

MineScope Surface Engineering, Underground Engineering,
and Engineering Optimisation

MINESCAPE ENGINEERING

WHO USES MINESCAPE ENGINEERING:

- ✓ Pit Engineers
- ✓ Surveyors
- ✓ Mine Planning Engineers
- ✓ Drill & Blast Engineers
- ✓ UG Mine Planning Engineers
- ✓ UG Geotechnical Engineers
- ✓ UG Drill & Blast Engineers
- ✓ UG Surveyors



MINESCAPE SURFACE ENGINEERING

The Industry Challenges

Rebounding from relatively low levels of capital investment and exploration spending, then Industry 4.0 Mining requirement, many mining companies are striving to achieve production targets to maximize returns. These companies are under pressure to increase output from existing mines and bring new projects online.

A key element in the drive for increased production and improved efficiency is combining innovation and technology with intelligent application of data analytics in mine design. MineScape mine planning software can help you meet the challenge.

The Solution

Specifically developed to meet the mining industry's rigorous demands, MineScape is used at more than 200 of the world's most complex mining operations from nickel and phosphate mining in Russia to coal mining in Indonesia. **MineScape Surface Engineering** is one of **MineScape 2021** products, a suite of solutions designed for open-cut mining operations for coal and metalliferous deposits. It delivers the functionality of automation, and analytical mine design, making it a leader in open cut mine planning solutions globally.

Incorporating many features, **MineScape Surface Engineering** offers exceptional ease of use through:

- Intuitive Microsoft-like familiar working environment
- True simultaneous multi-user access to all 3D data and models
- Quick designs with advanced Rapid CAD 3D capabilities
- Simple data management with MineScape Explorer to browse projects and manipulate data
- Volume and reserves calculation in customized Microsoft Excel format
- Rapid surface mine design and haul road functionality
- Short-term and Long-term planning tools
- Mine design objectives in strip-mining situations in MineScape Dragline
- Optimum drill and blast pattern with interactive 3D CAD environment
- Reduction management control and field survey data usage in MineScape Survey.

MineScape Surface Engineering allows you to achieve optimal efficiency in your open cut mine planning operations by allowing for a range of production alternatives to be developed and investigated quickly, maximizing mining operations through comprehensive control of design parameters which adaptable to the mining situation, and saving valuable time. Designed to automate mine planning and design analysis, it streamlines your engineering processes, improves your productivity, and increases your profit potential.

MineScape Surface Engineering is the most comprehensive and effective open-cut mine plan software solution for the mining industry. It seamlessly integrates information flows between survey, mine design, haulage road, drilling, blasting design, and lowers mining costs through smarter use of technology and information management systems.

MineScape Surface Engineering covers

- Open Cut
- Haulage Roads
- Drill & Blast
- Survey
- Dragline

WHO USES MINESCAPE SURFACE ENGINEERING:

- ✓ Pit Engineers
- ✓ Mine Planning Engineers
- ✓ Surveyors
- ✓ Drill & Blast Engineers

MINESCAPE SURFACE ENGINEERING

MINESCAPE OPEN CUT

MineScape Open Cut provides powerful tools to rapidly create and explore design options for open cut planning. Long-term planning tools, such as strategic and feasibility studies, are complemented by tools for short-term design objectives in terrace or strip-mining situations for dragline, truck and shovel mines. Enhanced 3D CAD combined with Rapid CAD features makes the designing process efficient and seamless.

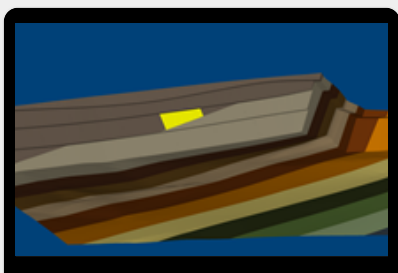
KEY BENEFITS

Practical

Includes dragline strips, pit pushbacks, ramps, roads, individual cuts and benches. Comprehensive control of design parameters enhances adaptability to the mining situation. Design information can be output as graphics, survey layout instructions or volumetrics.

Efficient

Allows for a range of production alternatives to be developed and investigated quickly by utilizing various design options over a common base project and data set. Layout of any designs may be detailed as plan and sectional graphics and as a set of field survey instructions.



KEY FEATURES

- ✓ **Flexibility** - as an integrated MineScape app, Open Cut can utilise the data from our highly advanced Stratmodel app. Data can be sourced easily from commonly used third-party products.
- ✓ **Just-in-time DTM** - this workflow based function is specially designed to speed up the current topography update process based on current survey data.

