



**UNDERGROUND
METALS**

**MODULE
SUMMARY**

VERSION 1.5



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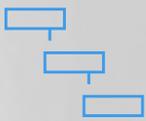
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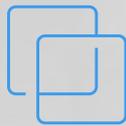
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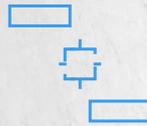
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A powerful design platform with superior data handling – the next generation of planning tools for mining

Deswik.CAD has been designed by mining professionals for mining professionals. Effectively a spatial database, Deswik.CAD combines the visual power of a modern CAD engine with the efficient data management of a fully featured database, giving you the ability to display, analyze and report your data however you need to.

Deliberately designed to provide generic engineering tools with flexible applications, Deswik.CAD is used and sought after across all mining sectors; underground and open pit mines, both coal and metal, throughout the world.

FULLY FEATURED CAD ENGINE

- » Modern Graphics engine designed to handle large mining datasets with excellent graphics performance.
- » Generate, slice and Boolean without errors. Arguably the best solids and polygon Boolean tools on the market.
- » Support for all standard CAD objects as well as mining specific objects including:
 - Irregular stopes and tunnels
 - Drill holes
 - Gridded seam and block models.
- » Superior graphic performance taking advantage of modern graphics card technologies.
- » Generate solids / polygons using a robust Boolean engine. Where other mining technologies fail, our solids will be valid.
- » Import invalid solids from other mining systems and repair them automatically.

INTEGRATED DATA MANAGEMENT

- » Superior attribute and metadata handling, bringing GIS-style capabilities to 3D mining data.
- » Brings advanced spreadsheet style calculations into the design environment, offering superior analysis and insights:
 - 3D spatial lookup formulae
 - Interrogate against solids for volume, area and intersections.

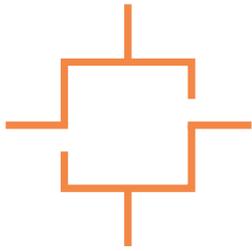
- » Incorporate a broad variety of data sources:
 - Global constants and parameter tables
 - Curve and value surface interpolation
 - Interactive and rules-based filtering from attribute values.

COMPREHENSIVE MINING DESIGN TOOLS

- » Advanced design and editing tools within a simple, modern, and intuitive interface.
- » Universal applications handle all mining sectors, open cut or underground, coal or metals.
- » Rules-based mine design engine for designs, allowing for scenario and what-if analysis.
- » Generate solids and surfaces using a multitude of methods:
 - Projection – strip or pit (open cut reserving)
 - X-Section along polyline (tunnels)
 - Manual or batch linking (stopes)
 - Tessellation (LIDAR data processing or DTM creation).

AUDITABILITY AND CONSISTENCY

- » Information manipulation using a powerful formula builder, instead of scripting.
- » Add structure to the planning process using graphical process maps tied into the entire Deswik.CAD toolset.
- » Wizard and rules-based tools provides data manipulation transparency.
- » Customizable process map macro builder:
 - Repeatable design and data transformations
 - Standardized planning process mapped to internal processes
 - Remove confusion for unfamiliar users.



Deswik.CAD

DESIGN & SOLIDS MODELING

POWERFUL REPORTING

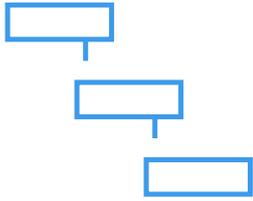
- » Rapid, intuitive plotting using the WYSIWYG principle.
- » Use custom filters and legend overlays for superior graphical reporting.
- » Flexible data queries generated on demand:
 - Volumes, areas, attributes and properties
 - Data histograms.
- » Familiar plotting functionality mirroring most other commercial CAD systems:
 - Unlimited, independent viewports for each plot
 - Title block text with intelligent attributes including date and user
 - Spreadsheet-style table editing; with tables easily placed into 3D space or on plots.

INCLUSIVE FORMAT

- » Based on an XML format, Deswik.CAD easily integrates with most mining and CAD packages including AutoCAD, Vulcan, Minex, Minescape, Minesight, Surpac, XPAC, etc.
- » Plugin and scripting interfaces allow for customization and data manipulation.
 - Integrated scripting development environment (IDE): Plugins can be developed in VB.NET or C# and easily integrated into the application
 - Powerful object model that allows full access to all properties and methods
 - In-built development environment with full access to the entire .NET framework.

SURVEY FUNCTIONALITY

- » Direct Integration with Leica Instruments:
 - Import jobs directly from DBX job files.
 - Upload reference data and survey stations from stations database.
- » A multi-user stations database stores all of the survey stations set up by the survey team as well as a ledger of the imported jobs
 - Supports either a standalone stations database file or directly integrates with Deswik.MDM (Mining Data Management) for enterprise sites.
- » Apply display styles to the imported survey data so that the observations appear as polylines, points, stations or inserts.
- » Ability to load survey stations from the database to the CAD for plotting or reference.
- » Export set-out and reference information to a variety of formats including; Leica DBX Job files, *.DXF, *.STR or user definable format text files.
- » Store, edit and label attributes per vertex on polylines.
- » Add a laser line offsets table to a plot.
- » Flatten a wall outline polyline to a floor centreline polyline.



Deswik.Sched

GANTT CHART SCHEDULER

A powerful Gantt chart scheduler specifically designed to handle the challenges of mine planning

From interactive Gantt charts to PERT network diagrams, Deswik.Sched is tailored for the needs of mine planners. Encompassing both rate and duration based scheduling, it easily handles the massive data sets that modern detailed planning requires; integrating production, ancillary and project activities with ease. Built around a powerful resource leveling engine; you'll understand your resourcing better than ever, setting priorities, constraints and objectives designed to reflect the real world requirements of actual mining activities.

Unrestricted by timescales, long-term and short-term planning horizons sit seamlessly together in a single schedule. By accessing the comprehensive suite of flexible reporting options, you'll generate more accurate output data in more meaningful ways, including detailed Critical and Point to Point path analysis.

Intuitive and flexible, Deswik.Sched can handle the planning needs of any mining sector; underground or open pit, coal or metal.

