



Welding  
Alloys  
Group



ACTING GLOBAL  
WELDING LOCAL

# WA Applications

for Steel Industry



## Why work with Welding Alloys Group?

WA Group specialises in refurbishing and fabrication of these components:

- Continuous Casting Rolls / Furnace Rolls
- Work Rolls / Back-up Rolls
- Run-out Table Rolls
- Pinch/Wrapper Rolls
- Galvanizing Pots
- Sintering
- Forming Rolls
- Mandrels

**Improve process efficiency with Welding Alloys!**



Welding Alloys Group provides complete, innovative and customised surface protection solutions to the iron and steel manufacturing industry.

- The largest range of wear resistant cored wires : Chromecore, Hardface, Stelloy
- Automated welding equipment for surfacing, joining and cladding : Roll Cladder, MultiSurfacer™
- Engineered wear protection solutions INTEGRA : 3D-Carb Technology, Hardplate™



Our brands specialised in wear protection solutions:



Wholly owned subsidiary of WA Group, Dalforsån remains in front as a trusted global supplier of clad state-of-the-art rollers. Our rolls can be found in many steel mill applications and the company supplies a tailored package to reduce the cost of repair and increasing productivity with rollers.

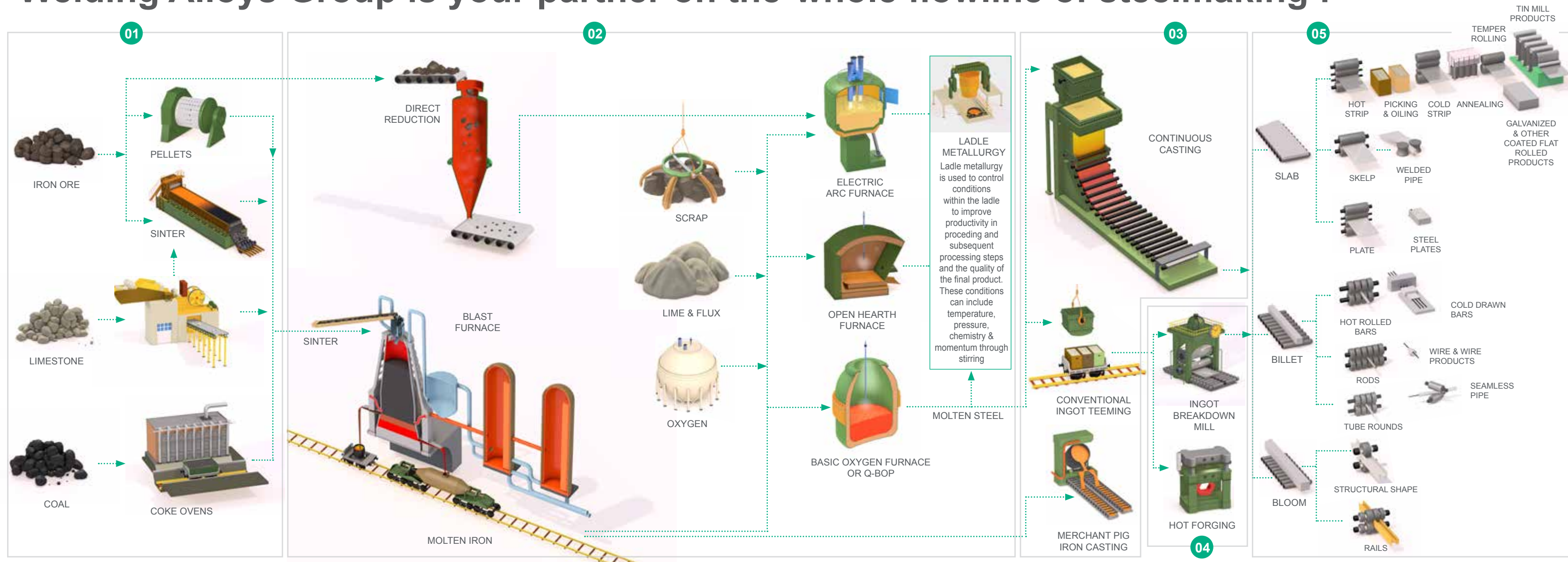
See more about Dalforsån visit : [www.dalforsan.se](http://www.dalforsan.se)



A member of the WA Group since 2011; Produr manufactures a range of advanced ceramic wear & protection materials which are used in a wide range of industrial applications including the steel industry, such as mining and raw material handling.

To find out more about Produr please visit : [www.wa-produr.com](http://www.wa-produr.com)

## Welding Alloys Group is your partner on the whole flowline of steelmaking :





# WA Chromecore 400

The ideal solution for your continuous casting rolls.



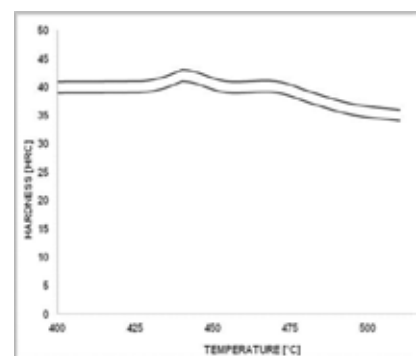
Through the entire surfacing wires dedicated to the continuous casting rolls, the CHROMECORE 400 family provides excellent resistance to plenty of wear :

- Corrosive environments
- Elevated temperature
- Cyclic thermal and mechanical stresses
- High slab contact pressure
- Adhesive and abrasive wear

## High quality cladding technology



Thanks to controlled chemical analysis (%C, %N, etc.), our cladding solution proposed a low delta ferrite contents deposit, improving the corrosion resistance.



By applying the adequate post weld heat treatment, you will achieve the expected hardness and a high quality deposit.



