

Decarbonisation and Cost Reduction Obtained by Replacing Transit Vehicles in Bauxite Mining

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Abstract



This work aims to demonstrate a pioneering study implemented at Hydro Paragominas Bauxite Mine in Brazil, where 45 Four-Wheel Drive diesel pickups were replaced by Two-Wheel Drive vehicles powered by Ethanol (Biofuel obtained from sugar cane), and 10 vehicles 100 % electrical. This was possible due to constant infrastructure works at mine accesses in accordance with national safety standards, mechanical assessments of vehicles with better resources to meet the local scenario, enabling Hydro Paragominas to achieve a projected reduction of approximately 3 475 tonnes of CO₂, approximately 9 520 trees planted over a period of 5 years, in addition to savings for the company's cash of approximately 3 million US dollars.

Keywords: Decarbonization, Cost reduction, Vehicles, Access, Ethanol.

1. Introduction

Currently, bauxite mines in Brazil practice a culture for vehicle traffic within the mine areas, limited only to 4-wheel drive trucks, and Hydro Paragominas Bauxite Mine (MPSA - Mineração Paragominas) does not escape this culture. Since the implementation of the plant operation in August 2004, this model of vehicles has been adopted as necessary for internal displacements.

Today, MPSA has approximately 100 light vehicles working directly to support its service fronts, from mining, research, maintenance, pipeline, environment, safety and other support areas.

Until Dec/2022, 97 % of the number of vehicles consisted only of 4×4 diesel trucks, which in addition to having a high cost in OpEx for the company, contributed to environmental impacts by burning this fuel, releasing polluting gases into the atmosphere, especially monoxide of carbon, nitrogen oxide, sulfur, among others contributing to the global warming process.

The infrastructure support team in charge of inspecting the light vehicle rental contract began a study among other models seeking to replace this dominance of 4×4 diesel vehicles, since the roads and accesses in the mine areas were gradually improving within the mining area, increasing road safety, opening doors for new tests.

New utility trucks began to appear on the market with greater safety features, emphasizing the Fiat Strada, Oroch and Saveiro pickups, both with flex-fuel engines, making it possible to work with Ethanol fuel, less polluting than Diesel and Gasoline.



Figure 1. Location map of Hydro Paragominas.

2. Location of the Hydro Paragominas Bauxite Mine

The MPSA (M3 and M5 mines) is located in the municipality of Paragominas, in the northeast of Pará, 350 km from Belém, the capital of Pará state. Access to the unit from Belém is via BR 316, BR 010, PA 256, Estrada da Mineração at km 36, as shown in Figure 2 showing the project location map. Paragominas also has an airport with an asphalt runway of 1600 m capable of receiving large private planes.

MPSA is an integrated bauxite production system, which includes mining activities, processing and transportation by pipeline to the Northern Brazil Alumina Refinery (ALUNORTE), in Barcarena, in the State of Pará.

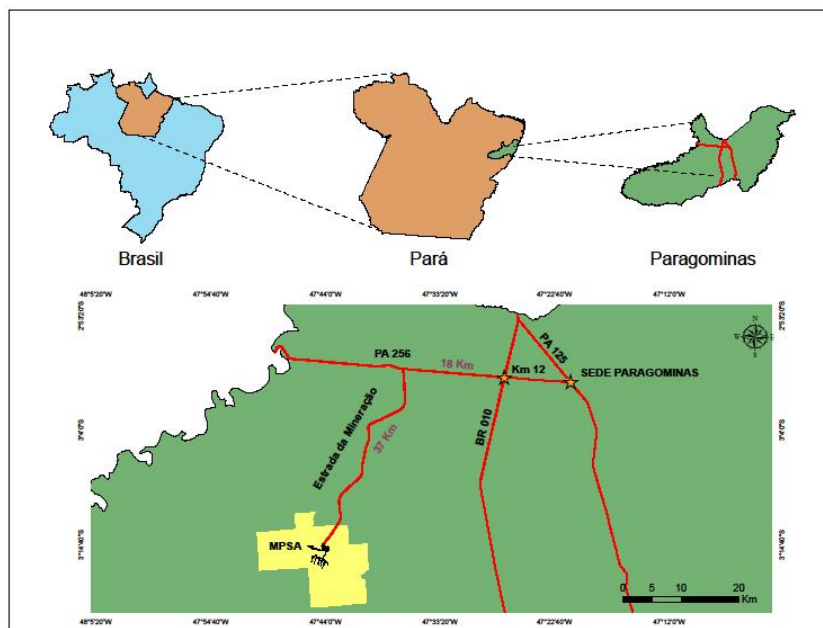


Figure 2. MPSA regional location map.

9. Conclusion

The choice of the support team in partnership with the other operational areas of the MPSA in scenario 2, was part of Hydro's strategy and the Paris agreement on decarbonization by 2030. Since most of these vehicles will use ethanol fuel, and electrical energy, which is more sustainable and greatly reduces the environmental impacts caused by the burning of fossil fuels (diesel and gasoline), releasing lower levels of polluting gases.

With this initiative to operate using vehicles with ethanol fuel and 100 % electric, it will reduce an approximate amount of 3 475 tonnes of CO₂, approximately 9 520 trees planted in a period of 5 years, in addition, an economy of approximately 3 million dollars in OpEx, demonstrating that it is possible to negotiate, make sustainability and innovate in contracts in the mining support area in atypical moments like the one we went through with the pandemic crisis with high prices for vehicle assemblers.

This good practice is already being sought and adopted by other units inside and outside the company, making it a reference contract in this segment.

Where it has already been negotiated with great success at the Hydro Alunorte unit, which adopted the same scenario for the bidding process for renewing the light vehicle fleet, further boosting sustainability and changing the culture of people and the company.



Figure 11. Benchmarking visiting the 100 % electric vehicles and charging stations – Alunorte visits MPSA

10. References

1. Ranking of best-selling pickup trucks, <https://motor1.uol.com.br/news/630553/vendas-picapes-2022-strada-hilux/> (Accessed on 15 June 2023).
2. Fiat, FIAT STRADA Technical Sheet, <https://strada.fiat.com.br/> (Accessed on 15 June 2023).
3. Insurance Institute for Highway Safety, Airbags, <https://www.iihs.org/topics/airbags> (Accessed on 01 July 2023).
4. Thalyta Pacheco, Ethanol production: first or second generation?, *Embrapa*, <https://www.infoteca.cnptia.embrapa.br/infoteca/handle/doc/886571> (Accessed on 10 July 2023).
5. Nicolas Tavares, Ethanol the best transition to electric vehicles, *Motor 1 Blog*, <https://motor1.uol.com.br/news/660139/stellantis-comparativo-etanol-carro-eletrico/> (Accessed on 01 July 2023).