INCREASING MINING EFFICIENCY AND PRODUCTIVITY
HOW INNOVATIVE TECHNOLOGY AND INDUSTRY EXPERTS ADVANCE OPERATIONAL EXCELLENCE
From climbing costs and variable commodity prices to increased shareholder demand to boost returns, the mining industry continues to face many challenges in search of productivity improvements. Looking to generate more value from their operations, companies must establish repeatable best practices that will enable them to become more efficient and productive. The best run mining companies realize that cost cutting is a path to destroy long term value. The right approach is to invest in the operation to maximize the use of the physical resource with the production processes, which ensures a high economic return.

*Increasing Mining Efficiency and Productivity* is a collection of 17 short stories from around the world. The unique insights shared within these stories showcase how the combination of software and services help companies overcome the challenges they face.
INCREASING MINING EFFICIENCY AND PRODUCTIVITY

GEOLOGY

From exploration to mine operations, GEOVIA’s geologists help many customers in the industry identify and quantify resources and improve how they manage geological data. Our geologists work directly with the customer, using their data, to create better geological procedures, establish best practices and help ensure compliance with regulations.

GEOVIA’s geologists assist with:

- Interpretation and validation of new data from drilling campaigns
- Understanding differences between geological models
- Developing efficient and accurate grade calculations
- Data management
- Ore body and seam modeling
- Statistical analysis
- Resource estimation
STATISTICAL ANALYSIS

CLIENT’S NEED
The client had two resource models which they needed to validate based on their input drillhole data, however the original data was in a non-Dassault Systèmes software package.

THE SOLUTION
Dassault Systèmes’ experts converted the client’s original data into Surpac in order to generate the input and output statistics. Dassault Systèmes then evaluated the statistical similarity between the input and output models and completed a trend analysis and visual validation. The team produced a report detailing the validation process and providing recommendations on how the client can increase the accuracy of the modeling of the deposit.

BENEFITS TO CLIENT
• Confidence in the accuracy of their data.
• Time savings.
• Reliable and accurate resource models.
The client needed to update their current block model, resource estimations and drillhole database to create a new mine design using the room and pillar method. With staffing issues and a skills shortage, the client turned to Dassault Systèmes’ GEMS experts to provide the software skills they required.

**THE SOLUTION**
Dassault Systèmes’ Services experts used GEMS to update and revise the client’s block model, and ensure their drillhole database was organized and accurate in order to create a new room and pillar mine design. They also validated all resource estimation data to ensure accurate reporting.

**BENEFITS TO CLIENT**
- Addresses skills shortage and staffing issues.
- Confidence in accuracy of data and new mine design.
- New workflows for reliable and consistent reporting.
- Provide client’s team with new skills.
GEOLOGICAL MODEL AUDIT

CLIENT’S NEED
The client had two separate geological solids models, each created by a different staff geologist in different years. With large volume discrepancies between the two models, they needed an experienced Surpac geologist to perform an independent audit to understand where the differences existed. Approximately 30 solids made up this thin vein gold deposit.

THE SOLUTION
Dassault Systèmes’ Surpac experts audited the client’s drillhole database to ensure data accuracy. They then carefully and systematically assessed the models through the drawing of cross sections at regular intervals, in order to understand the interpretations done by the previous geologists. They determined that both models were sound, and that the differences were due to different interpretations by the geologists.

BENEFITS TO CLIENT
• Addresses staffing shortage.
• Confidence in accuracy of geological models.
• Valid solids produced from complex solids models.
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RESOURCE ESTIMATION, GEOLOGICAL MODELING

CLIENT’S NEED
The client required a replication of their existing resource estimation using block modeling, as their own estimation did not involve block modeling.

THE SOLUTION
Dassault Systèmes validated the database that had already been created by the client, and once issues were identified and corrected, they created a replica using block modeling with variography in order to re-classify the resources as measured, indicated and inferred. Dassault Systèmes also created a report comparing the estimation carried out by the client with the modeling completed by Dassault Systèmes; a summary of the resource classification; and a plan for a drilling campaign in line with the upgraded resource classification.