Open arc process



Sub arc process



Thermal cracks to be avoided

# WA Chromecore 400

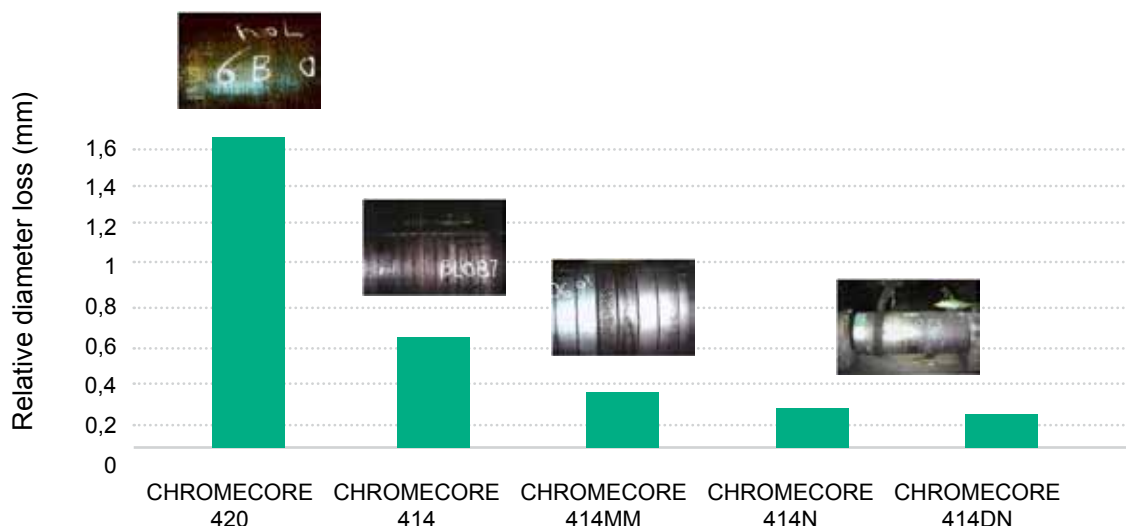
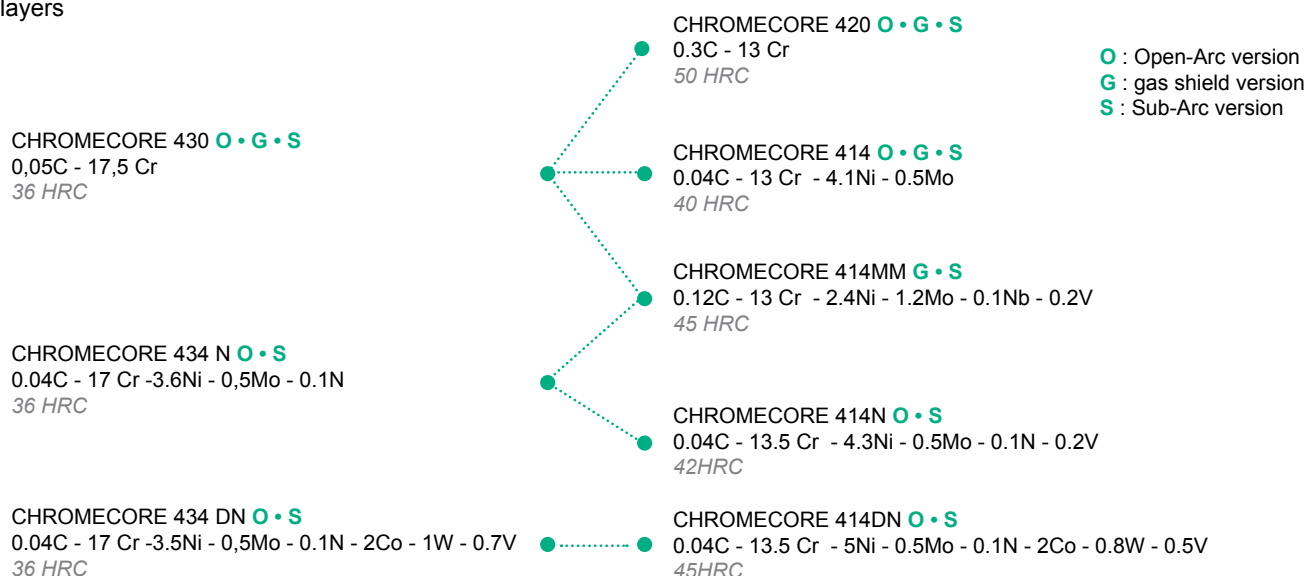
The ideal solution for your continuous casting rolls.



## Make the right and appropriate choice

### • CONTINUOUS CASTING line:

Welding Alloys Group has developed several combinations of cored wires to overlay your low alloys rolls: for Buffer & Final layers

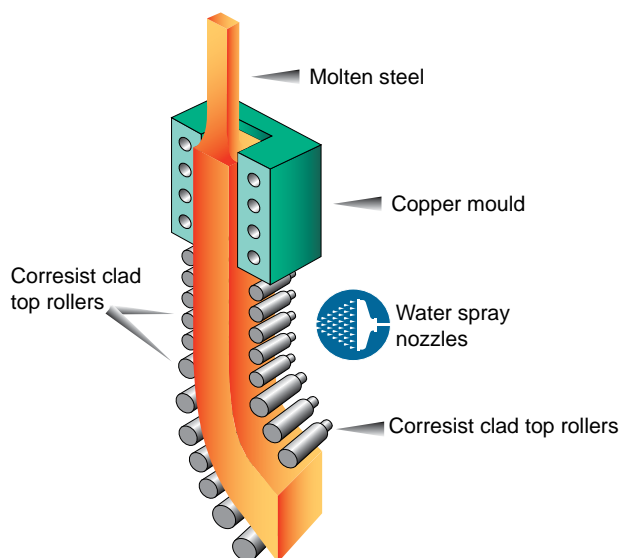


### • ROLLING MILL line:

DESCRIPTION	BUFFER LAYER	FINAL LAYERS	HARDNESS
Corrosion	CHROMECORE 430	CHROMECORE 414 COILER	50 HRC
No corrosion	-	HARDFACE DUALHARD C	55 HRC

# WA Corresist

Extend the life of your upper segment rolls.



Welding Alloys Group has become a global specialist in the development of cored wires dedicated to fighting wear.

Through the entire range of surfacing wires dedicated to the continuous casting rolls, the CORRESIST family provides excellent resistance to corrosive environments, high temperature and erosion.

In other words, this family is specially designed for the upper segment rolls of the caster.

**The CORRESIST Family** is the result of continuous research & development at Welding Alloys. The new wire is an iron-based super alloy and offers outstanding results by performing exceptionally well in high temperatures where corrosion and wear occur.

EN 14700: TFe12

## FEATURES

- Open arc / submerged arc and gas shielded wire versions are available
- Iron based super-alloy
- Microstructurally stable at high temperatures
- Service life comparable to Nickel based alloys

## BENEFITS

- ○ High productivity, reduced maintenance costs
- ○ Outstanding oxidation and corrosion resistance
- ○ Improved slab / billet quality
- ○ Less downtime



# WA Corresist

Extend the life of your upper segment rolls.



## EXTENDED ROLLER LIFETIME



Example: CORRESIST roller lifetime ( $\varnothing 130\text{mm}$ )  $\rightarrow$  800-1000kT cast steel



## REDUCTION IN OFFLINE MAINTENANCE



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[www.welding-alloys.com](http://www.welding-alloys.com)

# Weld cladding pioneer !



DALFORSÅN

Your specialized supplier  
of continuous casting rollers

## OUR STRENGTHS

### Just in time caster maintenance

A new maintenance concept will reduce maintenance downtime and manpower demands. Replace worn rollers and jackets with new top quality ones, just in time.

