Operations | Metals and mining | Improved process performance | Regression analysis

A Data Driven Methodology to Uncovering Energy Reduction Opportunities Within Industrial Operations

AMERICAN INDUSTRIAL PARTNERS

BUSINESS PROBLEM

Due to increased energy prices in Europe because of the war in Ukraine, Aluminium Duffel (AD), a leading manufacturer of rolled aluminum, has experienced increased operating costs. As such, AD aims to implement energy reduction initiatives that can help tangibly reduce costs. The objective of this project is to execute and open-ended, data-driven search for energy savings opportunities across the plant and develop tangible implementation plans for the found initiatives.

APPROACH

My approach involves first consolidating all available energy data into a usable format and from there, start an open-ended analysis of energy consumption within the plant. This involves finding patterns across the data that are not visible by looking at the operations. Vital to this approach is modeling an ideal operation of optimal energy consumption to which to compare current consumption.

DATA SOURCES

Time-stamped energy consumption data per product is available for all machines and is scattered in different databases. Additionally, data from sensors within each machine is available from a centralized digital dashboard, which shows temperature, pressure, amperage readings, among others.

Data Types and Format

Data types include time series, tabular, and discussions with experts. Data is found within excel files and SQL calls from several databases.

Proposed Methodology

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IMPACT

The overall project effort to reduce energy consumption will enable AD to reduce operating costs while also reducing its environmental emissions. Numerically, this project will allow AD to reduce energy consumption by 23% in the pre-heating furnaces.

DRIVERS

The dramatic increase in energy prices in Europe due to the war in Ukraine led to AD a very significant increase in operating costs due to increased energy costs. As such, there was a direct need to reduce energy consumption without affecting production levels.

BARRIERS

The biggest barrier was the lack of direction from within AD as to where energy saving opportunities existed. To date, AD has found energy savings opportunities by intuition of where energy is consumed. This meant that I had to develop a data driven approach to finding energy saving initiatives. Another challenge was that energy data was scattered across multiple servers and had to be consolidated prior to use.

ENABLERS

Strong support from AIP and the AD teams. Both teams agreed equally that energy reduction initiatives were imperative and were open to exploring new ways of achieving the energy reduction goals. This project carried high visibility within the company, which made obtaining support for it fairly straight forward.

ACTIONS

I consolidated all energy data in usable excel documents that allowed easy manipulation and analysis. From there, I started an open-ended analysis of energy consumption in order to find patterns or insights within the data. I then compared my findings to an ideal operation model that I developed from conversations with specialists, product recipes, and machine handbooks. This allowed me to identify performance gaps in the current operation.

INNOVATION

AD has relied on intuition to identify energy-saving initiatives. My solution involves and innovative use of energy data to find energy saving opportunities that would normally remain hidden. Another innovative aspect of my solution is the integration of operator feedback and with the energy consumption data. This allows for data to be better analyzed and in proposals of initiatives that result in more tangible solutions.

IMPROVEMENT

My solution will allow AD to reduce energy consumption in the pre-heating furnaces by 23%.

BEST PRACTICES

1. Incorporate qualitative operator knowledge into data analysis process to better understand results and findings. 2. Develop a thorough understanding of the technical/mechanical workings of each machines/process, starting from first principles fundamentals. This is critical to understanding where energy savings opportunities lie. 3. Be open to listen and develop relationships within the operations/manufacturing team.

OTHER APPLICATIONS

This approach can also be used to find operational inefficiencies. Similar to energy inefficiencies, operational inefficiencies can be detected by open-ended data analysis data informed by operational best practices and theoretical production baselines. In general this approach can be applied to other processes industrial operations beyond aluminum rolling.