COMPREHENSIVE SCHEDULING FUNCTIONALITY

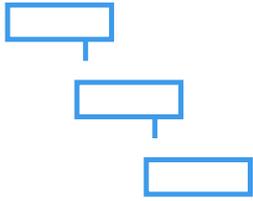
- » Familiar Gantt chart interface with inbuilt mining functionality designed for massive data sets.
- » Integrates production, ancillary and project activities with ease, using rate or duration-based scheduling.
- » Universal application – model open pit and underground mines in the same schedule.
- » Variety of configurable scheduler layouts, including:
 - Task and Resource Gantt
 - PERT network diagram
 - Linked reporting and 3D solid animation viewers.
- » Generate complex scheduling data through powerful spreadsheet-style formula tools, referencing data from a variety of sources, including lookup tables, range lookups, curves and global constants.
- » Innovative task and dependency options including:
 - Hammock tasks
 - Percentage overlap dependencies.

TIME MANAGEMENT

- » Detailed work calendars for scheduling and reporting from a shift basis through to a 100yr+ Life Of Mine.
- » Flexible combination of manual scheduling tools for short term and automated long term scheduling.
- » Scheduled task duration is calculated in seconds, allowing for infinitely customizable period reporting.
- » Construct detailed time usage models using:
 - Detailed rules based resource calendars
 - Grid based time usage data
 - Comprehensive time based reporting fields.
- » Integrate long, medium and short-term plans in one schedule, set specified planning horizons.

FLEXIBLE RESOURCING

- » Responsive resource assignment; pools assign resources based on task priorities and resource availabilities.
- » Build detailed and specific production rates with easy formula builders.
- » Resources can have a specific rate or group rates that will be applied depending on the task are assigned to account for variations in:
 - Design and environmental factors
 - Geological and geotechnical factors
 - Other factors such as efficiency and mining priorities.
- » Apply time variant fields to reduce production rates over specific periods.
- » Manual or rules-based resource assignment for individual or pooled resources.
- » Resource specific priorities and proximity de-rating for gear working close together.
- » Incorporate resource specific maintenance requirements including:
 - Maintenance events based on equipment hours
 - Retire and replace equipment based on a defined lifespan.



Deswik.Sched

GANTT CHART SCHEDULER

OPTIMIZED RESOURCE UTILIZATION

- » Powerful resource leveling engine with superior features including multi-pass leveling and input path scheduling.
- » Mirror real world objectives with dependencies, priorities, targets, constraints and resource limitations.
- » Applies a proprietary algorithm across the scheduled tasks in order to prevent over-allocation of resources by delaying lower priority tasks that cannot be resourced.
- » Tiered priority structure incorporating scheduling priorities, resource priorities and resource input path.
- » Sophisticated resource leveling functions including:
 - Fixed or preferential task grouping
 - Multilevel targeting and quantity constraints
 - Group constraints and blocking tasks
 - Task selection based on deadheading time for significant resource relocations.
- » Multi pass Resource leveling allows complex process modelling with specified rules for each leveling pass.
- » Interactive 'stepwise' troubleshooting of resource leveling process.

INTEGRATED REPORTING

- » User-defined pivot-style reports can be quickly customized to drill into the details of a schedule.
- » Unlimited options for pivot based reporting layout includes:
 - Task and resource filtering
 - Report based formulas
 - Incorporated graphing options
- » Live reports automatically recalculate when the Gantt time period is adjusted.
- » Record multiple schedule baselines to show schedule changes over time. Automated tools to keep schedules up-to-date.
- » Comprehensive suite of schedule analysis tools including:
 - Critical path analysis between selected tasks.
 - Dependency and conflict filtering.

SCHEDULE INTEGRATION

- » Operates stand-alone or integrated with Deswik.CAD and Deswik.IS.
- » Use the Deswik.SViz or Deswik.vSched platforms for quick 3D visualization of existing Deswik.CAD designs.
- » Copy and paste reports and data directly into Microsoft Excel.
- » Easy integration with a number of other scheduling packages.
- » Extensive sub-projecting capabilities for multiple schedule inputs.
- » Expand functionality with other Deswik modules including:
 - Deswik.IS
 - Deswik.Blend



Bridging the planning gap between designing and scheduling

Deswik.IS joins the power of Deswik.CAD and Deswik.Sched, dynamically linking your mine designs and schedules, enabling you to spend more time analyzing and planning scenarios rather than manipulating data. Gantt chart schedules can be modified and updated directly from the graphical environment, setting dependencies and specific resource input paths. Schedule-driven graphical animations give instant feedback on your planning changes, facilitating rapid schedule development.

Using process-driven reserving routines to generate schedule tasks from your mine design data, Deswik.IS automatically generates ancillary tasks such as drilling and blasting, adding the detail you need, while a set of flexible updating tools keeps both your graphics and schedule up to date. Multiple project schedules at different planning horizons can be merged and managed giving even greater flexibility to your mine planning structure.

SEAMLESSLY MERGES DESIGN AND SCHEDULING

- » Direct integration of the Deswik.CAD 3D design environment with the Gantt chart-based Deswik.Sched.
- » Instant feedback with animated schedule visualization and dynamic updating between design and schedule.
- » Take any type of design entity in the Deswik.CAD graphical platform and transform it into a task solid with a directly linked schedule task created inside Deswik.Sched; update, re-create, delete and manage task solids with any changes dynamically reflected in their associated schedule tasks.
- » Creates a direct link in real time – don't waste time exporting data or settings files that have to be uploaded and managed between different modules.
- » Manage any combination of open cut and underground, coal and metaliferrous mines from a single interface using universal processes.
- » Ability to change the linked Deswik.CAD and Deswik.Sched files as needed; multiple schedule scenario files can all be matched against a single set of task solids.
- » Record schedule changes as customizable animations to be shared across all stakeholders, keeping everyone up to date.