BENEFITS TO CLIENT
• Resource estimation conforming to JORC standards.
• Confidence in accuracy of updated drilling campaign.
• Reliable and accurate block model.
• Addresses staffing shortage.
• Time savings.

SOFTWARE CATEGORIES: GEOLOGY
LOCATION: ALBANIA
COMMODITIES: LEAD CARBONATE
MINING METHOD: OPEN PIT
PRODUCT(S): GEOVIA SURPAC™
SERVICES PROVIDED: RESOURCE ESTIMATION, GEOLOGICAL MODELING
CLIENT’S NEED
The client had upgraded from GEMS Desktop to GEMS SQL the previous year, and during the workflow analyses completed as part of the conversion, Dassault Systèmes’ experts identified improvements in the operation’s daily production activities. The Dassault Systèmes team presented more efficient ways for the client to work with production data, a new grade control system and daily production maps. The client engaged Dassault Systèmes’ Services to implement the proposed changes.

THE SOLUTION
Dassault Systèmes’ experts identified the client’s grade control workflow and then set up grade control polygon layers and workspaces. Where the client previously performed manual calculations for grade control, they could now use a short term block model for grade calculation, which vastly improved accuracy and efficiency. Dassault Systèmes also set up a new blast design framework in GEMS, which took a fraction of the time compared to their previous solution. The site’s mining technicians were trained in its use. As part of the Services implementation, the historical data was validated and organized inside GEMS. Dassault Systèmes also set up reporting for month-end grade control and survey-generated PlotMaker templates to facilitate the generation of production and survey maps. The operation was provided with a step-by-step guide to carry out these activities.

BENEFITS TO CLIENT
- Improved accuracy and efficiency of grade calculations.
- Significant time savings for blast design.
- Data centralization, ensuring the right data is always accessible.
- Elimination of inefficient manual inputs streamlined workflows.
FAULT SEAM MODELING CONSULTING AND TRAINING

CLIENT’S NEED
The client was looking to update and replicate an existing seam model, previously completed by an external consultant.

THE SOLUTION
Dassault Systèmes staff worked with the client not only to complete the model, but also to train the staff to update the model going forward, on a regular basis. Dassault Systèmes staff provided geological expertise and taught the client to load updated borehole data, review fault interpretation parameters and perform grid seam modeling.

BENEFITS TO CLIENT
• Improved proficiency, confidence and solid software comprehension by staff.
• Enhanced employee productivity by updating the model, in-house, going forward.
• Increased time and cost savings by eliminating the need for external assistance on future modeling updates.
• Increased savings through the reduction of modeling mistakes.
IMPLEMENTED DRILLHOLE DATA MANAGEMENT SYSTEM

CLIENT’S NEED
This client was in the exploration stage and collecting large amounts of data. The operation had been using time consuming, error prone manual spreadsheets to track core samples and lab data and required a more efficient data management solution.

THE SOLUTION
Dassault Systèmes implemented the Custom Core Logger and Custom Lab Logger to work with GEMS. These tools store and organize the significant amount of data generated from drilling campaigns and laboratory test programs. Easy to use, these tools bring consistency to data recording and reporting.

Dassault Systèmes began by conducting an audit to scope the structure and the type of data being collected, so the software could be adapted to suit their needs. Core Logger was implemented on two sites which are geologically different, requiring the database to be structured differently for each site. Lab Logger was then set up to create particular graphs and reports according to client specifications.

Following implementation, Dassault Systèmes provided on site training, created training manuals, and will continue to provide support and ongoing refinements as the operation’s requirements change with new drilling campaigns.

BENEFITS TO CLIENT
• Data integrity assured.
• Data security increased.
• Manual workflows eliminated.
• Reduced possibility for errors.
• Skilled staff free to focus on area of expertise.
• Time saved.
In this challenging time for the mining industry, efficient, economic and robust mine plans are required more than ever. GEOVIA’s engineers assist many customers in determining mine feasibility, optimizing economics and improving productivity.

