

# Your iron ore beneficiation solutions



**Mineral  
Technologies**

A Downer Company

**Downer**  
Relationships creating success



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**Whether investing in a new project or optimising an existing plant, there are many challenges to overcome including investment, licensing, infrastructure, recovery of materials and energy product. When major investors see that we are working on a project they have the confidence that it is well underway.”**

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## The first step – understanding your project vision

The world's leading producers rely on us to extract their valuable minerals.

Success is achieved through skilled, passionate people working together in pursuit of a shared vision and goals.

That's why the very first step we take in working with our customers is to **listen and understand what success for the project looks like.**

We then go out of our way to work collaboratively with our customer teams, based on our shared understanding of the project goals and timeframes.

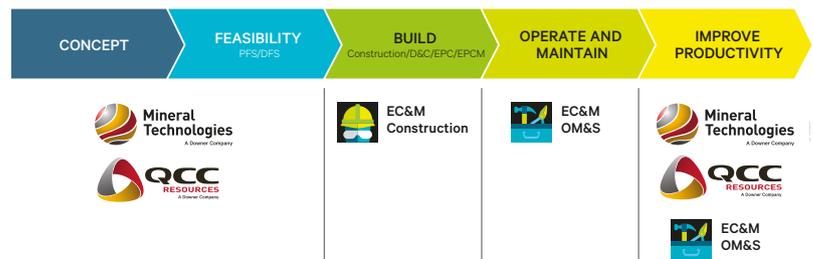
Working from this understanding we deliver a comprehensive range of equipment, plant design and services to achieve our customers' vision across all stages of the project lifecycle.

### Experience delivers results

From our beginnings in the 1950s separating heavy minerals from the local sands on Australia's East Coast, we have expanded and developed our capability. For over 25 years Mineral Technologies has delivered magnetic and gravity iron ore recovery solutions across Australia, Canada, Brazil, India and Africa. Today, we are recognised by customers worldwide as the **'go to' partner for process solutions across the project lifecycle.**

Customers call us when they need fast, cost effective process improvements to **lower costs, convert tailings into revenue or construct a new plant.**

Importantly, we also support NI 43-101 requirements as qualified experts for the processing section of technical reports. Worldwide, our involvement and participation in projects not only provides customers with confidence in a successful outcome, it also provides confidence for key investors and stakeholders.



## Reliable, expert delivery



**Helping to deliver your project vision, we provide core services from basic analysis through to complete metallurgically balanced flowsheets suitable for process engineering and detailed plant design.**

### Concept and Feasibility

We develop tailored solutions for beneficiating iron ore to extract magnetite, hematite and goethite. Starting with metallurgical testing, we test samples as small as 100 grams for characterisation through to larger samples up to 2,000 kg. Our testing uses state-of-the-art iron ore beneficiation equipment for crushing, grinding, classification, gravity and electrostatic separation as well as high and low intensity magnetic separation for wet and dry applications.

Our laboratory has the capability to create multi-stage pilot scale circuits to treat bulk samples (80-100 tonnes) for process testing and circuit optimisation. From our testwork we deliver concept, prefeasibility and feasibility studies as well as cost effective flowsheets to safely and efficiently extract the ore while delivering high availability, low capital and low operational expenditure.

Where the ore is different and challenging, we bring innovative capabilities to design new and unique solutions that augment and lift the potential of conventional flowsheets to extract the ore.

### Plant Design

**Extending beyond traditional spiral plants our designs incorporate gravity, magnetic and electrostatic beneficiation equipment with capacities ranging from 5 t/h to 7,000 t/h. Plants include integrated feed preparation, stockpile management and bulk materials handling systems which we also deliver to DSO operations.**

### Project Delivery

Our project delivery includes fully integrated Engineering, Procurement and Construction Management (EPCM) solutions from concept through to operations and ongoing asset management.

Mineral Technologies provides the EPCM services while Downer's Engineering, Construction and Maintenance division delivers construction services.

