



# ROCKY

## Vale uses DEM and FEA simulations to improve equipment and reduce costs

Rocky DEM and ANSYS software help the Carajás mine analyze equipment, test modifications, and ensure proper operation with speed and reliably.

Wanting to adapt to current economic times by increasing production, Vale continually invests in research and development, as well as improvements to their existing beneficiation plants. Their main goals are to reduce maintenance stop time and overall wear of their equipment.

One solution for increasing performance was discovered by the engineering team at Vale Carajás, Brazil—the largest iron ore mine in the world. They found that for two of their beneficiation plants, if they separated out the larger pieces of ore at the first plant before the ore transferred to the second plant, they could reduce the maintenance stop time of the latter plant and increase the productivity. To make the change, however, they needed a screen that could efficiently separate the particles of iron ore by size.

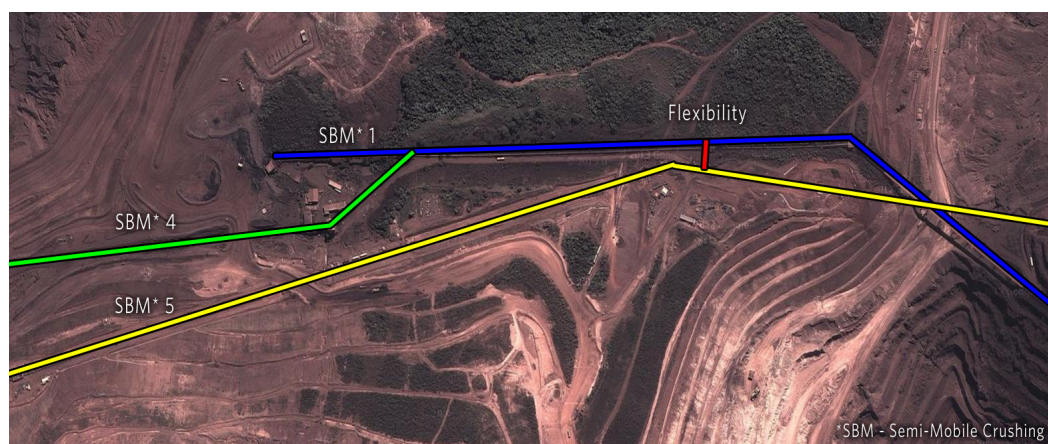


Image of plant 1 and 2 of Vale Carajás

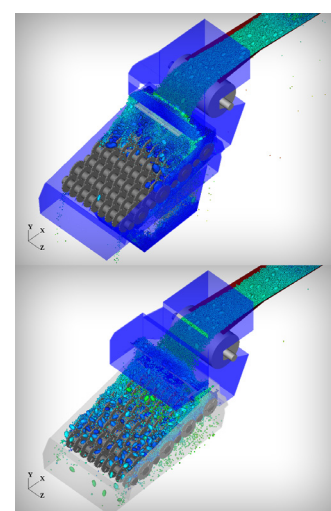
The market forces us to produce ever more with the equipment we already have, and we are only able to accomplish this by stimulating the productivity of our plants.

With the accurate simulation abilities found in both Rocky DEM and ANSYS, we can quickly measure and efficiently facilitate proper investment in our plants."

**Ueld José da Nobrega**  
Senior Engineer of Maintenance  
Engineering and Industrial  
Automation at Vale

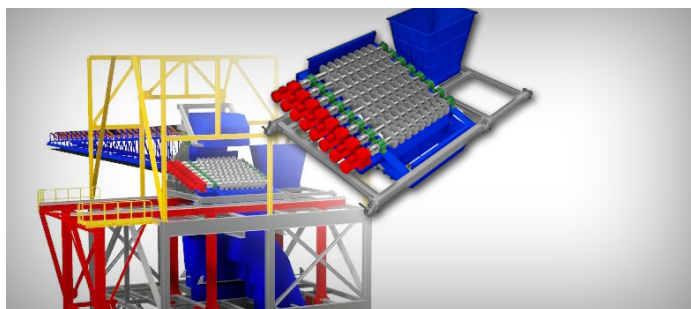
## ROLLER SCREEN AND STRUCTURE

The engineering team decided to use a type of roller screen for their solution, which was originally developed to work with coal. "We found that the configurations for the roller screen work quite well for iron ore", Ueld José da Nobrega, Senior Engineer of Maintenance Engineering and Industrial Automation at Vale Carajás, explained. "We analyzed the rotation, distance, and format of the disks and concluded that the components should operate in an efficient-enough manner to meet our needs."



