

Chrome Dinner Awards Nomination

Category: Outstanding Safety Performance

Nominee: Tharisa Minerals Level 9 Collision Avoidance Implementation

Open-Pit First

Executive Summary

Tharisa Minerals (Tharisa) is proudly nominated for the Chrome Dinner Award for Outstanding Safety Performance for its open-pit Level 9 Collision Avoidance implementation. This landmark safety initiative transformed a regulatory requirement into a connected, human-centric platform for zero harm, operational discipline, productivity and people development. Tharisa was the first Opencast mine in South Africa to stop a rigid dump truck (RDT) using a Level 9 system compliant with ISO 21815-2, and the first mine to achieve Level 9 full compliance on high-risk machines.

Rooted in Tharisa's strategic pillars of optimised operations, innovative thinking and responsibly enriching lives, the initiative brings the company's values-led "Superheroes" culture to life through safety, care, empowerment, innovation, integrity and communication.

The initiative is framed by "Lighthouse Partnerships": purposeful collaborations with external technology partners that guide, warn and protect by focusing on the most difficult, high-consequence vehicle-interaction risks rather than settling for incremental safety improvements.

Together, the partnerships, digital infrastructure and intervention controls created a practical pathway from compliance to measurable safety and operational value.

By January 2025, Level 9 had been installed on 149 units, after testing and commissioning across trucks from CAT, Komatsu, Bell and Volvo. This scale of implementation has supported fewer fatigue events, a material reduction in trackless mobile machinery property damage and targeted operator coaching that addresses leading indicators of risk before they escalate.

What distinguishes this project is its progression from mandatory collision-avoidance compliance to a connected, data-rich safety and performance platform that protects people, strengthens operating discipline and unlocks productivity, training and optimisation value. It is a compelling nomination for the Chrome Dinner Award for Outstanding Safety Performance because it demonstrates how technology can advance zero harm, while improving how operators work in a high-risk open-pit environment.

Project Overview

The Level 9 Collision Avoidance journey was developed in response to high-risk interactions between trackless mobile machinery (TMM), people and vehicles in an open-pit mining environment. It aligns with Tharisa Minerals' strategic focus on optimised operations, innovative thinking and responsibly enriching lives, it demonstrates how technology partnerships can strengthen safety performance while creating operational and workforce value.

The programme was built on the Earth Moving Equipment Safety Round Table (EMESRT) nine-layer control model, grouped across design, operate and react controls. In practical terms, the journey shifted the site from exposure reduction, awareness and advisory controls towards true intervention controls, that can slow or stop machinery where collision risk is present.

The implementation followed a deliberate decade-long arc: foundational work from 2013 to 2021, regulation promulgated in December 2022, protocol development and integration testing through 2023, and implementation progressing into 2025. The project records 149 trucks tested and commissioned across CAT, Komatsu, Bell and Volvo fleets, installation completed on 133 units by January 2025, and machine-interface proof of concept work targeting 64 Tharisa and 45 partner trucks by December 2026.

Exceptional Safety Performance Results

The Level 9 implementation produced measurable safety and operational improvements that support the zero-harm objective:

- **First-mover Level 9 compliance:** Tharisa was the first mine in South Africa to stop a rigid dump truck (RDT) using a Level 9 system compliant with ISO 21815-2, and the first mine to achieve Level 9 full compliance on high-risk machines.
- **Level 9 fleet coverage:** 149 trucks tested and commissioned across CAT, Komatsu, Bell and Volvo; 133 units installed by January 2025; machine-interface proof of concept targeting 64 Tharisa and 45 partner trucks by December 2026.
- **Fatigue-related events:** 50% fewer fatigue events within six months of live violation reporting.
- **TMM property damage trend:** Reduction from 45 incidents in 2022 to 14 incidents in 2025, representing roughly a 70% reduction over four years, no serious injuries related to property damage incidents over past 36 months and damages cost down from ZAR32.5 million in 2023 to ZAR 740k YTD 2026
- **Payload and volumetric scanning value:** Load carry measurement improvement of more than 17%, equivalent to parking four trucks, with fragmentation analysis extending the same data upstream.
- **AI simulation results:** Projected 5–15% throughput improvement, 10–20% queueing reduction and 3–10% cycle-time decrease.
- **Targeted operator training:** Transmission abuse and brake application errors reduced from 23.33 to 2.78, an average improvement of 88%.

These results are significant because they demonstrate both lagging and leading indicator improvement. The reduction in TMM property damage shows progress in critical risk control, while fatigue-event reduction, live violation reporting and operator analytics demonstrate proactive risk identification before serious incidents occur.