PROCESS DRIVEN

- » Comprehensive toolbox automates the conversion of design entities into schedule tasks with linked 3D solids.
- » Define complex mining processes through derived tasks such as drill and blast or dragline re-handle passes.
- » Wizard-based or manual project setup applies intuitive, process-driven routines to generate schedulable tasks from mine design data:
 - Define metadata to carry across the interactive link between the design and schedule.
 - Set rules to generate additional data during task solid creation
 - Run interrogation against geological models during or after the task solid creation process.
- » Develop derived tasks to represent a task that is involved in the cycle of extracting the main mining block; drilling and blasting could both be derived tasks for a mining extraction task:
 - Tasks can be scheduled and resourced separately to their parent task
 - Representative solids can be created for inclusion in animations.
- » Use linked attribute data to build a comprehensive set of activity type rules that define how a design entity is transformed into a task solid with linked schedule task:
 - Bench blocks
 - Tunnels
 - Stopes
 - Reserve solids
 - Outlines.
- » Incorporate solids Boolean processes during task solid creation to cut solids against each other and remove overlapping volumes; that is: remove development drives from within stope solids.

INCLUSIVE DESIGN

- » Create bench blocks or generate solids from reserve solids, tunnel centrelines and stope sections.
- » Specialized tools produce pit shell solids, bench block polygons, ore drive centrelines and assign attributes.
- » Take a series of pit or dump shell surfaces and cut them against a starting topography, and each other, to generate a series of closed solids.
- » Cut pit stage solids against grids to generate polygons representing the bench block shapes to be mined on each bench of a pit.
 - Automatically merges small polygons created at the edge of a pit shell with larger adjacent blocks, to create more practical mining shapes.
- » Create polygons and solids to represent an ore drive, using centerlines and polygons defining the ore limit outline.
- » Automatically or manually assign grouping or graphic attributes to your design entities before, during, or after task creation with a number of attribute assignment tools.

SEQUENCE VISUALIZATION

- » Innovative graphical interface with a flexible, rules-based approach delivers repeatable and auditable creation of complex mining sequences.
- » Graphically set resource paths for greater control of equipment sequencing.
- » Graphical dependency tool provides visual representation of every single task dependency in the linked schedule.
- » Intuitive manual linking between design graphics based on polygon, centroid or solid selection.
- » Build comprehensive sets of automatic dependency rules that can be re-run for new or updated designs as required:
 - Link directly on task metadata (attributes)
 - Spatial linking based on solid centroid
 - Vertical overlap and face angle.
- » Dependencies are automatically updated to the schedule in real time as they are created.
- » Access animation mode while creating dependencies to immediately visualize changes to the mining sequence.
- » Option to assign schedule resources to tasks graphically as part of the dependency creation process.

UPDATE AND INTEGRATE

- » Effortless transfer of data to bring schedule information such as resourcing onto the design solids.
- » Update mine plans against survey data, cutting solids and re-proportioning schedule tasks to the survey date.
- » Automates update of existing schedules from surface or underground mine surveys, cutting and re-proportioning tasks and rescheduling from the survey date forward:
 - Cut open pit mining reserves against survey surfaces or polygons, with linked schedule tasks adjusted to the remaining amount.
 - Updates face positions for underground development against survey pickups updating the schedule as required.
- » Automatic and on demand batch update functions transfers information from your design to your schedule and back again within the software – no need to save out files to load into different modules.

POWERFUL COMMUNICATION TOOL

- » Superb graphic reporting such as period progress plots, legend coloration and 3D animations.
- » Project merge facilitates multi-user planning of different mine areas or timeframes for true integration across a project.
- » Set a mining direction for your overall design; define specific dates and then cut the task solids to indicate the face positions.
- » Create stage plans that represent snapshots of the surface of your mining and dump faces at different times throughout the life of your mine.
- » Cut tunnels and outlines based on the meters scheduled to be mined across a range of periods that you define.
- » Manage different files related to the one mine plan by merging multiple base projects into one master project:
 - Build the master schedule from all tasks contained in the original base schedules.
 - Vary master schedule as required and then write changes back to the base projects to keep them updated.
 - Dependent tasks in the master schedule are incorporated into the base schedule as non-editable external tasks.

Understand material movement like never before with scenario-based modeling and analysis

Building from the Deswik.CAD graphics engine, Deswik.LHS has the power, flexibility and accuracy to deliver the haulage solutions you've always needed. Covering all variables in the material movement equation, Deswik.LHS includes haul road analysis, detailed truck modeling, fixed and mobile conveying and cost modeling. Offering numerous haulage strategies from minimizing dumping height to reducing haulage distance, the easy-to-follow wizard generates multiple scenarios with ease.

Model real world factors including TKPH restrictions, haul road congestion and speed limits; calibrate your GPS tracking data to your modeled cycle times. A comprehensive reporting suite reveals the crucial data behind your material movement schedule including detailed haulage paths, cycle time analysis and stage plans. Environmental reporting includes disturbance and rehabilitation forecasting, wet weather simulation and final landform analysis.

Deswik.LHS is equally applicable in open pit and underground environments, incorporating mining schedules at any planning resolution.

INDUSTRY LEADING HAULAGE MODELING

- » Deterministic model for every block of material captures variability and peak requirements for haulage and dump inventory.
- » Exposes issues hidden by averaging single hauls across large volumes in traditional methods.
- » Produce detailed, meaningful dump schedules from large datasets to accurately model complex material movements and compare dumping strategies.
- » Integrate with production scheduling to maximize opportunities and manage production risk at both tactical and strategic time horizons.
- » Model dragline, cast blast and dozer dumps as well as standard truck haulage or fixed and mobile conveyors.

MANAGED SCENARIOS

- » Scenario manager gives efficient evaluation of haulage variables, to refine strategies and identify value drivers.

- » Multiple materials in each scenario; map ROM and waste with rejects and tailings hauled or pumped in-pit.
- » Intuitive scenario manager and comparison tools facilitate rapid scenario generation for sensitivity analysis and effective contingency planning.
- » Set dumping strategies that can be varied over time including:
 - Minimize cycle time
 - Minimize RL
 - Minimize fuel usage
 - Minimize cost.
- » Manages stockpiling and re-handle through integration with Deswik.Blend.
- » Investigate the impact of truck limited haulage when integrated with Deswik.Sched.