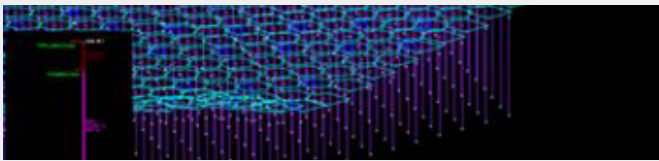
- ✓ **Short term planning** - provides more automated short-term design functions which also produces a complete set of 3D plans, merged contour lines, and triangulations with survey data. Detailed reserve calculation with both sectional and triangular mesh sampling is provided. All resultant design layers and triangulations are generated and managed by the intuitive workflow.
- ✓ **Long term planning/engineering solids** - provides automated pit shell designs by using basic design elements and applying multi-projection rules to various mining faces. The module utilises the new mesh engine to create solids which includes meta-data that can be filtered against. Designs, meshes as well as solids will be generated and managed by an intuitive workflow.
- ✓ **Reserves** - stratigraphic and quality models, as well as any MineScape surface can be accessed directly. For scheduling purposes, resource and waste material within the blocks can be defined and categorized to identify all material by block. Volumes, tons and grades are accurately calculated for every component within a design for use in other MineScape apps.
- ✓ **Just-in-time model** - short term/operation geology model can be easily updated by using the latest coal scan or drill hole touch coal data. This function ensures all design and volumes are as accurate as possible.
- ✓ **Interactive Bench Blocks** - short term solids can be quickly designed and divided into any shape or number using simple design lines. The sub-solid and reserves are saved in the project and can be used for reporting and scheduling at a later stage.
- ✓ **Reclamation** - By utilising cross sections and applying physical limitations, MineScape's reclamation module can calculate the cut fill balance and produce a final rehabilitation design that is patched into the post-mining surface. Dozer productivity can also be estimated by using the cut and fill centroid function within the module.

MINESCAPE SURFACE ENGINEERING

MINESCAPE DRILL & BLAST

MineScope Drill & Blast provides engineers with an interactive 3D CAD environment within which an optimum blast pattern can be quickly laid out and projected to surfaces.

MineScope Drill & Blast utilises designs and triangulations produced by other MineScope apps to keep a single source of truth as well as to achieve the that rapid design process. Hole layout reports can be exported to GPS-equipped drill rigs.



KEY BENEFITS

Integrated

Creates designs based on survey data and mine plans, utilising the geological model and outputs directly to survey data recorders and/or drill navigation systems. This eliminates the possibility of errors from data currency or transcription.

Optimization

Provides the capability to quickly test and verify a range of charging and pattern options to determine optimum design including PPV and powder factor.

Comprehensive

Includes designing for the entire drill and blast process from pattern layout to charging to tie up designs. The output includes full range of standard plots and reports, with the ability to configure site-specific output.

Flexible

Provides total CAD directed control over every aspect of blast pattern charging down to individual hole components

Auditable

Complies with requirements for PPV calculations and enables the ready tracking of consumables and results against a plan.

KEY FEATURES

3D Designing - the 2D laid out pattern can be projected according to the projection rules including azimuth and declination, depth limits (including geological units minus stand-off) and the effective blast volume of each hole generated. MineScope Drill & Blast has direct access to all design parameters including geological models, current pit survey, and proposed pit designs.

Decks and delays - inserts decks, delays and other named points into holes, both automatically during the hole generation process (from named explosive column definitions) or interactively through the manual charging option.

Charging - employs the concept of an explosive column to calculate charging on a variety of bases. Powder factors may be specified by both blast and blast holes. The system will recalculate column definitions to honour column to calculate charging on a variety of bases. Powder factors may be specified by both blast and blast holes. The system will recalculate column definitions to honour specified powder factors. Interactive modification of the charged holes is supported through specialized CAD functions.

Initiation - the initiation sequence can be designed with the tie-up function which also calculates the resultant peak particle velocity. Detonation times for each hole are calculated and graphically displayed. Special report graphics facilitate the identification of detonation time by hole. Graphical displays also allows interactive editing of delays with insufficient time separation.

Output reports ad layouts - generates charge sheets, full consumables (surface and downhole) reports and survey layout instructions in plot form or as digital instructions to a field recorder or GPS based drill monitoring system for the optimized blast. When required, the actual positions of drilled blast holes can be reloaded directly to the blast from survey entries and stored.

MINESCAPE SURFACE ENGINEERING

MINESCAPE DRAGLINE

MineScope Dragline allows engineers to define and test dragline excavation methods on real pit models, quickly and efficiently.

MineScope Dragline includes functions to simulate and measure a wide variety of material movement methods including cast blasting and production dozing. These functions allow operations in the pit to be faithfully modelled. MineScope Dragline is the best tool for dig optimization to test new excavation methods quickly against real data.

