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WEAR MATERIAL: THE FOUNDATION OF RELIABLE COAL POWER

Proper wear solutions for coal-fired power stations

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HSA INDUSTRIAL SOLUTIONS

HSA WEAR PLATES

SETTING THE SCENE

Fossil Fuels in the 21st Century

Coal-fired stations remain central to South Africa's power supply, and ageing units are being run harder and for longer.

Under that pressure, the condition of wear components decides whether a station stays available, efficient and compliant. Wear material is not a consumable to buy on price alone — it is part of how the plant performs.

Availability

Fewer unplanned mill and fuel-system outages

Efficiency

Stable fineness and fuel flow to the burners

Compliance

Well-prepared fuel supports emissions performance

Rising breakdowns

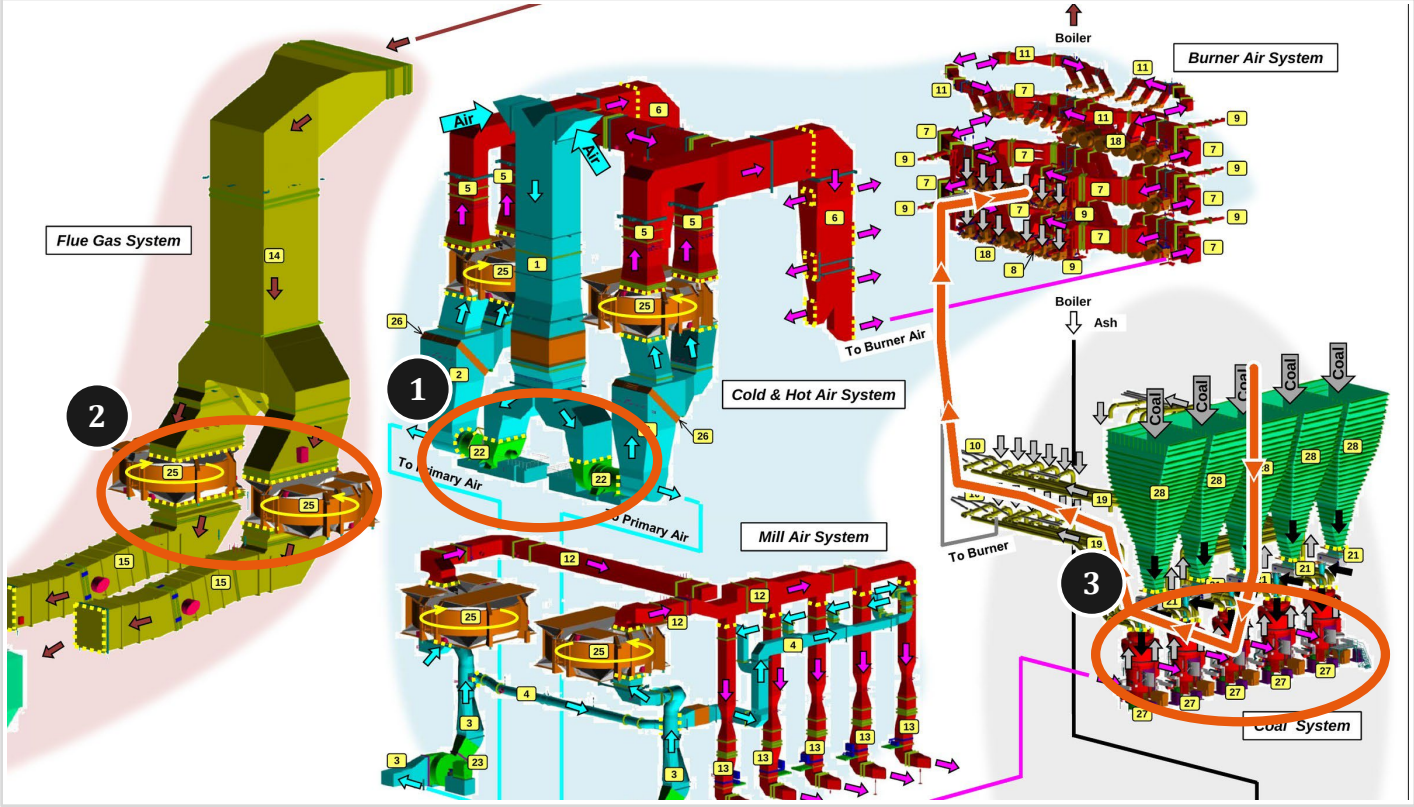
A competence gap and a lack of planning are causing more breakdowns. That calls for a more responsive service and longer-lasting, more robust wear material.



