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Master of Science HES-SO in Life Sciences

Data Management to optimize the filtration process of Difenoconazol

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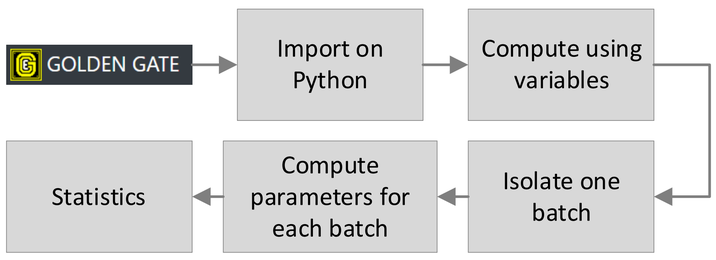
DESCRIPTION

Difenoconazol is synthesized at the chemical plant of Monthey in building 398. The process requires a filtration to remove by-products formed during the reaction. The process is well known and mastered by Syngenta as it has been continuously improved for several years. With the increasing presence of computers in the industry, all process data is recorded on a platform called GoldenGate. This platform allows statistics on each step of the production chain. Currently, the major parameters calculated for the filtration are: filtration time and filter occupancy. Other parameters are sometimes used to understand what happened on an operation that is out of specification.

These are often due to the formation of extremely hard balls at the end of the filtration process. These balls cause premature wear problems on the installations and can even lead to breakage (especially on mills at the conditioning stage). The use of GoldenGate data could predict the appearance of the balls and thus avoid them. In addition, washes could be better planned.



OBJECTIFS

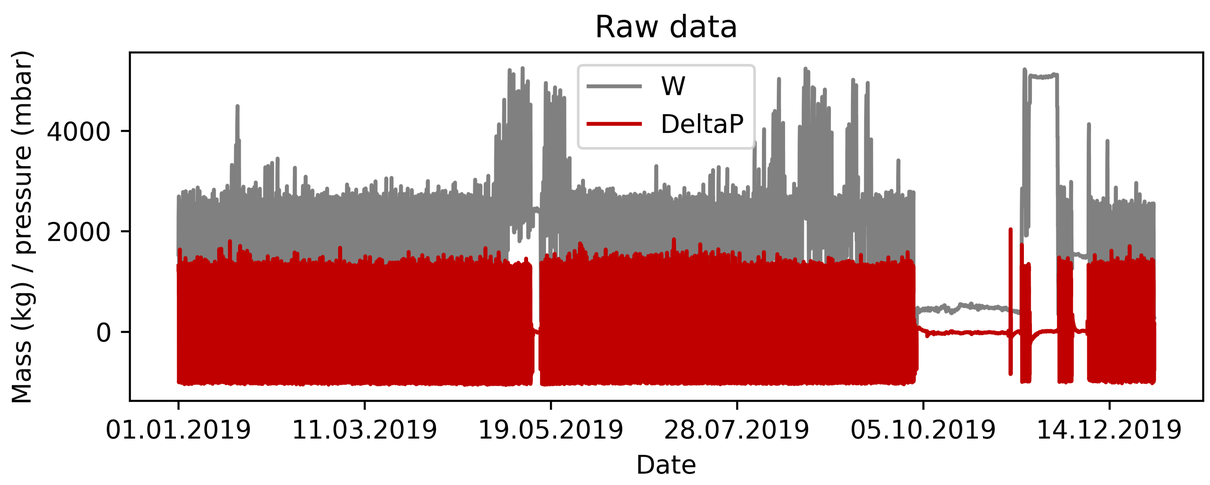
The goal of this project was to use the data recorded by GoldenGate to better understand the process. The tools given by Industry 4.0 were used to process a large amount of information quickly.

The objectives of this work were :

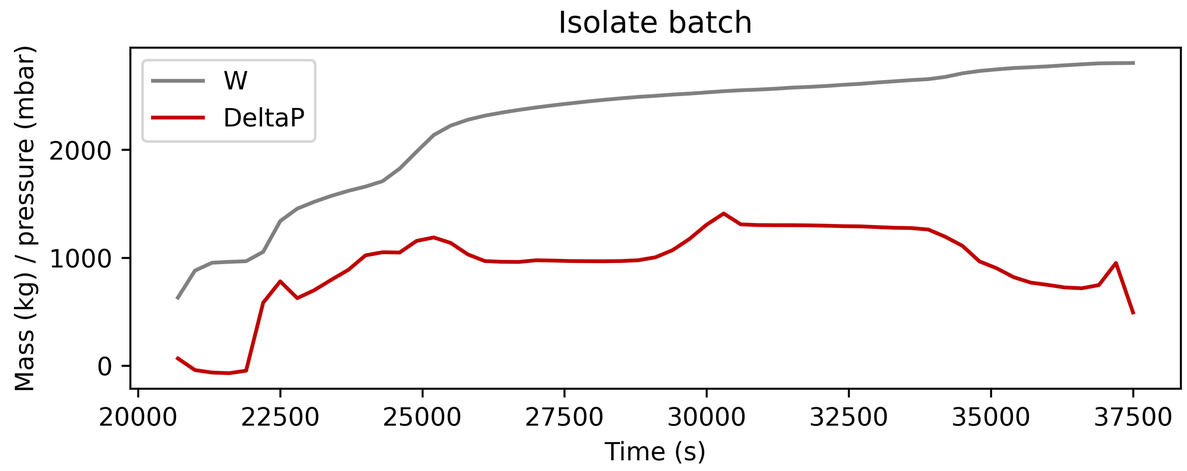
- Understanding of the filtration process
- Automation of data processing
- Improve the mathematical model of filtration
- Determine the parameters useful for the prediction of balls or a wash (key parameters)

RESULTS

In order to process as many variables as possible quickly, a data processing tool has been developed. This tool is a Python algorithm that retrieves production data over a defined time range. It scans the data page and isolates one by one the filtering operations. The parameters used for this are: the DeltaP between the filter and the filtrate pot as well as the filtrate mass. The figure below shows the evolution of the latter over the year 2019.



Based on the DeltaP, the mass of filtrate and their derivatives, the algorithm manages to separate each operation in order to obtain a range of data represented by the figure below.



The percentage of success in this step is 98.6% on all four filters. This indicates that a large proportion of the filtration is isolated. Once this is done, other variables can be added very easily and the process deviation easily calculated. Possible key parameters are cake resistance, filter resistance, brewer motor torque, etc. These parameters were all tested and compared with operations that formed balls or required washing.

Unfortunately, none of these variables gave satisfactory results. Nevertheless, the data processing tool works perfectly and has shown great flexibility and robustness in its operation.

CONCLUSION

In conclusion, the search for one or more parameters allows to predict a wash or ball formation. However, since drying also takes place in the filter, it is possible that the reason for the appearance of these may have something to do with the drying of the product.

The approach chosen may not be the most optimal for this kind of complex problem. Indeed, the algorithm uses precise conditions to isolate and process the data. It is possible that an algorithm using Machine Learning with a convolutional neural network may be more efficient. It would study the overall shape of the curve and not just a specific value.

As the algorithm has demonstrated its ability to process a large amount of data correctly and efficiently, it can be adapted to any filtration system. It is still required to adapt the conditions used in the code.

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