### First class economy

We offer cladded rollers manufactured to the highest European standards, competitive enough to be compared to Asia's production costs.

### Weld surfacing for improved performance

With continuous efforts in productivity and quality, we have been entrusted to supply state of the art rollers worldwide.



## PRODUCTS

### Rollers

With or without weld cladded surface. Cooled with center bore or revolver bores. Bare rollers or complete assembled with bearings and blocks.

### Roller Jackets

Cladded or not to your requirements.

### Axles

To complete the supply we are also geared to manufacture the axles.

### Roll Assemblies

Together with partners we source bearings etc, to offer you complete assembled roll-lines ready to be installed in the caster segments.







DALFORSÅN



SUB ARC



ROLL CLADDER



LATHE



MACHINING



INSPECTING

## FACILITIES

### Premises

**Workshop total area 4000 m2.**

Lifting capacity: Overhead cranes up to 30 tons.

### Heat treatment furnaces

Electrical convection heated Accuracy at max 950°C = +-5°C Workpiece temperature recorded  
Max. volume: 1600 x 1600 x 5300 mm.

### Weld surfacing machinery

**Automatic welding machine.**

For both sub-arc and open-arc welding process depending on customer requirements.

Max. workpiece weight: 30 tons.

Max. workpiece size: Ø 1500 x 6500 mm.

### Machining

**1 off CNC Lathe Design: PROFILA/NUM, type 1A 670.**

Max. workpiece size: Ø 2 100 x 10000 mm.

**1 off Horizontal Machining Center Design: HAAS, type EC-1600 YZT.**

50-taper geared-head, X=1626, Y=1270, Z=1016 mm.

**5 off CNC Lathe Design: DOOSAN, type Puma 400.**

To mention some of our equipment. The message is that we produce welded rollers in various shapes from bars to finished machined rollers under one roof!

## REFERENCES

OEM'S

SKF

SMS group

PRIMETALS  
TECHNOLOGIES

ABB

USERS

ArcelorMittal

TATA STEEL

aperam

outokumpu

SSAB

BLUESCOPE

NAS NORTH AMERICAN STAINLESS

NUCOR  
NUCOR STEEL GALLATIN

COLUMBUS  
STAINLESS  
Steel Ltd



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# WA Applications

## Galvanising Pots and Rollers



In the metal sheet galvanising process, galvanising pots and rollers are crucial parts subject to high temperature and corrosion. This combination makes the material's selection for wear protection of these parts extremely delicate.

Welding Alloys Group has developed over the last 15 years a specific cladding material and procedure to protect such equipment. For instance, GALVALLOY, a specific cored wire dedicated to resist the galvanising bath environment is designed for corrosion resistance in molten Zn bath. After 2 years in service, material loss is **less than 2 mm !**

### Why Welding Alloys?

- Dedicated to new pots and rolls and for repair & maintenance
  - ▶ Lower investment & maintenance costs, predictable maintenance
- Use of cored wires, Welding Procedures Specification, Automatic Process
  - ▶ Guaranteed high performance with less downtime
- Crack-free weld deposit
  - ▶ Guarantee of no localised corrosion in service
- Use of stainless, Ni- and Co-base consumables
  - ▶ High performance materials achieving maximum lifetime of parts



Galvanising roll after machining



# WA Applications

## Galvanising Pots and Rollers



### Technical Data

- Base material : construction steel P265GH
- Thickness 40 to 100 mm
- 4000mm length, 2500mm width and height
- Up to 20 t weight



Optimised bead surface appearance with GALVALLOY



Galvanising Pot Clad with GALVALLOY



Roller axis after machining



With deposit STELLOY 21-G



More than 40 Maintenance Operations  
over 15 years, several new pots supplied

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# WA Applications

## Steel Industry

### GFM Hammers/Forging Saddles

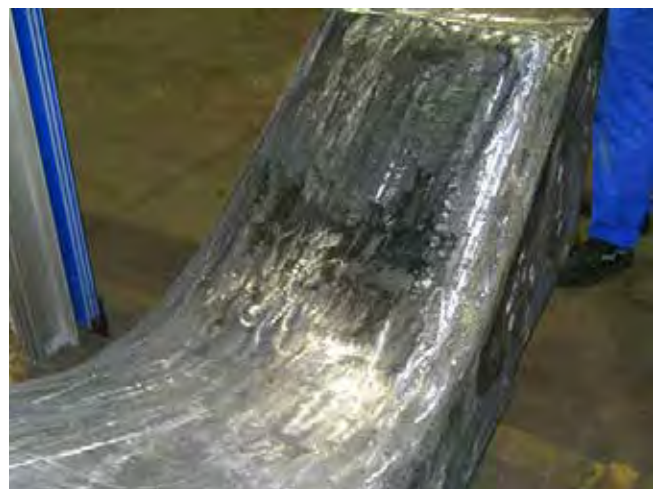


In the forging industry, free forging hammers are a crucial part subject to the heaviest stresses that can be applied to metallic materials. The combination of high temperature, high pressure and metal-metal friction makes the material's selection for wear protection of these parts extremely delicate.

Welding Alloys Group has developed in the last 20 years an expertise in hardfacing free forging hammers, with extensive use of **Stelloy Ni** cored wires. This solution provides extended lifetime and reliability in production.

#### Why Welding Alloys?

- Welding procedure developed for multi-layer welding and with different wire sizes
  - ▶ No limitation in size
- Use of cored wire
  - ▶ No need for special shielding gases or sophisticated welding equipment meaning a deposition rate up to **10 kgs/hr**
- Crack-free weld deposit
  - ▶ Guarantee of no break-out in service
- Use of Ni-base consumables
  - ▶ High performance materials achieving maximum lifetime of parts
- Welding procedures for repair of worn hammers or for new hammers
  - ▶ Cost saving in production



Worn forging saddles



# WA Applications

## Steel Industry

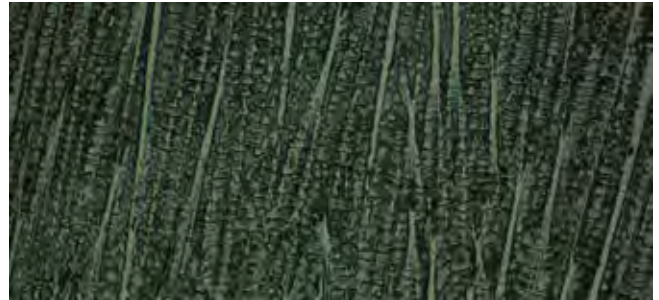
### GFM Hammers/Forging Saddles



#### Our Solutions

Welding Alloys repairs regularly sets of 4 GFM hammers using **Stelloy C + Stelloy Ni 520** in a 2.4mm diameter wire.