KEY BENEFITS

Reality-Based

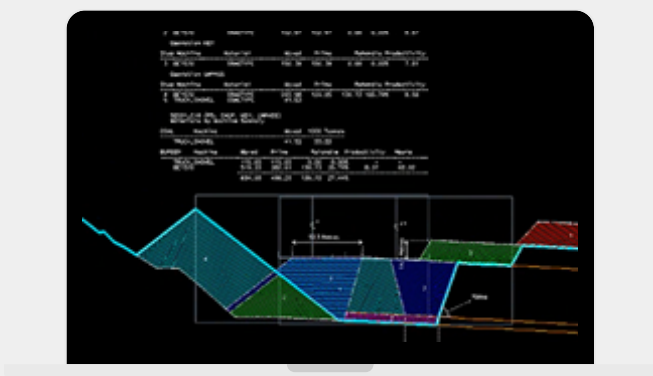
Works on real geology as well as hypothetical simplified sections based on the survey/drill holed updated geology model and real pit survey data.

Cooperation

Performs dragline design using geology, pit planning, survey and scheduling data. Accepted excavation designs (e.g. drill and blast of burden, reclamation of spoil, are immediately available to other planning staff and to surveyors for field layout without any need for transcription or modification.

Instructive

Includes an extensive range of output to assist both dragline engineers and dragline operators to achieve the design goals.



KEY FEATURES

- ✓ **Integrated** - MineScope Dragline draws its information regarding topographic and stratigraphic surfaces directly from existing MineScope models. These can be simply sketched-in planes and/or sections approximating geology, or real geology as defined by both pit survey and drilling through MineScope Stratmodel.
- ✓ **Operating parameters** - define and save the physical operating parameters of any dragline to build a database of available units. Material characteristics, such as swell, can similarly be assigned to each stratigraphic unit.
- ✓ **Cross-sectional approach** - enables the interactive definition of an excavation method as a sequence of steps using CAD functions. This automates virtually every movement process to display resultant cut and spoil geometry, while managing volume conservation.
- ✓ **Replays** - once defined, replays as a full spoiling simulation on multiple sections to produce the 3D surfaces that will result from multi-pass mining of a pit. Pre-established methods can be used on any section. Use replay tools to assist in the optimization of rehandle.
- ✓ **Optimization** - allows engineers to design, test, and refine various digging methods and pit geometries for given equipment to optimize spoiling strategies. It can also be used to define equipment characteristics for particular operations by comparing the productivity of a range of hypothetical draglines over a given set of mine plans.
- ✓ **Reclamation** - MineScope Dragline defines the final reclamation landform based on the user defined constraints which also generates 3D surfaces that form the starting point for the reclamation planning.

MINESCAPE SURFACE ENGINEERING

MINESCAPE HAULAGE ROADS

MineScope Haulage Roads enables the design of mining roads along any surface.

Cut and fills are generated as required while maintaining grade, curve and specifications. Cross-sections and volumes are generated to allow the optimization of road placement and estimation of construction costs.

KEY BENEFITS

Intuitive

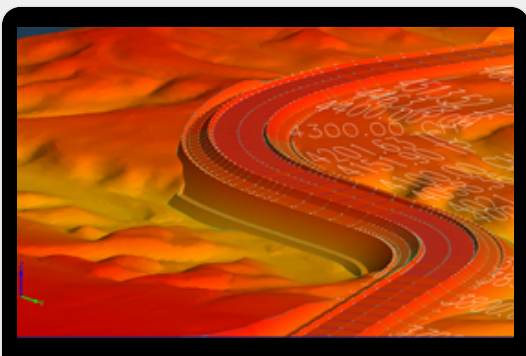
With the intuitive process workflow, complex designs with cut and fill benches can be generated in a few simple steps with limited experience. This allows your planning team to be more flexible and efficient within a short period of time.

Optimization

Allows for multiple road design scenario testing. Easy generation of alternate routes enables optimization and provides the means to make informed, cost-effective road planning decisions.

Increased Effectiveness

Provides a graphical output that is a compelling visualization tool for all contractors, miners and mine planning personnel.



KEY FEATURES

✔ **Interactive design capabilities** - easily generates complex designs, beginning with a simple line string representing a proposed centerline. This design can then be interactively manipulated and enhanced using MineScope's CAD tools. A design workflow structure provides an easy step-by-step guide to full featured design.

✔ **Input data** - permits input design features, such as super elevated corners, vertical and horizontal radius of curvature, transition curves, chainage points, edge drains, safety berms and sub-base location, to be processed.

✔ **Fully user-defined** - allows full user definition of road width, cross fall, cut angles, fill repose angles, bench height, widths, vertical and horizontal radius of curvature. The design can be manipulated and enhanced using the wide range of tools and functions.

✔ **Uses any surfaces** - any MineScope surface can be used. Appropriate road cuttings and infill to maintain the desired grade settings are created. Typical surfaces are topography, pit design surface and spoil.

✔ Can be used as an alternative to the ramp design package to design in-pit roads.

✔ **Multiple report formats** - generates reports as text or graphical cross-sections to provide a range of instruction formats for survey and construction personnel.

MINESCAPE SURFACE ENGINEERING

MINESCAPE SURVEY

MineScope Survey controls the reduction management and use of field survey data. The full range of surveyors' reduction transformation and adjustment requirements are supported.

