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CASE STUDY · MARLUC SYNOPSIS

Rio Tinto Pilbara autonomous trucks and trains

IMPLEMENTED 2008–2026 · MINING AND RESOURCES · AUSTRALIA · BAND B · PARTLY PROVED

VERSION 1.1 · PUBLISHED 15 NOVEMBER 2026 · UPDATED 25 NOVEMBER 2026 · FACTS CHECKED 15 NOVEMBER 2026

Rio Tinto began trialling autonomous haul trucks in 2008 and made its Pilbara iron ore rail network fully autonomous in 2019, with trains monitored from a Perth operations centre. By late 2024 Komatsu reported 300 autonomous trucks at 10 Rio Tinto sites. Productivity figures come from the vendor, and a May 2024 train collision is described differently by Rio Tinto and the rail union.

ABOUT THIS SYNOPSIS

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Facts and figures are as reported by the sources listed below, which may be incomplete, self-reported or out of date. Check the original source before relying on any figure.

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NOTICE WORDING LAST UPDATED 16 NOVEMBER 2026

AT A GLANCE

Frontier case: AI used for a scientific, medical or engineering breakthrough. MarLuc grades what has changed in practice so far.

AI and automation used: Autonomous haulage: perception, route planning and control software with central dispatch and remote supervision (Komatsu autonomous haulage system trucks and Rio Tinto's AutoHaul trains). Mostly rule-based autonomy, with little modern machine learning described in the sources.

Implemented: 2008–2026. Grade: band B, Operating model redesign, Partly proved.

Headline result, as reported: About 300 autonomous Komatsu trucks at 10 Rio Tinto sites and a fully autonomous Pilbara rail network, by the companies' accounts; a May 2024 train collision is disputed between Rio Tinto and a union

1 · The case

The facts, as reported by the 5 sources listed at the end. Where a source is silent, the field says "Not reported".

Organisation

Rio Tinto. Global metals and mining group that describes itself as operating in 35 countries with more than 60,000 employees. The autonomy programme covers its Western Australian iron ore operations in the Pilbara. Canvas block: 4. Operations and process. Also 5. People and skills, 6. Data and technology.

Business challenge

The challenge. By Rio Tinto's account, shift changes stop trains about three times on a typical journey, adding more than an hour, and moving drivers to and from trains is a high-risk activity. Komatsu cites mine safety and labour shortages as drivers for autonomous trucks.

How it was addressed. Rio Tinto trialled Komatsu autonomous trucks from 2008, took delivery of the first five in 2011, and reached 300 across 10 sites by 2024, by Komatsu's account. It ran the first autonomous train delivery in July 2018 and declared AutoHaul fully operational in June 2019. Trains are monitored from the Operations Centre in Perth, about 1,500 kilometres from the Pilbara. [1] [2] [3] [4] [5]

Who implemented it

Komatsu (Equipment or robot maker): Supplies the autonomous haulage system trucks, a partnership dating from a 2008 trial and a 2011 agreement.
In-house (In-house): Developed and operates the AutoHaul rail system and runs the Perth Operations Centre, per Rio Tinto and the union.
The union says AutoHaul was developed by Rio Tinto and is being licensed to other operators.

Technology (SEAM pillar E)

SEAM types: T9 AI in physical systems. Deployment: Mixture. Vendors and products: Komatsu, Komatsu autonomous haulage system (AHS) trucks, AutoHaul autonomous rail system.

Where it was built in: Autonomous trucks are supervised by a central system rather than a driver; AutoHaul trains are routed by a train controller at the Perth Operations Centre, with on-board and central computers taking over once a train is running, by Rio Tinto's account.

