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™

Welding Alloys Group is your partner on the whole flowline of steelmaking:
- Iron Ore
- Pellets
- Sinter
- Coke Ovens
- Blast Furnace
- Direct Reduction
- Scrap
- Lime & Flux
- Oxygen
- Molten Iron
- Limestone
- Coal
- 3D-Carb Technology
- Hardplate™
Our brands specialised in wear protection solutions:

Wholly owned subsidiary of WA Group, Dalforsan remains in front as a trusted global supplier of cladded 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 Dalforsan visit : 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

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

<table>
<thead>
<tr>
<th>Wire Type</th>
<th>DESCRIPTION</th>
<th>BUFFER LAYER</th>
<th>FINAL LAYERS</th>
<th>HARDNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHROMECORE 430</td>
<td>0.05C - 17.5 Cr</td>
<td>O • G • S</td>
<td>CHROMECORE 430</td>
<td>36 HRC</td>
</tr>
<tr>
<td>CHROMECORE 434 N</td>
<td>0.04C - 17 Cr -3.6Ni - 0.5Mo</td>
<td>G • S</td>
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• ROLLING MILL line:

**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:**
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<tbody>
<tr>
<td>Corrosion</td>
<td>CHROMECORE 430</td>
<td>CHROMECORE 414 COILER</td>
<td>50 HRC</td>
</tr>
<tr>
<td>No corrosion</td>
<td>-</td>
<td>HARDFACE DUALHARD C</td>
<td>55 HRC</td>
</tr>
</tbody>
</table>
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

Competitors

CORRESIST

Example: CORRESIST roller lifetime (ø130mm) → 800-1000kT cast steel

REDUCTION IN OFFLINE MAINTENANCE
Weld cladding pioneer!

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.

Dalforsán
Industrivägen 11
SE - 776 70 Vikmanshyttan
Tel. +46 225 595 460
E-mail: info@dalforsan.se

www.dalforsan.se
**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 2100 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**

*Welding Alloys Group*
marketing@welding-alloys.com
www.welding-alloys.com
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
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
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
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.
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

Manual Procedure
D2-Trak Procedure
D3-Touch® Procedure

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.
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-D\textsuperscript{Carb}\textsuperscript{TM} Technology. 3-D\textsuperscript{Carb}\textsuperscript{TM} Technology is exclusively provided by INTEGRA\textsuperscript{TM}.

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-D\textsuperscript{Carb}\textsuperscript{TM} 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 Sinter Stars repaired before installation

Dummy Bars protected with 3-DCarb™ Technology

Thermal analysis of parts in service

Reference: Major Steel Manufacturers

Welding Alloys Group
marketing@welding-alloys.com
www.welding-alloys.com
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

**PRODUCTS**

- Ceramic pipes
- Blast furnace pipes
- Pneumatic conveyors
- Cyclones

**WEBSITE**

www.wa-produr.com
FACILITIES

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

REFERENCES

Welding Alloys Group
marketing@welding-alloys.com
www.welding-alloys.com
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
Example of spalling issues (competitor product)

Waterjet cut holes

Sieve backside

Welding Alloys Sieve after 30 weeks in operation

Competitor Sieve after 16 weeks in operation

Welding Alloys Group
The go-to provider of engineered wear protection solutions

marketing@welding-alloys.com
www.welding-alloys.com

ASTM G-65 Wear Test (Independent Laboratory)

<table>
<thead>
<tr>
<th>Product</th>
<th>Wear Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild Steel</td>
<td>1</td>
</tr>
<tr>
<td>Q&amp;T 500</td>
<td>2</td>
</tr>
<tr>
<td>Hardplate™ 100</td>
<td>6</td>
</tr>
<tr>
<td>Hardplate™ 300</td>
<td>10</td>
</tr>
<tr>
<td>Hardlite™</td>
<td>12</td>
</tr>
</tbody>
</table>

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 for wear protection

WA Integra™
The go-to provider of engineered wear protection solutions

A worldwide presence

www.welding-alloys.com