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Vale expands the use of autonomous equipment and has 72 pieces operating in Brazil, benefiting directly more than 300 employees

Autonomous stocking yards were started this year in Maranhão and Rio de Janeiro; 24 trucks, 18 drill rigs and 30 yard machines are in operation already

Artificial intelligence, computer systems, GPS and radars are part of the routine of over 300 Vale's employees in Brazil being benefited by the autonomous operation. With this technology, that started being used four years ago, equipment operates with no personnel inside the cabins, which significantly reduces the risks to which employees are exposed in the operational area, in addition to providing more stability to the operation and generating gains of efficiency. With the start-up of the autonomous stocking yard at Ilha Guaíba Terminal, in Mangaratiba (Rio de Janeiro state), Brazil, which took place this week, Vale reached the landmark of 72 autonomous equipment in operation in four Brazilian states.

The company delivered last January the 18th stocking yard machine at Ponta da Madeira Maritime Terminal, in São Luís (Maranhão state), and in February the 11th drill rig in Itabira, at Minas Gerais state. The autonomous are also present in the operations in Carajás, Pará state, and Brucutu, Minas Gerais. A total of 24 haul trucks, 18 drill rigs and 30 yard machines are operating in the autonomous mode.

Besides safety and efficiency gains, which are common to all autonomous equipment, there are also sustainability benefits in the case of mobile equipment, such as haul trucks and drill rigs, due to the reduction in fuel consumption and the increase in components lifespan.

The first autonomous pieces of equipment to come into operation were haul trucks and drill rigs, in 2018, at Brucutu mine. Currently, there are haul trucks, drill rigs and stocking yard machines also operating in Carajás and drill rigs in Itabira; along with the yard machines started up this year in São Luís and Mangaratiba. Vale also operates autonomous drill rigs and scoops in its underground mines in Canada and an autonomous yard in Malaysia.

People at the centre

As the autonomous mode has advanced, around 300 employees ceased to work in areas that are subject to the risks inherent to the operation, such as mine pits and stocking yards in the Brazilian states of Minas Gerais, Pará, Rio de Janeiro and Maranhão. The implementation of autonomous mode in operations is being accompanied by training plans for employees to work with new technologies, preparing them for the mining of the future. All employees involved in the project received training, either for new roles (as truck lane designer) or to perform the same functions in a different way, interacting with autonomous vehicles.

Jérsica Cantanhede, stockyard operator in the control room at São Luís, Brazil

Felipe Cordeiro is a supervisor of Autonomous Operations in Carajás. Born in Pará, son and grandson of Vale's employees, he says that the implementation of the trucks, in September 2021, also included an awareness of the benefits

of technology:

“Some were afraid of the novelty because of the particular mining conditions in Carajás or the impact of the change on their careers. Initial results already show that the autonomous mode can make the operation safer, more efficient and sustainable. The staff understood that they are facing a window of opportunity for the future”.

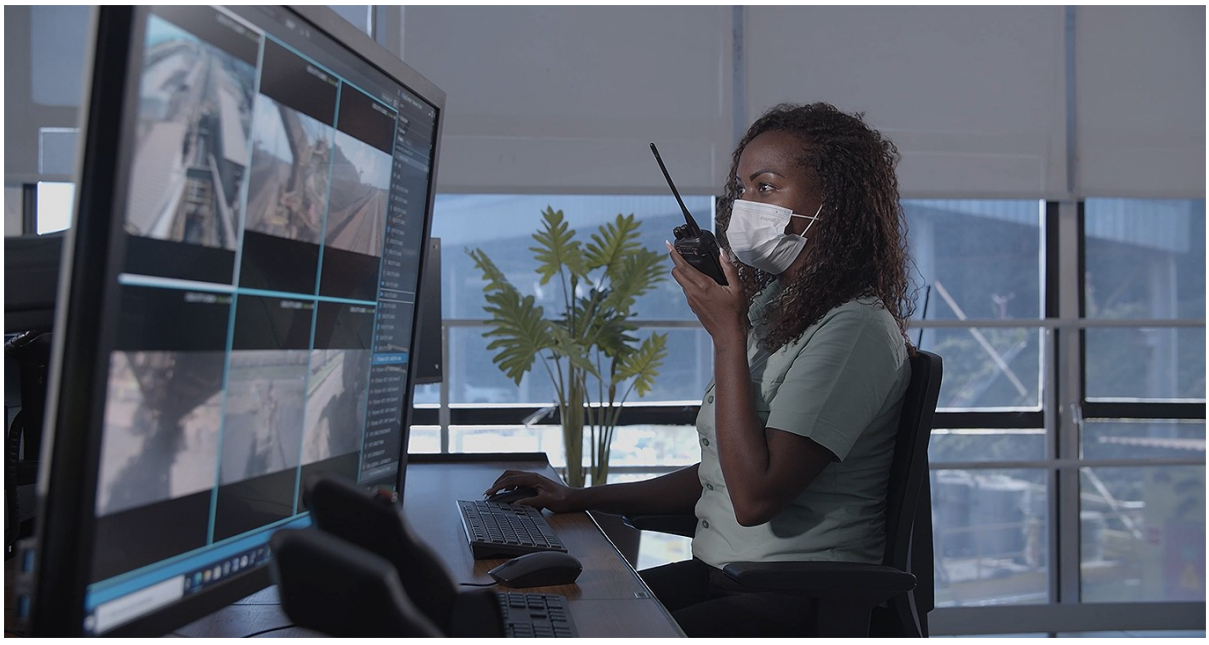
In Brucutu, drilling operator Claudinei Clemente dos Santos, 51 years old – 22 working at Vale – says that the autonomous operation also favors inclusion. In 2004 he was involved in a road accident, which left him with a physical disability. Technology has arrived to improve his working conditions.

