

Virtual mine management and training

SIMULATORS HAVE BEEN USED IN MINING FOR A COUPLE OF DECADES, BUT WITH THE ADVENT OF OFF-THE-SHELF VIRTUAL REALITY HEADSETS, THE TECHNOLOGY IS SET TO SOAR.



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In recent years, the mining industry has figured out what those in aviation have known since World War II: using simulators saves time, money and lives. Whether it's for the passage of trucks on a haul road, driving a haul truck itself, or for drilling and blasting, simulation technology is becoming more widely used. In one of its more unusual applications, it's wound up being a valuable training tool for crane drivers. While we don't normally associate cranes with mining equipment, the reality is that many mine sites use them for construction, and for relocating equipment and overhead cranes in processing areas.

According to Keith Bishop, General Manager – Marketing at crane hardware specialist Nobles, the advent of relatively inexpensive virtual reality (VR) headsets — such as the Oculus Rift — has made the technology even more appealing. “The first generation of crane simulators were like flight simulators, with lots of screens and

controls mocked up like a crane cabin,” explains Bishop. “But they weren't very well received since they were large, immobile and expensive because they had all that gear associated with them. And they still didn't provide a very realistic experience of operating a crane.”

“This VR technology takes simulation to a whole new level: you put a headset on and you're immersed in a crane cockpit, with a 360-degree view of everything that's going on, as if you were sitting in a crane,” says Bishop. “And the controls you operate are OEM specified crane controls, which are exactly the same as the major levers you'd use in that crane model, in real life. This combination makes for a very realistic simulation, and training experience.”

Not surprisingly, registered training organisations (RTOs) make up one of Nobles' main consumers of their simulation product. Since cranes cost millions of dollars and often only one vehicle is





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allocated per 10 or more students, training to a baseline of skill on a simulator means RTOs can maximise crane time for their students.

Elsewhere in training, simulators can be used to improve the competency of existing operators. Just as air forces, airlines and navies do, companies with large fleets of cranes can use simulators to expose their drivers to hazards they wouldn't normally encounter in an operational environment. By practising in the simulator, operators are better equipped to know what to do if something should go wrong, and at the same time valuable machinery is not being tied up or put at risk of damage.

In addition to RTOs, Bishop says large construction, mining, oil and gas companies with strong site safety compliance and control policies are interested in the VR system as a competency tool. "They need to be able to verify that all employees or subcontractors are compliant and capable of using heavy machinery like a crane, before letting them onto their sites," explains Bishop.

By using off-the-shelf technology, such as the Oculus Rift VR headset and a high-end gaming laptop, Bishop believes companies such as ITI are democratising VR technology. "One of the benefits of this type of system is that it uses existing off-the-shelf technology that can then be applied [to meet a variety of needs, whatever they may be]. As the technology improves and the price decreases, the cost of providing it as a service will also decrease, and the benefit of higher resolution, et cetera, will be passed on to users," says Bishop. "The system is incredibly simple and easy to operate — as simple as pressing a button to turn on a PlayStation, and it loads up straight away. There's no complex set-up routine; the most complex part is plugging in all the cables."

A similar trend is evident in mine management simulation programs such as RPMGlobal's HAULSIM, says Adam Price, the company's Simulation Product Manager. "In the past, any simulation undertaken at a mine site has been done by a simulation expert — not a haulage expert — and the simulation model was not for a specific project," he explains. "This is an expensive way to run simulations, and you're left with a static model that isn't kept up to date."

HAULSIM uses a gaming-inspired 3D model based on the user's unique mine site, providing an accurate visual representation of their scenarios. According to Price, this approach gives users a more holistic view compared to traditional models. In addition, HAULSIM's Discrete Event Simulation (DES) software models mine haulage systems by simulating equipment interactions and infrastructure, allowing users to navigate current operations and future mine plans.

"Using HAULSIM and its powerful DES, a gold mine in Canada was able to reduce the time taken to create scenarios from over a month to under a week," says Price. "This allows mining engineers to move away from

programming and instead focus on adding real operational improvements that will have an impact on the bottom line."

While safety is the highest priority on a mine site and products such as HAULSIM help to identify high-risk situations, simulation technology — such as Nobles' crane simulator — also saves mining companies big bucks. However, RPMGlobal's Price contends that many mining operations are making decisions worth several thousand dollars without a model to support the decision — and simulation can provide that data.

"Often decisions are based on a gut feeling rather than data," says Price. "We've found the answer after running a simulation is obvious after we've done the analysis, but the simulation often produces a different result to what we were expecting. Customers who use simulation have a much deeper understanding of their haulage systems, as they are able to test all possible scenarios, such as widening a road, decreasing the maximum queue lengths or adding a stop sign to a particularly congested route. They save money since they've investigated all other viable alternatives, and have only spent when their return on investment is proven."

With new technology comes fresh challenges, and VR and 3D simulation are no exception. "There's been a bit of suspicion from some of the more experienced crane operators, who question whether the technology will actually be able to simulate a real crane operating environment," says Bishop. "But as soon as they get on the gear, they quickly realise it's very close to the real-world experience of driving a crane. So, one of the main ways to get over some of the challenges is to just get people to drive it and see for themselves that it's not a toy, but a sophisticated education and training tool."

For RPMGlobal, Price says it's the mine sites themselves that provide the greatest challenge, since they are all so dynamic. "If you're simulating haulage, the road network is constantly changing, and the movement of equipment around that network depends on the demands of the day," explains Price. "That's why RPMGlobal has developed the largest public equipment library available in HAULSIM, to provide accurate load and travel calculations that keep up with the demands of an ever-changing environment. The network can be updated so that the model is always current and precise."

Despite fluctuations in commodity prices, the use of simulation technology by mining companies appears to be on the up and up. Price attributes this to the fact that simulations such as HAULSIM play a significant role in identifying areas for improvement and opportunities for increases in production. "Although commodity prices have risen, the same cost-cutting mentality exists and will continue even as the commodity prices rise further," he says. "This means the use of simulation will continue to grow as mining companies search to lower their costs." **AusBiz.**