SUPERIOR SCHEDULING FUNCTIONALITY

- » Input material movement schedules from multiple sources – Deswik.Sched, Deswik.Blend flowlog, .CSV and others.
- » Automated updating of Deswik.Sched files with key output haulage information for reporting.
- » Detailed material mapping links source and dump areas by material against each resource type for more accurate modeling.
- » Destination overrides to force material into specific dump locations.
- » Limit haul roads with congestion, so a different haul path must be found once congestion limit is reached.
- » Vary performance over time to model seasonal weather variations and reflect actual delay events with release dates for:
 - Haul roads
 - Dump areas.

EXPANDED SCOPE AND ACCURACY

- » Model dragline, cast blast and dozer dumps as well as standard truck haulage or fixed and mobile conveyors.
- » Calibrate theoretical cycle times against GPS logs of truck hauls for accurate models set to site conditions.
- » Unique method of importing site based truck GPS data and calibrating software to actual cycle.
- » TKPH tolerance and limiting of hauls to ensure that changing tire manufacturer can be quantified.
- » Rolling resistance rules to automatically populate haul path rolling resistances.

DETAILED DESIGN AND HAUL PATH MODELING

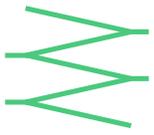
- » Generate precise in-pit and OOPD reserves through Deswik. CAD; trimmed to survey or detailed short term designs
- » Dynamic haul paths, stop signs and speed limits, rolling resistance, congestion and release dates.
- » Intuitive haul path and slot connection tools.
- » Dynamic haul paths that move with a changing landform throughout the schedule.
- » Manually audit cycle times directly from a 3D haul path.

EFFECTIVE REPORTING TOOLS

- » Report all aspects of a haulage scenario from mining block to haul routes to dump block via animations and tabular reports.
- » Customize reporting of individual or macro haul data, stage plan surfaces and contour plots.
- » Rapid generation of mining stage plan surfaces and contour plots.
- » Animations and period progress plots for communication of the plan.
- » Auditing tools ensure that the material has been moved in a practical fashion.

ENVIRONMENTAL PLANNING

- » Mining and dump disturbance reporting. Rehabilitation forecasting and selective material placement (acid mine drainage, tailings, etc.).
- » Understand the final landform with volume balancing and mine closure planning tools.
- » Wet weather event simulation with catchment and run-off reporting.
- » Report fuel and CO2 emissions.



Deswik.AdvUGM

ADVANCED UNDERGROUND METALS

Advanced functionality tailored to the specialized demands of underground metals operations

Developed in direct response to the needs of our customers, Deswik.AdvUGM adds functionality across the Deswik software suite. Continually updated with the latest releases from our development pipeline, this module enables your mine planners to do more effective, more detailed and more value driven planning. Unlocking advanced design and scheduling features for both long and short term planning, the module includes:

- » Underground Tabular Design Toolbox and Auto Development Designer for rapid development layouts
- » Easy development and stope reconciliation tools for compliance auditing
- » Backfill design and reconciliation including slump calculations
- » Advanced scheduling functions including backwards pass resource leveling, objective targeting and resource path importing.

Deswik.AdvUGM can be used with either Deswik.CAD or Deswik.Sched or a combination of both.

AUTO DEVELOPMENT DESIGNER

- » Uses rule-based processing to rapidly layout development and panels for underground mining operations.
- » Automates standard polyline manipulation tools and formula based attribute assignment.

UNDERGROUND TABULAR DESIGN TOOLBOX

- » Design toolbox developed specifically for repetitive underground designs in tabular-style deposits.
- » Generates development layouts relative to defined geological models.

PROCESS CMS

- » Import CMS polylines or triangles and stitch them together to create a closed solid.
- » Rapidly generate shells around CMS point cloud data.

AS-BUILT RECONCILIATION

- » Detailed reconciliation between as-built and design solids from a 3D perspective for development or stopes.

- » Report out dilution, overbreak and underbreak from hanging wall, footwall, sides, crowns and toes.

BACKFILL PLANNING AND RECONCILIATION

- » Generate staged backfill solids based on material characteristics and fill volumes from nominated fill points on a 3D stope void solid.
- » Reconcile actual fill amounts against required fill and determine void locations.

ADVANCED RESOURCE LEVELING

- » Access to features such as backwards pass leveling, multi-field or sink rate targeting and time usage models.
- » Short-term manual scheduling via interactive resource paths or import resource paths from other packages.

CALCULATE STEREONETS

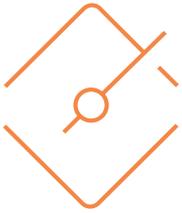
- » Import strike azimuth and dip data to generate geotechnical stereonets directly in the Deswik.CAD design space.
- » Supports Schmidt, Wulff, Rose and observation diagrams.

INCLUDES DESWIK.SVIZ (SCHEDULER VISUALIZER)

- » Embedded 3D visualizer for Deswik.Sched.
- » Utilizing a dockable interface, it provides interactive viewing and animation of mine designs, sitting side-by-side with the schedule tasks.

TUNNELS BY VARIABLE SECTION

- » Tunnel creation tool that uses chainage based rules to allow a tunnel to have variable profiles
- » The tool has 3 different rule sets available:
 - Primary X-section rule – this allows the user to change the profile of the tunnel as required
 - Secondary X-section rule – allows the user to insert repetitive changes to tunnel profile ie. safety bays, Fresh Air bases, electrical cut outs etc
 - Excavation Rules – allows the user to dice up any tunnel profile into excavation segments that will be excavated, ie. top bench, bottom bench, wall stripping etc.



Deswik.SO

STOPE OPTIMIZER

Underground stope shape optimization using the industry-leading MSO

A strategic mine planning tool, Deswik.SO automates stoping design for a range of methods used in underground mines. Able to quickly analyze stoping methods and parameters for a defined geological block model, you'll maximize the value of your ore body and develop a strategic plan assessed against a variety of approaches and constraints.

Built around the AMS Mineable Shape Optimizer, the tool allows you to define numerous properties for the stopes including; general shape and orientation, cut-off grade, cost and revenue, pillar sizes, dilution, mining limits and waste ratios. The scenario management tools allow multiple mining options to be considered and compared rapidly, generating output reports that let you optimize for your best case.