WHERE WEAR HAPPENS

Wear Along the Coal-to-Burner Fuel Path

The coal wear path through the station. Click to see where HSA parts are installed.



Coal wear path: bunkers, feeders, mills, PF pipes, burners

Where HSA parts are installed

1 PA inlet



Wear plate supplied for the PA inlet

Supplied by HSA / ProGO Wear

2 Gas air heater



Wear plate supplied for the gas air heater

Supplied by HSA / ProGO Wear

3 Vertical roller mill: parts supplied



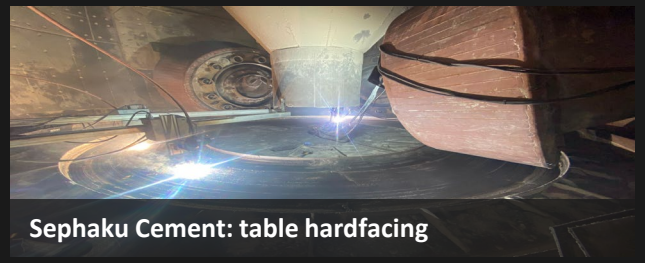
PROVEN ON SITE

Mill Tyres and Tables: HSA Work On Site

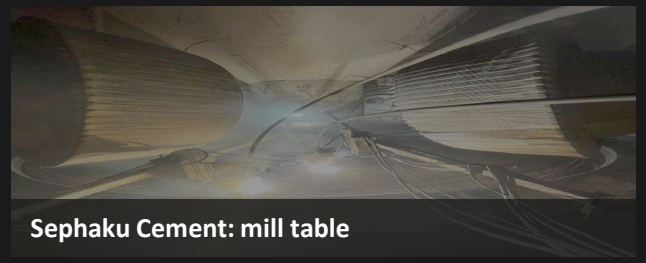
Vertical roller mill tyres and tables repaired at cement plants. The same approach applies to coal mill rollers and tables.



PPC Dwaalboom: HSA team on the coal mill table



Sephaku Cement: table hardfacing



Sephaku Cement: mill table

WHAT WE DO ON TYRES AND TABLES

Repaired and resurfaced in place

Tyres and tables are hardfaced on site, restoring the original profile and tolerances.

Automated welding, even overlay

Welding heads give uniform hardness and layer thickness across the table.

No off-site transport

Heavy components stay in the mill, which keeps the outage shorter.

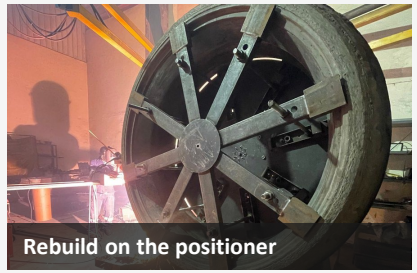
Longer service life and a lower total cost of ownership.

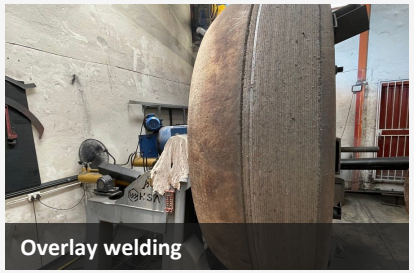
REPAIRING MILL TYRES

Mill Tyre Repair: On Site or in the Workshop

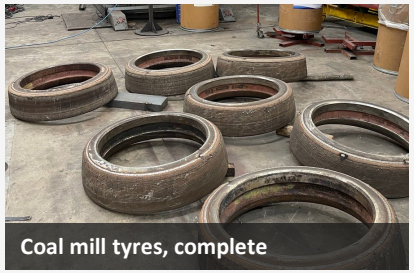
Repair extends tyre life. We choose where to do it by wear depth, base metal condition and outage window.


