IOT Vibration Monitoring System Interfacing with PI System

Pedro Costa[1], Marcos Branco[2], Gilmar Rios[3] and Glayson Habr[4]
1. Automation Engineer
2. Electrical Engineer
3. Electrical Engineer
4. Automation Engineer
Hydro Paragominas, Paragominas, Brazil
Corresponding author: pedro.costa@hydro.com

Abstract

Of Norwegian origin, Hydro currently has 13,000 employees involved in activities in more than 50 countries and on all continents. In the state of Pará it has two operations of Bauxite & Alumina Business Area: a bauxite mine (Mineração Paragominas) and an alumina refinery (Alunorte). In Hydro, the PI System, besides fulfilling the function of historian the process data and performance of the areas, was also adopted as the official concentrator solution to interface with initiatives related to Industry 4.0. Hydro Paragominas stands out as the first mining company in Brazil to obtain the ISO 55001 certification that evaluates the asset management systems and thus, reconciling its pioneering spirit in asset management, with its constant technological investment towards Industry 4.0. A system was implemented that consists in the quick installation (magnetic fixation) of vibration sensors of the VSE100 family in critical assets that are difficult to read manually by the predictive maintenance team, providing screens through the PI Vision interface easily accessible by the corporate network. The project explores connectivity, integration and functionalities of the Aveva PI System wa ith focus on predictive maintenance, either through CBM (Condition Based Maintenance), or using prediction rules through vibration profile signature. The integration developed in the PI System made it possible to automatically perform the process of opening maintenance notifications in the ERP software (SAP). Several gains were obtained mainly in relation to continuous monitoring, where although some operational conditions do not generate immediate damage to the equipment, they can cumulatively generate wear and premature failures. Thus it is possible to correct operational vices and easily expand the installation to other assets, creating a safer environment, with less exposure of the predictive team and automated notification of events.

Keywords: PI System, vibration sensor, predictive

1. Introduction

According to the strategic planning of the Brazilian Aluminum Association (ABAL) by 2030 companies in the aluminum chain need to reinvent themselves in the technology ecosystem and be sustainable. It is not easy to imagine a modern society without aluminum, in beverage cans, smartphones, automobiles, buildings, and energy in our homes, from mining to recycling, so aluminum drives the growth of the economy, being a strategic metal for Brazil [1].

From 2019 to 2020, bauxite demand showed a growth of 10.8 % for the processing of final products used in domestic consumption. Bauxite mining companies in the state of Pará are responsible for 82.8 % of Brazil's total production and grew 5.9% in the same period, showing that demand is growing more than production, requiring a strategic plan to sustain the aluminum chain [1].

From Norwey, Norsk Hydro currently has 13,000 employees involved in activities in more than 50 countries and on all continents. In 2011, the relationship that already existed with Brazil since the 1970s, due to the 5 % shareholding in Mineração Rio do Norte (MRN), became stronger. This was when the company acquired bauxite, alumina and aluminum activities from VALE S.A. in the northeastern region of Pará, becoming the owner of the bauxite mine in Paragominas/PA, the Hydro Alunorte alumina refinery in Barcarena/PA and the majority shareholder of Albras, a primary aluminum plant in the same municipality [2]. Figure 1 shows a macro flow of the aluminum production chain.