Fully integrated into Deswik.CAD, output stope wireframes and section strings can be directly incorporated into the Deswik mine planning process.

REALIZE MORE VALUE

- » Automatically generate highest value stope solids across a wide range of mining method geometries and ore body types.
- » Delivers strategic stope designs and pillar location optimization against complex ore bodies.

CUSTOMIZABLE DESIGN

- » Wizard-based setup for easy definition of stope parameters like strike and dip as well as stope and pillar widths.
- » Dilution offsets define planned dilution width on both footwall and hangingwall sides of the stope.

ECONOMIC OPTIMIZATION

- » Use geological model fields as cut-off values or calculate a value with grade, mining recovery, price, mining/processing costs and royalties.
- » Alter the maximum waste proportion of the stopes to vary resource recovery.

UNDERSTAND THE OPTIONS

- » Scenario Manager facilitates comparison of multiple design scenarios with rapid adjustments.
- » Export and import scenario settings for rapid setup of new projects and re-evaluate scenarios against new geological data.

INTEGRATED PLANNING SOLUTION

- » Embedded in the Deswik.CAD graphics platform for effortless generation of stope wireframes and solids.
- » Seamless flow into Deswik.Sched via Deswik.IS for rapid analysis of scenario results.



Deswik.ASD

AUTO STOPE DESIGNER

Automatically create mineable stopes for narrow-vein vertical mining methods

Designed specifically for use in narrow vein, steeply dipping ore bodies, Deswik.ASD quickly generates detailed stope shapes that are traditionally designed manually. Working from a geological block model, the tool automates the process of generating sectional slices through the ore body.

The stope shapes are guided by numerous properties including associated development designs, stope design parameters, pillar restrictions, dilution factors and cut-off grades. Scenarios can be easily adjusted allowing alternate scenarios to be compared rapidly, letting you optimize for your best case.

Fully integrated into Deswik.CAD, output stope wireframes can be directly incorporated into the Deswik mine planning process.

PRACTICAL RESULTS

- » Working from development layouts, Deswik.ASD slices against block models to generate section lines representing individual stopes.
- » Rapidly produces detailed stopes that are practical for narrow vein, steeply dipping deposits.

DETAILED DESIGN

- » Consider geological constraints and incorporate design parameters such as pillar restrictions, dilution factors and cut-off grades.
- » Assign minimum footwall angles to automatically adjust design and dilution to match.

SPECIALIZED FUNCTIONS

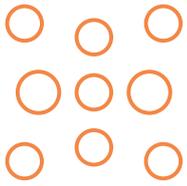
- » Constrain stopes to follow defined lenses in the orebody, accounting for close-spaced multiple lenses.
- » Development matching for incremental cost analysis to the extents of the ore body from a central access drive.

VARIABLE SCENARIOS

- » Supports multiple input data sources to generate variegated stope designs in different ore zones or geological models.
- » Attributes are automatically assigned to be quickly used in the generation of a schedule.

INTEGRATED PLANNING SOLUTION

- » Embedded in the Deswik.CAD graphics platform for effortless generation of stope outlines and solids.
- » Seamless flow into Deswik.Sched via Deswik.IS for rapid analysis of scenario results.



Deswik.UGDB

UNDERGROUND DRILL & BLAST

Fast, efficient underground drill and blast design

A Deswik.CAD module, Deswik.UGDB has been developed to manage the specialized needs of drill and blast designs for underground mines. Rapidly site rings, slots, drill holes either manually or through sophisticated automated tools, to deliver a comprehensive ring design every time. Ensure consistency by incorporating standard design metrics for drill rig parameters, explosives and detonator placement to prepopulate your design. Define blast pattern with primers, explosives and timing sequences to produce detailed blast designs and solids.

Generating a drill and blast plan is only half the job and Deswik.UGDB ensures that communicating the plan is just as easy. Rapid plotting from pre-configured layouts, direct export to drill rig guidance software and survey formats keeps everyone, from drillers to surveyors, working together.

SUPERIOR DESIGN TOOLS

- » Intuitive manual or automatic layout of drill holes with relation to design and existing voids.
- » Set design parameters for parallel or fanned holes including fixed toe spacing, collar spacing or angle changes.

LONG HOLE WINZE DESIGN

- » Use set templates to rapidly insert a winze adjusted to dip and length, and charge the holes.
- » Insert cut-off-slot rings with a long hole winze in line with the holes or a specific number of rings.

DYNAMIC UPDATING

- » Update holes layouts against survey and design changes, change the drill rig or reverse the drill look direction.
- » Copy designs between rings – new design automatically adjusts to the profile of the next ring slice.

BLAST DESIGN

- » Define charge holes and primer locations including customizable decking layouts with multiple explosive products.
- » Set blast timing for holes in various patterns and sequences and animate the resultant blast.

BLAST SOLIDS

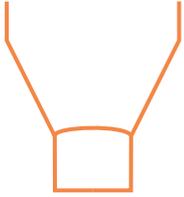
- » Slice the original stope solid against ring layout or generate directly from the ring designs.
- » Interrogate the blast solids directly and report against the physical values in a plot.

FLEXIBLE PLOTTING SOLUTIONS

- » Plot any combination of plan and section views for ring, winze and break-through designs.
- » Rapidly set-up plot templates with tables referencing key design information that updates for each plotted ring design.

DATA EXPORTING

- » Export to IREDES in Atlas Copco or Sandvik data format and upload the design directly to the drill rig.
- » Distribute ring designs and laser lines to surveyors in either DXF or CSV formats.



Deswik.Caving

CAVE FLOW MODELING

Modeling of rock flow within the cave Life-Of-Mine to give recovery and dilution forecasts

Deswik.Caving models simulate cave flow for the Life-of-Mine of a caving operation for several outcomes such as recovery, dilution and production scheduling.

PRODUCTION OPTIMIZATION

- » Models flow of rock within the cave Life-Of-Mine to give recovery and dilution forecasts.
- » Optimizes production targets at draw points.
- » Schedules production for block, panel and sublevel caving.