“When I was called to operate the autonomous drill rig, I got so joyful. Previously, I had to get on the equipment, drill the hole, get off to check how it was and return to the equipment. Today, I survey the area and return to the control center, enter the data in the machine and the drill rig performs the task autonomously. It is much more comfortable,” he explains.

More safety

Reducing employee’s exposure to risk is one of the most relevant benefits of technology. Ana Carolina Pacheco operates yard machines at the Ilha Guaíba Terminal (TIG). In the regular operation, she climbed up several steps to access reclaimers and stackers up to 40 meters high, moving each 8,000 tons of ore per hour. Starting this month, Carol will control the three machines from the Control Center.

“The operational site presents risk and those are significantly reduced with the autonomous operation. There is also an issue of ergonomics. I work more comfortably in the control room”, explains Carol, a proud resident of a Mangaratiba district.



Ana Carolina Pacheco monitors the stockyard at Ilha Guaíba Terminal, Brazil

In São Luís, the yard machines operators were removed from the equipment cabins more than ten years ago, when the operation became semi-autonomous. Now, with the change to the full autonomous mode, employees have experienced improvements in their work routine. After the implementation of the autonomous stocking yard, the machines are even more reliable, with sensors and other technologies, according to technician Jersica Cantanhede, 34 years old – 15 of

them operating yard machines at Vale.

“The fact that we’re no longer exposed in the cabin has been already an improvement. Now, we hope to increase productivity even further, keeping safety first”, she explains.
Since the implementation of the autonomous there has been no accidents involving people. As for haul trucks, for example, risky situations, such as tipping and collision, were eliminated. While detecting risks, trucks stop their operations until the road is cleared again. The security system's sensors are capable of detecting larger objects, such as large rocks and other trucks, as well as human beings who move in the vicinity of the road.

Sustainability and efficiency

Technology also brings environmental gains. In Itabira, autonomous drill rigs showed a 7.3% reduction in fuel compared to manned ones. This reduction accounts for around 1,200 liters of fuel per year, which is equivalent to 2,966 tCO2 less in the atmosphere. To absorb this quantity of emissions, an area of 22,000 square metres of forests would be needed.
In Brucutu, truck tires recorded a 25% increase in their lifespan, leading to less waste disposal. Lifespan increase of engines was also of 25%, which generates a significant cost reduction for the company, since each engine replacement costs 2.5 million reais.

The maximum speed of trucks in Brucutu, which was 40 km/h, reached 60 km/h. Hourly productivity, measured by the amount of iron ore transported per hour, increased by around 10%.

In the autonomous stocking yards in Carajás it has also been possible to measure efficiency gains. In two yards of plant 2, during the process of ore stacking and reclaiming, there was a 90% drop in operational deviations, such as the formation of non-standard ore piles. “With less deviations we gain in productivity because we load trains faster and in safety by reducing the risk of ore sliding in the pile”, says Joyce Freitas, autonomous yard supervisor in Carajás.

Expanding technology

Vale's autonomous program continues to expand, with a total investment of around US$ 45 million in 2022. By the end of this year, three more haul trucks, two yard machines and five drilling rigs will come into operation in Carajás, in addition to one more truck in Brucutu and three drilling rigs in Itabira, bringing the number of autonomous equipment to 86 in Brazil.
“The autonomous operation is making processes more stable and in line with safety standards, supporting Vale in its ambition to become a benchmark in mining safety,” explains program manager Pedro Bemfica. “Furthermore, the introduction of digital technology is making employees even more prepared for the industry's transformation trend.”

Innovation in safety

Innovation is key so Vale can improve people's lives and transform the future together with society. In its strategy, the company prioritizes safety, productivity and the low carbon agenda. Innovation initiatives for safety have been grouped since 2021 in the Safety Transformation Program, which has three main purposes: create initiatives to ensure safe processes; accelerate the implementation of controls in the operation; and remove people from hazardous activities using remote, autonomous and robotic operation techniques. Within the scope of the program are, for example, projects for the implementation of autonomous vehicles, development of fatigue detection systems in operators and the use of augmented reality for inspections and maintenance.

More information

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