What changed

Before: drivers operated haul trucks and trains, and trains stopped for crew changes. After: autonomous trucks do around 80 per cent of daily production haulage by Komatsu's account, and autonomous trains run the Pilbara rail network under controllers in Perth. The remaining human roles include controllers, maintainers and recovery crews. [1] [2] [3] [4] [5]

What it cost

Not reported

What it saved

By Komatsu's account: effective utilisation improved by 15 per cent across the Rio Tinto fleet. By Rio Tinto's account: avoids stops of more than an hour per train journey. Rio Tinto's own cost savings from the programme were not found in the sources opened. [1] [2] [3] [4] [5]

Governance and control

Rio Tinto says controllers set train routes and automatic systems stop trains for faults. After the May 2024 collision the rail regulator commented and the union says Rio Tinto suspended the 'On-Site' override. The regulator's findings were not found.

S2 · Accountable owner · Claimed
Rio Tinto's Managing Director of Rail, Ports and Core Services issued the company statement after the May 2024 collision, per the union; Rio Tinto's Global Head of Procurement commented on the Komatsu partnership. A named owner for autonomy overall is not reported. [2] [4]

A1 · Safe use · Claimed
Rio Tinto says autonomous trains remove the need to transport drivers 1.5 million kilometres a year; Komatsu says autonomous trucks remove operators from hazardous environments. Both are company and vendor accounts. [1] [2]

A2 · Human in the loop · Claimed
A train controller in Perth sets each autonomous train's route, by Rio Tinto's account. The union says controllers must have an override checked by a supervisor and describes limits on controller visibility under AutoHaul. [1] [4]

A3 · Monitoring and assurance · Evidenced
Australia's rail safety regulator commented on the May 2024 collision, per MINING.COM, and the union says Rio Tinto suspended the 'On-Site' override afterwards. No regulator report or findings were found in the sources opened. [3] [4]

A4 · Vendor AI · Claimed
Komatsu supplies the autonomous trucks under a partnership that began with a 2011 agreement to deploy 150 trucks; Rio Tinto's own assurance of the vendor is not reported. [2]

A5 · Agent controls · Claimed
Rio Tinto says AutoHaul trains stop automatically for wheel faults, broken couplers and obstructions at level crossings. The union says a second autonomous train ran into a disabled train in May 2024. [1] [4]

A6 · Standards and regulation · Not reported
Standards and regulation applied to the autonomous fleet are not described in the sources opened, other than notification of rail regulators after incidents.

What worked, what did not, what is unproven

WORKED

– Autonomous haulage has been in use for about 15 years and has grown from five trucks in 2011 to 300 in 2024, by Komatsu's account.

– Rio Tinto made the Pilbara rail network fully autonomous in June 2019, by its own account, after a first delivery in July 2018.

– The rail union says its members have worked with autonomous trains since 2018 and have accepted automation.

DID NOT

– In May 2024 a fully loaded autonomous train collided with wagons near Karratha; Rio Tinto reported no injuries, and the cause has not been published in the sources opened.

– Rio Tinto reported an autonomous train derailment in February 2024 and a similar one in June 2023, per MINING.COM; causes are not reported.

UNPROVEN

– Whether productivity and cost fell as the vendor and company describe: the 15 per cent figure is Komatsu's, and Rio Tinto's own figures were not found.

– The cause of the May 2024 collision and any regulator finding: Not reported.

– Whether this approach changes how the mining industry operates beyond the companies that adopted it. That is potential and not shown by the sources opened.

Timeline

2008 Rio Tinto begins a trial of Komatsu autonomous haulage, by Komatsu's account [2]

2011 Komatsu delivers the first five autonomous trucks to Rio Tinto mine sites in Australia, under an agreement to deploy 150 [2]

Jul 2018 First iron ore delivery by an autonomous train, Tom Price to Cape Lambert, monitored from Perth [1]

Jun 2019 AutoHaul declared fully operational across the Pilbara rail network [1]

2024 Komatsu delivers its 300th autonomous truck to Rio Tinto; Komatsu says 300 trucks work across 10 sites [2]

May 2024 A fully loaded autonomous train collides with wagons near Karratha; no injuries reported; Rio Tinto and the union give different accounts [3]

May 2026 Trade press reports Rio Tinto operates a truck fleet it describes as more than 90% autonomous; labour effects debated [5]

2 · Grade and SEAM assessment

MarLuc's opinion, made on the evidence above. How cases are graded: marluc.co.uk/case-studies/how-we-rate

Level of change and impact

Claimed: Not applicable. Grade: B, Operating model redesign. Proof: Partly proved. Level of change: Operating model.

