THOROUGHTEC™
simulation

CYBERMINE™
simulator system

DOZER SIMULATORS

"When efficient dozing keeps your mine operating smoothly, you'll find it pays to train your operators on a CYBERMINE simulator system."

> *Physically accurate vehicle cab*
The trainee operator executes all dozing, ripping and propulsion tasks from a highly accurate replica of the original cab interior complete with fully functional controls. Training in such an accurate replication allows for easy transferral of skills to the real world.

A SIMULATED VEHICLE THAT LOOKS AND FEELS REAL

Dozers are a crucial piece of mining support equipment, and inefficient bulldozer operation can cause significant backlogs in the production cycle.

The CYBERMINE range of bulldozer simulators quickly and cost effectively builds the proficiency of your dozer operators through a combination of advanced training techniques and state-of-the-art simulator technology. Mine site productivity and safety is improved without risk to mine equipment or staff, and at a significant cost saving.

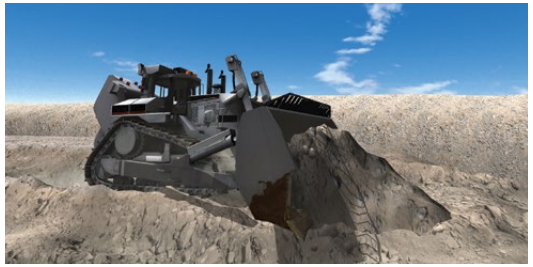
ThoroughTec's high-fidelity simulators are true to the original vehicle in every way, from appearance and feel to authentic replication of the operator interfaces, and they operate in a high-fidelity 3D mine world complete with artificially intelligent shovels, excavators, haul trucks and other equipment with which to interact. The vehicles, the world and even the operating procedures can be customised to match your exact mining operation.

It's in this world that your operators will develop their skills, so that they can keep your mine running smoothly and productively.

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

Authenticity and accuracy
The simulated bulldozer cab makes use of original components and specifications to create an ergonomically correct and accurate replica of the original vehicle with complete functionality. This consists of a seat that may be correctly angled with respect to the forward direction of motion of the dozer, surrounded by fully functional controls including pedals, switches, gauges, lamps and control levers. Vehicle specific functions such as automated blade functions can be included, as can the fitment of a single or multi-shank ripper.

Custom equipment
ThoroughTec can further customise your bulldozer simulator cab to exactly match the equipment operating on your mine site, such as the specific blade type being used. An optional rear projection screen gives a 360° field of view for reversing and ripping tasks.



> *Advanced soil modelling*
ThoroughTec's advanced soil interaction models for dozing allow the instructor to specify its cutting and traction properties, requiring the operator to exercise correct propulsion, blade and ripper articulation techniques for the various terrain types in order to obtain effective results. Deformable rocks and rock strata are present in certain areas for ripping exercises. As a result, all propulsion, dozing and ripping is authentic and true to life.

> *Advanced vehicle behavioural models*
All simulated vehicle behavioural dynamics are based on detailed mathematical models that use vehicle manufacturer specifications to provide accurate behavioural realism. The complex interactions between tracked vehicle drivetrains and the terrain necessitate the inclusion of factors such as the pressure-sinkage relationship and thrust-slip relationship for realism in propulsion, steering, slippage and vehicle control.

> *Multiple configurable dozing scenarios*
The virtual world includes a number of dozing scenarios, each in a designated area that includes all the necessary topographical elements for that particular task, including:
- Clean up
- Shovel pad preparation
- Road construction
- Dumping of waste
- Creation of a berm

> *Variable world settings*
Trainees are introduced to a number of scenarios that they may encounter under real operating conditions. This includes variations of:
- Light levels
- Visibility
- Weather
- Emergency situations
- Critical vehicle failures
- Different soil types and rock formations

PHYSICALLY ACCURATE VIRTUAL MINE WORLD

Trainee bulldozer operators are immersed into a high-fidelity 3D mine site, surrounded by a world populated with complex, multifunctional, artificially intelligent shovels, haul trucks and other vehicles with which to interact.

The dozer-specific mine world includes necessary topographical elements for all dozing scenarios from road building to ripping and clean up tasks.

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.

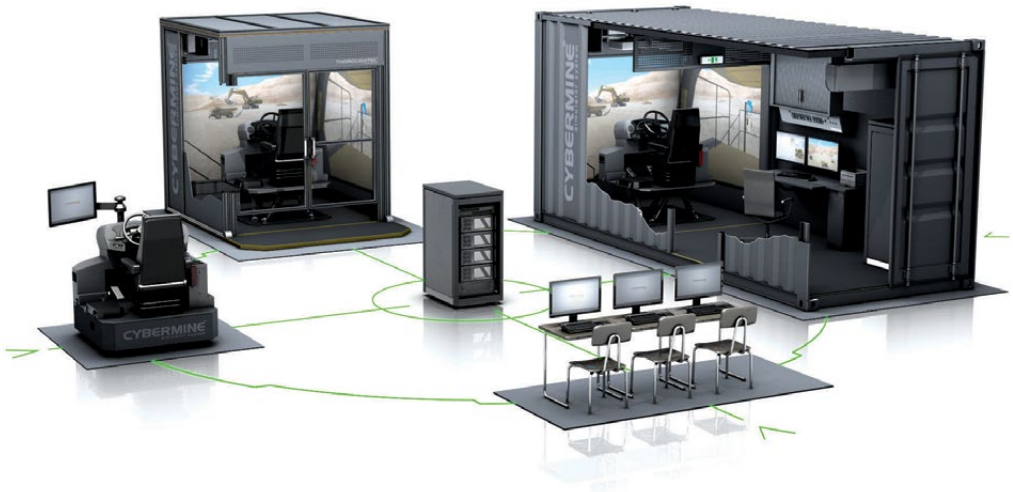
TRAINING AND EVALUATION TOOLS TO MAXIMISE SIMULATOR EFFECTIVENESS

In the CYBERMINE bulldozer simulator the operator performs all dozing and ripping tasks that would be required in the actual vehicle.

The operator's performance is continually monitored and recorded, with real-time instructor feedback in terms of blade articulation, blade load and track slippage, together with adherence to safety procedures, correct equipment handling techniques and response to emergency situations and failures. 2D and 3D views of the world allow the instructor to view the training sessions from any angle.

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 distance travelled, distances travelled while ripping and dozing, amount of material moved and percentage of time spent dozing material. Operator evaluation 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.

These multifaceted performance reports, together with the instructor's after-action review capability, provide a complete training and evaluation system for dozer operators.



The Complete CYBERMINE Training Solution

A range of ISO 9001:2008 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
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