The customer requested these have a service life of 200 hours, and previously was only getting 60 hours. The hammers were sent for machining, flattened and put in service again for a second cycle of 200 hours.



Micrography of a Nickel based superalloys (STELLOY Ni520-G) at 100x magnification



High accuracy in the shape required.



After repair and machining.



Rebuilding of surface in a multi-layer technology.



Reference : Integra™ Service Centers  
in France, Italy and Germany

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# WA Roll Cladders

MultiSurfacer™ Welding Technology

The benchmark in roll cladding



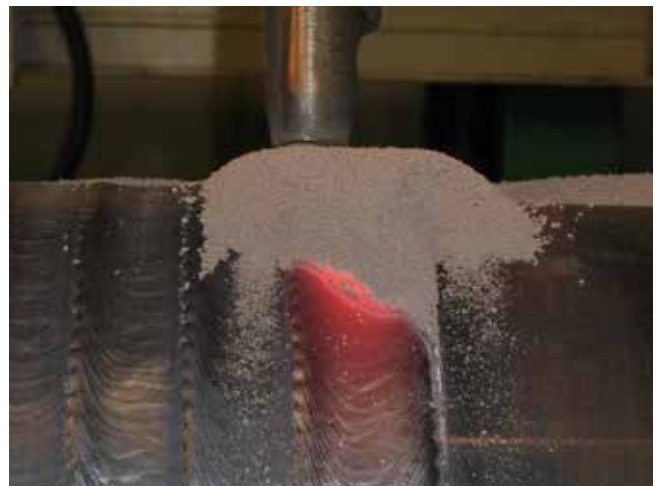
The MultiSurfacer™ Roll Cladding machine from Welding Alloys is designed to carry out multi-pass welding of cylindrical components, utilising a range of different welding processes; Open Arc, Submerged Arc and Gas Shielded.

Used globally to weld many different products for the steel industry, the Welding Alloys Roll Cladders typically weld rolls on slab, bloom, billet and thin slab casters as well as hot strip and section mills; improving the roll life and reducing manufacturing & maintenance costs.

Welding Alloys machines enable our customers to fully exploit the benefits of roll reclamation and cladding using Welding Alloys renowned and globally supplied technology.

## Why Welding Alloys?

- Welding costs are considerably reduced.
- Increased welding capacity.
- Reduction in waste material and associated costs.
- High machinery up time.
- Intuitive controls increasing productivity.
- 40% reduction in parameter set up time.



Continuous caster roll during submerged arc overlay cladding.



# WA Roll Cladders

## MultiSurfacer™ Welding Technology

### The benchmark in roll cladding



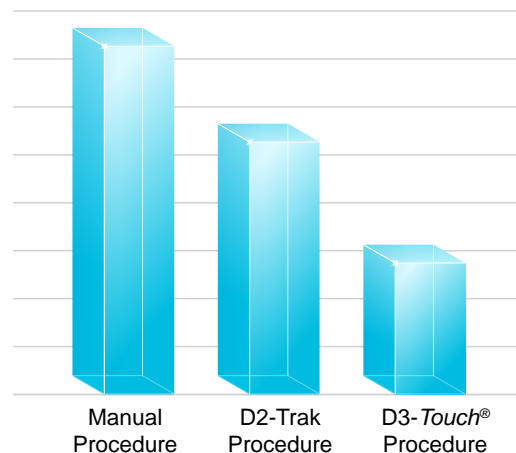
#### Our Solutions

Each roll cladding system can be programmed to accurately weld stringer beads or patterns (spiral, step-over, oscillated & intermittent), cladding/hardfacing with consistently high efficiency and quality.

With multiple machine configurations available, the MultiSurfacer™ Roll Cladding range of machines can be tailored to the customers' requirements, delivering a solution which meets the specifications set by a demanding and varied industry.

Welding Alloys provide the right balance of technology and expertise to each application, ensuring the right product and consumable mix is offered.

For any further information please contact:  
[marketing@welding-alloys.com](mailto:marketing@welding-alloys.com)



Time taken to enter weld parameters during initial set up procedures.



Automated flux & slag separation for recirculation.



Rolls clad using WA consumables & roll cladding machines.



MultiSurfacer™ R3000 Roll Cladder welding a roll with D3-Touch® control technology.



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# WA Applications

## Sinter Stars and Dummy Bars, Crash Decks



In the sintering process, sinter stars, dummy bars and crash decks are crucial parts subject to high temperature, impact and abrasion. This combination makes the material's selection and design for wear protection of these parts extremely delicate.

Welding Alloys Group has developed over the last 20 years an expertise in hardfacing of such equipment, introducing and constantly improving **3-DCarb™** Technology. **3-DCarb™** Technology is exclusively provided by INTEGRA™.

The interaction of multiple developments result in a massive increase of the lifetime with the longest-running sinter stars having achieved a lifetime of **39 months**.

### Why Welding Alloys?

- Dedicated to new parts and for repair & maintenance
  - ▶ Higher productivity and lower maintenance costs
- Use of **3-DCarb™** Technology, optimized design as per analysis of wear phenomena, use of materials resistant to temperature, abrasion and impact
  - ▶ Improve parts lifetime
- Use of cored wires, Welding Procedures Specification, Automatic Process
  - ▶ Guaranteed high performance with reduced downtime.
- Use of Cast Steel
  - ▶ Easily weldable and re-weldable on site
- Teeth can be replaced separately from the discs



Worn-out sinter stars after 9 months in service



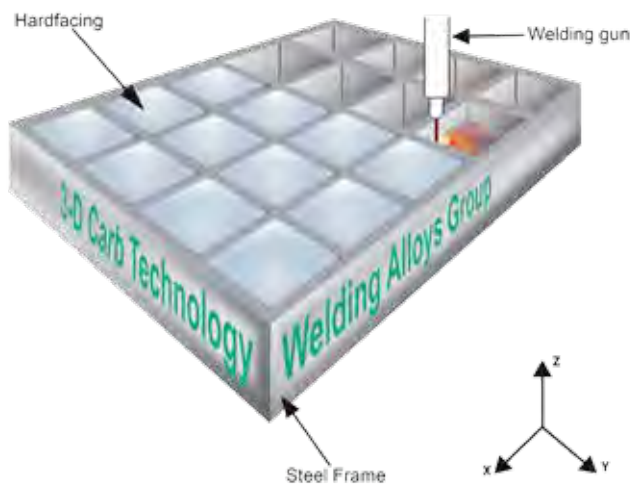
# WA Applications

## Sinter Stars and Dummy Bars, Crash Decks

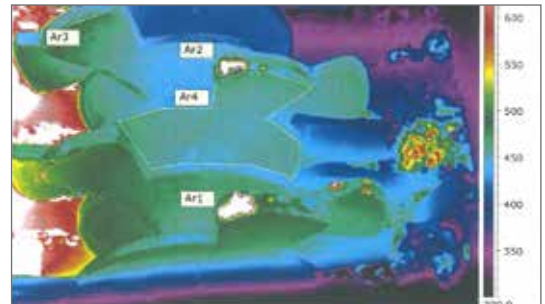


### Technical Data

- Sinter Stars Maximum Diameter :
- 2500mm
  - All Dummy Bars Dimensions
  - Crash Deck: Thickness up to 150mm