Before: worn groove


Rebuild on the positioner


Overlay welding


After: finished tyres


Coal mill tyres, complete


Painted and loaded

ON SITE

tyres and table repaired in the mill

- **No dismantling or transport**
  Rollers and table stay in the mill, so removal, haulage and refitting are avoided.
- **Shorter outage**
  Work is planned inside the shutdown and the mill is back sooner.
- **Tyres and table in one campaign**
  Automated welding heads work on both without leaving the mill.
- **Re-weldable**
  Hardfacing can be re-applied on rollers and tables as wear returns.

IN THE WORKSHOP

tyre removed and rebuilt

- **Full rebuild**
  Gouge out fatigued material, grind, machine, build up, hardface and stress relieve.
- **Controlled conditions**
  Lathe, positioning, heat control and inspection give repeatable quality.
- **The mill keeps running**
  With a spare tyre on site, swap and run while the worn one is rebuilt.
- **Plan around the shutdown**
  Rebuilds are scheduled to coincide with planned shutdowns.

How we decide: on site when wear is repairable and the base metal is sound; workshop for heavy damage or a full rebuild. We inspect first.

Sources: Castolin Eutectic (roller refurbishment, in situ or workshop); Fuller Technologies roller rebuild and hard facing services; Welding Alloys via AGG-Net (automated in-situ mill kits); Bulk-Online (in-situ regeneration of grinding tools). The workshop-quality point and the on-site versus workshop rule are HSA's own view.

WHY IT MATTERS

Combustion Quality Is Decided Before the Flame

A low-NOx burner can only stage the fuel and air it receives from upstream.

THE MILLING TARGETS

~72%
passing 75 µm
Fineness, with minimal oversize

15%
of the mean
Pulverised fuel distribution between burners

5%
of the mean
Primary air distribution between burners

WHAT GOES WRONG WHEN WEAR PARTS DRIFT

Fineness
A controlled band matters: too coarse delays burnout, too fine drives flame temperature up. **Wear link:** Worn classifier and throat parts lose the cut.

Fuel distribution
Rope formation at bends can leave some burners starved and others flooded. **Wear link:** Worn fuel-pipe bends make it harder to control.

Stable feed
The burner cannot correct unstable feed created upstream. **Wear link:** Blocked or hung-up chutes upset the feed the mill needs.

Reliability and emissions
Poor fineness drives up unburnt carbon in the ash. **Wear link:** Wear failures add unplanned outages on top.

Wear material is not a consumable. It protects the performance of the whole combustion chain.

Sources: Zwaan, C. and Preller, A. (EnFloTech), "NOx Is Decided Long Before the Flame", African Petrochemicals, 19 Oct 2026 (africanpetrochemicals.co.za/nox-is-decided-long-before-the-flame). Milling targets and combustion points are from the article; the "wear link" lines are HSA's own engineering view.

WHERE GOOD WEAR MATERIAL FITS IN

Abrasion Resistance: Complex Carbide Overlay Leads

ASTM G65 dry sand / rubber wheel test, Procedure A. Less material lost means higher abrasion resistance.

WHAT G65 TELLS US

Sand against a rubber wheel

A weighted specimen is pressed on a rotating rubber wheel while dry sand flows between them.

