



“ Correct drilling ultimately ensures that we achieve optimal ore extraction. Our CYBERMINE trained operators help us to achieve this goal.”

Drill rigs operate at the front line of underground mining and a mistake in the drilling cycle can have extensive safety and production implications.

The CYBERMINE range of drill rig simulators uses highly advanced simulator technology and training techniques to effectively train drill rig operators for every eventuality, without risk to equipment or operators or any reduction in productivity levels.

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 equipment, miners and other such entities. The simulated vehicles, the world and even the operating procedures can be customised to match exact mining operations.

It's in this world that operators develop their skills, so that they know what to do when it matters.



> *Physically accurate vehicle cab*
CYBERMINE drill rig simulators are highly accurate replications of the original vehicle. Trainee operators are placed in an ergonomically correct seat, surrounded by a detailed recreation of the vehicle's controls for an extremely authentic learning experience. This realism allows for easy transferral of skills from training to the real mining world.



A SIMULATED VEHICLE THAT LOOKS AND FEELS REAL

Operating a CYBERMINE simulated underground drill rig is like operating the real vehicle, but without the associated high costs and risks. It looks, feels, sounds and behaves like the original vehicle.

Authenticity and accuracy
The simulated drill rig cab makes use of original components and specifications to create an ergonomically correct and accurate replica of the original vehicle, complete with all drilling and tramming instruments and controls.

Customisable
CYBERMINE drill rig simulators can be customised to exactly match the equipment operating on client specific mine sites. For example, telescopic cylinder feeds can be fitted, while dual boom drill rigs can be configured to perform scaling, bolting and mesh handling tasks. The highly flexible drill pattern editor allows instructors to configure custom drill patterns and sequence, giving their trainees a competitive edge.

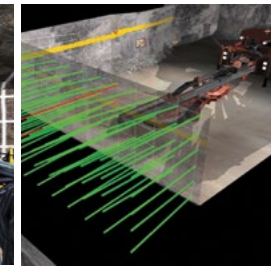


> **Advanced vehicle and terrain modelling**

ThoroughTec's advanced simulated rock characteristics (rock hardness and drillability) interact with realistic modelling of behavioural dynamics and hydraulic systems for a highly realistic drilling experience. In addition, the drilling simulation takes into account factors such as feed, rotation and percussion pressures, and bit rotation speed.

> **Advanced training tools**

A drill pattern editor enables the instructor to create a custom drill pattern for each of the rock faces, as well as the optimum sequence for drilling. For novice operators, alignment guides assist in correct positioning of the drill boom. As a result, the trained operator is able to exercise correct drilling and bolting techniques for each scenario and rock type.



> **Multiple configurable drilling and bolting scenarios**

The virtual world includes a number of drilling scenarios, each set in an appropriate area for the objective, including:

- Simple face on level ground
- Uneven face on a decline
- Simple face on a decline
- Cross-cut face

> **Variable world settings**

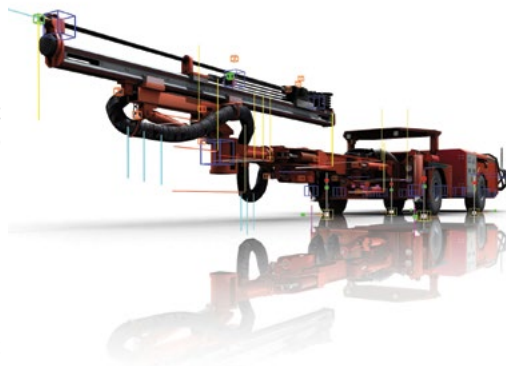
Trainees are exposed to a number of scenarios that they may encounter under real operating conditions, including:

- Emergency situations
- Critical vehicle failures
- Rock hardness
- Previous blast sockets (marked and unmarked)
- Even and uneven faces
- Rubble
- Fissures behind rock face

PHYSICALLY ACCURATE VIRTUAL MINE WORLD

Trainee drill rig operators are immersed in an extensive high-fidelity 3D mine world projected on screens surrounding the cab. The mine site is based on a typical mining operation populated with artificially intelligent miners, equipment and other entities with which to interact. Both underground and surface areas as well as access tunnels are simulated. Features such as tramming tunnels, varying drill faces, brake test ramps, shaft declines and inclines, crusher areas and operating ventilation doors are included.

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

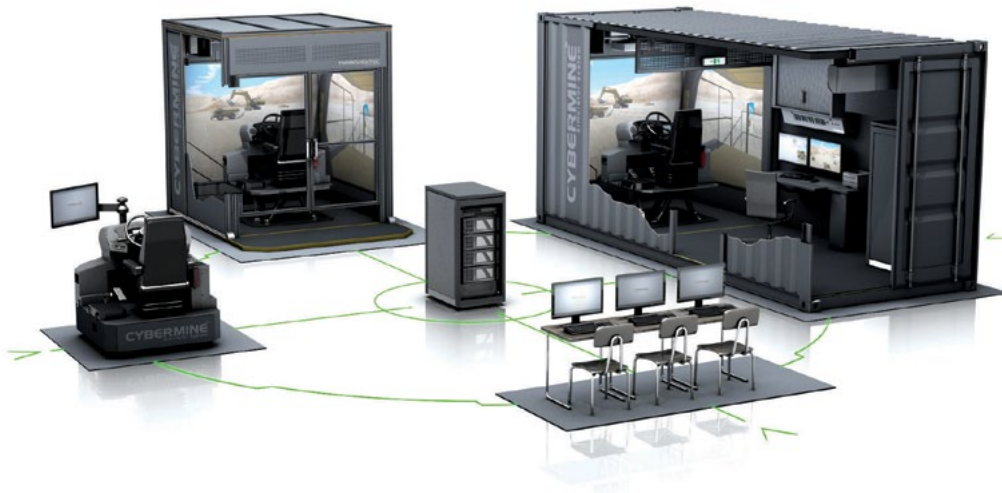
During the simulated drilling cycle, the drill rig operator performs all drilling tasks that would be required of the actual vehicle. The instructor is able to set a number of vehicle configuration options, such as the length of the drill rod, the selection of different drill bits or an automatic anti-jam action. Correct placement and deployment of the carrier module is required prior to drilling in the marked areas.

The operator's performance is continually monitored and recorded, in terms of drilling speed and accuracies, adherence to safety procedures, correct equipment handling techniques and responses to emergency situations and failures. 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 such as hole position error, drill angle error (pitch and yaw), hole depth, number of holes drilled, number of missed or skewed holes, as well as averages and totals for these quantities.

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 drill rig 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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