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## A new eye on fatigue

*Vale promotes the safety of its employees using an Industry 4.0 technology that detects levels of drowsiness in mine operations*

For Vale employees who work in the mines driving conventional or off-road trucks with up to 400 tons of capacity, glasses are much more than an accessory. A device installed in glasses detects levels of drowsiness in operators and emits visual and sound alerts in the truck cabin and in the monitoring center. In extreme cases, the employee is guided to a rest area and replaced, to avoid accidents. This wearable technology is one of the Industry 4.0 initiatives adopted by Vale. The company invested R\$15 million in the system – known as Optalert –, which has already been installed in more than 160 (small, medium and large) machines, covering 1,200 employees in the companies' mines in southeastern Pará. This technology was initially implemented in Mozambique, Africa, and tests are now being carried out in Minas Gerais.

The device measures the eyelid movement speed 500 times per second. Dedicated controllers keep track of the operators' drowsiness levels in real time, from a monitoring center, as soon as the operators start the engine and put the glasses on. The truck's control panel is equipped with a seven-inch screen that rates the employees' physical condition

on a 0 to 10 scale – 4.5 showing a warning state and above 5, a critical state. "This work is based on data cross-referencing between teams that control Vale's entire mobile vehicle fleet via GPS. Upon detecting drowsiness in an operator, the system emits an alert to the control team, which will interact with the employee, if necessary," explained Rafael Garcia, supervisor of the operational training area and responsible for managing the Optalert system.

Given the complexity of the operations – especially those carried out at night and overnight –, adopting this type of technology and digital platforms has brought gains to employee health and safety levels, in addition to protecting the assets and increasing productivity. "Today we are able to provide real-time indicators of the probability of drowsiness in the teams in operation. Using tools to speed up the sharing of information and generation of indicators with high reliability are key to keeping increasingly safe work environments in the new Industry 4.0 era," reinforced Garcia.

Optalert integrates a set of actions within Vale's Fatigue Management Program, which was deployed in the Carajás mines in 2015. The actions include assessing the operating profile of employees, medical follow-up, training, as well as raising the families' awareness on topics related to rest, sleep, nutrition, and physical and mental health. "The system has made us more aware of the importance to prepare for the workday, and of how critical family support and adequacy of routine are to keep the workplace increasingly safer. On top of that, the glasses are comfortable and help us remain alert at all times," explained Rogério Costa, off-highway truck operator, who has been with Vale for eight years.

### Prevention

Optalert was adopted as a preventive measure within Vale's Fatigue Management Program. Vale registered no fatalities in the area. "That's exactly the idea. To invest on preventing accidents related to sleep effects," added Garcia.

Drowsiness can reduce our mental ability and decision-making, making it harder for drivers to assess their own risks. According to data from the Brazilian Sleep Society, 30% to 40% of all fatalities related to vehicle accidents are caused by drowsiness.

### Vale in the Industry 4.0

In 2016, Vale began to deploy its digital transformation program to adapt to the Industry 4.0. This will drive integration among business areas around the world, helping the company reduce costs, streamline its processes, increase productivity and operational efficiency, and achieve the highest health and safety levels. The program is based on four pillars: Analytics, integrated systems and chains, robotics, and standalone equipment. The company is using the Internet of Things, Advanced Analytics, Machine Learning, Artificial Intelligence, and mobile applications, among other technological innovations. In 2017, the program yielded US\$51 million in savings for the company, and the expectation for 2018 is to further reduce costs by US\$49 million.

### About Optalert

The Optalert system is based on a lifetime of research by sleep science expert Murray Johns. The technology was patented by Optalert and became an integral method in detection and alert management for operators, focusing on operator safety.

More information