KEY BENEFITS

Accurate

Eliminates the potential for transcription errors by enabling the automatic transferral of two-way data between MineScope and field data recorders. Any design can be automatically translated into field layout instructions.

Adherence to standards

Standardizes the presentation of common information to minimize the potential for subsequent interpretation error. Standards can be changed at any time, and all data will be updated. The same data can be reported to any authority in the required coordinate system without reprocessing.

Integrated

Provides all authorized end users (e.g. geology, engineering) with immediate access to the most recent positional information, as all MineScope modules run across the same databases.

KEY FEATURES

- ✓ **Project setup** – Involves definition of required projection and local coordinate MineScope Survey controls the reduction management and use of field survey data.
- ✓ **Data input** – Manually enters or automatically downloads directly from field data recorders, with surveyor-defined codes automatically processed. All instrument types are supported, from chains and total stations to GPS and stereo digitisers, to reflector less and robotic survey instruments. Survey data from other sources such as aerial surveys or third-party packages can also be imported.
- ✓ **Company standards** – Ensures the adherence of all data to site and company standards using sets of user-defined lookup tables.
- ✓ **Pre-processing** – Uses coding conventions which can include pre-processing instructions to the data load process. Such instructions could be to delete or offset points, fix their position by resection or trilateration at load time, and to adjust prior entries.
- ✓ **Single command or step-by-step process** – Loads, pre-processes, reduces and displays data at a single command. Alternatively, each step can be processed separately and the results reviewed and checked. Full reporting of errors, adjustments, residuals and misclosures is provided. Processing functions include full network adjustment, traversing, levelling and coordinate transformation (Helmert and Lauf).
- ✓ **3D** – Loads data into a 3D space and makes data immediately available for CAD editing.
- ✓ **COGO** – Provides an additional tailored set of powerful COGO (Coordinate Geometry) CAD functions.
- ✓ **Volumes** – Includes triangulated sampling, cut and fill, and section-based (end area) calculation techniques.
- ✓ **Upload** – Supports the upload of any MineScope designs back to field recorders or as plotted instructions to complete the cycle of transcription-free field data management. Upload of design information (from any MineScope source) is just as easy, with positional information for any purpose available as either plotted layout instructions or directly written to field data recorders

MINESCAPE UNDERGROUND ENGINEERING

The Industry Challenges

The underground mining industry is facing a difficult challenge in the coming decades. A high-grade reserve is becoming increasingly difficult to obtain and production in underground mines continues at deeper levels. These challenges increase production cost for the companies and a technology shift is needed to secure the production.

All those concerned will have to make concerted efforts to overcome the challenges ahead to achieve success in the industry. A key element in the drive for increased production and improved efficiency is combining innovation and technology with the intelligent application of data analytics in underground engineering.

The Solution

Specifically developed to overcome the underground mining industry's challenges, **MineScape Underground Engineering** comes with its advance and intuitive technology. **MineScape Underground Engineering** is one of **MineScape 2021** products and provides a suite of solutions designed for underground mining operations for coal and metalliferous deposits. It delivers the functionality of automation and analytical underground mine design, making it a global leader in underground mine planning solutions.

- Incorporating many features, **MineScape Underground Engineering** offers exceptional ease-of-use through:
- Intuitive Microsoft-like familiar working environment
- True simultaneous multi-user access to all 3D data and models
- Quick designs with advanced Rapid CAD 3D capabilities
- Simple data management with MineScape Explorer to browse projects and manipulate data
- Volume and reserves calculation in customized Microsoft Excel format
- Longwall layout and conventional pillar design completed quickly
- An interactive 3D CAD environment to create underground ring design, drilling, and blasting
- Seamlessly integrated with other MineScape's products

MineScape Underground Engineering allows you to achieve optimal efficiency in your underground mine planning operations by allowing the design of various methods of underground mining, producing designs automatically over large areas, and saving valuable time. Designed to automate underground mine planning and design analysis, it streamlines your engineering processes, improves your productivity, and increases your profit potential.

MineScape Underground Engineering covers

- **Underground Planning**
- **Ring Design**

WHO USES MINESCAPE UNDERGROUND ENGINEERING:

- ✓ UG Mine Planning Engineers
- ✓ UG Drill & Blast Engineers
- ✓ UG Geotechnical Engineers
- ✓ UG Surveyors

MINESCAPE UNDERGROUND ENGINEERING

MINESCAPE UNDERGROUND PLANNING

MineScape Underground speeds the repetitive and time-consuming CAD processes that create underground designs. By specifying design parameters through tables and templates, accurate designs are rapidly developed. Using standard MineScape tools to create a totally integrated system can further enhance these underground designs.

KEY BENEFITS

Fully integrated – Integrates with MineScape’s geological and survey functionality.

High flexibility – Assures flexibility in application with extendibility afforded by the capacity to create user-defined commands for site-specific requirements.

Easy to use – Outputs accurate plans simply, yet yields sophisticated designs. Input plans become 3D models within which volumetrics and qualities can be correctly generated.

