Robotics

Mining 24 Hours a Day with Robots

Mining companies are rolling out autonomous trucks, drills, and trains, which will boost efficiency but also reduce the need for human employees.

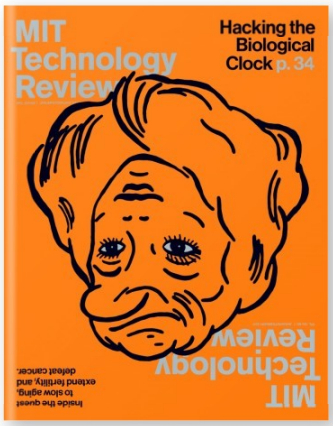
by Tom Simonite December 28, 2016

Each of these trucks is the size of a small two-story house. None has a driver or anyone else on board.

Mining company Rio Tinto has 73 of these titans hauling iron ore 24 hours a day at four mines in Australia's Mars-red northwest corner. At this one, known as West Angelas, the vehicles work alongside robotic rock drilling rigs. The company is also upgrading the locomotives that

haul ore hundreds of miles to port—the upgrades will allow the trains to drive themselves, and be loaded and unloaded automatically.

Rio Tinto intends its automated operations in Australia to preview a more efficient future for all of its mines—one that will also reduce the need for human miners. The rising capabilities and falling costs of robotics technology are allowing mining and oil companies to reimagine the dirty, dangerous business of getting resources out of the ground.



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BHP Billiton, the world's largest mining company, is also deploying driverless trucks and drills on iron ore mines in Australia. Suncor, Canada's largest oil company, has begun testing driverless trucks on oil sands fields in Alberta.

"In the last couple of years we can just do so much more in terms of the sophistication of automation," says Herman Herman, director of the National Robotics Engineering Center at Carnegie Mellon University, in Pittsburgh. The center helped Caterpillar develop its autonomous haul truck. Mining company Fortescue Metals Group is putting them to work in its own iron ore mines. Herman says the technology can be deployed sooner for mining than other applications, such as transportation on public roads. "It's easier to deploy because these environments are already highly regulated," he says.

Rio Tinto uses driverless trucks provided by Japan's Komatsu. They find

their way around using precision GPS and look out for obstacles using radar and laser sensors.

Rob Atkinson, who leads productivity efforts at Rio Tinto, says the fleet and other automation projects are already paying off. The company's driverless trucks have proven to be roughly 15 percent cheaper to run than vehicles with humans behind the wheel, says Atkinson—a significant saving since haulage is by far a mine's largest operational cost. "We're going to continue as aggressively as possible down this path," he says.

Trucks that drive themselves can spend more time working because software doesn't need to stop for shift changes or bathroom breaks. They are also more predictable in how they do things like pull up for loading. "All those places where you could lose a few seconds or minutes by not being consistent add up," says Atkinson. They also improve safety, he says.

The driverless locomotives, due to be tested extensively next year and fully deployed by 2018, are expected to bring similar benefits. Atkinson also anticipates savings on train maintenance, because software can be more predictable and gentle than any human in how it uses brakes and other controls. Diggers and bulldozers could be next to be automated.

Herman at CMU expects all large mining companies to widen their use of automation in the coming years as robotics continues to improve. The recent, sizeable investments by auto and tech companies in driverless cars will help accelerate improvements in the price and performance of the sensors, software, and other technologies needed.

Herman says many mining companies are well placed to expand automation rapidly, because they have already invested in centralized control systems that use software to coördinate and monitor their equipment. Rio Tinto, for example, gave the job of overseeing its autonomous trucks to staff at the company's control center in Perth, 750

miles to the south. The center already plans train movements and in the future will shift from sending orders to people to directing driverless locomotives.

Atkinson of Rio Tinto acknowledges that just like earlier technologies that boosted efficiency, those changes will tend to reduce staffing levels, even if some new jobs are created servicing and managing autonomous machines. “It’s something that we’ve got to carefully manage, but it’s a reality of modern day life,” he says. “We will remain a very significant employer.”