GEOVIA’s engineers assist with:
- Open pit and underground mine design
- Pit optimization
- Development and production scheduling
- Tailings modeling
- Caving
OPEN PIT DESIGN

CLIENT’S NEED
The client was in the process of revising their mine plan as part of a feasibility study, but their in-house team was short at least one mining engineer and urgently needed to complete six pit designs in one week in order to keep the project on track. As they had been engaging Dassault Systèmes for on site training services for over four years, the client requested that Dassault Systèmes provide an engineer with the appropriate mining knowledge and who was an expert in the software to assist their team in completing the designs on time.

THE SOLUTION
Surpac’s pit design capabilities allow engineers to design a pit while viewing relevant information simultaneously, ensuring that designs take into account the physical constraints of the mining area. Dassault Systèmes’ mining engineer was able to work with the client’s engineering team to complete all six pit designs, merged with local topography and adjacent pits, within the required timeline. All this time the Dassault Systèmes engineer was working remotely in Australia several thousand miles away from the project team in Madagascar.

BENEFITS TO CLIENT
• Enabled the client to complete the project in their designated timeframe.
• Confidence in the quality of the work carried out under tight time constraints.
• Reduced the risk and impact of future skills and staffing emergencies.
MINE DESIGN AND PLANNING

CLIENT’S NEED
The client was looking to begin planning for a second level in their underground block cave operation. In order to determine the best location, they needed assistance from experts in cave mining.

THE SOLUTION
Dassault Systèmes’ experts used PCBC to run several options for different levels and cave methods. They then computed the NPV and production schedules for each different mine plan scenario to determine the optimum solution for highest economic value.

BENEFITS TO CLIENT
• Confidence in location chosen for second underground level.
• Determined lowest economic risk.
• Reduced time to create plan.
• Fewer workflow steps.
CLIENT’S NEED
The client was looking to replace their existing competitive product, which they used for development and production scheduling as it was difficult to use and time consuming to setup multiple iterations of a schedule. The staff members who were familiar with the use of the software left the site, and so the operation chose to take that opportunity to implement MineSched.

THE SOLUTION
Dassault Systèmes’ scheduling experts spent time reviewing the site’s data to identify any problems, enabling the client to address incorrect data prior to the implementation. Having implemented MineSched and ensured the system was up and running with the site’s data, Dassault Systèmes provided three days of MineSched training for four staff members. After training, staff were able to quickly and easily setup numerous scheduling scenarios with multiple iterations. Working with the client, Dassault Systèmes demonstrated how to create a working life of mine schedule, successfully creating an underground schedule including over 900 stopes and nearly 100 kilometres in underground development.

BENEFITS TO CLIENT
• Reliable and accurate mine schedule.
• Staff fully trained in software use.
• Time savings.
• Feasible production schedule.
• Reduced economic risk.
• Confidence in data integrity.
CLIENT'S NEED
In order to gain additional investment in their project, the client needed to ensure their mine plan and scheduling were optimized. Having previously engaged Dassault Systèmes’ Services professionals, they asked for assistance with pit optimization.

THE SOLUTION
Dassault Systèmes’ Services experts applied new cost parameters to an existing block model in order to complete the pit optimization. Along with a report detailing the optimization, Dassault Systèmes provided a three year open pit scheduling plan, which would be generated every six months for re-evaluation. Working alongside the client on site ensured the team would be able to continue the project development on their own.

BENEFITS TO CLIENT
• Confidence in the accuracy of their data.
• Updated mine plan for obtaining investments.
• Accurate and reliable scheduling scenarios.
• Time savings.
• Able to continue work without assistance.

