

UNDERGROUND LOAD AND HAUL

Sandvik AutoMine development team

Finland and Sweden have led the world in the development of new mining technologies over the years. A team of four people - three from Sandvik Mining and one from Navitec - received the Finnish Engineering award in June 2013 for the development of the AutoMine automated loading technology. That Sandvik AutoMine team, inducted into the International Mining Technology Hall of Fame comprises Riku Pulli, Vice President, Mine Automation, engineer Janne Kallio from the Turku plant along with Timo Soikkeli and Brett Cook.



Riku Pulli

AutoMine is the automated loading and hauling system for underground hard rock mining which has transformed mining practices where it has been implemented. It can just as successfully be adapted to small scale operations as well as massive block caving applications. Moreover, the system incorporates functions and applications that allow it to interface with other third party IT systems at the mine site.

Sandvik Mining is now the world's leading provider of mine automation technologies with more than 16 automation systems having been deployed in seven countries including Canada, South Africa, Bulgaria, Finland, Chile, Sweden and Australia. Also, a growing number of other mines globally are showing interest in implementing AutoMine applications. Mines using the system include a wide range of commodity and mine

types such as Codelco El Teniente; Rio Tinto Northparkes; Newcrest Ridgeway; Rio Tinto Argyle; Petra Diamonds Finsch; Barrick Williams; LKAB Kiruna; Inmet Pyhäsalmi; Newcrest Cadia East; Dundee Precious Metals Chelopech; Boliden Garpenberg; and IAMGOLD Westwood.



Brett Cook

AutoMine system is a highly innovative automation system where operators, who would normally drive a single heavy-duty machine underground, can now sit in the comfort and safety of an air-conditioned control room on surface, and simultaneously monitor the movements of a fleet of driverless loaders or trucks hundreds of metres below the surface. Sandvik loaders or trucks navigate their way between the load and discharge points under the control of a supervisory system which is managing the traffic and monitoring the machines. AutoMine is equipped with a number of intelligent functions for example, if one of the machines strikes a large rock in the roadway, the system would then place a restriction on the speed in that area to ensure that machines following behind either slow down or stop at the obstacle, thereby

reducing potential damage to the equipment.

Mine automation promises several benefits, mainly increased fleet utilisation, improved working conditions and safety, increased production, reduced maintenance costs, as well as optimised tramming speeds and smoother equipment operation. Increased fleet utilisation ensures constant performance level enhancements and optimum use of the workforce. In other words, there are no breaks during shift changes, and increased productivity is achieved through a continuous process enabling integration of information on-site. This automated system provides “real-time” information to assist with the mine’s planning processes by measuring, controlling and reducing bottleneck areas, in addition providing supervisors and management on surface a complete “window” into the mining operation.

AutoMine’s greatest impact on improved production control has resulted in accurate execution of the production plan, production supervision, tracking of draw point status, and accurate collection of production data. This translates into significant financial and safety improvements. AutoMine was also developed as a modular system that could be adapted to specific customer requirements. This includes a Production Control System (PCS) for planning, optimisation of production execution and reconciliation of production inputs and outputs especially for block cave mines and a Mission Control System (MCS), the supervisory system responsible for controlling and monitoring the autonomous operations including traffic management and provides the remote operator’s user interface. A MineLAN broadband, high speed data/video communication system provides connectivity to automated underground loaders and trucks and associated equipment, while the onboard automation systems carry out the actual machine control, monitoring, and navigation. Finally, the Access Control System (ACS) isolates the autonomous operating area to ensure safety of personnel.



Timo Soikkeli

More recently in 2012, Sandvik Mining introduced an extended AutoMine product family, delivering high-quality and reliable fleet automation for drilling, loading and hauling, single loader automation, block cave draw control and process/information management systems.

“In developing the Sandvik AutoMine product family, we stayed true to the values that our customers expect from Sandvik Mining,” stated Riku Pulli, “The Sandvik AutoMine provides sophisticated fleet and information management and interpretation tools that help to reduce the potential for human error, improve operational efficiencies and ultimately help to optimize mining process decisions.” The Sandvik AutoMine products are built on the same core AutoMine technologies that provide configurable, expandable automation solutions to streamline and standardise workflow while enhancing

throughput.

The proprietary technologies that drive this reliability and efficiency include AutoMine Loading - providing fleet automation for loading: automated tramming, automated dumping and teleoperation-assisted bucket loading. It allows one operator to operate several loaders. It also includes AutoMine Hauling, which allows for a fully autonomous production cycle: automated loading, tramming and dumping. It can be integrated with manual or autonomous loaders, as well as with various filling systems. AutoMine Drilling offers versatile automation options from increased safety and efficiency to real-time process control, enabling constant productivity levels



Janne Kallio

with superior drilling accuracy and effective use of non-productive time. AutoMine Process Management offers real-time communication and process optimisation for managing the mining operation as a continuous process, maximizing uptime and increasing productivity.

Finally, AutoMine Draw Control delivers real-time process management for manually-operated LHD fleets with fully documented traceability to minimise the risk of incorrect result reporting; and AutoMine Lite offers single loader automation, boosting efficiency and controlling costs, with quick installation and startup without compromising turnaround time or operator workflow.