Accurate – Generates accurate designs including elevation, drainage and pillar size. Multi-seam workings are automatically superimposed and can be interrogated dynamically.

Quick access – Enables design alternatives to be assessed quickly and their recoverable tonnages and qualities calculated.

Fast storage and recall – Stores and quickly recalls geometry of standard panels. In addition it utilizes special mine designs which can be input to CAD and copied to any part of the design.

Automatic generation – Produces designs automatically over large areas bounded by mining constraints.

Flexible designs – Outputs designs as short-term and detailed, or long-term and more general, or a combination of both.

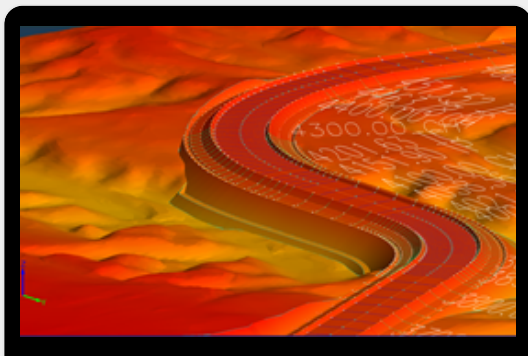
KEY FEATURES

- ✓ **Specialized CAD tools for fast accurate design work** – Generates long and short-term plans using comprehensive design templates, which can automatically build designs from the output of centre line, node and polygon data sets.
- ✓ **Assess design alternatives** – Optimizes designs by applying user-defined geometry sets that are readily defined, saved and recalled to create and rapidly visualize changes.
- ✓ **Interactive 3D design** – Uses powerful 3D CAD capability with specialized underground extensions to create a detailed design of panels, drifts and shafts.
- ✓ **Integrated 2D design** – Supports and enhances the 2D design approach with powerful CAD functionality and provides seamless integration with a complete 3D CAD system for optimum design evaluation.
- ✓ **Longwall design simplified** – Applies dimensions and creates longwall designs using templates. The design may be further enhanced using CAD tools for merge or split pillars, add bleeder roadways and impose specialized intersection designs. Designs may be systematically created with CAD system classification of long-term design components in terms of roadway recovery (percentage extracted). MineScape Underground Planning speeds the repetitive and time-consuming CAD processes that create underground designs and the detailed short-term components that are constructed to reveal individual roadway subdivisions.

MINESCAPE UNDERGROUND ENGINEERING

KEY FEATURES CONTINUED

- ✓ **The power of 3D visualization** – Provides true 3D visualization as designs are projected onto the relevant seam, which is linked with drifts and shafts. As a full 3D design, elements of the mine plan can be displayed in an endless variety of representations to assist in effectively communicating the design to others.
- ✓ **Integrated fully with survey** – Updates survey workings rapidly using specialized CAD functions. The system provides scope for user enhancement and provides compatibility with survey data/equipment standards. Features include user-defined symbols to identify the location of equipment, ventilation, transport, and reticulation, which may be required by management or for statutory purposes.
- ✓ **Volumes and scheduling** – Provides evaluation options for a combination of long-term blocks using recovery percentage and short-term heading/cross-cut design.
- ✓ **Reserves** – Enables flexible reporting of comprehensive data sets. Ensures that volumes, tons and grades are accurately calculated for every component.



MINESCAPE UNDERGROUND ENGINEERING

MINESCAPE RING DESIGN

MineScape Ring Design provides an interactive 3D CAD environment to create underground ring design, drilling, and blasting. The module is purpose-built to meet the specific needs of underground metals mining and allows the design of various methods of underground mining. Styles supported include, but are not limited to, block caving, long-hole and cut and fill stope mining methods. Design parameters are specified through templates resulting in accurate, repeatable designs. Standard MineScape tools are provided and Ring Design is fully integrated with all other MineScape modules.

KEY BENEFITS

3D Visualisation

All designs are easily visualised in the 3D view and any additional CAD data may be displayed alongside to assist with the design.

Fully Integrated

Ring design functions interact seamlessly with the MineScape data management tools and other MineScape modules.

Flexible

User defined parameters may be used for site specific requirements.

Easy to use

The tools used are intuitive and time to learn is minimal.

