APEX

ENGINEERING TECHNOLOGY GROUP

MINING CAPABILITY STATEMENT

COMPASS ASSURANCE SERVICES • ISO 9001 •

ISO 9001 QUALITY

OPTIMISED COMPONENT PERFORMANCE

MINING APPLICATIONS

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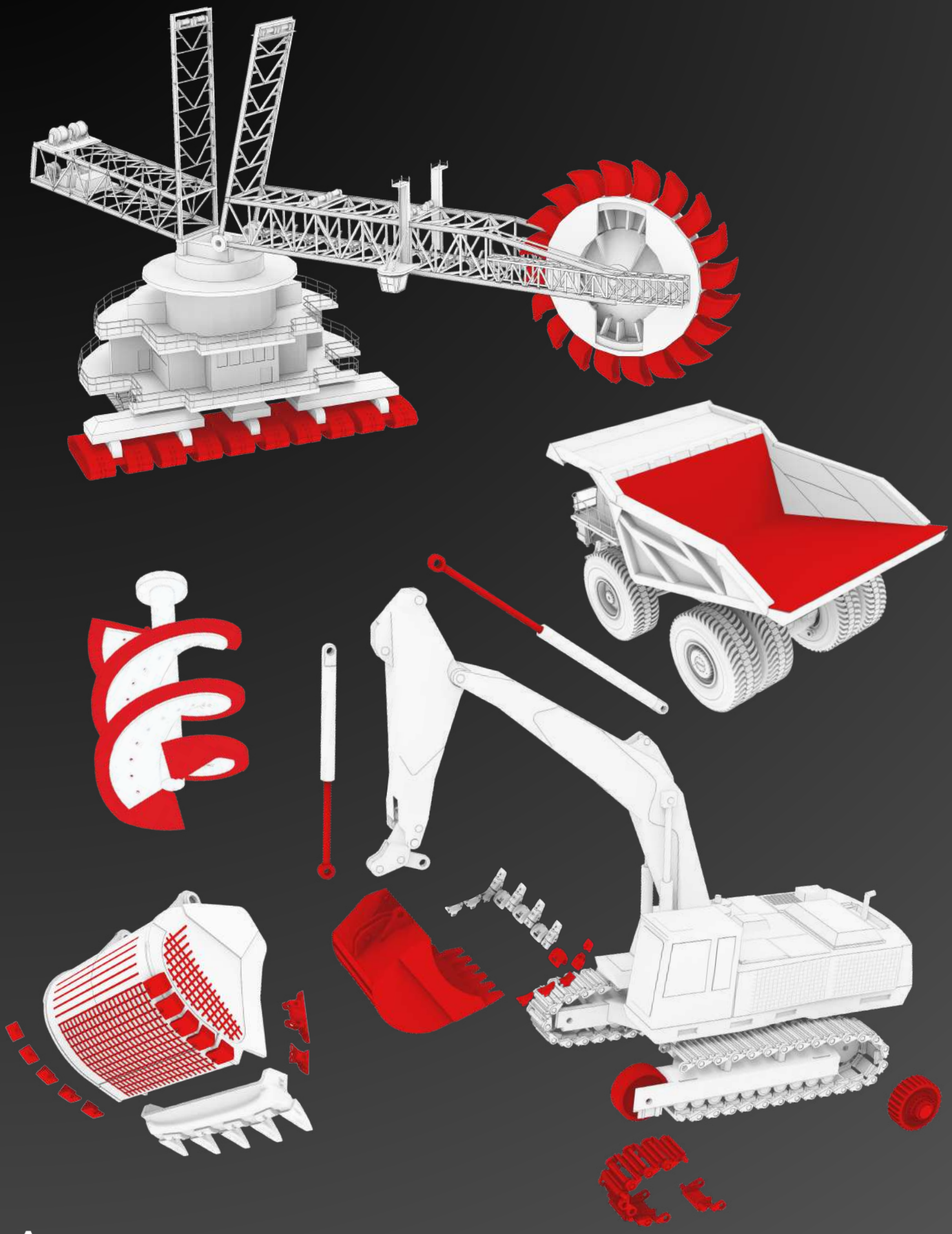
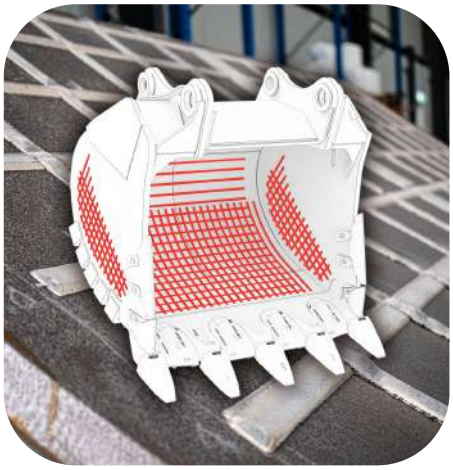


BENEFITS FOR MINING

Enhanced Component Durability



APEX ETG's laser cladding can be used to apply a protective layer of wear-resistant material onto mining equipment components such as drill bits, crushers, and hammers. This helps to improve their durability and resistance to abrasion, impact, and corrosion. The cladding layer acts as a shield, prolonging the lifespan of critical components and reducing the need for frequent replacements.