CAPABILITIES

- » Automatic flow mechanics properties.
- » Recovery reports generated by level, phase, resource classification, drawpoint and time.
- » Sublevel and block caving capability within the same model.
- » Allows for cave propagation within a simulation.
- » Allows for fine and alternate particle properties.

SMALL SCALE CALIBRATION

- » Produces ellipsoidal approximations of draw similar to those seen in reality.
- » Software has been calibrated against many operational mines.

INTEGRATION

- » Ease of importing .DXF files for cave back propagation.
- » Integrates with the Deswik process.



Deswik.Draft

DRAFTING AND PLOTTING

Unleash the drafting and plotting functionality of Deswik.CAD across your workforce

A streamlined version of the powerful Deswik.CAD graphics design software, Deswik.Draft offers a legitimate low cost Computer Aided Drawing option for sites with dedicated draughtsmen creating plots and plans. Featuring the same familiar, intuitively designed Deswik.CAD interface, it contains all of the plotting, annotation and polyline editing tools you would expect.

With the ability to import Deswik.CAD 3D solids as well as a large variety of other design files, draughtsmen can view and slice reserve solids as needed to convert your mine designs into a working plan ready for the jobsite.

FULLY FEATURED CAD ENGINE

- » Modern graphics engine designed to handle large mining datasets with excellent graphics performance.
- » Universal applications handle all mining sectors, open cut or underground, coal or metals.

IDEAL FOR DRAFTING AND PLOTTING

- » Version of Deswik.CAD containing just the functionality required for drafting and plotting.
- » Does not contain 3D solids design tools or the ability to run other Deswik modules.

COMPREHENSIVE DRAFTING TOOLS

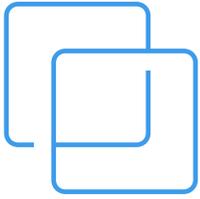
- » Advanced design and editing tools within a simple, modern, and intuitive interface.
- » Support for all standard CAD objects, polyline editing and drawing tools, dimensions and annotations.

PROCESS MANAGEMENT

- » Add structure to the planning process using a customizable process maps macro builder:
 - Repeatable design and data transformations.
 - Standardized planning process mapped to internal processes.
 - Remove confusion for unfamiliar users.

POWERFUL PLOTTING

- » Rapid, intuitive plotting using the WYSIWYG principle.
- » Familiar plotting functionality mirroring most other commercial CAD systems:
 - Unlimited, independent viewports for each plot
 - Title block text with intelligent attributes.



Deswik.Blend

MATERIAL FLOW MODELING

Optimize your product value with material flow modeling for both coal and metals

A companion module for Deswik.Sched, Deswik.Blend has been developed to meet the challenges of scheduling material handling and blended production outputs from any mining deposit, metaliferrous or coal. Using an intuitive graphic interface, complex material flows can be comprehensively modelled for easy multi-scenario analysis.

Built around the IBM CPLEX optimizing engine, Deswik.Blend schedules the available material with consideration for stockpile limits, flow constraints, plant capacities and product targets. Outputs are balanced across defined periods against the competing priorities of product quantity targets, product specifications and maximizing the value mix for multi-product scenarios.

Reporting directly into Deswik.Sched, the output flow log maps each material flow - tracking material throughout the entire beneficiation process to mining the block level of granularity. Matching this information into Deswik.LHS can define the additional haulage pressures of complex stockpile reclaim strategies.

PERIOD-BASED OPTIMIZATION

- » Material flow modeling and targeting that closes the planning gap between ROM production and blended product.
- » Develop product strategies for defined constraints using the IBM CPLEX solver engine.

MODEL COMPLEX SYSTEMS

- » Intuitive graphic interface builds a network of sources, stockpiles, plants and destinations via material pathways.
- » Blend materials on either a raw or product basis incorporating unlimited variables.

REALISTIC CONSTRAINTS

- » Simulate metal and coal plants, with flotation, washability and yield curves at discrete cut points.
- » Balance quantity and quality/grade targets with flow ratios, stockpile turnover and material transformations.

STRATEGIC OPTIONS

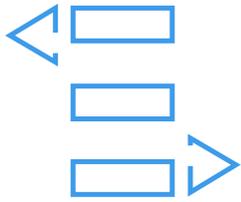
- » Audit material flows through the entire the network, trace from source block to destination via all stockpiles and plants.
- » Allow the blending engine to select the best production sequence for defined saleable product streams.

EMBEDDED REPORTING

- » Complete exposure of all data used during the blending process, reportable via Deswik.Sched.
- » Generates a detailed flow log record of each material movement from pit to stockpile to plant.

EXPANDED SOLUTION

- » Integrated seamlessly within Deswik.Sched eliminating any manual transfer of data.
- » Extend the results to Deswik.LHS for haulage scenario analysis including stockpile reclaim and transport trucking.



Deswik.SOT

SCHEDULE OPTIMIZATION TOOL

Realize more value from your resource with an NPV optimized schedule

A companion module for Deswik.Scheduler, Deswik.SOT works to maximize the value of your resource investment. Developed by MIRARCO (Mining Innovation Rehabilitation and Applied Research Corporation), Deswik.SOT uses heuristics and a unique evolutionary algorithm to optimize the Net Present Value of your long term mine schedule.

Calculating from defined cost and revenue inputs, Deswik.SOT rapidly selects for the maximum NPV at every possible branch point in a constrained mining sequence. Outputting as an optimized mining date for each task, NPV-optimized sequences are then processed through the Deswik.Sched resource leveling engine to produce a final NPV and resource optimized schedule.

Featuring a scenario-based process, resource capacity ranges can be easily explored, helping to quantify mining risk and develop mitigation strategies across your mining sequence.

SCHEDULE FOR VALUE

- » Uses heuristics and a unique evolutionary algorithm to optimize the Net Present Value of long-term mine schedules.
- » Control and narrow the focus by allocating more time to improving the highest-valued schedules.

UNDERSTAND RESOURCE CAPACITY

- » Capacity Analysis feature reports on the valid capacity ranges for the operational resources.
- » Investigate a range of scenarios with capacity flexing to optimize against varied operational resource capacities.

