

GEMCOM CUSTOMER CASE STUDY



All-encompassing Gemcom PCBC system boosts deposit value at De Beers diamond mine

Solution improves decision-making and productivity at block cave operation

Countries: South Africa

Objective:

Meet growth targets and aid feasibility studies, design and production management for block cave mining.

Approach:

Implement the Gemcom PCBC software solution for planning and scheduling block cave operations, obtain customised Gemcom development and integration services, and help staff become skillful in using PCBC tools.

IT Improvements:

- Management tools for improved mine performance
- Customised, effective solution with monitoring capabilities
- Integration of block modelling software and databases with new block cave management software
- Data integrity
- Information sharing between major components used in block caving

Business Benefits:

- Improved productivity in the underground mining environment
- Better dilution management and geotechnical stability
- Substantial boost in deposit value
- More accurate resource estimates and reports
- Faster analysis and better decision-making
- Easier staff transitioning and training (due to integrated systems and consistent database tables within PCBC and Gemcom GEMS)
- Less time required to update mine plans, evaluate options and compile information
- Streamlined strategic planning process – months to weeks
- Evaluation of various mining scenarios to determine profitability scenarios and reports to be run quickly and easily



"I consider Gemcom to be the foremost authority in the block cave mining method. They helped De Beers come up with a mining system that was all-encompassing and aligned with our strategic vision."

— Jaison Rajan, Section Leader—Mining Technical, Finsch Mine, De Beers Consolidated Mines



Automated trackless block cave mining at Finsch Mine.

The world's first automated, trackless underground mine

Established in 1888, De Beers Consolidated Mines (DBCM) is renowned for the exploration, mining and marketing of rough diamonds. DBCM produces approximately 40 percent of the world's supply of rough diamonds. The Finsch diamond mine, located in Lime Acres in the Northern Cape, South Africa, is among seven operations that DBCM manages. Discovered in 1961 during asbestos exploration, De Beers first developed the deposit as an open pit. Since 1991, production has come from the underground mine beneath the old pit.

Finsch is a classic diamondiferous kimberlite pipe with sufficient reserves to maintain current mining rates for 17 more years. To improve the mine's sustainability, De Beers needed to transition from blast hole open stoping mining to an automated trackless block cave mining method at Block 4. This changeover would require an automated framework integrated with robust planning and scheduling software.

"The strategic objective of the automation project was to make the mine inherently safer by reducing the exposure to natural and manmade hazards," explains Jaison Rajan. "The other strategic intent of automation was to increase productivity." As Section Leader—Mining Technical for the Finsch Mine, Rajan directs mine planning, scheduling, production and monitoring.

Implement ideal block cave framework

De Beers selected Gemcom and Sandvik to build its block cave mining framework. In the process, Finsch became the world's first automated, trackless mine requiring no operators on its production trucks. The mining framework consists of an automated ore-transport system by Sandvik, integrated with Gemcom PCBC and Cave Management System (CMS) software specifically designed for planning and scheduling block cave operations.

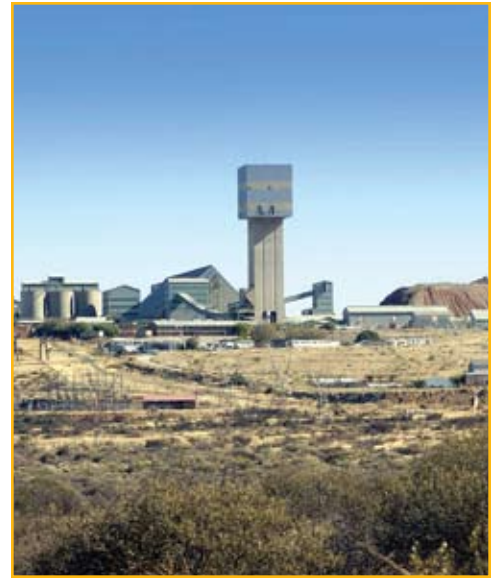
Gemcom collaborated with Sandvik to create the system, which allows De Beers managers to analyse mining sequences and rates from draw points over the short- and long-term. It also facilitates information sharing between major components used in the operation.

"When we started the project, we contacted Sandvik and Gemcom to get an idea of their experience with block cave mining and to identify key parameters within the design," Rajan says. "We needed a system we could manage on a real-time basis from our operations control room on the surface. The ideal system would incorporate the outputs from Gemcom software to ensure geotechnical stability and provide information to efficiently plan the day's activities."

The 'foremost authority' in block cave mining

After implementing the PCBC software, De Beers asked Gemcom to enhance it specifically for the Finsch operations and the company's Microsoft SQL Server database. The Gemcom development team also enhanced CMS, a subsystem within PCBC for cave management. It interfaces with the Sandvik AutoMine system. AutoMine allows operators to monitor a fleet of driverless trucks hundreds of meters below the surface, while sitting comfortably and safely in a control room on the surface.