3D-Carb technology



Thermal analysis of parts in service



Sinter Stars repaired before installation



Dummy Bars protected with **3-D Carb™** Technology



Reference : Major Steel Manufacturers

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# WA Application

## Steel Industry Plain Bearings



Grinding of a restored plain bearing

The transport rollers in steel plants are mounted on bearings. These bearings are subject to high temperature stress, abrasion and metal-to-metal friction.

Welding Alloys offers to build up and protect worn bearings using a special antifriction alloy. This involves initial machining, sandblasting, centrifugal coating and machining to the original shape. Ultrasonic and dye penetrant testing ensure the quality of the bearing.

### Why Welding Alloys?

- The lifespan of the part is increased
- Repair and replacement costs are reduced
- High customer satisfaction
- Reduced downtime



Grinding of a restored plain bearing



# WA Application

## Steel Industry Plain Bearings



### Our Solution

Bearings in steel plants vary in diameter from 300mm to 1000mm and are subject to heavy abrasion and metal-to-metal friction. Repair and antifriction application with our special soft alloy greatly prolongs the lifetime and reduces the cost of replacing the bearings. Welding Alloys proposes the optimal alloy according to the bearing diameter.



An example of a damaged bearing

# WA Application

## Steel Industry

### Hydraulic Forging Piston



Protection by arc spraying of a hydraulic forging piston

Forging is a manufacturing process involving the shaping of metal using localised compressive forces. High pressure (elastic deformation) and metal abrasion (in the sleeve joint) affect the pistons of the hydraulic press.

Welding Alloys offers an arc spraying solution with a special material to protect them and prolong their lifetime. This material also withstands elastic deformation.

#### Why Welding Alloys?

- Large cost savings through increased lifetime
- High customer satisfaction
- Reduced downtime



Piston ready for dispatch



# WA Application

## Steel Industry

## Hydraulic Forging Piston



### Our Solution

Pistons in forging machinery are subject to high pressure and deformation wear. Welding Alloys provides an arc spraying solution with a special powder which achieves a hardness of 48-51 HRC. The work starts with machining and sandblasting. Several layers are applied by arc spraying.

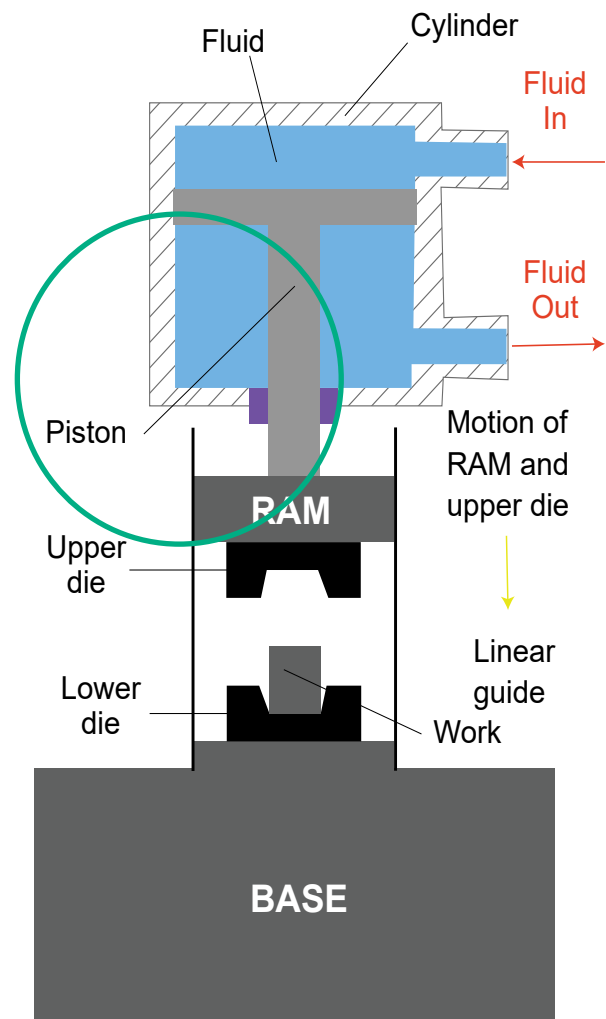


Diagram of a hydraulic forge

# WA Application

## Steel Industry Profiling Mill Rolls



Complete refurbished of a profile mill roll

Profile rolls in steelworks are exposed to heavy abrasive wear and cracking, due to the pressure placed on them when the rolling of billets, bars and rods is in progress.

Horizontal cracks are dangerous and may cause the roll to break, if a crack is left untreated the damage will increase over time. Welding Alloys **Integra**™ has developed a complete repair service which prolongs roll life, giving production of up to 120,000 tonne compared to the original service life of 36,000 tonne. The WA **Integra**™ team uses hardfacing wires to repair any cracks found on the roll.

### Why Welding Alloys?

- Complete service completed in our workshop
- Tailored wires for surface protection against heat and abrasion
- High customer satisfaction
- Reduced plant downtime
- Repair is less costly than purchasing a new part.



Submerged arc welding



# WA Application

## Steel Industry Profile Rolls



### Our Solution

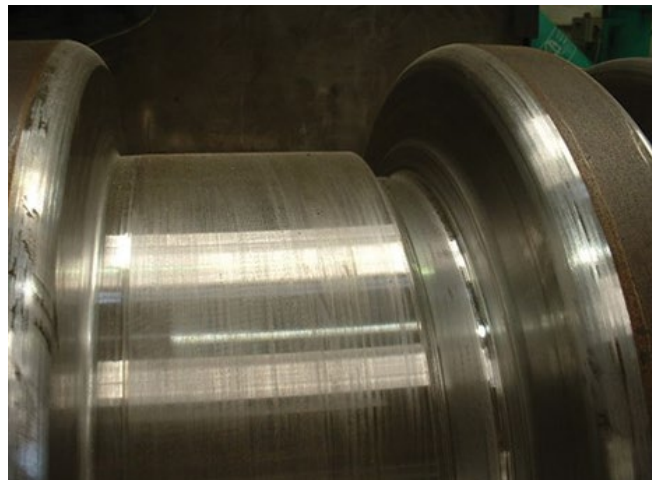
A typical profile roll can measure 4750mm in length and 850mm in diameter. WA Integra™ will take the roller back to one of our dedicated service centres. Offering a complete repair service, starting with machining of the roll, this removes any rust and material on the roll.