ADD CONSTRAINTS

- » Apply fleet-size constraints, as an additional option to traditional production constraints.
- » Fix start date of defined activities such as exploration drilling and understand their impact on the NPV of the operation.

ASSESS RESULTS

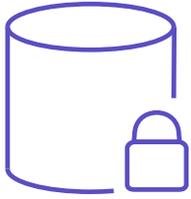
- » A set of significantly different schedules with the best optimized NPVs are retained for comparison.
- » Add contaminant costs when the concentration passes a specified threshold for a given scheduling period.

SEAMLESS INTEGRATION

- » Embedded within Deswik.Sched, the Deswik.SOT forms can be prepopulated from existing schedule fields.
- » Optimized SOT sequences can be applied as seed schedules for further Deswik.Sched resource leveling processes.

NEW IN SOT 2.0

- » Count capacity profiles.
- » Scheduling period specified separately for each resource capacity.
- » More detailed specification of recovery factors.
- » 'Trigger' activities can modify plant capacities, have associated capital costs, associated changes in recovery and operating costs.
- » MaxLag property ensures fill activity occurs within specified time. MaxLag can also be used to limit delay between successive development activities.
- » Operating costs for an activity can be aggregated from operational resource costs, or based on multiple activity properties.
- » Bar charts allow for a comparison of alternative schedules in terms of production, cash flow, or other properties.
- » Efficiency improvements for scheduling and sliding operation.



Deswik.MDM

MINING DATA MANAGEMENT

A spatial database and process workflow management tool

Tightly integrating with the Deswik.CAD and Deswik.Sched applications, Deswik.MDM provides a spatial database and process workflow management tool for the entire technical services department. A single point solution for data management and security, Deswik.MDM also supports versioning by increment or date with rollback functionality. Built on a standard Microsoft platform including SQL Server Database, the system allows typical mining data and documents to be organized and categorized; data is tagged using attributes and edited through user-definable, auditable workflows.

MINING DATA MANAGEMENT

- » Management of mining data and associated documents using multiple data stores and workflows.
- » Incorporates spatial CAD graphics, geological models, tabular data, schedule tasks and associated documents.

DATA STORAGE AND REFERENCING

- » Uses attributes and spatial bounds to allow relevant data to be stored and retrieved.
- » Extract the data in multiple formats for referencing and editing in third party applications.

CHECK IN/CHECK OUT

- » Extract portions of data in a subject area for editing and then merge back into the entire dataset.
- » Data is locked during checkout to ensure a single version is maintained.

PROCESS WORKFLOWS

- » Process workflows can be built into the MDM, defining or enhancing current organizational planning processes.
- » Workflows provide formalized, repeatable processes that ensure data validity and auditability.

DATA SECURITY

- » Users are assigned rights to only allow read or write access to specific categories of data.
- » Users can be grouped to allow multiple people to work on common tasks as available.

TASK ALLOCATION

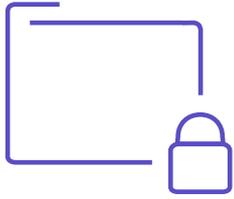
- » Specific users can trigger a job which is added to the task list of a group of users.
- » Completion of one job can trigger multiple other workflows and notifications to key users.

PREVIEW LATEST MINING DATA THROUGH THE NETWORK

- » Preview tool allows all users to view the latest mining data they have rights to on their local machine.
- » Preset views provide ways to rapidly access typical graphical information or reports.

MINING DATA VIEWER

- » The Deswik.MDM SiteView module allows users on a site to view data stored in Deswik.MDM via a simple, configurable, CAD-based interface.



Deswik.FM

FILE MANAGER

Proactively manage data versioning with an integrated document management system

Deswik.FM is a centralized, collaborative and auditable document management system. Operating from an integrated user interface within the Deswik suite, users add or remove files and control file versioning via an intuitive check in/check out mechanism.

Built on an application server that allows documents to be organized in different repositories, with an integrated backup mechanism to revert to older revisions that allows users to modify content with confidence. Integrated access control via specified user groups and permissions improves security, providing active risk management for your data.

The system has been designed to fully integrate into your customer's existing user management infrastructure via an Active Directory interface.

COMPLETE VERSION CONTROL SYSTEM

- » Rapidly make modifications, comment on check-in changes or revert files.
- » Check out specific versions or get 'read only' copies of files checked out by another user.

GROUP BASED PERMISSION MODEL FOR REPOSITORIES

- » Users are automatically authenticated and added to the repository via Active Directory interface.
- » Dynamically update a comprehensive list of permissions for each group or repository.

CENTRALIZED CONFIGURATION MANAGEMENT

- » Centralized web-based platform for administrators to configure and monitor system health and settings.
- » Manage groups, users, repositories and permissions from a single point.

DIRECT INTEGRATION WITH DESWIK SUITE

- » Intuitive user interface docks directly within Deswik.CAD or Deswik.Sched.
- » Familiar tree structure representation of files includes status and history for selected files.

MULTI-TIER SYSTEM

- » Deswik.FM is set-up as a scalable N-Tier system for optimum security and performance.
- » Uses existing IT infrastructure for databases, network storage, web servers and active directory servers.



Deswik.OPS

OPERATIONS SCHEDULING & TRACKING

Enhanced operations planning through collaborative weekly and shift scheduling

Deswik.OPS is a web-based, operations scheduling, production data management and collaboration tool suitable for any mining type and commodity. Integrating with the organization's longer-term schedules, it enables short-term planners to rapidly create detailed, activity-based shift plans directly from the short-term schedule.

Deswik.OPS manages the progress of mining activities within the site and meets the daily requirements of short-term engineers, production engineers, shift bosses, control room personnel, site superintendents.

Deswik.OPS is highly configurable and integrates with third-party production data capture systems and the Deswik suite of mine planning tools,

OPERATIONS PLANNING

- » Quickly build detailed, activity-based weekly and shift plans directly from the short-term plan, and manage the integration between longer term schedules and the operations plan.
- » Convert longer term tasks into detailed activity cycles.
- » Record in-shift movements and better understand the constraints within the mine for the shift being managed.
- » Monitor equipment availability and utilization, and dynamically adjust the shift plan based on the impact of delays upon your schedule.
- » Dynamically change a plan at the shift level and add new activities as required during the shift.
- » Track and manage resource and material assignment, movements and delays.
- » Rapidly build detailed activities to allow for Short Interval Control during a shift while monitoring any deviations from the longer term goals of the organization.
- » Monitor progress against the plan: the shift view provides a clear picture of what is happening throughout a shift for the control room operator. Check the progress of previous shift.
- » Display multiple baselines or future plans to ensure the active operations schedule follows the longer term plans.