SOFTWARE CATEGORIES: ENGINEERING
LOCATION: BRAZIL
COMMODITIES: IRON ORE
MINING METHOD: OPEN PIT
PRODUCT(S): GEOVIA WHITTLE™, GEOVIA SURPAC™, GEOVIA MINESCHED™
SERVICES PROVIDED: PIT OPTIMIZATION, PIT DESIGN, PRODUCTION SCHEDULING
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CLIENT’S NEED
The waste rock and tailings at the client’s site had very low acidic neutralization capacity. The potentially acid-forming characteristics and high lead levels of the waste were not expected based on the results of their previous work, and they needed a cover system which would provide a barrier to the environment in order to protect plants, animals and the air, and minimize the infiltration of groundwater.

THE SOLUTION
Dassault Systèmes’ experts designed waste dumps for the client according to their specifications, and used MineSched to sequence them in accordance with the site’s life of mine plan. They were also able to create a tailings site plan and calculate earthworks volume and containment volume, and design the tailings storage facility as per the client’s requirements. In addition to meeting the client’s cover system, design, and scheduling objectives, the work done by Dassault Systèmes helped the client to prepare both their cost model and their mine closure report.

BENEFITS TO CLIENT
• Cover system meets environmental requirements.
• Reliable and accurate scheduling of waste dumps.
• Control over tailings and waste planning, designing and scheduling.
• Confidence in accuracy of mine closure report and cost model.
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OPERATIONS

Smooth and efficient processes lead to achievement of peak mining productivity and cost control. This is made possible through the establishment of consistent, best-practice workflows, underpinned automation, data management, and collaborative software. It also requires expert execution of mining software tools to create better models, plans, and actionable data. GEOVIA’s operations specialists assist with:

- Consistency of procedures
- Understanding the production processes
- Data accuracy and reconciliation
- Increasing and maintaining site productivity
- Data security and version control
- Software implementation
- Grade control
- Resource estimation and reserves calculation
- Surveying
- Long-term and short-term planning
- Blast design
- Advanced reporting
- Database administration
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CLIENT’S NEED

The client needed to prepare short and long-term schedules and life of mine plan. With numerous sources of material at varying grades, it was crucial to get the right balance of production and blending.

THE SOLUTION

Dassault Systèmes provided a solution in three phases. The first phase involved an operational audit of the client’s data, systems, resources, and skills to identify how they use their data and whether any additional staff training would be necessary. The second phase entailed conducting a pilot study of one of their mines and demonstrating how Surpac, Whittle, and MineSched could interact most effectively. Once the procedures had been tested and outputs had been agreed upon, the third phase – implementation across all operations – was completed.

With the solution implemented, and training provided by Dassault Systèmes, the client is now able to complete their exploration program, update block models and geology planning and define the schedules for each pit and how they should interact.

BENEFITS TO CLIENT

- Staff trained in most efficient use of software.
- Ability to maintain and increase site productivity.
- Reduced time needed to complete projects.
- Consistency of procedures.

SOFTWARE CATEGORIES: OPERATIONS, ENGINEERING
LOCATION: UK
COMMODITIES: INDUSTRIAL MINERALS
MINING METHOD: OPEN PIT
PRODUCT(S): GEOVIA SURPAC™, GEOVIA WHITTLE™, GEOVIA MINESCHED™
SERVICES PROVIDED: LIFE OF MINE PLANNING, SHORT AND LONG-TERM SCHEDULING
CLIENT’S NEED
The client engaged Dassault Systèmes Services staff to understand if existing data structures and collection tools were adequate for month-end reconciliation.

THE SOLUTION
Dassault Systèmes staff undertook a week-long scoping exercise to verify the accuracy of the client’s data used for production and reconciliation. A follow-up report identified all areas of potential data inaccuracy complete with recommendations for improvement to ensure the best data was available for production. Dassault Systèmes staff provided the client with a better understanding of the production processes, using the software to create better plans and reduce the variance between forecast and actual production figures, resulting in better reconciliation. Following the data accuracy assessment, Dassault Systèmes was engaged to design a comprehensive process to test and identify reconciliation issues.

