



Final Project

Project Requirements

November 2019

Cement Mill Process

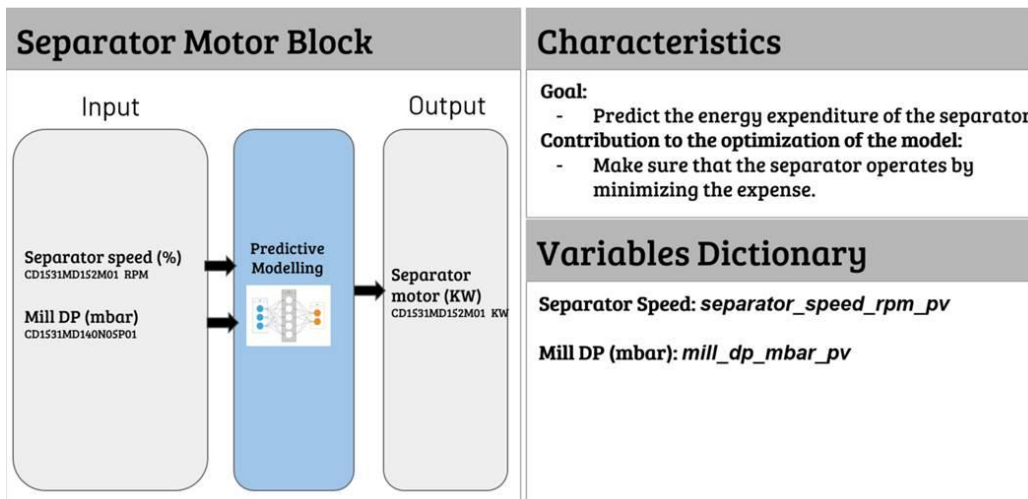
This is a mimic of the Cement Mill in PECEM Plant in Brazil. This gives an overview of the process of the mill.



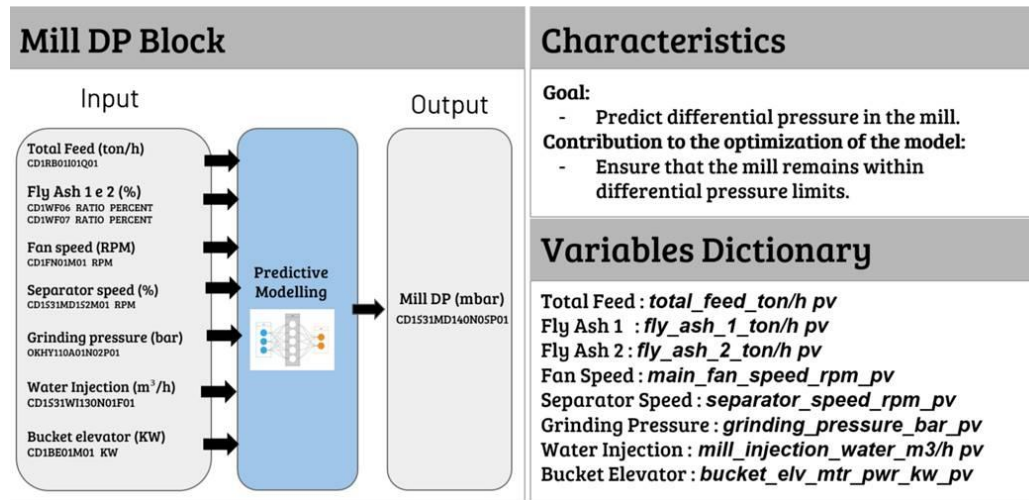
You can find a more detailed mimic in a separate file accompanied with an excel file which maps the numbers in the mimic with the tag names of the sensor variables.

Block 1: Separator Motor Block

For analysis purposes the production process can be break down in several blocks. Each block describes a specific part of the process. For example, the Separator Motor Block give us the dependence of the energy expenditure of the separator from the input variables. Theses dependencies have been determined by business knowledge which means that can be other dependencies as well which can be defined by extra analysis.



Block 2: Mill Differential Pressure Block



Tasks

You are given a dataset that contains measurements for a 5-month period from a cement mill plant. There are **2 separate problems** that need to be addressed, i.e. the *Blocks* above. Each of these has a series on inputs (which are the independent variables that should be used) and one output (that will serve as the target variables). These are described in the Figures above.

For each of the two blocks:

1. Check the dataset for irregularities (e.g. missing or extreme values, values in bad format) and make the appropriate actions if needed.
2. Understand the main statistical characteristics of the important (input, output) variables of the dataset using visual and statistical methods.
3. Quantify the delay time (if any) between a variation in the input variables and the outcome effect in the output variable.
4. Explore the correlation of the output variable with the input variables using visual and statistical methods and describe the influence on the output variable that a variation of the input values causes.

Main Task

5. Using the proposed input variables (and any other variable from the received dataset that you think is relevant) create a model that can predict the output variable at time t' $\leq t - 30$ secs.

Bonus Tasks

6. Try to repeat the task No. 5 for a time period 5 minutes ahead of the current mill state.
7. Investigate if the use of any other variables, not present in the block's "input variables", can help.

Comments

This cement mill produces two types of cement. There are relevant variables in the dataset that give this information.

We are interested in predictions when the mill operates in normal conditions. E.g. we are not interested in the periods when the mill starts or stops its operation. The main variables that determine a normal operating condition for the mill is the Mill Motor KW and the Mill Fresh Feed.