As one of Australia's largest providers of engineering services for critical infrastructure projects we deliver civil, structural, mechanical, electrical, instrumentation and technical capabilities.

### Operate and Maintain

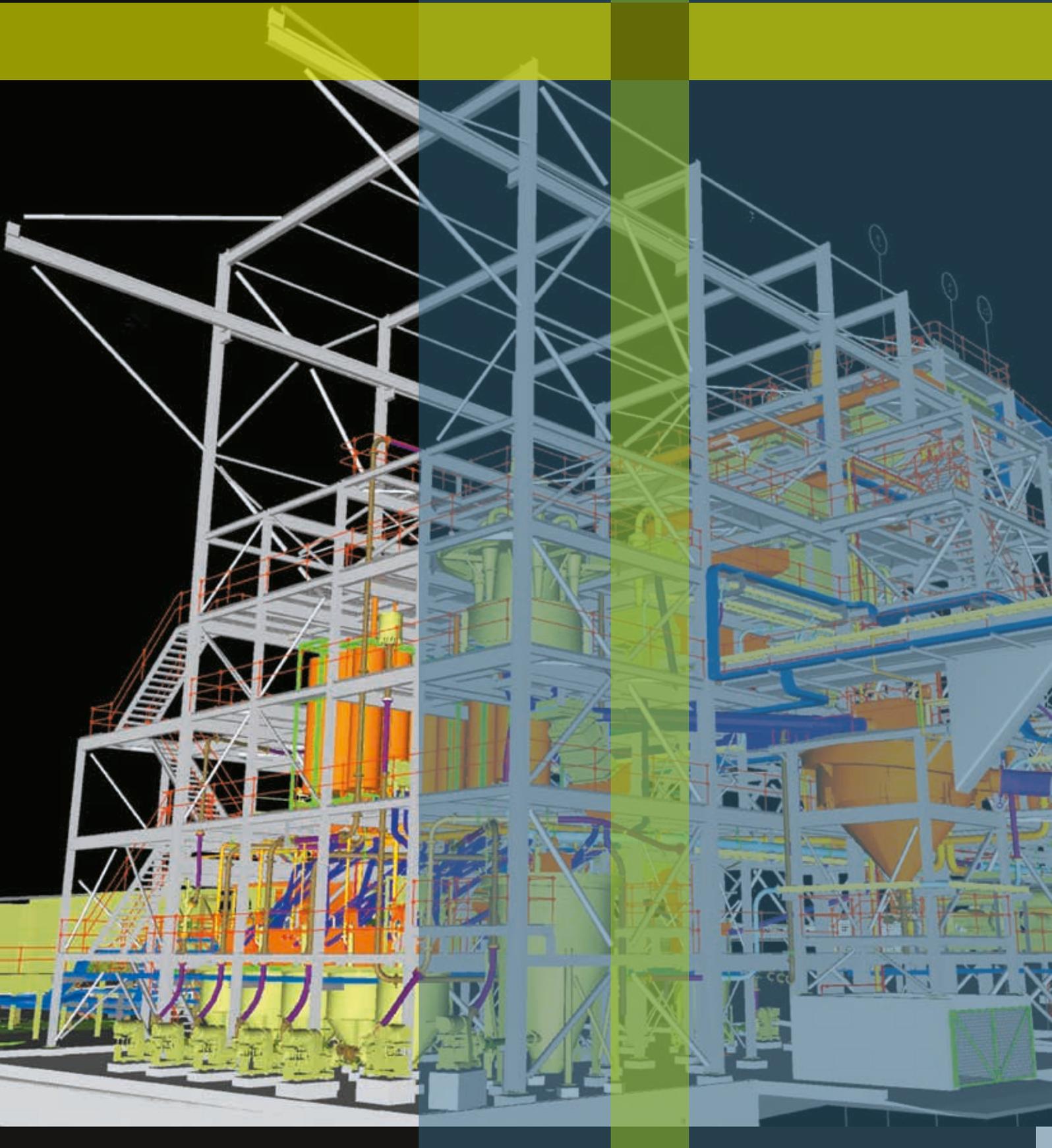
We deliver services for maintenance shutdown and sustaining capital projects. Our teams are experienced in the maintenance of industrial assets with specialists located in the iron ore belts of Western and Southern Australia.

