Predictive Maintenance for Hydraulic Lift
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Introduction:

This report presents the results of a predictive maintenance project for a hydraulic lift at XYZ corp. The goal of the project was to improve the efficiency of maintenance procedures and reduce the frequency of equipment failures, in order to extend the lifespan of the equipment and minimise downtime.

Equipment and Data Sources:

The lift operates under a range of conditions, including temperature fluctuations and incremental sound increases based on how long it runs for. To gather data for the predictive maintenance model, sensors were installed on the lift to measure variables such as temperature, amps, and vibration. Data was collected at intervals of 10 minutes and stored in a central database. This database would then be converted into a CSV file.

Analysis Techniques:

To analyse the data and create the predictive maintenance model, we used machine learning algorithms to identify patterns and trends in the data. We trained the model on a sample of data from the past month and a half, and tested its accuracy on a separate sample from the same period. We used a range of performance metrics to evaluate the model, including accuracy, precision, and recall.

In specifics:

1. Visualized each sensor in a time series graph
2. Retrieved rolling averages and standard deviations of each sensor.
3. Calculated the PCA with two principal components, and then ran a Dickey-Fuller test.
4. Plotted autocorrelation.
5. Selected the top 3 from the dataset that showed anomalies.
6. Applied the models on both a K-Means clustering algorithm and a Isolation Forest Model.

Results:

Our analysis showed that the predictive maintenance model was unable to create any insight from the data as there was a insufficient lack of data in general. The glaring issue at the moment is that the system has yet to fail. In our methodology, it requires signs of failure or critical weak points. Unfortunately, the system did not indicate any signs of that.

Recommendations:

Based on the results of our analysis, we recommend implementing the predictive maintenance model on a full-time basis once a few years of data has been collected and well documented. This will require the ongoing collection and analysis of data from the sensors, as well as the integration of the model into the facility's maintenance procedures. We also recommend monitoring the performance of the model on an ongoing basis and making any necessary adjustments to maintain its accuracy.

Conclusion:

In conclusion, the project is a bit too early for predictive maintenance in my personal opinion as not enough information has been gathered and infrastructure has not been set in place by the company that has commissioned us. Predictive maintenance is an asset that every innovative executive wants to implement. However, many do not have the proper systems and data in place to execute proper predictive maintenance. The biggest success stories of predictive maintenance within IOT lie in large manufacturers and industrial brands such as Daimler AG and British Petroleum as they have collected decades of existing data and have the proper data lakes in place to sanitise, process, and prepare the data ready for extraction. By my estimates, it might take 2-3 years to get the necessary baseline as long as there is a synchronised objective from the top of the company to the bottom. One of the key assets that I would suggest would be to digitise some form of work orders that will record ongoing maintenance / failures. This would add greatly to the existing program by providing it valuable failure windows.