THOROUGHTEC™
simulation

CYBERMINE™
simulator system

SURFACE ARTICULATED DUMP TRUCK SIMULATORS

> **" We need to get the most out of our ADT fleet, and have found that simulation training allows us to achieve this."**

> Physically accurate vehicle cab
> The trainee ADT operator executes all driving, loading, hauling and dumping tasks from a highly accurate replica of the cab interior. The seat is surrounded by fully functional controls including steering wheel, switches, gauges, levers and pedals. The vehicle's functionality is customisable to match factory options.

A SIMULATED VEHICLE THAT LOOKS AND FEELS REAL

Poor driver skills and habits can have a significant impact on safety and productivity in ADT operations.

CYBERMINE articulated dump truck simulators use cutting-edge simulator technology and highly sophisticated training techniques to rapidly develop and hone operators' skill and experience levels without exposing your equipment or operators to unnecessary risks or removing operating equipment from the production cycle.

ThoroughTec's high-fidelity simulators are true to the original vehicle in every way, from the ergonomics of the cab with authentic replication of the operator interface, to highly accurate behavioural characteristics of the equipment being simulated.

The CYBERMINE ADT operates in a high-fidelity 3D mine site where the operator can perform the full range of ADT functions, interacting with artificially intelligent dozer, haul trucks, shovels and other support equipment. Dedicated areas are provided within the operational mine world to provide for the training of specific loading and hauling tasks and emergency situations.

It's in this world that your operator will hone his skills and experience, so that your mine site operates as safely and productively as possible.

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

Authenticity and accuracy

The simulated articulated dump truck cab makes use of original components and specifications to create an ergonomically correct and accurate replica of the original. All simulated vehicle behaviour dynamics, including those of vehicle articulation and sophisticated hydro-pneumatic suspension, are based on detailed mathematical models that use vehicle manufacturer specifications to provide accurate behavioural realism. As a result full driving, loading, hauling and dumping tasks are an accurate reflection of reality.

Highly customisable

CYBERMINE ADT simulators are extremely accurate replications of the original vehicle, including custom procedural or operational features that have been included on the customer's own equipment. For example, with the inclusion of rear-view camera systems or additional lighting systems.

Any ADT model from any OEM manufacturer can be simulated, along with any OEM optional features.

> *Advanced soil and terrain modelling*
> ThoroughTec Simulation uses advanced soil and terrain models to complement equipment simulation, such as deformable soil models for the vehicle loading simulation, allowing realistic fill factors. The traction properties of the terrain change according to the weather for a more authentic driving experience.

> *Advanced vehicle behaviour modelling*
> All simulated articulated dump truck behavioural dynamics are based on detailed mathematical models that use vehicle manufacturer specifications to provide realistic behavioural response of the machine to operator inputs. Complex physical interactions such as those involved in vehicle articulation and hydro-pneumatic suspension are simulated to an extremely high level of fidelity for realistic visual and tactile feedback during the entire loading, hauling and dumping training situation.

> Multiple configurable load-haul-dump scenarios
> The virtual world includes a number of load-haul-dump exercises, each set in an appropriate area for the objective. This includes:
> • Long haul and short haul exercises
> • Visible side and blind side loading
> • Shovel area
> • Stockpile area
> • Crusher area

> Variable world settings
> Trainee operators are introduced to a number of scenarios that they may encounter under real operating conditions. This includes:
> • Light levels (day or night)
> • Visibility (good, mist or fog)
> • Weather (rain or sun)
> • Emergency situations
> • Critical vehicle failures
> • Rubble spillage
> • Broken down haul truck in the road

PHYSICALLY ACCURATE VIRTUAL MINE WORLD

Trainee operators are immersed in an extensive high-fidelity 3D mine site featuring full loading, hauling and dumping functionality, as well as artificially intelligent dozers and other support equipment commonly seen in such an environment. Advanced soil modelling is used for highly realistic interaction between the mine world and the articulated dump truck.

The weather and time of day can be manipulated to cover various operating conditions, while world specific parameters and interactive events can be adjusted for broader operator experience.

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 different characteristics such as surface traction, sub-system failures such as transmission or steering system failures, and advanced emergency situations such as brake failures, engine fires or burst tyres.

The operator's loading, hauling and dumping exercises are continually monitored and recorded, as are instrumentation states, controls interaction, adherence to safety procedures, correct equipment handling techniques and response to emergency situations and failures. The instructor is able to continually monitor, in real time, controls and parameters such as vehicle and engine speed, selected gear, articulation angle and service brake position. At the end of each

exercise, the instructor is provided with a set of reports covering various aspects of operation. For example, a productivity report details quantifiable returns for each loading, hauling and dumping cycle, and a summary of the productivity of the total exercise, including number of alignment attempts, time to load, mass of the load dumped, percentage of load dumped, as well as average tonnage and number of cycles per hour, are recorded. Operator evaluation is against a set of predefined checks for the cab type and is categorised into health and safety, machine use and productivity enhancement.

These performance reports provide a complete training and evaluation system for ADT operators.
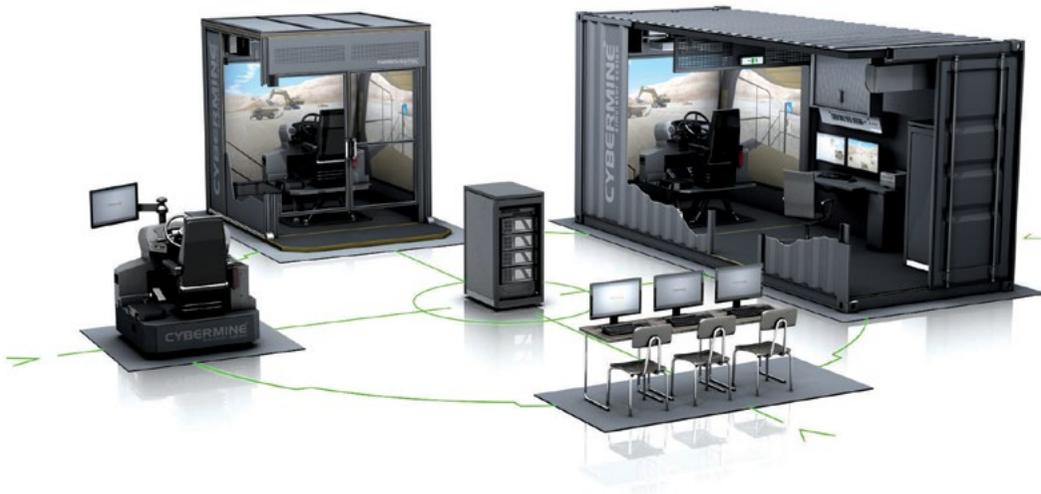
The Complete CYBERMINE Training Solution

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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CYBERMINE simulator system
CYBERQUIP simulator system
CYBERWAR simulator system
CYBERDRIVE simulator system

ISO 9001 | ISO 14001 | MIL STD

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