Operating model (Level 3, band B). Haulage, rail and control rooms were rebuilt around autonomy and held for years. The benefit is not independently measured, so the grade rests on scale and duration. Band A might be argued from industry spread; the sources opened do not show that.

Band B, Level 3. Over about 15 years Rio Tinto moved haulage in the Pilbara from driver-operated vehicles to autonomous trucks (around 80 per cent of daily production capacity by Komatsu's account) and to an autonomous rail network run from Perth. Jobs and control rooms changed with it: the union says its rail members have worked alongside autonomous trains since 2018. That is a changed operating model, corroborated by several parties. The cost and capacity benefit is not independently measured in the sources opened, so the marker is Partly proved and not Proved.

The SEAM view and lessons learnt

This is among the longest-running large autonomy deployments in a heavy industry. The evidence for scale is consistent across the vendor, the company, the union and the press. The evidence for cost, productivity and jobs is thin and mostly from the parties that sell or run the system. A mid-sized or larger operator should read it as a case in which safety critical autonomy can run for years, and in which incident handling, override rules and worker trust need design as much as the vehicles do.

1. Publish productivity and workforce results with a baseline.
2. Design override and recovery procedures for autonomous and manned vehicles together.
3. Share incident findings with the workforce and the regulator.

Evidence

Score 2 of 4. Corroborated scale, unverified benefit: several parties describe the deployment, but productivity figures come from the vendor and no independent measurement was found.

Evaluation method. Company web story, a vendor statement relayed by trade press, news reporting and a union statement; no independent evaluation, and no regulator finding on the 2024 collision.

Sources disagree. Fleet share: Komatsu's statement puts 300 autonomous trucks at around 80 per cent of daily production capacity, while Mining Technology says Rio Tinto operates a truck fleet that is more than 90% autonomous. May 2024 collision: Rio Tinto's spokesperson described a set of stationary wagons, the rail regulator said a recovery train reportedly crashed into the driverless train it was sent to retrieve, and the union says a second autonomous train ran into 222 loaded cars.

Status. Ongoing: autonomous trucks and trains continue to operate in the Pilbara; trade press in May 2026 describes the truck fleet as more than 90% autonomous.

3 · Original sources

Read these in full. To challenge a fact or a grade, use the contact form at marluc.co.uk or the link on https://marluc.co.uk/case-studies/rio-tinto-pilbara-autonomous-haulage

[1] Rio Tinto: How did one of the world's largest robots end up here?
https://www.riotinto.com/news/stories/how-did-worlds-biggest-robot

[2] AlCircle: Rio Tinto welcomes 300th Komatsu autonomous haulage truck at Pilbara operations, WA
https://www.alcircle.com/news/rio-tinto-welcomes-300th-komatsu-autonomous-haulage-truck-at-pilbara-operations-wa-111740

[3] MINING.COM: Fully-loaded Rio Tinto's autonomous train crashes in Australia
https://mining.com/fully-loaded-rio-tintos-autonomous-train-crashes-in-australia

[4] Mining and Energy Union: 'A catastrophic failure of safety systems'
https://meu.org.au/?p=9032

[5] Mining Technology (via Yahoo Finance): Automation and FIFO: changing roles in Australia's remote mines
https://finance.yahoo.com/sectors/energy/articles/automation-fifo-changing-roles-australia-090000545.html

https://www.riotinto.com

Version 1.1 · Published 15 November 2026 · Updated 25 November 2026 · Facts checked against sources 15 November 2026 · Downloaded 26 November 2026. This PDF may be out of date: the latest version, and a way to report an error or a better source, is at https://marluc.co.uk/case-studies/rio-tinto-pilbara-autonomous-haulage

VERSION HISTORY

v1.1 25 November 2026 Method update: technology type updated to T9 (AI in physical systems) and controls re-checked against sources; structural controls recorded for the trains only.
v1.0 15 November 2026 First published