KEY FEATURES

- ✓ **Intuitive blasthole design** – Both angle and distance methods are catered for with blasthole spacing. Easy to use tools are provided to allow for standoff or overdrill. In addition, the module has simple and intuitive blasthole editing functions.
- ✓ **Accurate rig position** – Predefined rig offsets which are editable and moveable in CAD are used to define the rig position. Multiple rig positions are allowed in each drive.
- ✓ **Straightforward charging tools** – Charging algorithms are provided to calculate charge patterns. The charge lengths are displayed graphically to quickly visualise and optimise.
- ✓ **Effortless delay allocation** – Blast hole delays are assigned automatically based on user defined parameters.
- ✓ **Blast summary** - A blast summary may be created for one or more blast rings. The summary may include, but is not limited to, blast volumes, average blasthole lengths or total charged blasthole lengths.
- ✓ **Reporting** - Generate reports of all elements contained within a blast ring. Several formats are provided.
- ✓ **Undo facility** – Design steps may be undone at any stage within the design process.
- ✓ **Repeatability** – All parameters used in the design are stored and may be used again at any time. In addition, once a ring design is created, it may be kept as a template and applied to multiple sections.
- ✓ **Fast and accurate** – All designs are based on site survey and geological data. As the module is fully integrated within MineScape, the most up to date data is used. The design process rapidly refers to the relevant information and generates the design using the parameters provided.
- ✓ **One step orebody preparation** – Wireframes and drive designs are initially created by the engineers and geologists. Ring Design provides tools to quickly slice these triangulations in preparation for the ring blast design.
- ✓ **Automatic generation** –The user can regenerate new designs automatically, using predefined templates.

MINESCAPE ENGINEERING OPTIMIZATION

The Industry Challenges

The need for a method to optimize the potential of existing reserves is crucial for mining companies due to their current reserves being depleted. However, many mining companies are unable to quickly generate sensitivity analysis of final economic pit limits because of the volatility of mining costs and commodity prices.

A key element in the drive for optimized production and improved efficiency is combining innovation and technology with intelligent application of data analytics within a mine planning system using **MineScape Engineering Optimization**.

The Solution

MineScape Engineering Optimization is the unrivaled tool to overcome these challenges. Delivered as a product within MineScape 2021, **MineScape Engineering Optimization** is a solution designed for reserve optimization for coal and metalliferous deposits. **MineScape Engineering Optimization** delivers a comprehensive model and accurate Pit Optimization results, making it the best choice for your project decision making.

Incorporating many features, MineScape Engineering Optimization offers exceptional ease-of-use through:

- Intuitive Microsoft-like familiar working environment
- True simultaneous multi-user access to all 3D data and models
- Quick designs with advanced Rapid 3D CAD capabilities
- Simple data management with MineScape Explorer to browse projects and manipulate data
- Accurate interpolation through surface-following estimation
- Fully integrated using block models or stratigraphic models
- Utilizes a simple, easy to use interface to supply input parameters with fast and accurate results.

MineScape Engineering Optimization allows you to achieve optimal value in your mining project through generating optimum final pit design and saving valuable time. Designed to automate, it streamlines your engineering optimization process and maximizes your profit potential.

MineScape Engineering Optimization covers

- **Block Model**
- **Stratmodel**
- **Pit Optimization**

WHO USES MINESCAPE ENGINEERING OPTIMIZATION:

- ✓ **Pit Engineers**
- ✓ **Mine Planning Engineers**

MINESCAPE ENGINEERING OPTIMIZATION

MINESCAPE BLOCK MODEL

The geological block model is built by progressively introducing geological elements through the loading of physical interpreted shapes or interpolation using material associations and/or zones following with a selection of algorithms. The model can be displayed at any time to validate the model construction process. The completed model becomes the base for reserves and other mine planning work.

KEY BENEFITS

Accurate

Delivers total control over the model orientation, construction, and interpolation, allowing the deposit to be accurately defined and estimated in 3D space.

Comprehensive

Enables you to use all available information, including vertical or inclined drill holes, pit survey, digital terrain data, faults, and areas defining washouts. Interpreted control can be super imposed in areas of structural complexity that are not well represented by the data.

Powerful Visualization

Displays graphical results limitlessly, providing powerful visualization for presentation to anyone from geologists to mine planners to mine managers.

Fully Integrated

Accesses and uses any other MineScape app, including Pit Optimization. Export to third-party optimization tools, such as WHITTLE 4D, is also supported.

Stratigraphic Model to the Next Level

A natural extension of MineScape Stratmodel. Users can easily convert a stratigraphic model into a block model, whenever vertical quality variability requires sophisticated estimation technique.

KEY FEATURES

User control- allows user definition of parent block and sub-block creation against any surface, interval (including those produced from MineScape Stratmodel) or wireframe to define geological, quality and mine planning entities. Model construction allows orientation in any X, Y or Z direction (rotate, dip and plunge), block size and shape.

Construction efficient – efficiently interrogates the customization of block storage through a unique user-defined index. Sub-celling of models allows economic storage, interrogation, and processing of model files.

User interaction- provides a model data structure that allows MXL (MineScape Expression Language) and MPL (MineScape Programming Language) to process or calculate block attributes, e.g. products and grade equivalents.

Interpolation- incorporates a full suite of industry-standard interpolators including inverse distance, ordinary and universal Kriging (absolute and indicator) and nearest neighbor for block estimation. User-defined sample and block selection parameters are provided as well as trend or surface following interpolation controls.

Interrogation- fully accessible for interactive graphical interrogation and viewing capability. Models can be sliced and intersected in any orientation to reveal graphical depiction of ore zones, dilution, and grade trends against any block attribute. Reports, bar/frequency charts and grade tonnage curves can also be generated.