The Integra™ team then carry out non-destructive testing on the roll before cladding with our specially developed submerged arc HARDFACE wire in combination with our WA Flux.

The roll is grinded and finished, before it is delivered back to the mill, ready to go back into production.



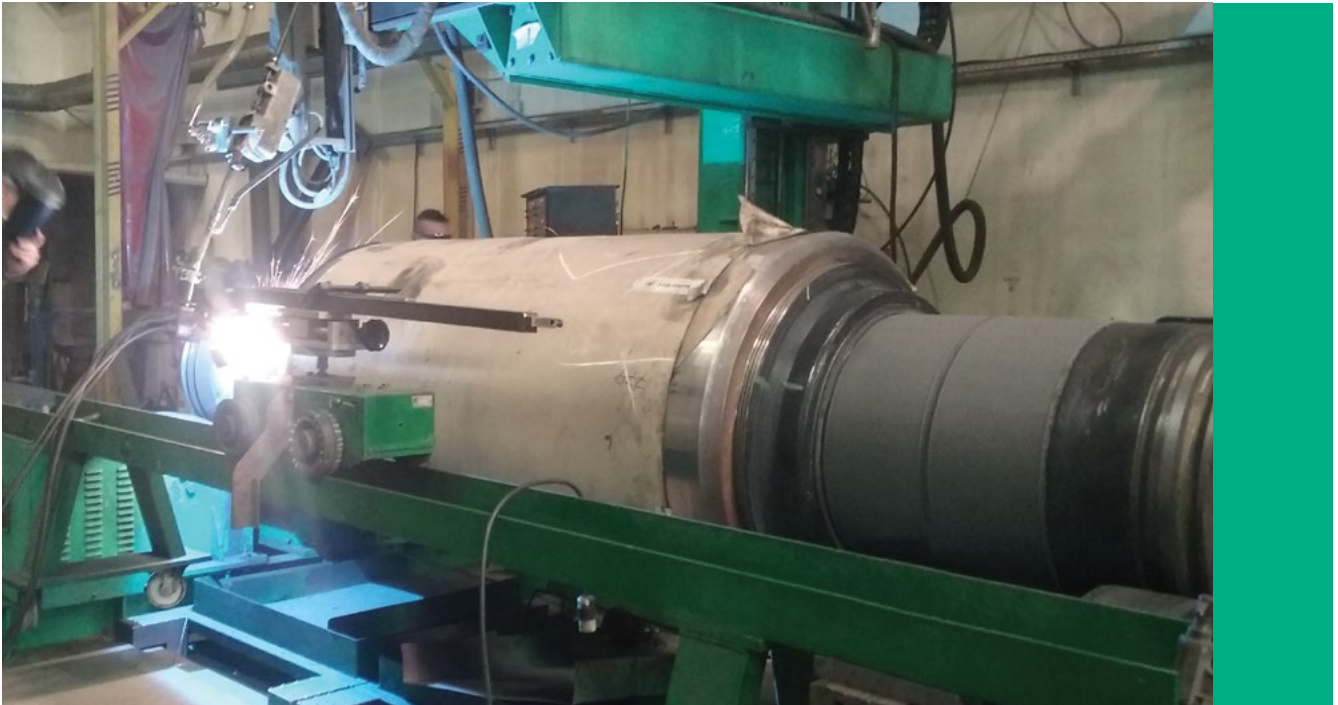
Worn out profile rolls



Refurbished profile rolls

# WA Application

## Steel Industry Roller Press



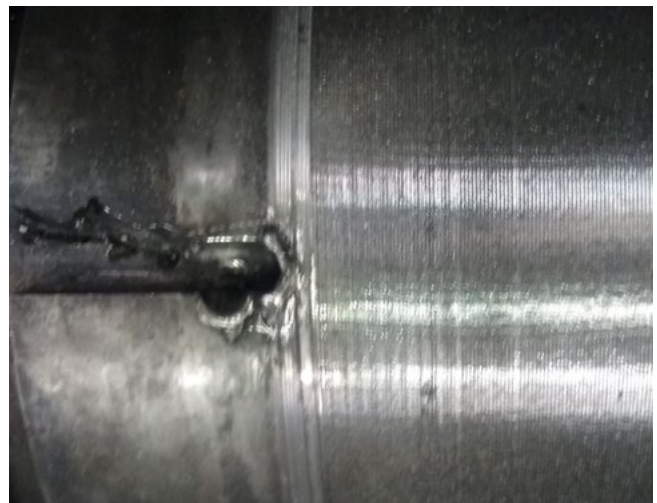
Roller press during the arcing process

Roller press mills are used in various industries such as cement, mining and agriculture. In the steel industry these cylindrical rollers are subject to high pressure, impacts and abrasion. The metal forming process causes wear on the rollers as the metal is passed through the rollers.

Welding Alloys offers a cost effective solution to protect the rollers against wear by applying an arc sprayed coating. This solution avoids deformation and allows layers up to 15mm to be deposited.

### Why Welding Alloys?

- Large cost savings through increased lifetime
- Refurbishment can be carried out in our workshops or in-situ
- High customer satisfaction
- Reduced mill downtime and increased efficiency



Roller press prepared for arc spraying



# WA Application

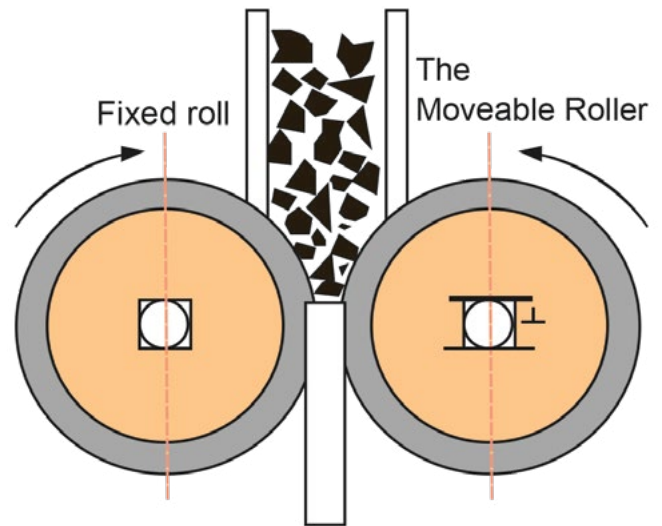
## Steel Industry Roller Press



### Our Solution

Roller presses come in various sizes, for example 3.7m long and 580mm in diameter with a weight of 15.6 tonne – like the roller on the front of this sheet. The base material is often cast iron.

