

automation

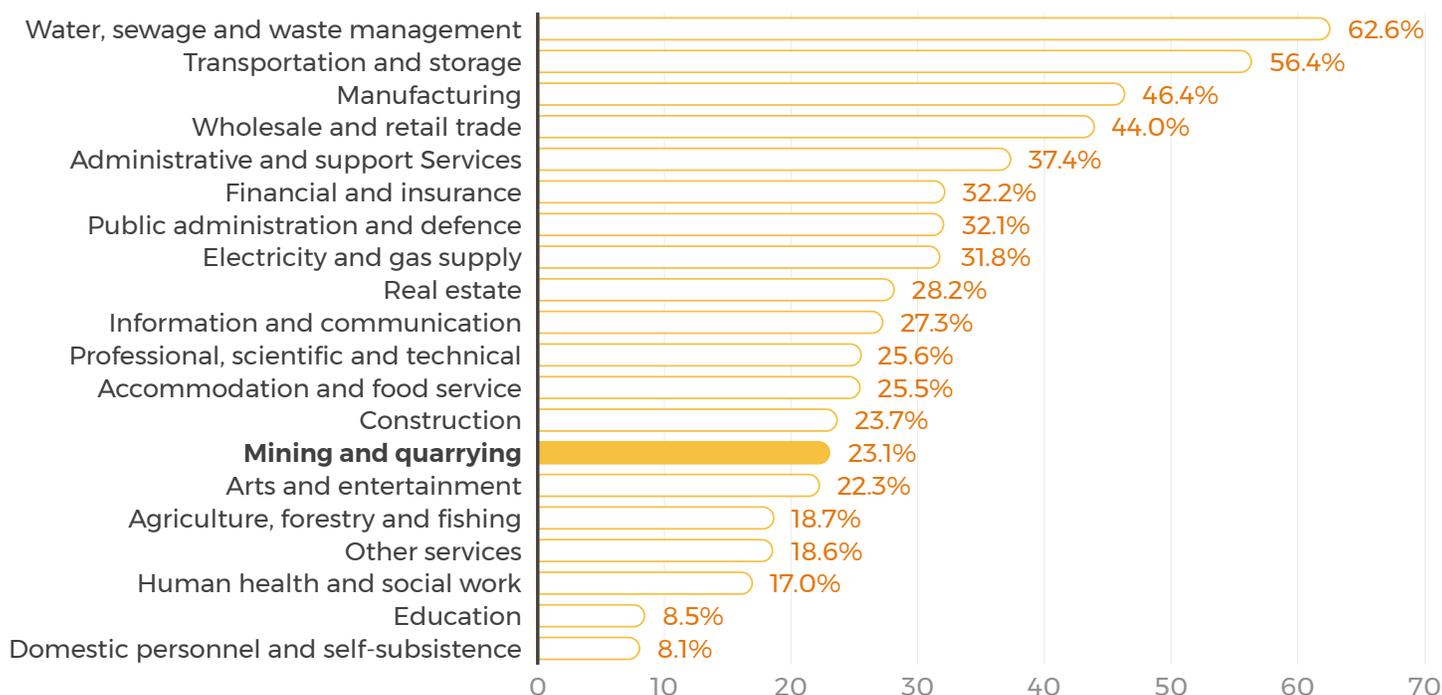
MINING'S BIGGEST UNTAPPED OPPORTUNITY

by Michael McCrae

If a mining job is repetitive, physical and requires minimum training, it's likely the position is under threat of being filled by a robot.

According to PWC that measured the effect of automation on the UK workforce, 23% of mining jobs will become redundant by 2030¹ as advances in robotics, sensors and big data gain greater industry penetration.

POTENTIAL RISK OF AUTOMATION FOR ALL UK INDUSTRY SECTORS



Data: PWC's Will robots steal our jobs?

¹<http://www.pwc.co.uk/economic-services/ukey/pwcukeo-section-4-automation-march-2017-v2.pdf>

What jobs will be lost?

Any position that is less skilled and more manual. Education is the main differentiator. Jobs that require no post secondary training face a 46% risk of being taken by robots² while jobs that require an undergraduate degree or higher face just a 12% risk.

Safety is a major reason touted for the drive to automation. In 2015, 26 miners died in the U.S. alone. Setting up safety protocols and training programs to prevent accidents consumes time and resources. But automation savings from cutting the workforce can have a significant impact on a mine's bottom line, too.

Brad Terhune, cost analyst and senior geologist at Mining Intelligence, says reducing that workforce through automation can have a "significant impact" on a mine's costs.

"Consider a 40,000 tonne per day surface mine with an 8:1 stripping ratio. About 206 truck drivers would be needed, which roughly makes up 26% of the hourly workforce,"

"While the savings are not a 1:1 relationship—a small handful of people are still needed to run vehicles remotely and autonomous vehicles are more costly—a reduction of the hourly workforce can have a significant impact on a mine's costs.

"Labour is the second largest operating cost center,"

brad terhune

Rio Tinto has been an industry leader in using automation. The miner faced a huge spike in wage costs during the last commodity boom. Train drivers were reportedly earning up to earning \$240,000 a year³, equivalent to a U.S. surgeon's pay. Rio Tinto is now several years into an automation drive. Trucks, trains and drill rigs are all increasingly operated remotely. When the automation drive kicked off, Rio Tinto planned for savings of over \$200M over a three year period⁴.

