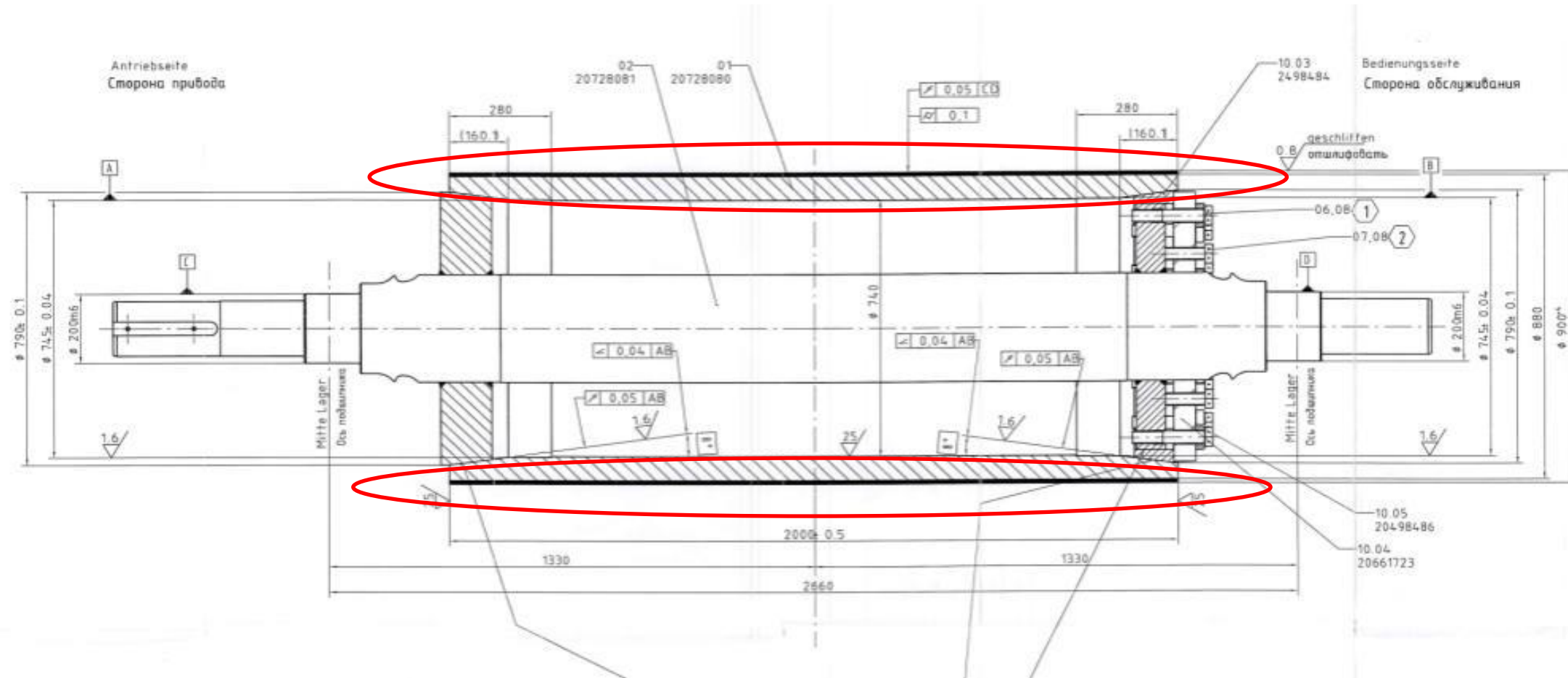
Application: Work, Pressure, Transfer, Table Rolls

Product: Colmonoy 62, 88, 133, 125, 69, 625,

Wallex 6

Application Method: Spray & Fuse

Steel Mill – Hollow Table Roll



Application: Hollow Table Roll

Product: Wallex 6 or Colmonoy 6

Application Method: Spray & Fuse or Laser Cladding

Steel Mill - Roll Coating for Wear Protection

Lengthening the life of rolls



Application: 1141 Rolls (like 1045 steel). The rolls vary in size from 2" and 5" length by 3"OD and 4"OD respectively

