

# Guided Spotting

*A new open-pit loading technology to improve excavation load cycles*

By Greg Lanz



The ProVision Guided Spotting system facilitates dual-sided loading to help mines increase their truck-shovel productivity.

As the mining industry continues its climb out of this latest depression, open-pit mining organizations are striving to improve productivity wherever possible. One area that has large potential optimization gains is in the excavation load cycle, as inefficient truck spotting while loading and dumping can significantly impact a mine's productivity. While this challenge has gone largely unresolved historically, new and emerging operator-assist technologies may finally provide the solution that mine operators need to improve productivity while loading and dumping.

## Importance of Load Cycle

The load cycle plays a critical role in the production process of an open-pit mine, and can dramatically influence a mine's overall profitability, making it a key target for optimization. Since loading units can directly influence the utilization of haul trucks, optimizing a mine's excavation load cycle also optimizes its high-cost equipment and minimizes total truck wait time at the shovel by maximizing material movement, increasing truck utilization,

and decreasing the required fleet size for a given target production.

## Challenges With Load Cycle Optimization

An ideal load cycle is one that minimizes shovel hang time, optimizes shovel swing angle, maximizes trucking capacity, and allows for greater compliance to plan. But accomplishing this ideal load cycle is not an easy task, as the efficiency and safety of haul truck maneuvering at shovels, crushers, and dumps varies dramatically with operator skill. Increasing employee turnover and the lack of available and recruitable skilled operators further complicates the variability of operator capability across a mine site. As a result, mines often employ standard operating procedures geared toward the lowest level of capability to ensure a safer production. Traditional practices such as bucket spotting and single-side loading can reduce the risk of truck-shovel impacts, but at the cost of productivity, as the resulting increase in shovel hang time reduces the productivity of both shovels and trucks.

Additional challenges that haul truck drivers often face in truck-shovel interactions include the difficulty of determining the correct approach to radial equipment, working in a highly distracting and very dynamic shovel area, and a lacking understanding of the shovel operator's preferences (i.e., desired spot side, location and heading).

Load cycle optimization is further complicated by siloed approaches by operations, engineering, safety, and training departments within an organization, who often focus only on specific portions of the load cycle, rather than the cycle as a whole.

## New Operator-assist Technologies

Operator-assist technologies can help the load-cycle optimization effort by potentially equalizing the performance of all operators to a capability close to (or even beyond) that of the most experienced operator. An operator assist system that approaches optimization holistically by considering the load cycle as a whole will provide the aforementioned benefits while also accounting

for such factors as safety, bench design, truck spotting, truck and shovel size, environmental factors, operator skill level, and single- or double-sided loading.

Modular Mining Systems has recently developed an operator assist technology, called Guided Spotting, that has the potential to significantly improve both shovel and truck productivity in open-pit mines by improving visibility and efficiently guiding haul truck drivers, while reversing their truck toward the shovel loading position, without guidance from the shovel operator. The Guided Spotting system was built on the success of Modular's ProVision machine guidance solution for excavators, released nearly 20 years ago, and utilizes the ProVision solution's same advanced guidance technologies and high-precision GNSS positioning to assist truck operators in efficiently spotting at load and dump locations. The Guided Spotting technology has undergone extensive field trials at a large open-pit copper mine in Utah and will be released later this year. The technology has already demonstrated the viability to:

- Increase shovel productivity by 4% to 35% (9% average);
- Contribute two to eight additional loads per hour;
- Reduce swing time by up to 15% (based on a 75° swing angle);
- Reduce total haul truck cycle by 1%-2% (based on a 25-minute return cycle); and
- Achieve additional gains by optimizing spot location and eliminating re-spotting.

The Guided Spotting system is ruggedized for reliability in challenging mining environments, including inclement weather, poor lighting, deep pits, and congested areas. The system is designed to improve both shovel productivity and operator awareness, utilizing visual displays to leverage existing practices. By mounting these displays on or near mirrors, the system encourages continued mirror use rather than seeking to replace the existing practice with technology. Simple operator feedback mechanisms provide clear, intuitive guidance for operators using the Guided Spotting technology, which does not require specific center of vision focus, as a backup camera would.

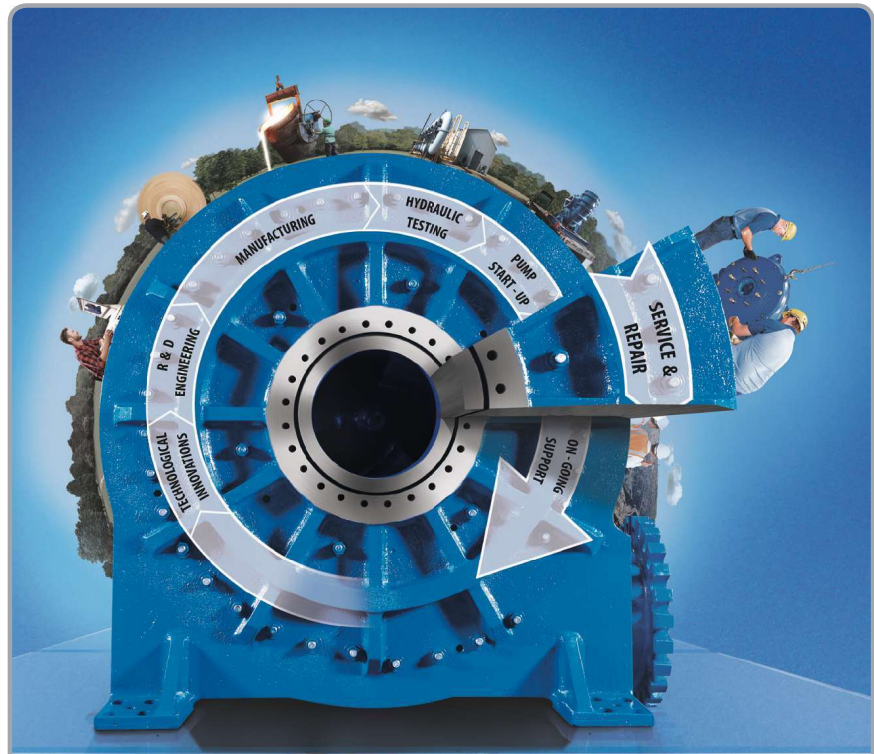
"Without operator-assist technology, mine operators were increasingly forced to err on the side of safety, which often comes at the price of productivity," said Michael Lewis, vice president of product innovation at Modular. "Guided spotting facilitates the efficient and safe spotting of trucks, and

will enable mines to reclaim their lost productivity without compromising safety."

Modular's Guided Spotting technology has already demonstrated the potential to increase productivity by facilitating double-sided loading, reducing the occurrence of truck repositioning, increasing operators' situational awareness, optimizing swing angle, and reducing shovel

hang time. But in the near future, mine sites will also be able to use the Guided Spotting technology to optimize crusher dumping, dozer-assist truck spotting, paddock dumping, pantograph guidance, and lane-keeping guidance.

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