SCHEDULE INTEGRATION

- » Direct integration with the short-term planners' schedule lets you rapidly build your operations schedule. For example, you can import the first 1-3 weeks of the 12-week plan from Deswik.Sched or a third-party system.
- » Use process and site-specific activity cycles along with business rules to expand your schedule into an operations schedule.
- » Deswik.OPS builds on the strong foundations provided by the powerful Deswik.Sched engine to manage dependencies and business rules.
- » Scheduling information and production data can be exported back to the short-term plan to update the tasks' percentage of completion.

TRACK AND MONITOR ACTIVITY PROGRESS

- » Throughout a shift, capture real-time data regarding shift operations, and map all collected data to activities in the schedule.
- » Automatically import production data for each activity from a third-party system, or manually enter it for equipment not managed by a Fleet Management System.
- » Captured production data can be used to auto-update the shift progress.
- » Stores all imported or entered production data to allow reporting of planned vs actual.
- » All collected data is mapped to planned activities to display progress against the plan.
- » Minimize data collection at shift end by recording specific information at the end of each activity.
- » Rapid, intuitive reporting.
- » Build and manage your own reports with the intuitive and interactive report builder, or draw information from the Deswik.OPS SQL database using third-party reporting tools.

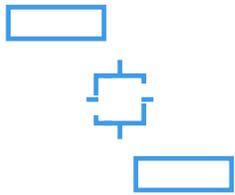


Deswik.OPS

OPERATIONS SCHEDULING & TRACKING

COLLABORATION

- » Deswik.OPS is a web-based collaboration tool that makes a plan from a coming shift and tracks progress against the plan. It improves communication across shifts between all site personnel.
- » Users can add structured comments about locations, activities, resources, or a shift, and add attachments to increase meaning.
- » Every decision made is considered, visible, and seen as understood.
- » Different plan views are available for different stakeholders: location tracker and whiteboard for the shift supervisors, Gantt chart for the scheduling engineers and control room operators, dashboard reports for the management team.
- » The data underlying the operations schedule is kept synchronized between the multiple views.



Deswik.SViz

SCHEDULER VISUALIZER

Visualize your mine planning with Deswik.SViz

SViz is an embedded 3D visualizer for Deswik.Sched. Using a dockable interface, it provides interactive viewing and animation of mine designs, sitting side-by-side with the schedule tasks. Working from an initial design created through the Deswik suite, SViz can enhance the scheduling process with real time visualization of schedule changes.

Full integration with Deswik.Sched lets you apply filters, color blocks by schedule fields and assign resources, to view your their schedule data in a more meaningful way.

A low cost option designed to free up Deswik.CAD and Deswik.IS licenses, SViz maintains the unique integration of design and scheduling that sets Deswik apart.

STREAMLINED FUNCTIONALITY

- » Works with Deswik.Sched, independently of Deswik.CAD or Deswik.IS.
- » One application and one interface for scheduling and visualization.

FULLY FEATURED VIEWER

- » Load in Deswik.CAD design files that have been processed through Deswik.IS.
- » Simple 3D visualization of tasks without the need to load a CAD design file.

ANOTHER INTUITIVE VIEW OF ALL YOUR TASKS

- » Task selection synchronized between the normal scheduler view and the visualizer – select tasks in the grid or in the 3D view.
- » Task solids in the 3D view can be coloured by the task's Gantt bar colour.

SCHEDULE INTERACTION

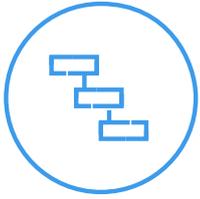
- » Dependency view that clearly shows successor and predecessor tasks in the 3D view.
- » Assign resources by dragging directly onto the 3D task solids.

IMPORTS SETTINGS AND DATA

- » Imports file settings such as legends, layer pre-sets and plane definitions for the Deswik.CAD design file.
- » Display design layers through the layer directory and access all the attributes and properties of the solids.

SYNCHRONIZED

- » See your changes to the schedule instantly reflected in the animation in the viewer.
- » Apply schedule filters to see them instantly reflected in the viewer.



Deswik.vSched

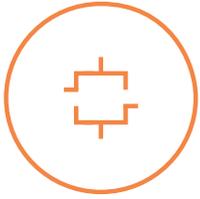
SCHEDULER VIEWER

Communicate your mine schedule with Deswik.vSched

Deswik.vSched is a free, standalone application to view Deswik.Sched schedule files. Unrestricted by licensing, it can be installed on any system ensuring that every stakeholder in your mine planning process has access to the latest mine schedule.

INCLUDED FUNCTIONALITY

- » Apply pre-configured layouts or create a new one as required from:
 - Task grid setups
 - Gantt chart views
 - Reports
 - Timescales
 - Grouping.
- » View all of the file settings including:
 - Production fields
 - Custom fields
 - Filters
 - Calendars.
- » Adjust the view; collapse and expand groups.
- » Apply date range filters.
- » Print the schedule.



Deswik.vCAD

CAD VIEWER

Communicate your mine design with Deswik.vCAD

Deswik.vCAD is a free, standalone application to view Deswik CAD design files. Unrestricted by licensing, it can be installed on any system ensuring that every stakeholder in your mine planning process has access to the latest mine design.

INCLUDED FUNCTIONALITY

- » Run animations published through Deswik.IS or simply load up design files.
- » Select, pan, orbit, zoom, and display the animation in 3D.
- » Display the properties and attributes of a selected object.
- » Display or hide design layers through the normal layer directory.
- » Apply previously defined:
 - Color legends.
 - Plane definition views.
 - Layer pre-sets.
- » Filter objects on a layer interactively.



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Delivering mining efficiency

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