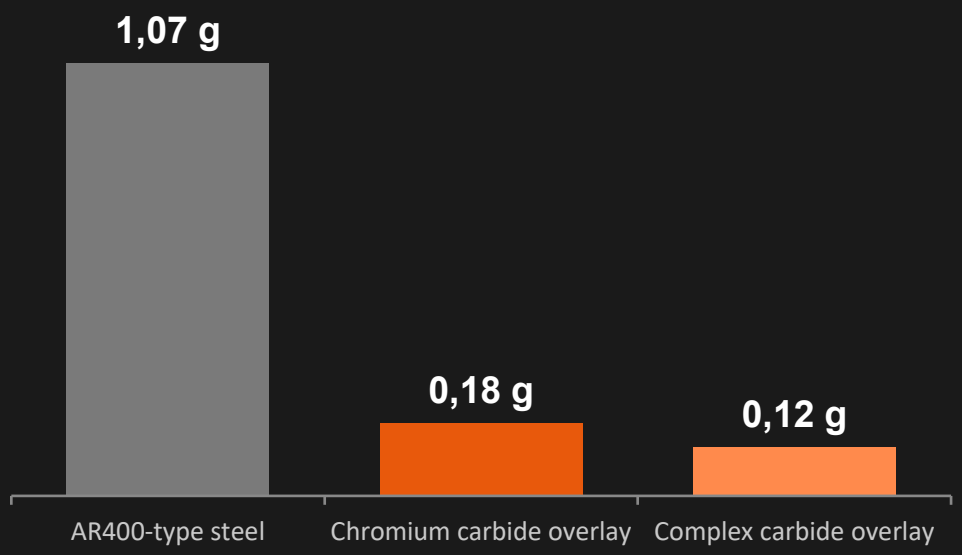
Lower loss, longer life

Material lost is weighed. Procedure A is the severe version, used for medium to extreme resistance.

A ranking, not a life promise

It compares materials under identical conditions. Site life also depends on impact and heat.

ASTM G65 PROCEDURE A MASS LOSS, GRAMS (lower is better)



≈6×

Chromium carbide overlay
less material lost than AR400-type steel

≈9×

Complex carbide overlay
less material lost than AR400-type steel

Complex carbide adds Nb, Mo, V or W to the chromium carbide, keeps its wear resistance in hot service (to 600 °C per SSAB) and typically lasts 3 to 5 times longer than plain chromium carbide overlay.

Sources: ASTM G65; SSAB Duroxite 101 and 200 data sheets (overlay values are guaranteed maxima: 0.18 g and 0.12 g); AR400-type value from an academic G65 Procedure A study of Hardox 400 (about 1.07 g); SSAB overlay products guide. Different laboratories, so read as indicative. Ceramics can beat overlay in pure sliding wear: see next slide.

THE FULL PICTURE

Where Overlay Fits: Overlay vs. Ceramic vs. AR Steel

	Complex carbide overlay HSA 300 and range	**Ceramic tile liners** glued or plug-welded	**AR steel plate** AR400 to AR500
Sliding abrasion	●●●●○ Very high: G65 loss at most 0.12 g	●●●●● Highest in pure sliding wear (vendor: 3 to 5 times chrome carbide)	●●○○○ Lowest: about 6 to 9 times the loss of overlay
Impact tolerance	●●●●○ Moderate impact on a tough steel backing; coal is brittle and crushable	●●○○○ Poor fracture toughness; tramp metal and large lumps crack tiles	●●●●● Tough, but wears away fastest
Installation	●●●●○ Bolted or welded; cut, rolled and formed to chutes, bends and cones	●●○○○ Glued or plug-welded; careful alignment and surface preparation	●●●●● Bolted or welded; easy to fit
Ease of maintenance	●●●●○ Re-welded and built up in place, on site if needed	●●○○○ Damaged tiles replaced one by one; hard to inspect behind	●●●●○ Weldable and simple, but changed out more often
Upfront cost (more dots = cheaper)	●●●○○ Moderate; chrome carbide is relatively inexpensive vs tungsten carbide	●●○○○ Generally the more expensive option, plus fitting care	●●●●● Lowest upfront, but shortest life

More dots = better. Qualitative HSA assessment drawn from the sources below. Tungsten carbide overlay resists abrasion best but costs more and suits low-impact sliding only.

Sources: SSAB overlay products guide and Duroxite data sheets; Martin Engineering (wear liner materials); Saint-Gobain Performance Ceramics (ceramic lining FAQ); Canadian patent CA 2908016 (ceramic liner replacement); Fisher et al., J. Thermal Spray Technology (overlay cost); Eng-Tips and Bulk-Online practitioner threads (ceramic impact and cost).

