



Success Story | Chile Repowering with Tier 4 engines

Configuration for repowering

2.682 HP (2000 kW)



mtu Series 16V 4000 C45 engine



24,000 accumulated hours
time between overhaul



More than 720,000 accumulated
hours time between overhaul!

The emission savings in numbers

CO₂

-9.960t

Particulate Matter
(PM)

-91t

Nitrogen Oxide
(NO_x)

-3.000t

CLEANER OPERATIONS WITHOUT COMPROMISING PERFORMANCE

Anglo American uses **mtu** engines as a more sustainable option for Chilean mining

Executive summary

On land, air, and water, industries are striving for sustainable solutions that will make their operations ready for the future. The mining industry is no exception. A South American mine, Anglo American's Los Bronces operation in Chile, now relies on **mtu** engines: even without exhaust gas aftertreatment, these engines comply with EPA Tier 4 regulations, they consume less fuel than T2 engines and still deliver the same power as previous engines. Another success in the chapter of cleaner engines.

What:

Repowering a mining haul truck fleet with cleaner engines

Where:

Los Bronces mine, central Chile, near the Santiago Metropolitan Region

Why:

To achieve its own emissions guidelines and those of the nearby metropolitan region without compromising performance

Main benefits:

- Cleaner operations through reduced emissions
- SCR system not needed inside the truck
- Long operating time, backed by proven reliability



A Rolls-Royce
solution

ACHIEVE TARGETS TOWARDS NET ZERO EMISSIONS

For the operation of the Los Bronces mine in Chile, Anglo American was looking for an engine that not only meet local emissions requirements but could also meet its own sustainability goals without sacrificing performance.

Initial Situation

Anglo American, the mining operator for Los Bronces, operates the mine in the center of Chile, close to the densely populated metropolitan area of the capital Santiago. With a fleet of 30 mining haul trucks powered by *mtu*, copper is extracted from the ore-rich earth in the open pit mine around the clock. Both the city region, with well over 5 million inhabitants, mandates emission guidelines for mine operations, as does Anglo American itself. The company, with ore and coal mines around the world, has its own plans to make operations increasingly sustainable in the long term.

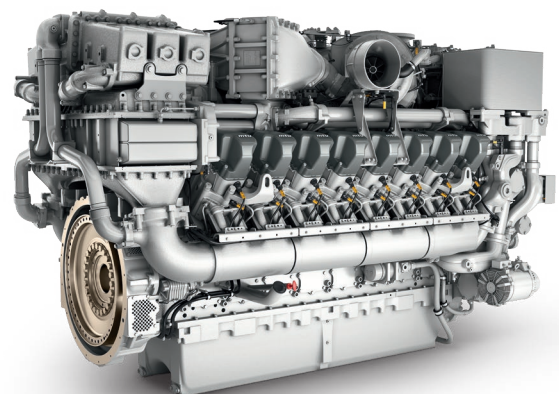
These goals are not only due to government guidelines, but also the company's own desire to actively combat climate change. For the fleet at the Chilean mine, the company was therefore looking at engines to repower that would meet the emissions targets without compromising performance. Together with Detroit Chile S.A., the company found what it was looking for in the *mtu* Series 16V 4000 C05, which, in addition to significant emission savings, also offered other benefits for operations in the South American mine.



Solution

A strategic repowering project for Los Bronces was launched between Anglo American, Detroit Chile S.A. and Rolls-Royce Solutions. Since the project began in January 2018, 30 trucks in the fleet, all Komatsu 930Es, have been equipped with *mtu* engines. An operating time of around 24,000 hours was calculated for each engine. Until today this fleet has surpassed an impressive 720.000 operating cumulate hours.

Another and undoubtedly the biggest benefit of this repower project is the cleaner operation of these engines, or the tremendous reduction of emissions. To comply with local emissions regulations, the previous engines required to add a selective catalytic reduction (SCR) system to meet Tier 4 emissions. This includes additional maintenance and extra failure points that impact truck operation, the use of Diesel Exhaust Fluid (DEF) and the potential for the catalyst to become contaminated at any time through regular operation of the truck, requiring replacement of the catalyst. Since the *mtu* engine meets Tier 4 emissions without the SCR system, this results in fewer downtime, less maintenance, and lower operating costs.



mtu Series 16V 4000 C45 engine
2.682 HP (2000 kW)



A STRONG SIGN FOR THE REGION AND OTHER MINES IN SOUTH AMERICA AND THE WORLD.

