Development of a preventive maintenance plan for Natura's production plant to improve production times and reduce downtime by predicting equipment failures

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Diagram

Description automatically generated with medium confidence

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# Introduction

In this study I will base myself on the maintenance information of the production plant of the Natura group in the city of Buenos Aires, to determine through data analysis if the maintenance plan that is currently being used is adequate for the facilities and covers the needs of the machinery used, or if on the contrary it should be adapted and could through changes improve the productivity of the plant, by reducing downtime and delays due to corrective maintenance that derive from poor planning in preventive maintenance.

For this we will use different models for the prediction of data in order to compare the results and to be able to determine which one is the best adapted to the needs of the factory according to the data that we have and the relevance of these at the time of making the predictions. Within the data analysis I will use 5 prediction models (Random Forrest, Logistic Regression, Decision Tree, support vector machine and Neural Networks) which I chose based on the characteristics of what each one could contribute to the investigation taking into account the advantages and disadvantages of each one, aspect that I will deepen later with the development of the investigation.

It is worth noting that I chose to approach my research from the premise that my problem is a classification problem, in which the duration of the stoppages as well as the working times of each machine helped me to determine and differentiate between failures that generate downtime and maintenance stoppages that although they are found in the data, they may be scheduled stoppages or minor adjustments that should not be counted for the company as a failure or deficiency in maintenance.

The findings of this study could influence the adoption of new strategies for predictive maintenance contributing to more sustainable and efficient production as ineffective maintenance management can result in unplanned and prolonged downtime, which affects a plant's ability to meet production deadlines and maintain necessary inventory levels. In contrast, predictive maintenance allows you to anticipate and prevent failures before they occur, minimizing downtime and ensuring continuous and efficient operation, which means not only protecting your assets, but also ensuring your products reach the market in a timely manner.

## Context y Justification:

Avon's production plant in Moreno, inaugurated in 1977, is fundamental for the company in Argentina and the South American region as it is responsible for covering 70% of the country's domestic demand, and supplies part of the markets in Chile, Uruguay and Paraguay. This plant produces more than 400,000 products a day, so having to deal with downtime represents a setback that a priori must be minimized as much as possible in order to meet the deadlines for both internal and external markets. As we have already pointed out, this plant is part of Avon's global strategy, both in terms of capacity and geographical location. Now, since the beginning of 2020, integrated into the Natura & Co group, new quality standards have been established for products and manufacturing, which have helped to improve in the aspect that concerns us and showed a change to reinforce the commitment to innovation and sustainability.

In the following table, considering the data I have, you can see how the trend of failures over the last 3 years has been, considering that at this point the maintenance staff of the company Natura already had two years of management at the time of the first record:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **2022** | **2023** | **2024** | **Total** |
| **Stop\_date count** | **7132** | **5879** | **1586** | **14597** |

Table 1 Failure record per year

Taking these data into account, we can roughly say that management has been good since the change of administration, as we can see a decrease in failures over time, although this is something that, as I said, we can visualize with these data, although we will go into it in more depth later to determine if there is a trend in the data, either due to seasonality or machine use.