Reduce Total Overall Costs

Laser cladding can result in significant cost savings for mining companies. Extending the lifespan of critical components and reducing maintenance downtime, it reduces the need for frequent equipment replacements and associated expenses. Moreover, the ability to repair and refurbish components rather than replace them entirely can lead to substantial savings in the long run.

Improved Operational Performance

By selectively depositing materials with specific properties, APEX ETG's laser cladding can optimise the performance of mining equipment. For example, adding materials with high hardness and toughness can enhance tools' cutting or crushing efficiency. In addition, it allows for tailoring the characteristics of components to meet the demanding requirements of mining operations.

Innovative Maintenance and Efficient Repairs

Laser cladding can be used for repairing damaged or worn-out mining equipment parts. Instead of replacing the entire component, a localised area can be repaired by depositing a suitable material using laser cladding. This approach significantly reduces downtime and costs associated with equipment maintenance and the need for spare parts inventory.

Minimise Risk, Maximise Safety

The improved durability and reliability of components achieved through laser cladding can enhance mining operations' safety. Reliable equipment reduces the risk of unexpected failures, minimising the chances of accidents or injuries to personnel.

Tailored Engineered Solutions

APEX ETG offers a wide range of alloy powders. This enables APEX ETG's experts to use the most appropriate material for a specific application, taking into consideration factors such as wear resistance, heat resistance, and chemical compatibility. Additionally, laser cladding can be tailored to deposit complex shapes or geometries, allowing for customisation of mining equipment components as per specific operational requirements.

MINING APPLICATIONS

GROUND ENGAGING TOOLS

Application examples:

<u>Above-Ground Mining:</u>

- Haul truck bed liners
- Shovel and excavator bucket lips
- Grader blades
- Dozer blades
- Ripper shanks and teeth
- Conveyor belt components such as rollers, idlers, and skirting systems.

Application examples:

<u>Below-Ground Mining:</u>

- Continuous miner cutting heads
- Longwall shearer picks
- Shuttle car components such as cutting heads and scraper blades.
- Roadheader cutting bits

TRUCK BODY

Application examples:

- Tray
- Bearing journals
- Struts
- Suspension
- Engine block
- Undercarriage
- Dimensional reclamation of critical parts

FINAL DRIVE

Application examples:

- Wheel hubs: flanges, bearing surfaces, wheel mounting surfaces, and seating surfaces.
- Spindle shafts, bearing journals, and tapered surfaces,
- Steering arm bores.
- Planetary gears

MINING APPLICATIONS

HYDRAULICS

Application examples:

- Longwalls/roof supports
- Hydraulic cylinder rods
- Cylinder barrels
- Piston heads
- Valve spools
- Accumulator pistons
- Chrome replacement

DRILLING

Application examples:

- Drill bits
- Drill rods
- Stabilisers
- Core barrels
- Auger flights
- Auger driveshafts
- Drill collars
- Subs and connectors

PUMPS

Application examples:

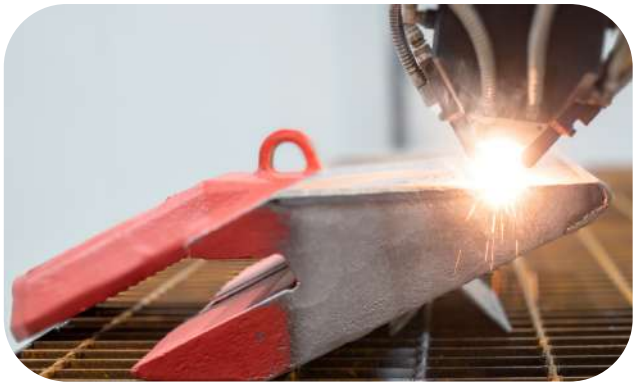
- Pump impellers
- Pump casings
- Wear rings
- Shaft sleeves
- Bearing housing surfaces
- Volute liners
- Mechanical seal components
- Suction and discharge flanges

CRUSHING

Application examples:

- Primary, Secondary and Tertiary crushers
- Gyratory crushers
- Impact crushers
- Cone crushers
- Mobile and fixed plant machinery wear parts

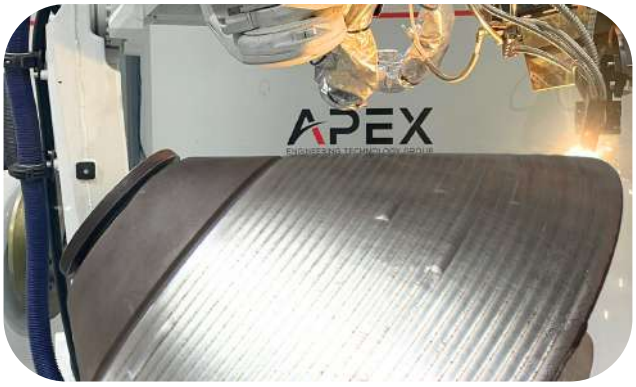
CAUSES OF WEAR



Abrasive Wear

Abrasive wear occurs when hard particles or materials abrade the surface of components.

APEX ETG's laser cladding process ensures metallurgical bonding of a wear-resistant coating, providing enhanced resistance against abrasive wear. Examples include bucket and shovel teeth, grinding mill liners and drill bits.



Impact Wear

Impact wear results from high-energy collisions between components and hard objects, such as rocks or ore.

APEX ETG's laser cladding reinforces these components, providing impact-resistant coatings that can withstand the forces generated during drilling, grinding, and excavation. Examples are crusher hammers, impact plates, wear plates, and crusher liners.

Fatigue Wear

Fatigue wear occurs due to repeated cyclic loading, leading to crack formation and component failure.

APEX ETG's laser cladding can be employed to repair worn or damaged areas on these metal components, restoring their strength and extending their fatigue life. Examples include shafts, gears, bearings and structural components such as pinion shafts and strutts.

Erosive & Corrosive Wear

Erosive wear occurs from high-velocity fluid streams with solid particles, causing surface erosion. Corrosive wear results from chemically aggressive environments, degrading materials.

APEX ETG applies hard wearing sacrificial layers to absorb erosive forces and protect against chemical attack, preserving component integrity. Examples: pump impellers, slurry piping, valve components.

ENGINEERED SURFACE SOLUTIONS

What is laser cladding?

Laser cladding is the most advanced hardfacing process on the market today. Unlike traditional hardfacing, laser cladding uses a laser beam as the source of energy instead of an arc to fuse or alloy coating material and the base material together.

What are the benefits of laser cladding?

- Laser cladding has a significantly reduced heat-affected sone (HAs), which means short cooling times. This creates many advantages:
  - Base material dilution is minimal
  - Almost no distortion of the base material
  - The coating material retains many of its original properties. Resulting in coatings with high hardness and excellent wear resistance, corrosion resistance and dimensional control.
- Large area with high deposition rate
- Cost-effectiveness
- High accuracy
- No flaking or peeling
- 4mm to 30mm deposit width
- Excellent cladding metallurgy
- High-efficiency process — lower thermal input and lower powder consumption
- Minimal pre and post-processing required
- Precision control
- A high-resolution process enables thin-clad layers of ~0.25 mm thickness
- Lower residual stress and distortion

OUR CAPABILITIES

LARGE AREA LASER CLADDING

APEX ETG offers high-quality laser cladding services for a variety of industrial applications.

Laser cladding services

- 10 kW direct-diode high power large area cladding
- Hotwire and powder feed delivery options
- Up to 15kg/hr material deposition
- Up to 95% deposition efficiency
- Minimum Heat Affected Zone (HAZ)
- Large area laser heat treatment capabilities

INTERNAL DIAMETER (ID) CLADDING

ID laser cladding is when the inside of a component, such as a pipe, bores or tubes, is clad. Our versatile ID laser cladding capabilities are ideal for:

- Bores or tubes 75mm in diameter or greater
- Reach up to 2.5 meters in length
- High precision deposition in small areas
- Hotwire and powder feed delivery options
- Wide range of high-performance alloy materials

LASER HEAT TREATMENT

The advantages of APEX ETG's cost-effective surface hardening diode laser heat-treating service are high processing speed and precise case depths resulting in negligible distortion and enhanced resistance to wear, fatigue and corrosion resistance. Application examples include: carbon alloy steels and cast irons, bearing surfaces, cutting surfaces, pumps, valve seats, drive train components, gears, pulleys, hand tools, needles and pins, forming tools, stamping dies and turbine blades.