Gemcom's CMS automates and optimises the draw control process, which is a critical element in cave management. Referencing the PCBC model, the CMS



Underground head gear at the Finsch diamond mine.



Day to day production with automated trucks.

“We considered some competitors’ software, but decided that PCBC was the way to go. We have not found anything to compare to PCBC’s functionality.”

— Jaison Rajan, Section Leader–Mining Technical, Finsch Mine, De Beers Consolidated Mines



Remote loading of underground mining vehicles from surface control room.

spells out the number of tonnes and priority for each location. In essence, the CMS acts as a guide for mining the block cave most efficiently in the correct sequence to minimise unrecoverable mistakes.

“I consider Gemcom to be the foremost authority in the block cave mining method. Tony Diering programmed PCBC based on the considerable knowledge he has gained from various block caving mines and that helped us come up with a mining system that was all-encompassing for De Beers,” says Rajan.

Quick results with Gemcom software

De Beers and Gemcom have enjoyed a well-established, professional working relationship dating back to the mid-1990s. When De Beers needed 3-D grade and geological information, the company deployed a Gemcom GEMS solution for multiple user access, first at its Venetia mine and later, at Finsch. The solution enhances the mines’ geology, blast ring designs, planning, scheduling and ore accounting functions. The geological model for Block 4 resides in the GEMS database.

Prior to installing PCBC, De Beers geologists created some initial designs for mining Block 4 using Microsoft Excel spreadsheets and manual calculations. However, they wanted to evaluate the design more thoroughly and produce an even better one. These objectives prompted them to evaluate the rich features within PCBC.

Collaborative, seamless communications

The Gemcom developers designed PCBC to assimilate seamlessly with the AutoMine, cave management, GEMS and Microsoft SQL Server database systems. The fusion of SQL Server with the operational systems allows the work teams to contribute, extract and share mining information within a secure platform they customarily use. Transitioning and training new staff – along with auditing – are easier tasks because of database consistency and the standardised way De Beers maintains data within SQL Server across departments.

“PCBC was designed to integrate heavily with elements of our other systems. This integration across various departments cuts out many spreadsheets and the possibility of miscommunication. It provides a seamless communication line between our various departments. And with a fully automated system, we have continuous communications about what is happening underground,” says Rajan. Approximately 100 employees in the production, planning and geotechnical departments rely directly and indirectly on PCBC.

A ‘brilliant’ solution for one-of-a-kind mining operations

While the AutoMine system directs how mining takes place and the equipment operations, PCBC uses mining and geotechnical parameters to propagate



Underground crusher with rock breaker.

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the cave efficiently. PCBC also calculates mineral reserves and draw point valuations based on the geological model within GEMS.

The PCBC software reconciles the daily draw orders with the actual ore extracted from each draw point, and feeds that data to the CMS. These capabilities make it easier for De Beers personnel to manage the amount of tonnage from each draw point and preserve the stability of the entire excavation. Besides accurately tracking mining positions, the staff can better plan future production activities. For example, PCBC mimics the dilution process and calculates various options to help De Beers personnel construct a realistic plan for dilution management.

“One of the brilliant things about PCBC is it provides a detailed series of reports on the resource itself. Based on an operating rate, it can provide the exact amounts of each ore type we can uncover and the grade level within the ore body. I can tell PCBC to produce 10 or 20 tonnes, and the software will display how many diamonds we can expect. Using that information, we can constantly compare actuals with what we are getting to assess the quality of our resource estimation. We can also use the information to improve upstream efficiency,” says Rajan.

Contributing to better decisions

Before the PCBC implementation, mining changes caused problems and extended the time necessary to update plans and evaluate various options. Even compiling information and predicting tonnages for the company’s strategic business planning (SBP) process took months. That timeframe has dropped to several weeks. As part of the SBP process, Rajan’s team runs various mining scenarios within PCBC to decide which is most profitable

“Using PCBC, we can virtually look at what is happening in the cave and make decisions based on that,” Rajan explains. “The more detailed our reports, the better information we have for analysis and that contributes to better decisions.”

The value of expert services

When De Beers first adopted PCBC, Gemcom dedicated one of its top consultants to steer the implementation and training over six months. “This was extremely valuable in that we had someone who could solve our problems relatively quickly and answer our questions right here at the site,” says Rajan.

De Beers continues to work with Gemcom consultants on various PCBC projects. The assurance that PCBC and the Gemcom experts provide, along with the success of automated mining, may stimulate De Beers to deploy the solution at its flagship site, the Venetia diamond mine.

“We definitely are receiving a return on our PCBC investment and on Gemcom’s services and support,” Rajan concludes.

De Beers Finsch Mine Solutions at a Glance

Primary Applications:

- Gemcom PCBC
- Gemcom Cave Management System (CMS is a subsystem within PCBC)
- Gemcom GEMS
- Sandvik AutoMine system
- Microsoft SQL Server

Gemcom Services:

- Consulting
- On-site training
- Software customisation
- Systems integration
- Technical support

For more information email
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