

THOROUGHTEC™
simulation



CYBERMINE™
simulator system 

WHEEL LOADER SIMULATORS

“CYBERMINE simulator training makes our operators as efficient and versatile as the machines that they operate.”

Wheel loaders are called upon to perform a variety of tasks to maintain the efficiency of the surface mine's production cycle. CYBERMINE wheel loader simulators enable trainee operators to train for all of these tasks under every expected condition, quickly and effectively. Cutting-edge simulator technology and advanced training techniques are used to train, re-train and evaluate correct propulsion, loading, digging and dumping techniques, increasing productivity and safe operation of the wheel loader.

ThoroughTec's high-fidelity simulators are true to the original vehicle in every way, from the ergonomics of the cab with its authentic replication of the operator

interfaces to the highly accurate behavioural characteristics of the simulated equipment.

The CYBERMINE wheel loader operates in a high-fidelity 3D mine world where the operator can perform the same full range of wheel loader functions as the OEM machine, interacting with artificially intelligent haul trucks and other support equipment.

It's in this world that your operators will develop their diverse skills and experience, so that your mine site operates as safely and productively as possible.



> Physically accurate vehicle cab

The trainee wheel loader operator executes all digging, loading, cleanup and dumping tasks from a highly accurate replica of the cab interior. The seat is surrounded by fully functional controls including joysticks, levers, switches, keypads, gauges and pedals. The vehicle's function is also configurable to match the customer's OEM equipment for even greater accuracy, including all factory offered options.



A SIMULATED VEHICLE THAT LOOKS AND FEELS REAL

Operating a CYBERMINE wheel loader is like operating the real vehicle, but without the high costs and inherent risks.

Authenticity and accuracy

The simulated wheel loader cab makes use of original components and specifications to create an ergonomically correct and accurate replica of the original vehicle. All simulated vehicle behavioural dynamics, including those of vehicle articulation and the complicated interaction between boom and bucket, as well as bucket and terrain, are based on detailed mathematical models that use vehicle manufacturer specifications to provide accurate behavioural realism.

As a result, full propulsion, loading, mucking and cleanup tasks are an accurate reflection of reality.

Highly customisable

CYBERMINE wheel loader simulators can be customised to a large degree, matching procedures or operational features on the customer's own equipment. Additionally, any wheel loader model from any OEM manufacturer can be simulated, along with OEM optional features such as non-standard boom heights, bucket types, additional lighting or even vehicle management systems.



> **Advanced soil modelling**

Complementing the equipment simulation are ThoroughTec's advanced simulated soil interaction models which require the operator to exercise correct digging techniques in order to obtain efficient bucket fill factors.

> **Advanced vehicle behaviour modelling**

All simulated wheel loader behaviour dynamics are based on detailed mathematical models that use vehicle manufacturer specifications to provide realistic behavioural response of the machine to operator inputs. In addition, the wheel loader simulation accurately models complicated physical interactions such as vehicle articulation and bucket and boom interaction. As a result, all associated wheel loader tasks from propulsion to digging and loading are simulated with realistic visual and tactile feedback for complete immersion into the training scenario.

> **Multiple configurable loading and cleanup scenarios**

The virtual world features a number of loading and cleanup scenarios, each set in an appropriate area for the objective, including:

- Truck loading
- Scooping and loading of overburden
- Cleanup of soil spillages
- Stockpile loading
- Waste Dumping

> **Variable world settings**

Trainees are exposed to a number of scenarios that they may encounter under real operating conditions, including variations of:

- Light levels
- Visibility
- Weather
- Emergency situations
- Critical vehicle failures

PHYSICALLY ACCURATE VIRTUAL MINE WORLD

Trainee operators are immersed in an extensive high-fidelity 3D mine world based on a typical opencast mine operation, complete with stockpile loading, pit loading, parking and dump areas, incorporating all essential features typically encountered on a surface mine site. Artificially intelligent haul trucks interact with the wheel loader to train and evaluate the operator in correct loading procedures, including use of horn and bucket position as signals. World specific parameters and interactive events can be varied for a broader operator experience, such as rubble spillages, broken down haul trucks and road traffic.



A custom mine site can also be created: A world that looks identical to your mine and operates in accordance with your unique operating scenarios and procedures.