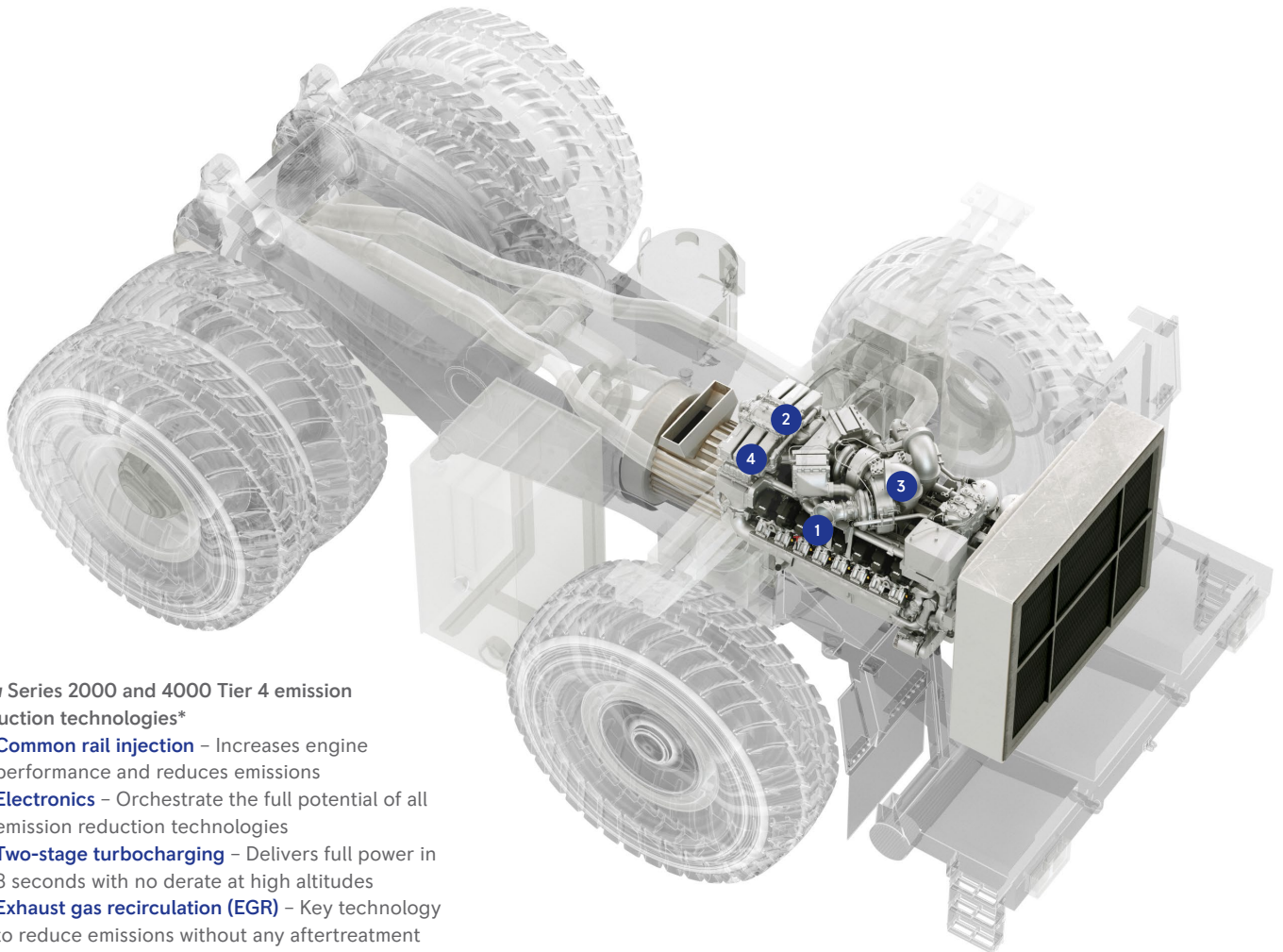
With the **mtu** Series 16V 4000 C05 engines, Anglo American is cutting CO₂, particulate matter and nitrogen oxide emissions, demonstrating that the mining industry can and must become more sustainable in the future.

The results on site convinced all parties involved of the following: emissions have been reduced considerably. Since the start of the repower project in January 2018, around 9960 tons of CO₂, 91 tons of particle matter and over 3000 tons of nitrogen oxide (NO_x) have been eliminated. As a result, the mining haul trucks meet local emission targets and bring Anglo American's operations at the Los Bronces mine closer to the goal of net zero. They also stay below EPA Tier 4 emissions targets.

An important factor in the decision for our solutions was the holistic approach: together with Detroit Chile S.A., we were able to provide engines, repower kits and ongoing comprehensive service that gets the most out of the **mtu** engine. The first of the trucks recently achieved over 24,000 hours of operating time, in mid-2023, and is still operating as expected. This proves the project is a strong, sustainable milestone not only for Anglo American, but also for other mining companies. The future has already begun and together, we are providing a cleaner future for the world.

HAUL TRUCK ENGINE SOLUTIONS

Discover the advantages of **mtu** Series 2000 and 4000 haul truck engines. Through their increased performance and productivity, they enable the potential for substantially lower CAPEX, OPEX, fuel consumption and emissions.



mtu Series 2000 and 4000 Tier 4 emission reduction technologies*

1. **Common rail injection** – Increases engine performance and reduces emissions
2. **Electronics** – Orchestrate the full potential of all emission reduction technologies
3. **Two-stage turbocharging** – Delivers full power in 8 seconds with no derate at high altitudes
4. **Exhaust gas recirculation (EGR)** – Key technology to reduce emissions without any aftertreatment

The above-mentioned exhaust technologies in combination with a Miller combustion cycle and a very robust block that can withstand peak pressure ensure best performance without the need for exhaust aftertreatment, even at Tier 4.

* The image shows an **mtu** Series 4000 engine.

Start saving with advanced **mtu** mining engines

Interested in learning more?

Contact us today at

info@ps.rolls-royce.com

Or call +49 7541 90-7 7777

Your benefits:

- Full haul truck performance at high altitudes
- Increased productivity
- Reduced fuel consumption and carbon emissions
- Lower operating costs

Rolls-Royce Group

www.mtu-solutions.com