BENEFITS TO CLIENT
• Identification of potential data inaccuracy in order to implement change.
• Improved understanding of the production processes.
• Enhanced productivity with the ability to create better plans.
• Increased cost savings and improved reconciliation with fewer discrepancies between forecast and actual production figures.
CLIENT’S NEED
The client wanted a consistent and automated grade control system with documentation so all employees on site could easily use.

THE SOLUTION
After consulting with the site’s geology managers, Dassault Systèmes’ experts set up workflows for their grade control function. This allowed the grade control procedure to be performed faster while maintaining a consistent output. Training was provided in the software and the grade control function – enabling everyone to use it confidently. The site is managed remotely, and with this implementation of Surpac, the mine manager can be confident in the reliability and accuracy of the work being performed remotely on site.

BENEFITS TO CLIENT
• Allows off-site managers to be confident in their data.
• Ability to maintain and increase site productivity.
• Reduced time needed to complete production tasks.
• Fewer and more simplified workflow steps.
• Consistency of procedures.
CLIENT’S NEED
The client is a gold mining operation comprised of four different sites. Already using Surpac for geology and mine planning, they needed a way to centralize the data from all sites to their head office in Northern Mexico, as the senior managers there had no visibility into each project’s data.

THE SOLUTION
Dassault Systèmes installed the Hub server, and configured it to meet their specific data management needs. Hub allows the operation to centralize the data from all four operations, providing transparency for the head office. With Hub, the remotely located sites can easily work independently, as head office staff can rapidly download and review data. Additionally, the implementation, configuration and training of Hub took only three days for the Dassault Systèmes staff to complete.

BENEFITS TO CLIENT
• Fewer and more simplified workflow steps.

• Data centralized and easily accessed by head office.
• Solution tailored to work with their data.
• Hub provides data security and version control.
• Data is easily backed-up.
INCREASING MINING EFFICIENCY AND PRODUCTIVITY

MINE PRODUCTION MANAGEMENT SOFTWARE IMPLEMENTATION AND GRADE CONTROL WORKFLOW IMPROVEMENT

CLIENT’S NEED
The client required a cost-effective, fully integrated production management system to automate the capture of all operations data for reporting and analysis. They also wished to improve their grade control workflows.

THE SOLUTION
Dassault Systèmes Services professionals worked with the client to understand their objectives in improving mine productivity through the implementation of InSite mine production management and reconciliation software. The goal was to provide reports and data for analyses that could be used by different mining departments to improve not only their functions, but also the overall productivity of the mine site. With InSite, data is captured and validated automatically across the mine site.

In addition to implementing InSite, Dassault Systèmes staff also reviewed the workflows used in the Surpac geology and mine planning software to streamline, document and automate them. The end result was the establishment of repeatable, best-practice grade control workflows.

BENEFITS TO CLIENT
• Enhanced ability to control costs through better utilization of equipment.
• Increased site productivity.
• Automated and standardized data capture and validation.
• Centralized operational database for reporting and analysis.
• Compared and analysed scheduled mining to actual activities.
• Created accurate daily reports quickly and with minimal effort.
• Simplified grade control workflows.

SOFTWARE CATEGORIES: OPERATIONS AND GEOLOGY
LOCATION: FINLAND
COMMODITIES: GOLD
MINING METHOD: UNDERGROUND AND OPEN PIT
PRODUCT(S): GEOVIA INSITE™ AND GEOVIA SURPAC™
SERVICES PROVIDED: SOFTWARE IMPLEMENTATION AND GRADE CONTROL
The mining solutions you expect. From the people you trust.

When you don’t have the in-house expertise or time available, GEOVIA can help you with your geology, engineering and operational needs. We can also provide you with knowledge and tools that enable you to increase productivity. Our expertise spans modeling, design, optimization, scheduling, data management, automated workflows, system configuration and all points in between.

Contact us today! GEOVIA.Services@3ds.com
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