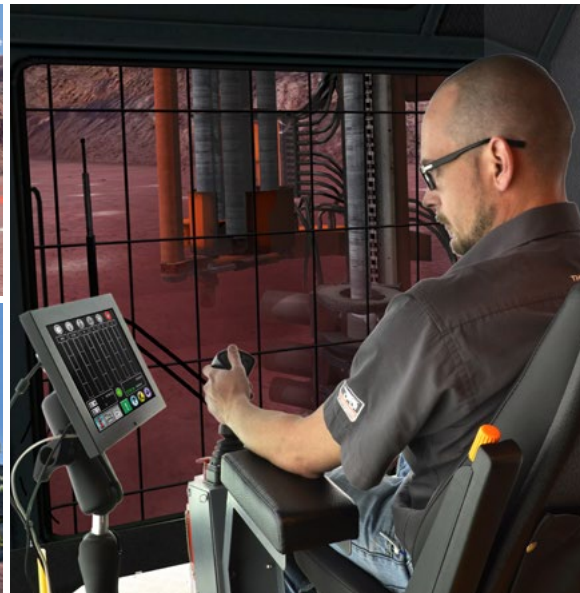
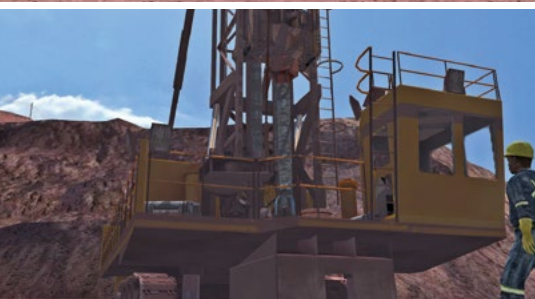


THOROUGHTEC[™]
simulation



CYBERMINE[™]
simulator system 

SURFACE DRILL RIG SIMULATORS

“For a productive surface mine site, we need drill rig operators who have been trained by seeing it all before. CYBERMINE simulators are designed to achieve this goal.”

Surface drill rigs are an integral part of surface mining operations, so their efficient operation is essential for a productive mine site. CYBERMINE surface drill rig simulators train operators to achieve optimal efficiency levels, exposing them to all likely procedural and emergency scenarios so they are prepared for the real-life equivalent. This is achieved by pairing advanced simulator technology with state-of-the-art training techniques.

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

The CYBERMINE surface drill rig operates in a high-fidelity 3D mine world where the operator can perform all necessary propulsion and drilling operations against a predefined drill pattern for the exercise, interacting with an automated drilling assistant for positioning and deck assistance when required.

The drill rig, the 3D world and the operating procedures are highly configurable to a customer's specific needs.

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



> Physically accurate vehicle cab

The trainee operator executes all propulsion and drilling tasks from a highly accurate replica of the cab interior. The seat is surrounded by fully functional controls including switches, gauges and joysticks. The vehicle's functionality is also customisable to optional factory specifications.



A SIMULATED VEHICLE THAT LOOKS AND FEELS REAL

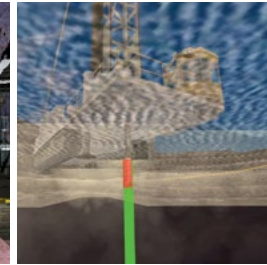
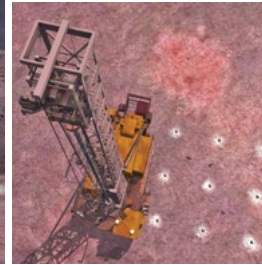
Operating a CYBERMINE drill rig is like operating the real vehicle, but without the high costs and inherent risks.

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. All simulated vehicle behavioural dynamics are based on detailed mathematical models that use vehicle manufacturer specifications to provide accurate behavioural realism for both propulsion and drilling. As a result, drill control and placement are an accurate reflection of reality.

Highly customisable

While each CYBERMINE surface drill rig simulator is a highly accurate replication of the OEM vehicle in appearance and function, it can be customised to match any factory optional features or operating procedures used on your mine site.



> **Advanced rock modelling**

Complementing the equipment simulation are accurately modelled interactions between the vehicle and the terrain. Simulated rock characteristics (hardness and drillability) and dynamic and visual modelling of the terrain during and after drill bit penetration provide a highly realistic drilling experience.