### Improve productivity

Post operational handover we maintain a focus on project and plant support with the objective of continually improving plant operating efficiencies.

Through our ongoing research we develop new processes and plant optimisation solutions. A good example being our work with Arrrium to beneficiate tailings at the Iron Duke and Iron Baron beneficiation plants in South Australia.





## Industry leading technology



Customers value our ongoing commitment to researching and developing new, innovative equipment designs that extract maximum value from fine minerals.

### Equipment Development and Selection

When purchasing new equipment, we understand that customers need to ensure the equipment maximises grades and recovery while delivering low operational costs and fits within tight capex budgets.

For this reason our equipment is designed and manufactured using the latest technologies and is fully tested in processing operations to ensure optimal performance. This means that when we release new process equipment you can be assured that it will be fit-for-purpose and cost effective.



**We recently developed the HC33 spiral for use in ArcelorMittal's iron ore projects in Canada, Brazil and Africa. These operations utilise our HC33 and WW6 spirals in multi-stage circuits with the HC33 spirals installed in a rougher duty and the WW6 spirals in cleaner and recleaner duties.**

The latest range of equipment designed for the optimisation of iron ore beneficiation includes:

- HC33 – High Capacity Spiral Separator;
- WW6 Spiral Separator Series;
- FM1 (Fine Mineral) Spiral Separator;
- HG11 Wash Waterless Spiral Separator;
- Reading Wet High Intensity Magnetic Separator (WHIMS) and Medium Intensity Magnetic Separator (MIMS); and
- Carrara High Tension Roll (HTR) Separator.

Customers using our WHIMS equipment value the reliability and separation efficiency. For electrostatic separation, the recently released HTR400 incorporates unique composite electrodes that deliver high throughput and low operating costs.

### Benefits of Mineral Technologies Equipment

- high mineral recoveries over a wide particle size range;
- highly selective operation improving product grade;
- compact and low weight construction reduces installation costs;

- low equipment maintenance requirements for greater plant availability;
- spiral equipment is operator friendly, no need for skilled labour;
- no reagents are used in the circuits; this delivers environmentally friendly processes reducing operating costs and lowering potential for environmental incidents;
- robust and proven designs incorporating innovation when applicable; and
- energy efficient magnetic elements for reduced OPEX.

### Completed Projects

- Mont Wright, ArcelorMittal, Canada;
- Bloom Lake, Cliffs Resources, Canada;
- Mount Tokadeh, ArcelorMittal, Liberia;
- Iron Duke and Iron Baron, Arrium, Australia;
- Bhushan Power and Steel, India;
- Roy Hill Iron Ore, Australia; and
- Christmas Creek, FMG, Australia.



## Relationships creating success



**Our experience in delivering equipment and services to iron ore customers ensures that we understand what's important to their success.**

We work hard to create and sustain valued relationships that enable our teams to fully understand, predict and deliver solutions that turn possibilities into reality for our customers.

### **ArcelorMittal, Canada**

Engaged by ArcelorMittal, the world's leading steel and mining company, we designed and delivered new equipment to replace the 30-year old GEC spiral assemblies at the Mont Wright iron ore mine in Canada.

**In 2011, we delivered 5,760 spiral starts and in 2014 we delivered an additional 2,688 iron ore spiral starts to the mine. These represented the largest delivery of iron ore spirals to any one mine site.**

To meet Mont Wright's specific beneficiation requirements, we embarked on an extensive research program which identified engineering innovations to our HC33 and WW6E spirals, as well as new manufacturing and assembly processes at our production facility in Australia which ensured delivery of the large volume of spirals in tight timeframes.