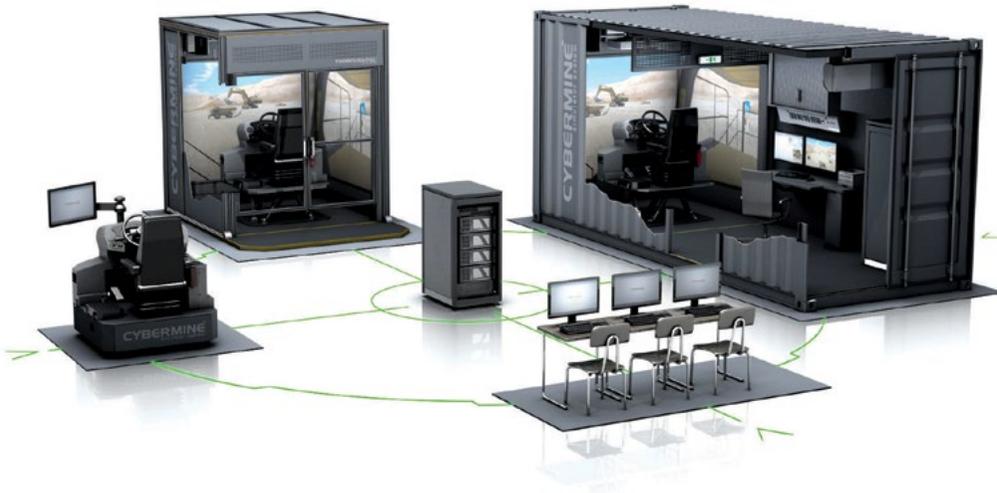
TRAINING AND EVALUATION TOOLS TO MAXIMISE SIMULATOR EFFECTIVENESS

Exercises can be configured to address various training requirements, including operations with loading techniques, automated haul truck behavioural patterns, sub-system warnings and failures (such as overloaded bucket warnings or steering failure) and advanced emergency situations such as brake failures, engine fires or burst tyres.

The operator's loading and cleanup exercises are continually monitored and recorded, as are instrumentation states, controls interaction, adherence to safety procedures, correct equipment handling techniques and responses to emergency situations and failures. The instructor is able to continually monitor, in real time, controls and parameters such as vehicle

and engine speeds, pedal positions (left, right and throttle), selected gear and route profile. At the end of each exercise the instructor is provided with a set of reports covering various aspects of operation. For example, productivity reports detail quantifiable returns for each loading, hauling and dumping cycle, as well as a summary across all cycles for the exercise. Factors such as time to load, the load dumped, percentage dumped, total tonnage loaded and dumped, as well as average tonnage dumped and number of cycles per hour, are recorded.

Scoring is against a set of predefined checks for the cab type and each is categorised into affecting one of health and safety, machine use or productivity enhancement.



The Complete CYBERMINE Training Solution

A range of ISO 9001 certified and MIL-STD design engineering compliant training tools linked to a central student database for a seamless progression from new recruit to productive operator

> Computer Based Training (CBT)

- Developed in collaboration with recognised training specialists
- Fully interactive multimedia content including photographic still shots, 2D and 3D computer animations and video with audio overlay
- Integrates fully with CYBERMINE FMS and OFT systems
- Wide variety of course topics: Machine introduction, roles and responsibilities, standard operating procedures, occupational health and safety, production techniques and machine operation in emergency situations

> Operator Familiarisation Trainer (OFT)

- Familiarises operators with new equipment
- Identification and basic operation of the instruments and controls of a specific machine type
- Utilises interchangeable CYBERMINE vehicle cabs
- Fully adjustable touch-sensitive HD screen
- Exploration, Training and Evaluation modes of operation
- Video and audio feedback to the trainee

> Full Mission Simulator (FMS)

- High fidelity simulation for comprehensive operator training
- High resolution projected displays with 270° or 360° field of view
- Utilises interchangeable CYBERMINE vehicle cabs
- Active force feedback steering (as required)
- 6DOF or 3DOF motion platforms
- Spacious instructor station with dual HD screens
- Single base unit provides both surface and underground vehicle simulation
- Containerised or fixed facility units

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