

A dispatch room with the Modular Mining DISPATCH Central application running in the foreground

composition, pit design, or mine plan, can cause production levels to fluctuate. As such, the mine enlisted PA for help in pinpointing the underlying reason, rectifying the issue, and getting production back on track.

With a focus on helping the mine maintain its performance standards amid dynamic conditions, the PA team worked with mine personnel to compare the 2018 production records to those from 2019, and conduct a thorough review of the mine's DISPATCH® Fleet Management System (FMS) configuration. Over a series of visits, the PA team updated relevant system parameters and provided dispatcher training to improve optimisation of the automated truck/shovel assignments and minimise truck queue and shovel hang times. After the PA team recalibrated the DISPATCH system's settings, the mine achieved sustained

No time for idling

Paul Moore reviews trends in the FMS space, both surface and underground, with some updates from key players both big and small

Fleet management systems in mining, often referred to in the industry simply as FMS, are the backbone of surface mines, where they optimise the comings and goings of production equipment maintaining the highest productivity and efficiency. But today they offer a lot more than dispatching including incorporating elements of tyre monitoring, fuel management, machine guidance, collision avoidance, fatigue monitoring and predictive maintenance – all areas that have traditionally been supplied as standalone technologies but today are often factored into the overall FMS offering as part of a package, though are often still supplied by the same specialists as part of partnership agreements and joint interfaces, or in some cases these companies have been acquired – a good example being Hexagon acquiring collision avoidance company SAFEmine whose technology was then embedded into the Hexagon FMS solution. Added to that, of course today FMS offerings are having to interface with autonomous haulage systems (AHS), both from mining equipment OEMs but also OEM-agnostic players. This is a whole other topic in itself, especially when it comes to how interoperable the platforms are.

Today, the FMS market in mining includes a diverse set of players, including three owned by major mining equipment OEMs (Caterpillar's MineStar, Komatsu-owned Modular Mining, Hitachi-owned Wenco) plus OEM independent companies including iVolve based in Australia, Zyfra Mining (former VIST Group) with a strong position in Russia but also growing globally, and Hexagon Mining. But there are a lot of new players coming into the market today, nimble companies offering in some cases more flexible, more cost competitive options. Also, in the underground space, true FMS is still not really being used in the sense it is used on the surface

due to the different type of working environment, with most underground mines using forms of advanced tracking together with production optimisation software. But here progress is also being made, as rather than trying to adapt surface FMS to underground, new solutions are being put in place that have been designed for underground.

Performance assurance at the next level

Looking in-depth at how Modular Mining's FMS solutions are applied in a tailored approach for each mine, in March of 2015, the company introduced the Performance Assurance (PA) program, a next-level support initiative designed to ensure that each customer receives maximum sustained value over the life of their Modular Mining technologies. With each PA engagement, a dedicated team of experts collaborates with a cross section of mine personnel to develop tailored, flexible, and proactive solutions to address each operation's specific challenges.

The company says participating mines have seen numerous benefits, including enhanced truck productivity, shorter queue times, reduced equipment maintenance costs, and more. A longstanding Modular Mining customer recently expressed concerns about diminished production volumes from its truck and shovel fleets. Any of the events that mines experience on a regular basis, including changes in personnel, fleet



A PTX device running Modular Mining's DISPATCH Mobile application

improvements in fleet utilisation and marked increases in production rates. Most significant was the 29% uptick in ton miles per hour (TMPH), which increased the average from 958 to 1,238 from May to December 2019, as shown in the attached graph.



After the PA team recalibrated the DISPATCH system's settings, the mine achieved sustained improvements in fleet utilisation and marked increases in production rate

Hexagon – short interval control and the art of smart

A proven fleet management system can bring many tangible benefits to a mine, including better and faster data to make real changes. But **Hexagon** adds that by integrating FMS with a dynamic scheduling solution means the dividends can be even more impressive. “Finding the best FMS for your mine, either through large-scale dynamic assignments fleet management, tablet-based fleet management, or just using secondary data collected by telematics or collision avoidance systems is critical. Finding a partner that can guide you through that journey is equally important.”

Hexagon told **IM** it created its Mining division to provide customers with a smarter, more holistic view of their mine. Underground or at the surface, that means bridging the gaps between a strategic plan, a tactical plan, and execution of the tasks involved in moving material.

