

Changing Lining Technology at the SAG Bauxite Mill at Hydro Paragominas

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Abstract

This work was carried out on the premises of the Hydro Paragominas Bauxite Mine, located 70 km from Paragominas city in the state of Pará, Brazil. The Paragominas plant is responsible for processing and sending bauxite pulp through a pipeline over 244 km extending to the Hydro Alunorte refinery in Barcarena city also in the state of Pará, Brazil, the main equipment responsible for the production of this pulp are the mills. As a result of cooperation between the maintenance, process and industrial operation engineering sector of Hydro Paragominas and the company Metso Minerals, a customized specification project and optimization of the SAG mill body liners was developed. Previously, the SAG mill linings (162 pieces) were manufactured in steel alloy and due to the comminution process, several parts broke, causing lost production, increased costs and exposure of maintainers to risk. The project aimed to mitigate coating breakages throughout the set's useful life campaign, which is an average of 3 years. To achieve this, the material technology was changed from steel alloy to a hybrid coating (Hardox500 and special rubber), the angle of attack was changed from 20° to 25° and the pieces were unified, which reduced the number of pieces from 162 to 54. With these modifications, “zero” liner breakage throughout the useful life was achieved resulting in OpEx savings of 540 kUSD/year, an increase in the feed rate in the mill of 29 t/h which represents a gain of 6.69 MUSD/year and a reduction in risk exposure in the individual coating replacement activity. The coating replacement frequency was previously monthly and was reduced to only occur in Overhaul stops every 3 years, in the risk matrix the risk level went from 12 to 2. The project exceeded all expectations for product application.

Keywords: Comminution milling, Liners maintenance, Reliability and operational guarantee, Safe operation, Performance improvement.

1. Introduction

Mineração Paragominas is an important part of Hydro's strategy as a global provider of innovative and sustainable aluminum solutions. Mineração Paragominas is responsible for the bauxite mine, which is located approximately 70 km from the municipality of Paragominas, in the northeast of Pará, on the Miltônia 3 Plateau. It currently has approximately 1 400 company employees and around 800 outsourced employees.

The mining operation began in March 2007 and currently moves around 16 million tonnes of ore per year, generating 11.4 million tonnes of bauxite annually, which is transported by a mine pipeline, the first in the world to transport this type of ore.

In Paragominas, bauxite removal goes through the processing stage, which consists of crushing, grinding and classification. The processed ore is mixed with water, forming a pulp that is pumped through a pipeline to the Alunorte refinery, in the city of Barcarena, where the bauxite is refined, transforming it into alumina, a raw material for aluminum.

Grinding is the main process for obtaining ore for granulometric adjustment and separation of silica from bauxite, in Figure 1 shows Plant 1 and Figure 2 shows Plant 2 of Mineração Paragominas.



Figure 1. Plant 01



Figure 2. Plant 02

2. Objective

In Brazil, SAG mills usually use steel alloys as the construction material for their coating, however, due to the problems that were occurring in the operation of SAG mills at the Mineração Paragominas unit, it was necessary to seek an alternative solution to solve the problems of cracks and coating breaks (shown in Figure 3).



Figure 3. Cracked linings

By mitigating the risk in the replacement activity and significantly reducing the frequency of execution of this activity from monthly to three-yearly (36 months), the risk level in the risk matrix was reduced from 12 to 2 as shown in Figure 8. The risk level was validated by the Hydro occupational safety team, confirming the great improvement in the safety of all maintainers helping drive towards the Hydro target of zero accidents.

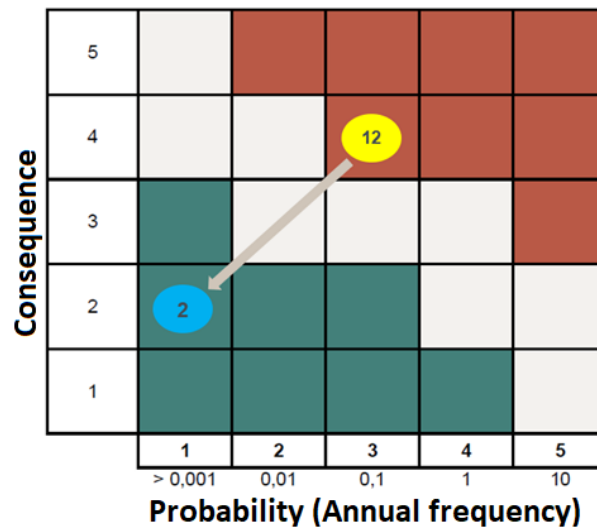


Figure 9. Activity risk matrix

5. Conclusion

After 1 year of operation, it can be concluded that the technology change was a success, in addition to being the first SAG mill in Brazil to have hybrid liners (Hardox500 and special rubber), the results achieved exceeded what was expected for this technology change, as evidenced in topic 4.

For this development to be successful, the Hydro team first applied the pillars of BABS (Hydro's management system) to build and apply this improvement, using change management as the basis for structuring the project and Hydro's vision applied to the scope of the project. With the pillars of values, care: we always aim to mitigate the risks of employees who work in the maintenance and operation of the Mill, collaboration: the project has always been done in "8 hands" Engineering, Maintenance, Operation and Process, always aiming for the best context for all disciplines and courage: in installing the first hybrid coating with 100% external fixation on a SAG Mill body in Brazil.

The entire project was carried out in conjunction with the partner company Metso, which supported the Hydro team and provided all the materials, as well as using the technical standards that govern Asset Management, aiming for the standardization and physical integrity of assets.

6. References

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