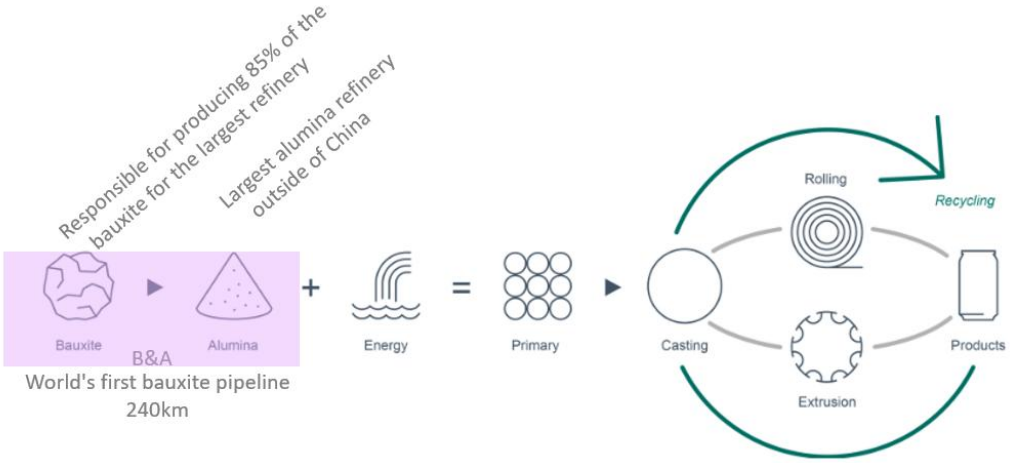

Figure 1. Aluminum production chain.

Hydro Paragominas' production starts with the bauxite mining operations which delivers a certain mass of ROM (Run of Mine) to the bauxite beneficiation operations. The beneficiated bauxite separated from the tailings is delivered to the Pipeline operations which transports and delivers it to the dewatering operations in Alunorte plant. Figure 2 shows a macro flow of the bauxite process from ore mining to dewatering at the Alunorte plant in Barcarena/PA.

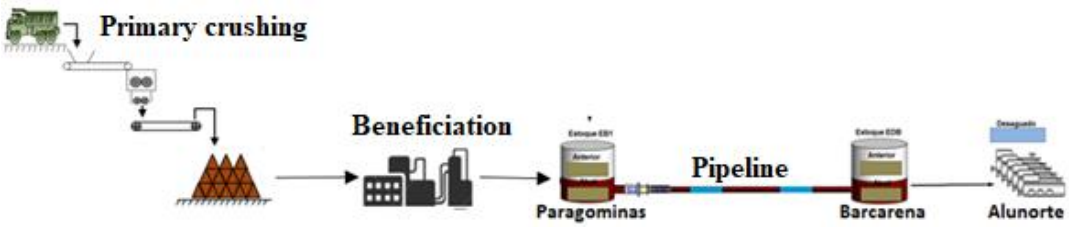

Figure 2. Macro flow of the bauxite process.

The competitiveness of a company depends on the application of best practices evidenced through results selected by a systematic process consolidated over the years. It is also observed that the tools to be applied depend on the stage in which the maintenance is and that traditional techniques for effective problem solving are recommended, such as Reliability Centered Maintenance (RCM) and Failure Mode and Effect Analysis (FMEA) [3].

RCM is a methodology that studies a system so that it fulfills the desired functions and directs insights supporting managerial actions and the best maintenance strategy in order to avoid failure or reduce losses due to failures. RCM analyzes historical data with the record of these failures of a maintenance system, generating indicators related to asset reliability [3]. FMEA, in turn, allows to identify and prioritize potential failures in physical assets, and to evaluate systems and processes, aiming to predict or anticipate failures based on known modes and recommend

possible to confirm the value above 9 mm/s global level with strong correlation of the displacement level only in axial, proving the existence of error in the coupling clutch clearance.

6. Conclusions

Several gains were obtained mainly in relation to continuous monitoring, where although some operating conditions do not generate immediate damage to equipment, they can cumulatively generate wear and premature failures. Thus, it is possible to correct operational vices and easily expand the installation to other assets creating a safer work environment, with less exposure of the predictive team and automated event notifications, to know the effects and causes of potential failures, possibility to create reliability curves more easily, adjust maintenance plans with assertiveness, calibration of component levels in stock, without putting the business operation at risk, in short, the purpose of this work is to make Hydro Paragominas' bauxite processing plant more available, with greater reliability, within the planned costs and without harming the aluminum chain. The continuity of this work is being done with a Machine Learning tool for AVEVA prediction, in order to reduce operating costs and reduce operational risks, joining Data Science methodologies with RCM methodologies.

7. References

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