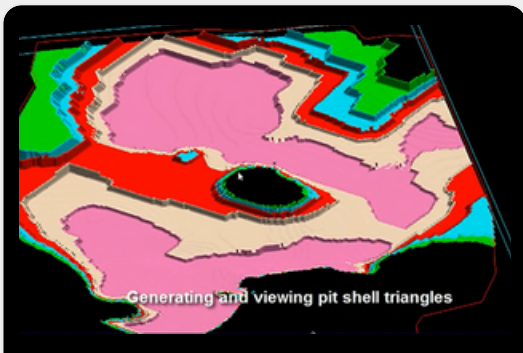
Reserving- classifies reserves by level, material type, polygon, wireframe, and any block model attribute. Fully integrated with MineScape's mine design functionality.

MINESCAPE ENGINEERING OPTIMIZATION

MINESCAPE PIT OPTIMIZATION

MineScape Pit Optimization provides the mining engineer with a simple, easy-to-use solution to calculate the most economically feasible mineable areas.

MineScape Pit Optimization utilizes the power of MineScape CAD while directly accessing MineScape Block Models to simplify the pit optimization process. Pit Optimization has a simple, easy to use form interface to supply input parameters. The results are written directly to the MineScape Block Model and are available for visualizing in CAD, interrogation and reserve calculations.



KEY BENEFITS

Fast Results

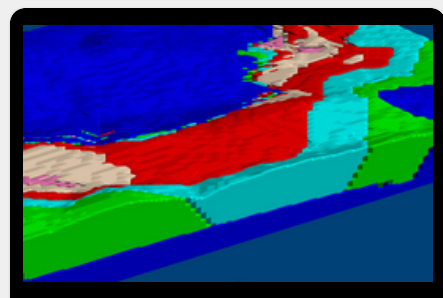
Integrated with the MineScape mine planning system. Results are immediately available for mine design, reserve calculations and visualization in MineScape CAD.

Accurate

MineScape Pit Optimization is powered by Minemax Planner, utilizing a maximum flow algorithm to get fast and accurate results. Combined with the automated workflow which provide more time for analysis, enabling better project decisions.

KEY FEATURES

- ✓ Integrated with MineScape Block Model, MineScape Stratmodel, and CAD
- ✓ Multiple elements and processes are supported
- ✓ Multiple slope regions
- ✓ Variable mining and processing costs are supported
- ✓ Supports generation of nested pits for push-back design
- ✓ 3D visualization of blocks and triangulated pit shells
- ✓ Handle large block models with tens of millions of blocks

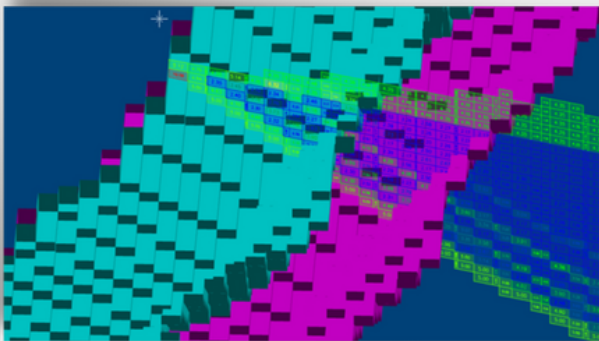


MINESCAPE ENGINEERING OPTIMIZATION

PIT OPTIMIZATION PRO

MineScape Pit Optimization Pro provides mining engineers with an easy-to-use solution to delineate ultimate economic pit shells.

It takes pit optimization work to the next level by utilizing the power of MineScape Core and the Stratmodel application while directly accessing stratigraphic models to simplify the pit optimization process.



KEY BENEFITS

Accurate

MineScape Pit Optimization Pro is powered by Minemax® technology providing a fast, accurate max-flow optimizing algorithm called 'Push-Relabel'. Push-Relabel provides the exact same results as Lerchs-Grossman and is substantially faster.

Simple

It takes full advantage of stratigraphic models created from the Stratmodel application.

Scenario Based

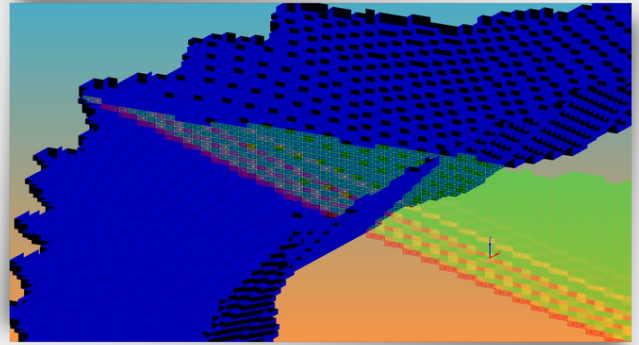
Easily manage different pit optimization runs.

