New Wear-Resistant Welding Technology for Vertical Roller Mills

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WA Integra® Applications – MillCarb™
Cement & Coal Milling
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1. Who are The Welding Alloys Group?

Welding Alloys was founded in 1966 in Fowlmere, a small village near Cambridge, by Metallurgist, Dr. Jan Stekly.
1. Who are The Welding Alloys Group?

- >150 countries
- 28 subsidiaries
- 1000 employees/specialists
- 25 Integra Centres
1. Who are The Welding Alloys Group?
2. Traditional Component Refurbishment

In Situ Method

Typical WA Mill Kit – In-Situ Welding
2. Traditional Component Refurbishment

In Workshop Method

Typical WA Workshop Kit
Refurbishment of grinding components used in the Cement and Coal Fired Power Industries has been very much focused on hardfacing using cored welding consumables with similar properties and chemistry.

The addition of alloying elements can
- Increase hardness
- Increase abrasion resistance
- Increase brittleness.
- Increase costs

Often the addition of expensive alloying elements does not justify the limited increase in component life.

2. Traditional Component Refurbishment
2. Traditional Component Refurbishment

- Various welding techniques result in varying degrees of weld metal dilution by the base material.
- Frequent refurbishment cycles of worn components can limit the lifetime of the base material.
- Traditional hardfacing consumables do not live up to the wear life standards set by alternative solutions.
2. Traditional Component Refurbishment

- Alternative solutions provide extended wear life but may be at a much higher cost, and may not always be repairable.
- Opting for non-repairable alternative solutions could also lead to increased mill downtime (and thus production losses) due to longer lead time of spare parts.
3. **MillCarb™ The Welding Alloys Solution - Features**

- A welded solution like any other hardfacing solution.
- Increases wear life without increasing weld material brittleness.
- Utilises a tried, tested and proven welded matrix embedded with ultra-hard Ceramic particles.
- A re-weldable and repairable solution.
- Can be applied to all grinding components weldable by traditional hardfacing.
3. **MillCarb™ The Welding Alloys Solution - Features**

- A solution developed in collaboration with a world leading research organisations in joining technologies and tested with leading OEM’s and international welding experts.
- The wear protection mechanism has been proven to be substantially better than any of the other wear mechanisms it was tested against.
- Extensively tested under normal operating conditions in industry.
3. MillCarb™ The Welding Alloys Solution - Features

The MillCarb™ microstructure has been designed to

• Combine the wear resistant properties of advanced and complex ceramics.

• Graded ceramic grain sizes for optimum distribution within the matrix

• Shock absorbing properties of a metallic matrix, creating the ultimate ceramic metal matrix composite.
3. MillCarb™ The Welding Alloys Solution - Features

Metal Matrix Composites

Compared to individual components:
- Higher strength to weight ratio
- Higher wear resistance
- Higher stiffness
Wear Mechanisms within VRM’s 
(Base metal, external element and environment)
3. MillCarb™ The Welding Alloys Solution - Features

MillCarb™ combines fundamental principles with vast technical and empirical know-how.

The microstructure of 5-layers of MillCarb™ showing uniform distribution of the ceramic particles throughout the thickness of the entire weld deposit.
3. MillCarb™ The Welding Alloys Solution - Features

Uniformly Distributed Ceramic Particles in a Multi-Layer Welded Matrix
3. MillCarb™ The Welding Alloys Solution - Features

Ceramic Particles at various magnifications
3. MillCarb™ The Welding Alloys Solution - Features

A partially welded grinding component for the cement industry using the Welding Alloys MillCarb™ Solution.
4. Comparative Data in a coal grinding environment

**MillCarb\textsuperscript{TM} vs the Rest**

- Throughput (Tons)
- Millimeter wear

Lines represent different models:
- **MC**
- P-1
- P-2
- P-3
- P-4
- P-5
- P-6
5. Benefits of Welding Alloys MillCarb™

- The MillCarb™ Solution is repairable.
- A welded overlay with substantial wear life increase when compared to other solutions.
- 100% Welding Alloys Technology, backed by years of expertise and experience.
5. Benefits of Welding Alloys MillCarb™

- A true Engineered Solution designed in collaboration with leading OEM’s.
- Process optimisation done through FEA in partnership with global welding experts.
- The solution offers advanced materials combined with optimised process parameters.
5. Benefits of Welding Alloys MillCarb™

Preventative Hardface Welding
5. Benefits of Welding Alloys MillCarb™ - Summary

• Lower wear rates
  – Longer lasting components
  – Reduced maintenance cycles.
  – Lower maintenance costs
• Maintained production rates
• Lower power consumption.
• Reduced operating costs
• Lower Total Cost of Ownership
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