> **Advanced modelling of vehicle systems**

Crucial to the effective simulation of drill rig equipment is the accurate physical modelling of the complex behaviour and interaction of the mast, drill steel, bit, flushing system, wrenches etc., as well as accurate modelling of the artificially intelligent deck assistant where applicable, to provide realistic behavioural response to operator inputs.

> **Multiple configurable drilling scenarios**

The virtual world features a number of drilling and propulsion scenarios making up the entire drilling cycle, including:

- Pipe and drill bit installation exercises
- Adjustable rock hardness and drillability characteristics
- Training mode for drill pattern assistance
- Varying drill rig states of readiness

> **Variable world settings**

Trainees are exposed to a number of scenarios that they may encounter under real operating conditions. This includes:

- Light levels
- Visibility
- Weather
- Emergency situations
- Critical vehicle failures
- Artificially Intelligent traffic

PHYSICALLY ACCURATE VIRTUAL MINE WORLD

Trainee surface drill rig operators are immersed in a high-fidelity 3D mine world complete with deformable soil for drilling exercises and surrounded by a world populated with typical mining equipment, as well as an automated human assistant for certain drill preparation tasks. Dynamic terrain allows for highly realistic interaction between the mine world and the drill rig for propulsion simulation under varying conditions. The weather and time of day can be manipulated to cover all expected operating conditions, while world specific parameters and interactive events can be varied for a broader operator experience.

A custom mine site can also be created in accordance with client specific operating scenarios and procedures.



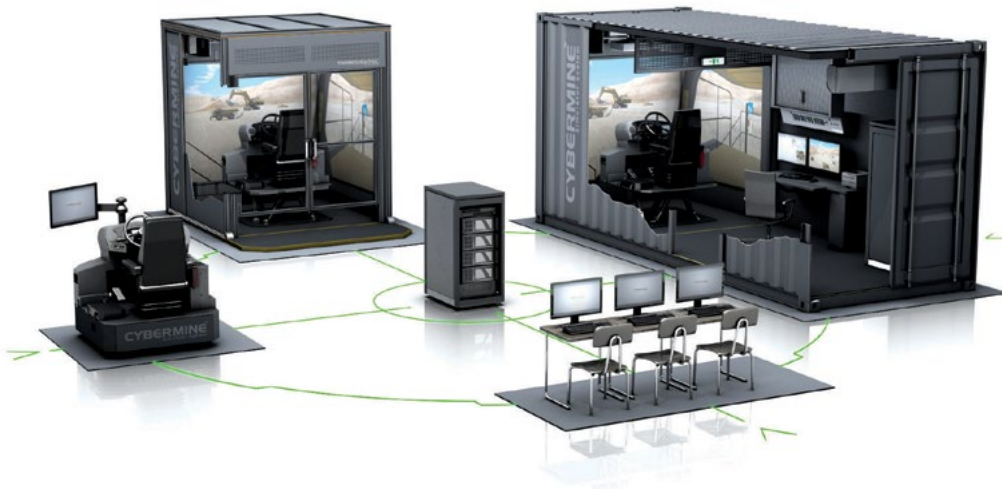
TRAINING AND EVALUATION TOOLS TO MAXIMISE SIMULATOR EFFECTIVENESS

Exercises can be configured to address various training requirements, including operations with different rock hardness and drillability characteristics, sub-system failures (such as blocked drill bit and hydraulic failures) and advanced emergency situations such as engine fires. Instructors can determine the drill rig's location and state of readiness for each exercise, allowing the trainee to focus on a particular discipline and maximise the efficiency of each training session.

The entire exercise is continually monitored and recorded, including instrumentation states and controls interaction, as well as adherence to safety procedures, correct equipment handling techniques and response to emergency situations and failures. The instructor

is also able to monitor, in real-time, the bit rotation speeds and bit force, the drill rig state (propel, hoist, drill or thread), hole depth and water flushing. 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 states quantifiable returns such as number and depth of holes drilled and any discrepancies against the drill pattern.

Operator evaluation is against a set of predefined checks for the drill rig and each is categorised into affecting one of health and safety, machine use or productivity enhancement. These multifaceted performance reports provide a complete training and evaluation system for drill rig 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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