Welding Alloys start by gouging, and dye penetrant testing. This is then followed by rebuilding to the original shape, using arc spraying. The repair can be carried out in our work shop or in-situ depending on the circumstances and customer requirements.



Schema of roller press function



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# WA Application

## Steel Industry

### Rolling Mill Bearing (Casing)



Bearing of a rolling mill ready to be dispatched

Most steel mills have a rolling mill division that converts the semi-finished steel products into finished products. This process is done by deformation through compression and reduces the thickness of the steel to get different profiled bars.

The bearings are required to withstand heavy loads and high speed rotations in severe environments. Inside of the casing it must be smooth, rust free and operate under high temperatures, often scratches and wear occur.

#### Why Welding Alloys?

- Machining and buildup to the original shape
- Cost saving, no new parts are needed
- Improvement of durability and service life to withstand heavy loads and high speed rotation
- High machinery uptime



Bearing during preheating



# WA Application

## Steel Industry

### Rolling Mill Bearing (Casing)



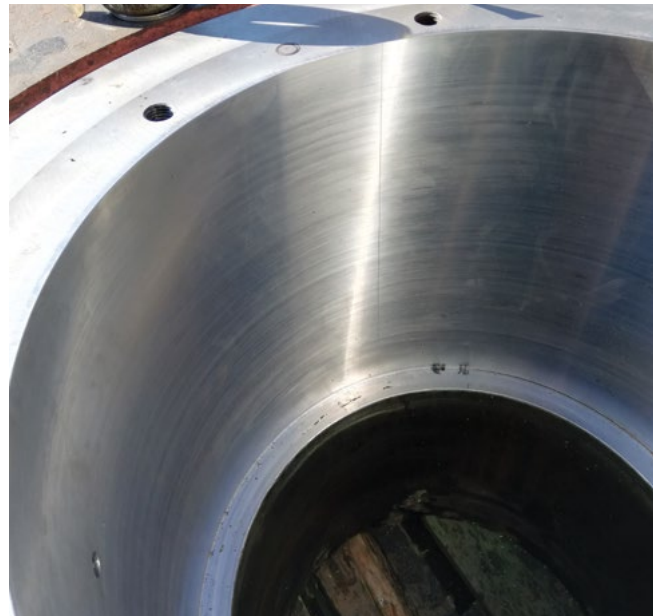
#### Our Solution

After machining, the part must be cleaned of any lubricant. Inside of the preheated part, a ROBOFIL cored wire is applied, 3mm over the original diameter.

The last step is to machine the inner diameter to the original size.



Back to the original size of the bearing



Close up of bearing



**PRODUR**

Wear Resistant Materials and Solutions

# UPGRADE FOR WEAR RESISTANCE!

## Produr offers advanced solutions for bulk material handling

WA-Produr's wear experts have been working with steel and pyrometallurgy for 25 years and will provide support and advice tailored to the steel industry. Produr uses a wide range of wear resistant materials to protect the processing equipment and to improve reliability, safety and productivity.

### OUR STRENGTHS

#### A wide range of Advanced Wear resistant materials

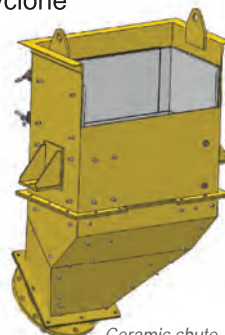
Durzalt (cast fused Bazalt)  
Durhart (Cast Fused Alumina)  
Aldur (Sintered Alumina)  
SiC (Silicon carbide)  
Q&T Steels / Hardplates

#### Engineering capabilities

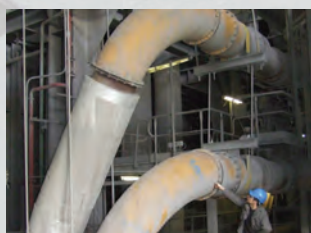
Produr Engineers analyze your process and requirements and design the adaptive solutions for your equipments

### PRODUCTS & SOLUTIONS

Ceramics bucket wheels reclaimers  
Ceramic pneumatic conveyors  
Ceramics Cyclone / Hydrocyclone  
Protection for blast furnaces  
Pipping for blast furnaces  
Hoppers, chutes, extractors



Ceramic chute



CERAMIC PIPES



BLAST FURNACE PIPES



PNEUMATIC CONVEYORS



CYCLONES





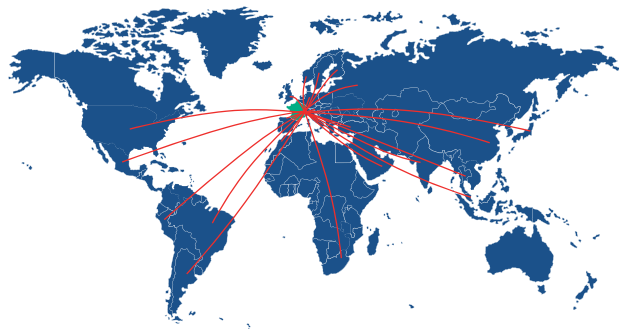
# PRODUR

Wear Resistant Materials and Solutions



## FACILITIES

Workshop total area 4'500 sqm  
 Plasma cutting  
 Heavy bending  
 Boiler making  
 Machining  
 Ceramics workshop  
 Lifting capabilities up to 20 tons



## REFERENCES



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WELDING LOCAL

**Welding Alloys Group**

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 www.welding-alloys.com



# WA Integra™ Sieves and Screens

**Welding Alloys' solution to combat wear in demanding screening applications**

In the coke, iron and steelmaking industries, sieves and screens are used in extremely harsh environments that are prone to wear caused by temperature, impact and abrasion. The screening equipment used in these industries are specifically designed to optimise the flow of material and reduce clogging.

The sieves and screens developed by Welding Alloys Group are tailored to our customers' requirements and provide unique solutions in terms of design and diversity of materials used.



