Energy Optimization through a Metso Outotec Process Control Optimizer in Fluid Bed Alumina Calciner at CBA

Steffen Haus[1], Allan Borges[2], Natalia Almeida[3] and Anderson Duck[4]
1. Senior R&D Engineer
2. Senior Project Engineer
Outotec GmbH & Co. KG, Oberursel, Germany
3. Process Engineer
4. Process Consultant
Companhia Brasileira de Alumínio (CBA), Sorocaba SP, Brazil
Corresponding author: steffen.haus@mogroup.com

Abstract

The Metso Outotec Calciner Optimizer is an advanced real-time digital solution to optimize production tradeoffs and pushing the calcination plants to its optimum performance. Today, Metso Outotec has developed a complete tailored Advanced Process Control solution called Calciner Optimizer, which is in continuous operation at Companhia Brasileira de Alumínio (CBA) Alumina Calcination plants since late 2020. The core of the Optimizer solution is a know-how-based algorithms including enhanced process models to improve the operational performance. The paper explains the architecture of the Calciner Optimizer. The achieved results at CBA indicate significant energy savings and is showing a use-time of close to 100% when the plant is running in normal operation mode. Achievements with respect to fuel gas savings as well as greenhouse gas (GHG) emissions are discussed. An important factor in a successful implementation of an Optimizer at CBA Calcination plants is the close cooperation between CBA process experts and Metso Outotec digital and process experts. The paper describes how both parties contributed in this project to create a successful outcome. CBA experts provided the specific plant related constraints and requirements, while Metso Outotec digital experts tailored the Optimizer to specific needs. It is further described how modern digital infrastructure is used to achieve a good cooperation. Data driven analyses combined with process understanding were used to identify saving potential in the plant operation. An example is given in the paper.

Keywords: Calciner Optimizer, Energy savings, Advanced process control, Emission reduction.

1. Introduction

The Calciner Optimizer is an advanced process control (APC) based digital solution to support the daily operation of an alumina calcination plant [1]. In Metso Outotec (M:O) digital portfolio, the Optimizer development started in 2017 with the Roaster Optimizer, which are today used in several roasting plants and as well during commissioning of newly constructed plants [2].

From the Roaster Optimizer as a basis, the portfolio was extended to Alumina Calcination plants and tested first in late 2018 at one of the two fluidized bed alumina calcination plants of CBA. In 2019, several performance test runs were done at CBA with the Calciner Optimizer. Today, the Metso Outotec Optimizer technology is as well rolled out to iron ore Pelletizing plants. A reference in Thickening is [3] or in Leaching [4].

This paper describes the use of the Calciner Optimizer at both Companhia Brasileira de Alumínio (CBA) plants in Brazil with the main target to reduce the specific fuel consumption. CBA plants are located in Aluminio, Sao Paulo and is operating two Calciners, Calciner 5 and Calciner 6, with the Optimizer. The plants were built in 1985 and 1990, respectively. Modifications were carried out over the years. Currently, CBA operation is focusing on fuel savings to reduce costs and CO_2 emissions. Thus, the Calciner Optimizer focusses mainly on the reduction of the specific fuel consumption to support these operational targets. The specific fuel consumption is compared to a baseline operation in a period before using the Metso Outotec Calciner Optimizer.

The paper is structured as follows. Section 2 describes the on-site architecture of the Calciner Optimizer. In section 3, the operation of the Calciners with the Optimizer is described. The measured results, energy saving, CO_2 reduction as well as the time the Optimizer is operated at CBA are discussed in section 4. The collaboration between Metso Outotec and CBA during the project execution is described in section 5. The utilization of data analytics in combination with the APC digital solution to identify process bottlenecks and to further improve the operation is discussed in section 6. Conclusion and outlook are given in section 7.

2. Calciner Optimizer Architecture

The setup used on site of the Calciner Optimizer is shown in Figure 1.

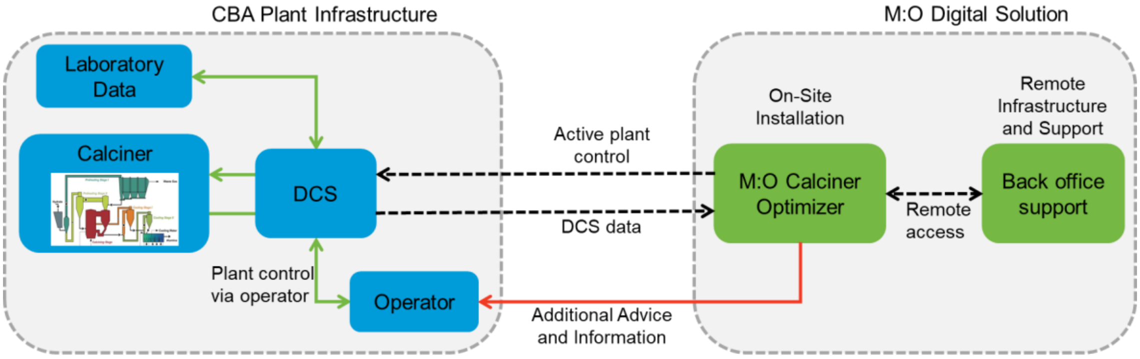

Figure 1. Architecture and integration of the Calciner Optimizer on site.

The left side is showing, in blue, the classic plant automation based on a distributed control system (DCS) and operator controlling the plant. Despite the Optimizer integration, the main setup of the plant DCS is entirely untouched. This means, all relevant safety functionalities like warnings, alarms, or emergency sequences remain and are in place when the plant is controlled via Optimizer.

The right side of the architecture graph shows the M:O Digital Solution. Firstly, it shows the M:O Calciner Optimizer. The Optimizer is connected to the plant (DCS) via an Open Platform Communications (OPC) interface. The Optimizer is installed locally within the plant premises. The setup allows the Optimizer to read the plant process data and to send set points back to the DCS controllers. Thus, the Optimizer actively controls significant parts of the calcination process. The set points are calculated continuously within the advanced process control scheme in the Optimizer or via further additional logics, simulations, mathematical operations etc. The connection between DCS and Optimizer is realized using an OPC interface.

M:O experts can connect remotely via secure internet protocol to the Optimizer on site. This allows M:O digital experts and process experts to fine-tune the Optimizer and to apply updates and new functionality. In addition, the remote infrastructure allows for data analysis to identify the best operational practices or to identify the most suitable settings for the Optimizer.

The Calciner Optimizer itself is implemented in M:O own APC software ACT, which is entirely developed and maintained by M:O and used in various APC and monitoring solutions worldwide. The platform can connect to any DCS system. It can execute many mathematical operations, simulations, create user interfaces, etc.

References

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