One of the key engineering innovations was the development of rubber alternatives to standard polyurethane (P.U.) parts to meet ArcelorMittal's objectives of extended spiral longevity and durability.

With one of the most aggressive wearing ores in the world, the wear rate sat heavy on customer management minds. Mineral Technologies stepped up, delivering rubber alternatives to P.U. and taking a commercial extended warranty to back our confidence in the product delivered.

### **Arrium, Australia**

Reflecting the emerging trend to beneficiate low-grade tailings stockpiles to produce high-grade ore, we introduced the latest technologies and clever design to deliver cost-effective beneficiation process plants for the Iron Baron and Iron Duke projects in South Australia.

The challenge for these projects was managing the high variability of the low-grade tailings stockpiles. Our know-how and experience in metallurgical testwork helped us to uncover a number of beneficiation options including process designs which achieved cost-effective solutions using the latest HC33 gravity separation spiral technology, coupled with coarse and fine jig technology.

Arrium engaged our expertise for the Iron Baron project from concept through design and execution.

Awarded the Engineering, Procurement and Construction (EPC) contract in 2010, Mineral Technologies worked with Downer to deliver the construction phase. Based on our extensive testwork, the total solution also included a process guarantee which significantly reduced project risk for Arrium.

The project was delivered as an open book Target Cost Estimate (TCE) contract giving transparent value and confidence to Arrium. The plant passed performance testing 46 days from first ore.

**The Iron Baron plant beneficiates highly variable low-grade ore from a nominal 50% Fe to an Fe content of 64%. At full feed capacity the plant is capable of 2.2 mtpa feed capacity.**

Due to the success of the Iron Baron project, we were engaged to deliver a complete solution including testwork, design, delivery and commissioning for the new Iron Duke spiral processing plant which was successfully delivered in 2013.

This spiral upgrade delivered 15% more iron recovery with an on-site modular build of two weeks and 48-hour tie-in; delivering more profit with minimal interference.





## Health and safety



**Zero Harm is embedded in our culture and is fundamental to our future success. We are committed to achieving our goal of Zero Harm.**

Zero Harm means sustaining a work environment that supports the health and safety of our people and minimises the impact our business has on the environment.

We work to eliminate all injuries by identifying and controlling hazards, protecting our people from exposure to health and safety risks, and supporting their general health and wellbeing.

**We recognise that working on critical infrastructure is like no other project. This is why our passionate safety culture, refined project management processes and collaborative approach help us deliver services while maintaining the primary focus of Zero Harm.**

We are continuously improving our management systems, and remain focused on managing risks with the potential to cause serious harm. We learn from our experiences, and develop our frontline employees with the commitment and capability to manage Zero Harm.

- **Leadership:** We listen, set clear expectations, develop and involve our people, and act with integrity;
- **Culture:** We have an aligned set of values throughout our organisation;

- **Systems:** Our approach is simple, robust and consistent across our businesses;
- **Hazards:** Our hazards are identified, assessed, controlled and monitored; and
- **Actions:** We learn from our experiences, and do what we say we will do, translating Zero Harm theory into good work practices.

We have placed a strong governance charter on Zero Harm to ensure the strategy and performance is developed, monitored and refined.

Our Executive Management Team ensures that we have the mandate, systems and processes in place to assist our people to deliver a Zero Harm environment.



## Our Promise

To work closely with  
using world leading



h customers to help them succeed,  
insights and solutions.

**Diversity and inclusion**

**We are committed to ensuring that we have a diverse and inclusive workforce which fulfils our employees', customers' and shareholders' expectations, while also building a sustainable future for our business.**

**2017 - 2020 Action Plan**

To advance our diversity and inclusion efforts, the Engineering, Construction and Maintenance (EC&M) division has an established Diversity Taskforce which is responsible for implementation of the division's Diversity and Inclusion Plan 2017-2020.

The objectives for our Plan are focused on the following three key areas:

- Youth;
- Aboriginal and Torres Strait Islander (ATSI) workforce development; and
- Gender Equity.





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