Roller screen before (top) and after (bottom) the changes with uses Rocky DEM

To test the roller screen solution and ensure that the building structure could withstand the additional weight of the equipment, the engineers and designers at Carajás conducted different simulations using both the Rocky DEM and ANSYS analysis tools.



◀ This image shows the final structure with roller screen

“The simulations that we conducted with Rocky DEM and ANSYS allowed us to define the parameters for efficient screen operation in a way that could meet our design requirements. The simulation results were very close to real-world results, obtaining a margin of error of less than 5%,” said Ueld.

## RETURN ON INVESTMENT

From original project conception to final implementation of their screen roller solution, Vale Carajás needed only three months—1/4 the time it would have taken without the use of simulation tools. “If we had do this project the traditional form, with no simulations, we would need more than one year,” Ueld says. “Now that we have these powerful simulation tools and expert people to work with the software, the project verification and execution of changes was much faster.”

## CHALLENGE

During the transfer of iron ore from the first plant to the second, reduce the maintenance stop time of the second plant by first filtering the particles with a roller screen so that only the smaller-sized ore reaches it.

## SOLUTION

Use Rocky DEM simulations to test the efficiency of the roller screen equipment at optimal calibrations, and use ANSYS FEA simulations to verify that the structure design can support the added weight.

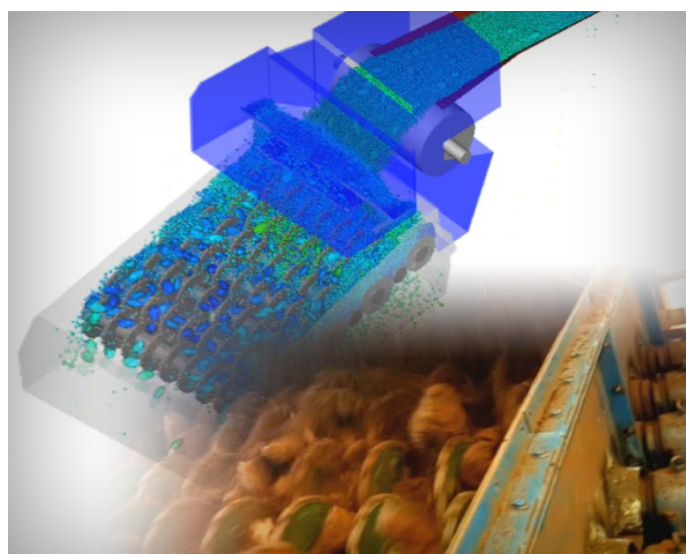
## BENEFITS

Rocky DEM and ANSYS simulations helped ensure a reliable design that met the goal of reducing the maintenance costs of the second plant. Design development was reduced from 12 to 3 months with a predicted return on investment of almost R\$ 7 million in just the first year of operation.

To implement their solution, the engineering team at Vale Carajás invested nearly R\$ 10 million (Real - Brazilian currency) in the roller screen modifications. Today, the screen is in full operation. By successfully filtering out the larger particles from the first plant, it is already reducing the maintenance stop time at the second plant. Vale predicts that after twelve months of operation, the new equipment will reduce maintenance costs by almost R\$ 7 million. This return Vale expects to have by the end of 2015.

## MINING INNOVATION

The crisis in the mining sector has led companies to seek out ways to make them more competitive by improving their plants, increasing productivity, and reducing costs. In this case, Vale Carajás used Rocky DEM and ANSYS simulation tools to improve the performance of their plants. “In the mining sector, equipment stays unchanged for years and innovation is very limited,” Ueld explains. “The use of these simulation tools has helped us to make innovations in a short period of time; an ability that has become indispensable to our continued success in this business.”



◀ With simulation softwares was possible predict the changes, analyze of ROI and decide what is the best solution for increase de productivity, reduce maintenance stop time and overall wear of equipment

You  
Tube

◀ Watch case video: <http://bit.ly/roller-screen-vale>



Vale is the largest mining company in the world, the leading producer of iron ore, and the second largest producer of nickel. The company's operations also extract manganese, copper, coal, cobalt, pellets, among others, and produce some fertilizers such as phosphate (TSP and DCP) and nitrogen (urea and ammonia). Vale operates in thirteen Brazilian states and five continents.