Rio Tinto

Mine of the Future™

Next-generation mining: People and technology working together
It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change.

Every new Mine of the Future™ technology begins with the question: ‘What new idea can we bring to mining to make it safer, more productive, or more sustainable?’

Charles Darwin
The Mine of the Future™ programme is creating next-generation systems and technologies to drive Rio Tinto to become a global leader in fully integrated, automated mining.

It aims to:
– improve employee safety;
– increase productivity;
– lower energy consumption; and
– reduce environmental impact.

This will give us a sustainable competitive advantage and enable us to deliver greater value.

Innovation is the key to solving the increasing challenges posed by geology, legislation, economics and the need to keep our employees safe. We use it to identify, develop and implement smart step-change technologies that significantly improve how we work.

Mine of the Future™ is also mastering the delicate relationship between human and machine. The energy and ideas of our talented people unlock new possibilities, and we nurture and reward innovative thinking.

Mine of the Future™ has two main goals:

**Surface**: achieving massive productivity gains in large-scale surface mining

**Recovery**: extracting more ore from complex orebodies.
Rio Tinto is creating a pipeline of groundbreaking technological innovations through alliances with partners in business, industry, science and academia. These partnerships give us access to world-class teams with multi-disciplinary skills not commonly applied in mining.

We have used these partnerships to establish six Research Centres and an Innovation Centre that speeds up the time it takes to deploy proven technologies to our operations around the world.

Networking: Building global partnerships

Strong global research and development collaboration supports in-house innovation, creating technologies that significantly improve our operations.
Intellectual property: Protecting our ideas, technologies and systems

Intellectual property fosters innovation and is vital to ensuring our employees’ brilliant ideas are credited, nurtured, valued and protected.

The benefits of innovation rely on owning and controlling our ideas, technologies and systems. A specialist team protects intellectual property within Mine of the Future™ by developing specific protection strategies for every project, so Rio Tinto can continue to gain long-term value from innovation.
People:
Technology is nothing without the people who develop, test and operate it

Mine of the Future™ values its people highly, and focuses on mastering the relationship between human and machine.

To stay ahead in the highly competitive world of mining, we must innovate and automate. This requires a long-term investment in technology and a talented and well-trained workforce to develop, operate, maintain and manage our operations.

Technological developments will mean some jobs are replaced but other new jobs will be created. Skilled people will always be needed to oversee autonomous systems and changing technology provides our employees the chance to develop and use skills in innovative work environments.

400
EMPLOYEES AT OUR OPERATIONS CENTRE IN PERTH
Our innovation journey

Mine of the Future™ was launched in 2008, embarking on a journey of technological discovery and achievement.

- **2008**: Atlas Copco alliance
- **2009/10**: Automated truck Pilbara “A” pit trial
- **2010**: Automated train trial
- **2010**: Drillers’ aid trial
- **2010**: Autonomous Drilling System trial
- **2011**: Operations Centre commissioned
- **2011**: Komatsu MOU for 150 autonomous trucks
- **2012**: Automated truck deployment
- **2012**: Cab-less drill
- **2012**: Automated truck deployment
- **2012**: Announcement of autonomous train deployment
- **2014**: Deployment of the Autonomous Drilling System
- **2014**: Launch of the Processing Excellence Centre in Brisbane
Productivity: Safer, more efficient mines increase productivity

Never before has maximising productivity been so crucial. Fewer Tier 1 deposits are being found, demand for resources is higher than ever, and we face skills shortages, energy constraints, complex geographical challenges and increased environmental requirements.

Autonomous Haulage System
Safer trucks, less fuel, operators out of harm’s way
Our iron ore operations in the Pilbara, Western Australia manage the world’s largest fleet of autonomous trucks. These driverless vehicles deliver their loads more efficiently, minimising delays and fuel use, and are controlled remotely by operators who exert more control over their environment and ensure greater operational safety.

Autonomous Drilling System
More effective drilling, better operator safety
Rio Tinto’s automated blast-hole drill system enables an operator using a single console at a location remote from the machinery to operate multiple drill rigs from multiple manufacturers. It is much safer for the operators and it maximises precision and equipment utilisation.
PeakFloat™
Process improvement, increased mineral recovery
PeakFloat™ increases the extraction of minerals by optimising operating conditions during the widely-used flotation process. Previously, large amounts of minerals have been lost because conditions in the flotation tank could not be controlled to maximise the success of the process. The PeakFloat™ high-performance computer system can optimise float conditions to deliver maximum mineral recovery.

AutoHaul™
Increased train capacity, less cost
AutoHaul™ is the world’s first fully autonomous, heavy-haulage, long-distance rail system. It allows our iron ore operations to increase the additional haulage capacity needed during periods of rapid expansion, without having to buy or lease more trains.

3.9 MILLION KILOMETRES COVERED BY OUR AUTONOMOUS TRUCKS SINCE DEPLOYMENT IN 2012
Big data: Enhancing operational performance by analysing and visualising data

We are developing new ways to maximise the value of the vast amounts of data that our operations produce so we can improve the way we predict the economic viability of a resource, improve ground monitoring, optimise fleet management and improve the safety of ship loading.

Mine Automation System

Integrating data, centralising mine operations

The Mine Automation System acts like a computer’s central processing unit, integrating all automated elements of a mine and optimising efficient and effective operation. It produces real-time models based on data from key elements such as equipment, geology, and control and planning algorithms used to coordinate vehicle fleets.

RTVis™

Clearer data models, better decisions, safer conditions

RTVis™ software interprets complex datasets and creates a user-friendly 3D display of a mine that is easily and quickly understood by pit controllers, geologists, drill-and-blast teams, mine planners and supervisors. It allows them to make informed decisions while working remotely from the machines.
Excellence Centres
Data access, expert clusters, enhanced productivity
Excellence Centres unite our experts with those from partner organisations, and give them access to real-time data from operations around the world so they do not have to be on site. These centres allow teams to make better decisions, enhance productivity, and reduce costs. They also improve the safety and wellbeing of our employees by reducing the need to travel to mine sites to share expertise and excellence.

Rio Tinto Operations Centre
Integrated operations, increased efficiency, better risk management
Rio Tinto’s Operations Centre in Perth, Australia, is “Mission Control” for the entire Pilbara iron ore network located 1,300km to the north. From this one site, more than 400 operators analyse data and synchronise an integrated system in real time, managing 15 mines, 31 pits, four port terminals and a 1,600km connecting rail network. This increases efficiency, improves reliability, decreases variability and allows the business to better identify and improve performance across the supply chain.

5 MILLION
MEGABYTES STORED ON ALL BUSINESS SYSTEMS
About Rio Tinto

Rio Tinto is a leading global mining and metals company. Our focus is on finding, mining and processing the Earth’s mineral resources in order to maximise value for our shareholders. We have the people, capabilities and resources to supply a world hungry for the metals and minerals that are used in everyday life.

Our 66,000 people work in more than 40 countries across six continents, including in some of the most difficult terrains and climates. We are strongly represented in Australia and North America and also have significant businesses in Asia, Europe, Africa and South America.

With headquarters in the United Kingdom, our Group comprises Rio Tinto plc – a London and New York Stock Exchange listed company – and Rio Tinto Limited, which is listed on the Australian Securities Exchange. This global presence, and our expertise in technology and marketing, enables us to supply the right product, at the right quality, at the right time.

Our major products are aluminium, copper, diamonds, gold, industrial minerals (borates, titanium dioxide and salt), iron ore, thermal and metallurgical coal and uranium. From our diverse portfolio, we supply the metals and minerals that help the world to grow.