THE BUSINESS CASE

Why Complex Carbide Overlay: Cost, Uptime, Maintenance

COST SAVING

Cost per tonne

Total cost is the liner system cost divided by tonnes handled. A longer-lived liner spreads supply, fitting and shutdown cost over more tonnes. Chrome carbide overlay is also relatively inexpensive next to tungsten carbide overlay and polymer liners.

UPTIME

7,224 MW

Eskom's unplanned outages averaged 7,224 MW in the week of 6 to 12 March 2026, against 15,382 MW a year earlier. Filling the gaps with diesel peakers cost R6.38 billion from April 2025 to March 2026. Every avoided breakdown protects output.

EASE OF MAINTENANCE

Repair in place

Overlay parts are re-welded and built up on site, and mill tyres and tables can be refurbished in situ without removal. Ceramic tile liners are replaced tile by tile, which is labour intensive and slow.

Our recommendation: complex carbide overlay (HSA 300) as the standard for chutes, hoppers, mill inlets and fans, with ceramics reserved for low-impact sliding zones.

Sources: Welding Alloys South Africa (Engineering News, Feb 2018) for cost per tonne; Fisher et al., J. Thermal Spray Technology (overlay cost); Eskom statement via gov.za, 13 Mar 2026 (outages and diesel spend); Castolin Eutectic and Hlakani Engineering (in-situ VRM repair); Canadian patent CA 2908016 (ceramic liner replacement). Eskom figures show why reliability matters; they are not wear-specific.

WHAT WE SUPPLY

HSA Wear Plates: The Right Grade for Every Zone

HSA 100
STANDARD GRADE

57–62 HRC

Chutes, hoppers and general abrasion. Severe abrasion with low to moderate impact. Cost-effective.

HSA 200
PREMIUM GRADE

58–63 HRC

Mill liners and high-volume abrasion with moderate impact. Flat surface, tighter tolerances.

HSA 300
COMPLEX CARBIDE

60–65 HRC

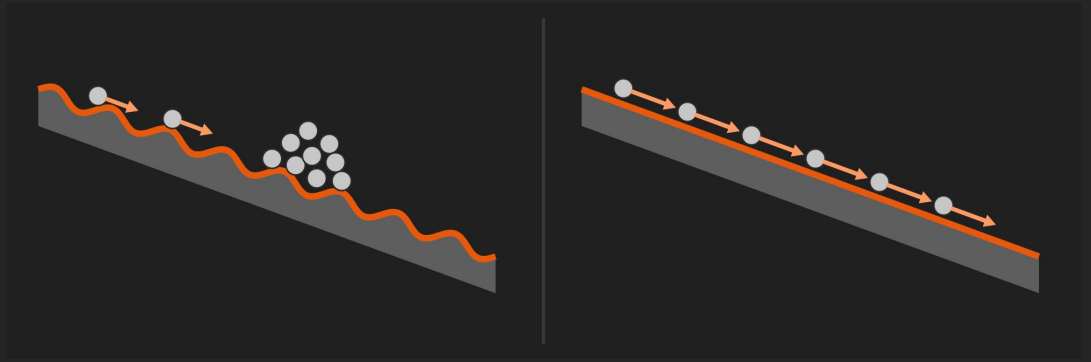
Extreme abrasion and impact: crushers, mill inlets and fans. Our highest-performance grade.

HSA-F
SMOOTH PLATE

57–62 HRC

Flow-critical chutes, hoppers and transfer points. Same hardness, flat ripple-free finish.

HSA-F: THE FLOW EFFECT



Standard overlay: ripples catch material

HSA-F: material slides through

- **Less friction**
  A flat surface lets coal slide instead of catching on weld ripples.
- **Less blockage**
  Fine, sticky or damp coal and ash have less to hang on at chutes and transfer points.
- **Longer service life**
  Same 57–62 HRC and about 32% chromium as our standard grades, so abrasion resistance is kept.

Also supplied: cladded pipe and elbows · hammer and crusher hardfacing · fan and impeller overlay · on-site VRM repair · plate from 6 mm to 30 mm

THANK YOU

Questions?

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