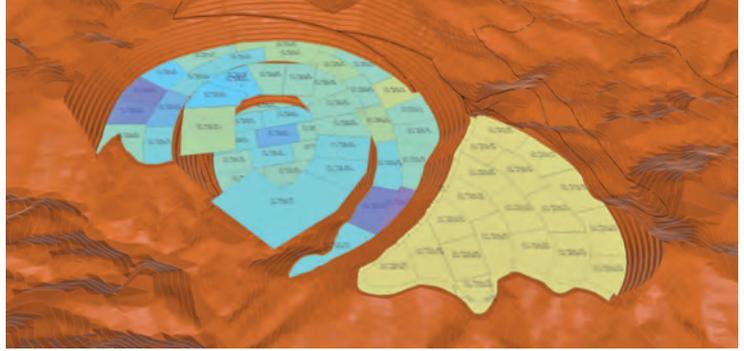
In other words, short-interval control. “Greater control at a sub-shift level delivers even greater insights and aligns company strategy with execution,” says Mining division CTO, Rob Daw. “Hexagon’s customers are seeing great benefits in this area from the integration of our MinePlan scheduling solutions, Activity Scheduler (MPAS) and Schedule Optimizer (MPSO), and our fleet-management solution, MineOperate UG Pro and OP Pro. The data produced by that connection can pay huge dividends when it comes to

productivity.”

MPAS allows for direct access and feedback from actual production data in near real-time to compare and allow adjustments to the planned schedule and reconcile with real life. “Feed your

short-term plan directly into the task management system and automatically update your short-term plan based on actual task progress. Delays are identified and the schedule can be updated immediately to account for the uncertainty. In both open pit and underground design and scheduling, we can connect with real-time data through short interval control.”

By reducing the variance between plan and actual, Hexagon says customers are capturing greater project value. “A copper mine in Mexico, for example, had struggled to reconcile plans prepared with different software tools. The customer’s mine plan called for a high profile of run-of-mine leach and total material movement. A solution was required that would allow engineers to evaluate other planning alternatives to optimize the material routing in the schedule and reduce the mining rate.”



Hexagon’s MinePlan Activity Scheduler allows for direct access and feedback from actual production data in near real-time to compare and allow adjustments to the planned schedule and reconcile with real life

The mine migrated to MPSO to produce optimum yet practical mine plans for long, medium and short-range planning, all in one tool. At the core of the mine planning process, MPSO is used to generate practical short- to long-term project schedules.

By also using MineOperate OP Pro, the mine applied field data (eg speed table and cycle times) to accurately model the equipment requirements associated with a mine plan and specific material movement project. The integration between the two solutions dramatically improved performance, reducing the variance between plan and actual.

Elsewhere, similar integration at an



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Haul Optimization system has also become part of the standard fitment of new machines and is often installed during the machine build right alongside the OEM commissioning team. The Titan 3330™ system is comprised of several sensors that measure the machines movements and our purpose-built Data Acquisition module uses the latest edge computing technology to provide the operator with the required information instantly right onboard the machine. The Titan 3330™ system is available with multiple reporting and integration options. Due to customer demand, we recently released a new 'on demand' Advanced Analytics and Short Interval Control platform. The ORION Data Analytics reporting platform delivers productivity and machine health insights directly to operational teams from our suite of digital products. It enables miners to drill down into a range of operational metrics, including dig unit productivity, truck payload compliance, machine attachment duty and operator performance. Insights are delivered via web or mobile platforms, via secure databases and simple-to-use interfaces. Additionally, we believe empowering operational best practice comes from integrated solutions, so we have an open third-party interface protocol that can integrate Titan 3330™ and our other products, with FMS and operational execution software platforms.

Q What is next for CR Digital in terms of solution development?

A We have several products due to be released in 2020 including a new generation of GET Toothloss detection for hydraulic excavators, rope shovels and wheel loaders. We are also putting the finishing touches on the expansion of the Titan 3330™ Load Haul Optimization system to include wheel loaders. In January, we announced the acquisition of Seattle based Thunderbird Mining Systems, a strategic move that further expands CR Digital's product offering, IP, sales/marketing and technical support activities into the blasthole and drilling markets. Integrating our portfolio of technologies together will see rapid growth in real time operational analytics, from drilling and rock strata, through to load haul of that same block, we will be able to help operations hone in on maximised recovery and high cost per tonne efficiency, now from drill to mill.

underground gold mine in Brazil saw an 11% increase in fleet production within four months of deployment of MineOperate UG Pro. "Not only does UG Pro integrate with Hexagon's safety, scheduling and data visualisation tools, it also synchronises with data from third-party vendors."

For Daw, such integration is part of what makes a mine smart. "There's a huge opportunity within mining operations to develop these technologies," says Daw. "When it comes to smart devices and smart connected devices, a recurring theme among the clients I talk to is, how do we get access to more of this data so we can look at it, analyse it, and make more proactive decisions? IoT devices are what will allow us to pull all of the data from all of these different areas of an organisation and start to look at trends using artificial intelligence. Once that ecosystem is established within our operations, we can make better, more proactive decisions."