WELDING

At APEX ETG, we use both conventional and laser welding technologies in conjunction with automated robotics allowing us to offer fabrication and hardfacing services, ensuring quality, repeatability and productivity.

Welding and fabrication services

- High-speed fabrication
- 3Phase 400amp MIG welder
- Cutting and forming custom jigs for applications
- Equipment reclamation and repairs

OUR CAPABILITIES

MACHINING

We offer a comprehensive range of services and equipment to manufacture new components, from unique 'one-offs' to large batch runs in a broad range of sises, weights and geometries.

Pre and post-machining services:

- Milling machine with 1.5m bed
- Lathes; 1-4m between centres, up to 2200mm swing
- Cylindrical grinder 3.5m between centres, 650mm swing
- Linisher 5.5m between centres, 1600mm swing diamond belts
- VTL 1200mm swing with a height of 1200mm

TURNKEY SYSTEMS

Our turnkey systems are custom-built to meet your needs. Through our business partnerships with equipment manufacturers and our expertise, we are able to design, manufacture, build and integrate systems for laser cladding and thermal spray applications. Once the system is fully commissioned, we provide calibration, training and aftermarket maintenance support to your organisation

COHERENT FST

LABORATORY SERVICES

APEX ETG's in-house laboratory covers a range of services to engineer, test and analyse hardfacing and laser cladding applications ensuring the optimal surface solution. **These capabilities include:**

- Sample preparation and testing
- Material analysis equipment and software
- Twin rotatory sample grinding & polishing
- Micro and macro hardness testing
- Positive Material Identification (PMI)
- Ultrasonic Testing (UI)
- Dye penetrant inspection

RESEARCH AND DEVELOPMENT

APEX ETG is actively searching for the next innovative component, product, system, technology or process that can increase the opportunities for surface coating solutions. APEX ETG is at the forefront of cutting-edge hardfacing technologies and provides ongoing R&D collaboration opportunities for businesses looking to improve their efficiencies, long-term profitability and environmental goals.

SUSTAINABILITY

Material Conservation

Laser cladding involves applying a thin layer of material onto a base component, which helps restore or enhance its functionality. This targeted approach minimises the use of raw materials compared to full component replacement, reducing waste and conserving resources.

Extended Lifespan

By repairing components using laser cladding, their operational lifespan can be significantly extended. This reduces the need for frequent replacements, which not only saves resources but also reduces the environmental impact associated with the production and disposal of new components.

Energy Efficiency

Laser cladding is a highly efficient process that uses focused laser energy to melt and fuse the cladding material onto the base component. Laser cladding typically requires less energy input than traditional repair methods, such as welding or thermal spraying, resulting in lower energy consumption and reduced carbon emissions.

Reduced Waste Generation

Repairing components through laser cladding generates less waste compared to replacement options. Instead of discarding entire components, laser cladding selectively repairs and reinforces damaged areas, minimising the amount of material that would otherwise be sent to landfills or recycling facilities.

Improved Performance and Functionality

Laser cladding can enhance the performance and functionality of components by using specialised cladding materials, such as corrosion-resistant alloys or wear-resistant coatings. This improves the durability of repaired components, reducing the likelihood of future failures and the associated environmental impact.

Cost-effectiveness

Laser cladding can often be a cost-effective repair option compared to component replacement, particularly for high-value or complex parts. By avoiding the need for complete replacements, businesses can save on procurement costs, transportation, and disposal expenses while reducing the overall environmental footprint.

APEX ETG's Sustainability Strategy

Sustainability is at the heart of our business and our purpose in creating lasting value for our clients and society. To this end, it is about integrating environmental, social and governance (ESG) considerations into our decision-making every day. As a solutions and services provider, our focus is on contributing to better outcomes for our clients, people, partners, suppliers, and the environment. APEX ETG is uniquely placed as a trusted partner to help facilitate sustainable, responsible and efficient operating procedures. By working together, we collectively contribute to a low-carbon future.

In the battle against global warming, APEX ETG supports companies in heavy industries to reach their carbon neutrality targets by offering sustainable alternatives to wear part replacement and R&D collaboration opportunities to pursue green energy innovations. Refurbishing, reinforcing and repairing wear parts damaged by friction, impact, and erosion with refined hard-facing processes minimise waste, reduces downtime and costs, and is a sustainable business approach.

APEX ETG's collaborative R&D efforts with OEMs and service providers are aiding the mining, mineral processing and a range of industries move towards sustainable practices with laser-clad hardfacing on excavators, screens, crushing, wear parts and many more applications. We're excited to be working on new lines of business services that we hope will further support our clients, contribute to the community, and enable a just and fair transition to a cleaner global economy.

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