Technology-Enabled Risk Control System

The Level 9 solution was not implemented as a stand-alone compliance tool. It became part of a connected-mine backbone supported by communication infrastructure, data capture, live analytics and risk-based decision-making. The project identifies the following enabling components:

- Lighthouse partnerships with external technology partners to guide, warn and protect by solving high-consequence safety and optimisation challenges.
- Machine learning enablers across fleet monitoring, fatigue detection, proximity detection systems / vehicle detection systems (PDS / VDS), condition monitoring, operator behaviour, incident reporting and maintenance systems.
- Discrete-event simulation and digital twins to test “what if” optimisation scenarios before operational changes are made.
- Fibre-in-motion network infrastructure to support open-pit connectivity.
- Level 9 pit geofences to define and monitor operational risk areas.
- Congestion heatmaps and road-segment speed analysis to understand exposure and traffic behaviour.
- Live violation reporting to identify and respond to unsafe conditions and behaviours.

This system design enabled the project to move beyond warning and awareness into an integrated safety intervention platform that provides practical information for supervisors, operators, trainers and operational leaders. It also converted a compliance platform into a productivity engine by linking vehicle-interaction controls with payload monitoring, volumetric scanning, dispatch simulation, face-shovel dig-rate studies and operator performance analytics.

Innovative Safety Initiatives and Workforce Engagement

The Level 9 programme strengthened the link between technology and people by using data to guide targeted coaching, operator development and leadership interventions. The presentation positions the journey as “Zero Harm to Human-Centric Value”, showing that the same systems used to reduce risk can also support skills development and productivity.

Operator performance analytics continuously analyse fleet management system (FMS), equipment health monitoring (EHM) and simulation data to identify risk, optimisation and career development opportunities from leading indicators. The system automatically identifies a prioritised list of operators for targeted training, recommends focused interventions, highlights top performers for progression or recognition, and assesses training effectiveness after training.

This approach is important because it shifts improvement away from generic retraining and towards focused interventions. Operators receive coaching where it is most needed, top performers can be identified for progression or recognition, and training resources can be directed to the highest-risk or highest-value opportunities.

The human-centric value is clear: improvement is achieved by preventing unnecessary training and downtime rather than applying blanket programmes. Shift analysis alone identified two- to five-minute improvements at each shift transition point, while targeted coaching on transmission abuse and brake application reduced errors from 23.33 to 2.78, an average improvement of 88%.

Measurable Improvements and Positive Outcomes

Building on the results above, the implementation delivered combined safety, productivity and people-development value in three key ways:

- Strengthened critical risk control by moving from advisory safety information to practical Level 9 intervention controls.
- Improved early-warning capability by giving supervisors and operational leaders better visibility of fatigue risk, live violations and congestion behaviour.
- Turned operational data into productivity insight by linking safety controls with payload monitoring, dispatch modelling, road-speed analysis and shift-performance review.
- Focused training resources on the highest-value interventions by using operator analytics to identify specific risks, coaching needs and post-training improvement.
- Reduced unnecessary downtime by replacing blanket retraining with evidence-led, targeted coaching and shift-transition improvement opportunities.
- Created a repeatable model for converting compliance-driven technology into a broader safety, productivity and people development platform.

The initiative therefore demonstrates that a safety compliance mandate can become a broader value platform, improving the way people work, learn and make decisions in a high-risk open-pit mining environment.

Strategic Alignment and Benchmark Value

The Level 9 implementation aligns directly with Tharisa Minerals’ values of safety, care, empowerment, innovation, integrity and communication. It also supports strategic pillars including safety, health and environment (SHE), technology and innovation, optimised existing operations and responsibly enriching lives.

As an open-pit first, the project provides a practical benchmark for how mining operations can implement advanced collision avoidance in a way that integrates regulation, original equipment manufacturer (OEM) testing, site-specific conditions, communications infrastructure, analytics and human-centric improvement. Its benchmark value lies in the deliberate progression from a Level 9 compliance journey to a connected, data-rich mining operation where the same infrastructure now supports productivity, optimisation and people development.

Conclusion

Tharisa Minerals' Level 9 Collision Avoidance implementation sets a national benchmark for open-pit safety innovation. By becoming the first mine in South Africa to stop rigid dump trucks using a Level 9 system compliant with ISO 21815-2, and the first to achieve Level 9 full compliance on high-risk machines, Tharisa has shown how a mandatory compliance requirement can be transformed into a connected, human-centric platform that protects people, strengthens operational discipline and advances zero harm. For its first-mover achievement, measurable safety outcomes and innovation-led approach, Tharisa is a compelling nomination for the Chrome Dinner Award for Outstanding Safety Performance.