## Features

- Made of *Hardplate*
- Conically cut holes
- High flatness
- Complete construction for areas exposed to temperatures up to 700°C
- Holes from min. 4x12mm to open ended in thicknesses from 4mm (2+2) and thicker
- Primary material always in stock

## Benefits to You!

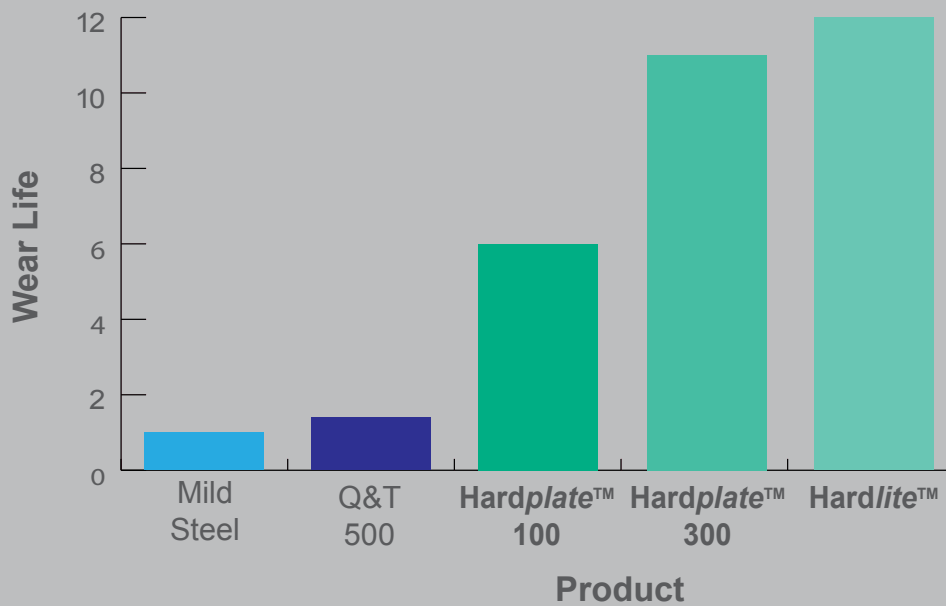
- Less clogging
- Minimum 3 x longer lifetime compared to competitors solutions
- Ready to install
- Short delivery times



**Hardplate™ 100**



## ASTM G-65 Wear Test (Independent Laboratory)



Waterjet cut holes



Sieve backside



Example of spalling issues  
(competitor product)



Welding Alloys Sieve  
after 30 weeks in  
operation

Competitor Sieve  
after 16 weeks in  
operation





# Our Technical 'Spark' Solves Your Industrial Challenges



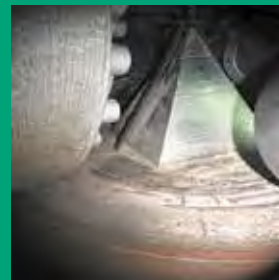
## WA Consumables

The go-to provider  
of advanced welding  
consumables



## WA Machines

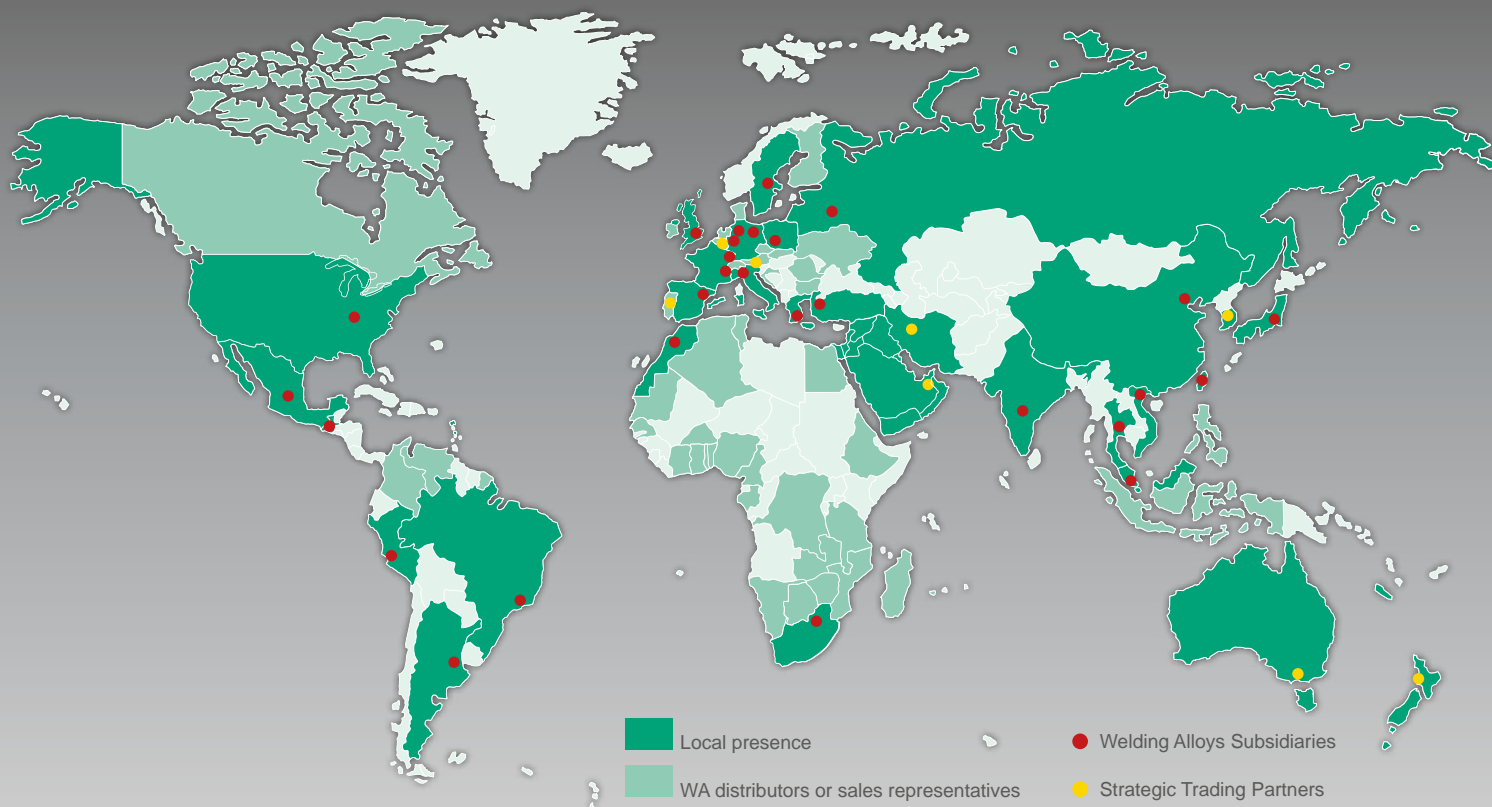
The go-to provider  
of automated equipment  
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