As automation gains greater industry acceptance, opportunities abound. The old cost structures for running a mine can be looked at anew. Projects once deemed uneconomic can now be run using entirely different procedures and technology. For example, expensive safety procedures may no longer be required if a robot is doing the work. Capital expenditure that had a huge cost component due to planning for workers at remote sites can now be pared back.

As more mining processes become automated, Mining Intelligence allows analysts to run what-ifs on mining projects. Embrace disruption. Look at old projects with new eyes and predict your profits.

²<http://www.pwc.co.uk/economic-services/ukeyo/pwcukeyo-section-4-automation-march-2017-v2.pdf>

³<http://www.abc.net.au/news/factcheck/2013-10-30/are-train-drivers-in-the-pilbara-the-highest-paid-in-the-world/5029012>

⁴<http://www.mining.com/rio-saves-200m-a-year-using-robots-big-data>

Here are some highlights from mine automation over the past five years that are upending the cost it takes to build and run a mine:

Rio Tinto Reduces Maintenance Costs by \$200M over three years

Adopting big data will save Rio Tinto \$200M over a three year period⁵ by reducing equipment maintenance costs, says Greg Lilleyman which is leading the Mine of the Future initiative⁶ that kicked off in 2008.

By using predictive analytics and enhanced maintenance planning systems, the integrated Australian miner can extend maintenance cycles times. Trucks spend more time moving ore and making money.

There can be many ripple effects from automating mine work. A recent study of Rio Tinto's automated truck fleet by the Mining Technicians Group Australia⁷ highlights just one change.

Road grades can now be steeper and narrower since automated haul trucks are driven with much more precision. Since robots are less error prone than human drivers, pit design can be less forgiving and cost less.

Rio Tinto continues to add more autonomous equipment to its fleet, which is operated remotely from a building near the Perth airport, some 1,500 km away from the mine site.

BHP Eyes Ships for Automation after Roboticized Trains and Trucks

After automating trucks, drills and trains, the next logical step for BHP Billiton is the ships transporting ore⁸.

BHP charters 1,500 voyages each year making it the world's largest dry bulk charter. In 2016 it procured freight for close to one quarter of a billion tonnes of iron ore, coal and copper.

BHP believes automation and shipping can improve safety and lower costs. The company also believes shipping automation is a logical extension of its cur-

rently automated logistics channel. And being one of the world's largest shippers, BHP will have an outsize influence on pushing shippers towards automation.

"Building on automation and remote-operation changes in our land-based supply chain, autonomous vessels offer significant opportunities to improve safety," said Rio Tinto in a statement.

The company believes that autonomous vessels could be "manifest" by 2026.

Battery-powered underground loaders require less space and ventilation

Battery technology is changing the economics of underground mining by reducing space and ventilation requirements.

Atlas Copco introduced a battery-powered underground⁹ loader onto the market. The need came about when Kirkland Lake Gold told the Swedish-based mining equipment supplier that a battery-powered underground loader could extend the life of its underground mine in Ontario. Using batteries would

drastically decrease the space and ventilation needs underground mining, thus decreasing capital costs.

The trial was a success. The battery technology is no longer just a trial but being sold commercially. The battery-technology was added to Atlas Copco's ST7 or Scooptram 7, a 6.8-mt-capacity loader. The battery technology is now being rolled out to Atlas Copco's full line of loaders.

⁵ <http://www.mining.com/rio-saves-200m-a-year-using-robots-big-data/>

⁶ <http://www.riotinto.com/australia/pilbara/mine-of-the-future-9603.aspx>

⁷ <http://www.mining.com/web/impact-adapting-automated-haulage-systems-typical-open-pit-mine/>

⁸ <http://www.mining.com/web/robot-ghost-ships-extend-miners-technology-drive-seas/>

⁹ <http://www.mining.com/two-types-mine-operators-looking-battery-technology/>

Drillers Get on the Automation Bandwagon

Boart Longyear is adding rod-free handling to its drill units. Rod-handling is the number one cause of injuries and other injuries in drill sites. Automated rod-handling not only reduces the manpower required for drilling, but reduces manpower on the drill rig. The technology is currently being used on the LF 160. Adding automation to more drill units is planned.

Other exploration companies are going further and seeing dramatic results. Using a mix of drones and automation¹⁰, Yukon-based mining driller Groundtruth Exploration reduced exploration by up to 80% and taken has 18 month projects down to two to three weeks.

Summary

While mining is often a conservative industry, cost pressures due to the cyclical nature of the industry and the high costs of ensuring work safety have pushed miners to forefront of automation. While Silicon Valley dreams of robot cars on all the streets, iron ore miners have already robotized trucks moving ore.

The automation revolution has arrived and the technology is being picked up by more and more miners. Understanding what costs will change and what the impact will be is key to uncovering new opportunity since the old cost assumption models will no longer apply.

¹⁰<http://www.cbc.ca/news/canada/north/yukon-prospectors-aim-to-take-new-technology-to-the-world-1.2886319pdf>

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