Product: Colmonoy 5

Application Method: Spray & Fuse



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Steel Mill – Reclamation and Repair

Problem

Two particular areas of extra wear – worn away from surrounding area

Solution

MIG weld worn areas with mild steel wire to bring back to dimension

Hard face the rolls with Colmonoy 63U-M (US Equivalent = Colmonoy 72)

*“Next to the high quality of your **nickel-based powder**, your **technical assistance** on site in terms of **process analysis** and **improvement** was a real helpful service” – Alexander Wiegard, Managing Director, Gustav Wiegard MASCHINENFABRIK*



Colmonoy 63U-M

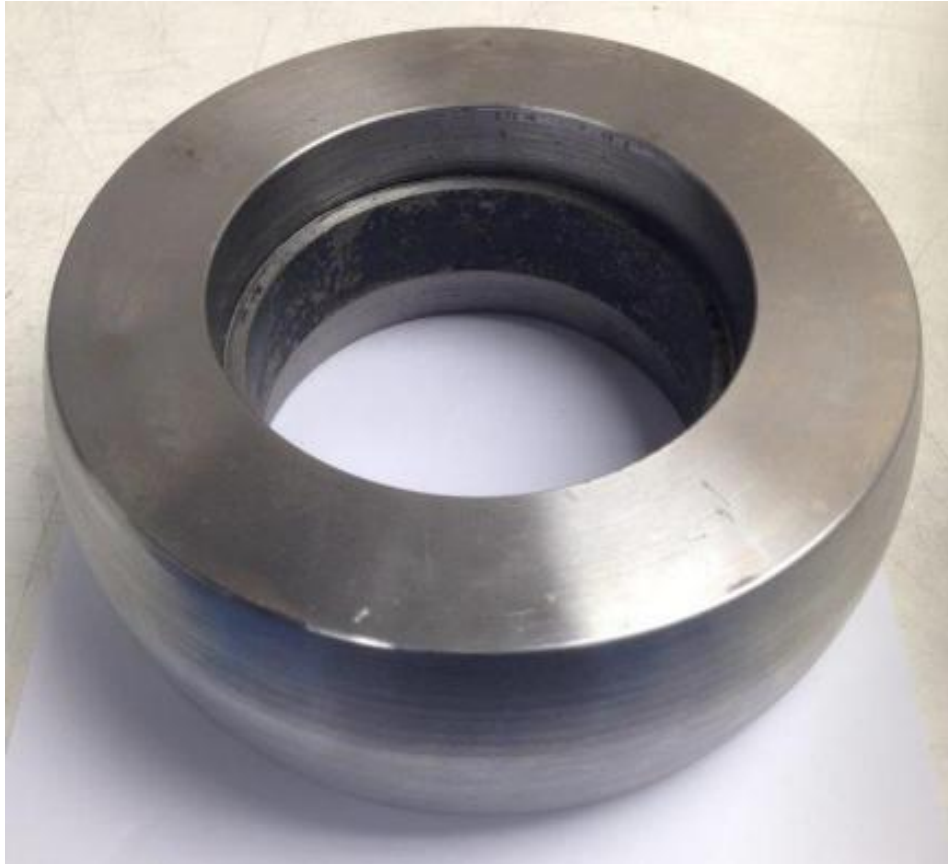


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© Images Courtesy of Gustav Wiegard

Steel Mill – Burr Masher Roll

Flattens the burr on the steel strip when sheared



Application: Burr Masher Roll

Product: Colmonoy 88

Application Method: Spray & Fuse



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Steel Mill – Diablo Rolls

Application: Diablo Rolls

Product: 316 Stainless Steel coated with Colmonoy 88

Application Method: Spray & Fuse

Coating Thickness: 1mm up to 2.5mm



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Steel Industry Overview



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SURFACING ALLOYS

