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Vale invests R$60 million in innovative technologies for rail and port operations

In 2010, Vale's logistics department will invest approximately R$60 million to develop and implement innovative technologies in its heavy haul railroads - the Vitória-Minas (EFVM) and Carajás (EFC) railroads - and ports. These investments include new equipment to operate locomotives using remote control and "dynamic helpers," extra engines designed to couple with moving trains to help them up steep hills - never before used in Brazil. "We look for the best possible technology on the market to modernize our railroads and ports and, unusually for the industry, we adapt it to the specific characteristics of our heavy haul railroads," explains Humberto Freitas, Vale's director of logistics operations.

In order to operate locomotives using remote control, Vale is testing two sets of equipment on the Vitória-Minas Railroad (EFVM). The equipment allows drivers to leave the cab and carry out switching maneuvers remotely, from a vantage point with a full view of the operation. The trials are taking place at the Engenheiro Bandeira and Ouro Branco rail yards in Minas Gerais, both on the EFVM. "Train drivers can do maneuvers without needing to talk on the radio with switchmen. The switching process is quicker," explains Gustavo Mucci, general manager for rail innovation and development at Vale. By the end of the year, the company will have tested another two such systems on the same railroad. Total investment in the scheme is R$4.6 million.

Vale's logistics department has also invested R$9 million to develop an artificial intelligence system at Ponta da Madeira seaport in São Luis, Maranhão. The system enables all of the terminal's stackers and reclaimers - used to move ore from the stockyard onto conveyor belts, which then take it to the ship - to be operated remotely. The system uses a software program allowing the machinery to be operated from the port's control center. Vale is the first company in Brazil to have equipped all the stackers and reclaimers at a port terminal with a remote control system.

At the control center, operators each have their own command terminal. As a result, when they need to operate a different machine, they only have to activate a command rather than switch to a different terminal. The terminals' operational system and layout is the same as that adopted at major European ports such as Rotterdam. "Using cameras and sensors installed in the machines, operators can control the machines at a distance, from where they can see the stockyard as a whole," says Humberto Freitas.

Dynamic helper - used for the first time in Brazil

Vale is the first company in Brazil to develop a "dynamic helper," an auxiliary locomotive that couples with a moving train in order to help it move up a steep section of track. Previously it was necessary to stop the train to add on the helper engine before continuing onward, but now the procedure takes place in motion, by means of a dynamic coordination process. It is estimated that using this technology will cut fuel consumption by up to 5%, given that trains use the most fuel when they stop and brake.

The system uses a dynamic process to enable the train and helper to come together, with couplings aligned using a laser system. The helper waits for the train to arrive on a siding beside the main track. Once the train has gone past, the helper "chases" it along the main track, they synchronize their speeds and then couple whilst in motion. The operation takes

place automatically, with the driver monitoring it rather than performing it manually. "This is a state-of-the-art technology that is much more energy efficient, and we are very proud of it," says Freitas.

Train simulator: the most modern in the world

In March, Vale began tests on the world's most advanced train simulator, developed in partnership with the Polytechnic School of the University of São Paulo (USP). The tests are taking place at the company's Center of Excellence in Logistics (CEL), in Vitória, Espírito Santo state.

The tool, which realistically simulates Vale's railroad lines using 3D technology, will be used for driver training. It will result in improved operational safety, fuel savings and less wear and tear in locomotives and wagons. The technology behind the R$2.5 million project has been developed totally in Brazil.

The virtual reality simulator reproduces the rail lines of the Vitória-Minas (EFVM), Carajás (EFC), North-South (FNS) and Centro-Atlântica (FCA) railroads, which together have more than 10,000 kilometers of track. 3D images show the train's behavior throughout a rail line's trajectory, in different kinds of weather, such as sunny, foggy and rainy. Using a geo-referencing system, the simulator can also generate sections of track that do not exist in real life, and replicate hazardous situations such as animals crossing the track at night.

The simulator is equipped with innovative tools, including a reader of geo-referenced data (latitude and longitude) that provides a 3D vision of all topographical features along a rail line, such as sharp bends and surface irregularities. "The software will be installed in training cabins, which replicate the inside of a Dash 9-model locomotive cab, and will simulate moving trains," explains Gustavo Mucci, Vale's general manager for rail innovation and development. The simulator also takes into account, within a virtual reality environment, all of the train's characteristics, including braking efficiency, dynamic braking, train/wheel traction, travel time, fuel consumption and safety procedures. "Train drivers will be exposed to real operational situations," says Mucci.

Over the last eight years, Vale has invested R$9.5 million in simulator technology and in 2010 the company will invest an additional R$1 million to improve the new simulator's modules. As of the second half of this year, it is planned that around 24 training cabins will be installed at the Center of Excellence in Logistics in Vitória, in São L Over the last eight years, Vale has invested R$9.5 million in simulator technology and in 2010 the company will invest an additional R$1 million to improve the new simulator's modules. As of the second half of this year, it is planned that around 24 training cabins will be installed at the Center of Excellence in Logistics in Vitória, in São Luís (Maranhão) and along the course of the FCA railroad, at mobile training units run by Valer, Vale's education department. Around 540 drivers will receive training this year.

The technology used in the simulator enables the training to be supervised via the internet. As a result, one supervisor is able to simultaneously monitor more than one training activity in remote locations.

More information

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