

CAT® MINESTAR™

INCREASING PRODUCTIVITY



WHAT'S IMPACTING PRODUCTIVITY
IN YOUR OPERATION?



FLEET



TERRAIN



DETECT



HEALTH



COMMAND



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In today's mining industry, companies are always on the lookout for new ways to lower costs and improve the bottom line. Over the last several years, mining companies have had to take a closer look at their operations and find ways to work more efficiently in order to keep operations profitable. One of the most impactful ways to accomplish this goal is to increase the productivity of your machines, processes and people.

This paper covers some key productivity challenges—such as increasing Return on Investment (ROI), improving equipment utilization and honing operator skills—and illustrates how technologies can help you address them.

MAXIMIZING RETURN ON INVESTMENT



As the mining industry has discovered in recent years, cyclical does not always mean predictable. Today's mines are focused on being lean and pulling more from the same capital resources. Gone are the days of throwing money at a process until productivity increases — an approach that ultimately raises long-term costs. The industry instead is attempting to make existing assets work smarter to reduce overall costs to produce. Every dollar invested must show returns, and those returns are often expected on a short timeframe.

Large mining companies are shifting their focus to using every asset to its full potential, strategically allocating their capital reserves to maintain investor confidence. There has been significant turnover in the top management of many major mining companies as they restructure to better suit this new approach.

To get a better picture of the kind of returns customers are expecting to see, let's look at a real Caterpillar customer's situation. We collaborated with a company in Latin America to reduce the cost of drilling operations. Working with both the customer and the local Cat

dealer, we helped the site with a trial run of Cat® MineStar™ Terrain for drilling, demonstrating the value of the technology and its impact on productivity.

During the two-month trial, the customer saw a 30 percent increase in machine utilization. Terrain enabled the drills to operate at night, opening up an entirely new shift. Guidance replaced the need to survey before laying out the drill pattern, which was previously impossible due to survey restrictions on the night shift.

Depth accuracy also improved, which resulted in about a 5 percent reduction in cost per hole when combined with the elimination of survey supplies. Other benefits of this system have yet to be quantified: Reduced consumable costs, the effect of improved fragmentation on downstream operations, reduced survey costs and more. In addition, the 30 percent increase in night-time utilization could easily offset the decision to purchase another drill in the future.

Based solely on the initial cost savings, the customer determined that the system would pay for itself in just 18 months. From that point on, everything is direct ongoing cost reduction—and a solid ROI. As more information becomes available from this customer, we will continue to share the results.

INCREASING EQUIPMENT UTILIZATION



Efficiently using your existing equipment can help you quickly increase productivity and lower costs. By looking at your total time, we can help you better understand the breakdown of effective machine usage and downtime using a time usage model. Understanding how a machine's time is used during a shift is important when it comes to measuring and improving productivity.

For example, let's look at an underground gold mine in Canada that asked us to help them leverage technology to improve equipment utilization and availability. We were able to quickly identify a few key areas for immediate improvement: Cycle time, shift change, smoke-out time (the time it takes to get back to work after a blast) and operator-induced maintenance events.

We evaluated their cycles and processes to find areas where cycle times could be reduced. The mine is an open stope application, where remote mucking is common and there is a significant amount of time spent transitioning between manned and remote operation in response to unsupported roof conditions at the stope. We found that by eliminating these transitions, we could improve cycle times by 35 percent.

We also found an opportunity to reduce the amount of time lost to shift change. Traditionally, shift change was a two-hour transition by the time

operators rode the lift to and from the operating level. If operators were controlling machines remotely from the surface, this transit time would be eliminated — cutting shift change time in half while still allowing time for a machine walkaround performed by someone else underground.

Relocating the operator would also solve the issue of downtime after blasts. Air quality isn't a limitation imposed by the machine, but rather the person driving it. If there is no operator physically present, a machine can enter a blast zone as soon as the dust has settled, cutting that downtime in half

We also found that technology could help this customer reduce downtime from operator-induced maintenance events. Even the most skilled and experienced operators occasionally make mistakes and every site will experience drive wall impacts and the maintenance issues associated with them. But technologies can help us reduce their frequency by as much as 10 percent.

If the customer implemented all of these improvements, the result would be an additional 272 tonnes (300 tons) of material per machine per day in production for this underground gold mine.

At another customer's site in Australia, we used a one-month sample to analyze and attempt to improve the utilization of their haul fleet. In the first phase of project, the team focused on improving effectiveness of the hauling fleet in operation—temporarily ignoring delay time. Seeing some quick, easy changes that could significantly improve productivity, the team set a goal of 20 percent above baseline for flat haul/calendar hour improvement. By reducing hang time, queuing time and travel-empty time while increasing travel loaded time, the team exceeded their goal and improved production by just over 26 percent.

Once that phase was complete, the team moved on to delay time. We were able to reduce the impact of shift change by increasing first and last hour tons by 20-50 percent, an effective improvement of 5 percent over the course of the whole shift.

This is a good example of how Caterpillar, our customer and our dealer (WesTrac in this case) came together to use best practices and change management to significantly impact a productivity goal. With active management of situational changes, our customer has shown that not only can they sustain this progress, but also that they can continue to improve their productivity even after our team has departed.

HONING OPERATOR SKILLS



There's no argument that data is essential in order to make actionable decisions. Tracking how operator performance affects the bottom line is no exception.

First and foremost, it is important to remember that performance feedback should never be a strictly negative experience. If you gather data on your operators' performance, you will see situations when they perform exceptionally well. Make sure to share this feedback as well as any corrective measures, as it can improve employee morale and drive operators to be even better.

You may not think an operator's performance can have a significant effect on throughput, but a study on payload-to-target from an iron ore mine in Australia clearly showed an opportunity for shovel operator training to improve payload accuracy. The operator was trained on bucket fill and proper use of onboard information, and provided with a histogram window that showed how close bucket weights were to target.

By simply tightening the payload curve by 6 percent using training and onboard information, the customer was able to move 146,000 additional tonnes (161,000 additional tons) every month. The site now has a more valuable employee — an expert operator with sharply honed skills who can train other operators and has credibility among the other workers.

CONCLUSION

One of the most important things to remember when evaluating operations is the importance of information. You can't improve what you can't measure. Data plays a key role in helping us understand everything from performance to utilization to operator skill. But data is only part of the solution. Many mining companies gather huge amounts of data but struggle to turn any of that information into actionable insights or effective decisions.

That's where Caterpillar comes in. By leveraging the knowledge and experience of employees and dealers working in all kinds of applications all over the world, we are better able to help you use technologies to turn your data into a concrete plan for improvement.

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