Comprehensive Results

Run effective sequential processes to perform a Pit Optimization, generate meshed pit shells for visualization, write the resultant values to a file, and generate a report categorized by pit shell phase.

Multiple Costing Parameters

Easy access to multiple costing parameters to generate economic pit limits based on revenue criteria.



Fast Results

Runs multiple processes that create the file structure needed to run a Pit Optimization.

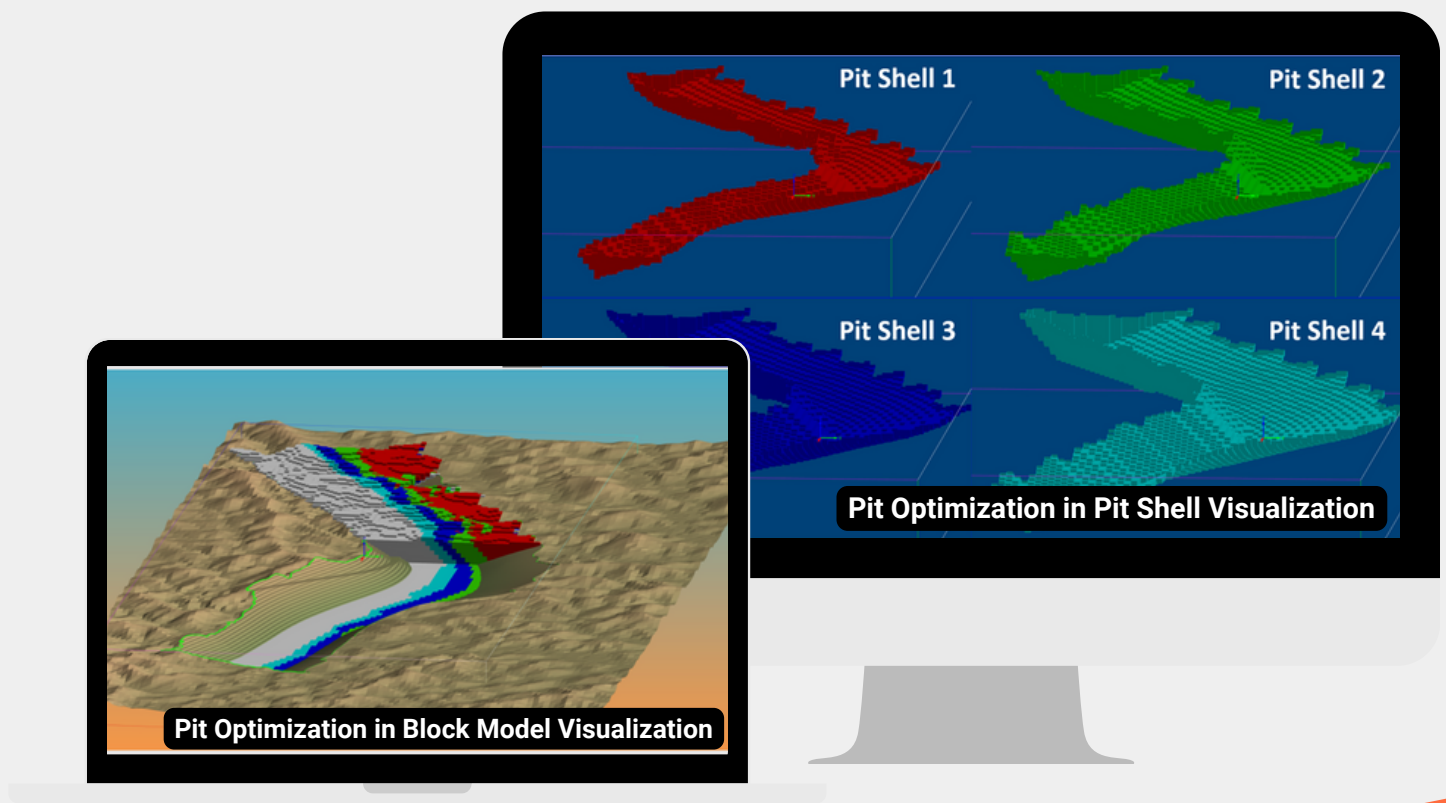
KEY FEATURES

- ✓ Integration with MineScape's Stratmodel and mine planning system
- ✓ Direct access to Stratmodel quality models as optimization input
- ✓ Improved UI to include multiple costing parameters
- ✓ Sped-up work without initial block model building required
- ✓ Leveraged reserve process over familiar functionalities
- ✓ Supports multiple elements, slope regions, and processes
- ✓ Supports variable mining and processing
- ✓ Combines multiple processes for automation
- ✓ Generates nested pits for push-back design

MINESCAPE ENGINEERING OPTIMIZATION

KEY FEATURES CONTINUED

- ✓ Immediate results for mine design, reserve calculations and visualization in CAD
- ✓ 3D visualization of blocks and meshed pit shells
- ✓ Supports advanced or customized deposit price based on grade/quality



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