Milestone 1 – Proposal

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DCS 680

Topic

Quality Control and Defect Management in Manufacturing

This project aims to help manufacturing teams understand defect patterns in equipment, thereby reducing repair costs and enhancing customer satisfaction.

Business Problem & Research Questions

Unplanned defects in manufacturing equipment result in increased repair costs, production delays, and decreased customer satisfaction. By analyzing the relationships between defect types, their most frequent locations, seasonal or time-based trends, and the inspection methods used, we can design a more effective preventive maintenance schedule. Improving quality control in this manner will reduce operational costs and enhance customer experience.

Questions:

- Which inspection methods are most effective at detecting severe defects?
- Are certain defect types more likely to be severe or costly?
- Does severity impact repair costs?
- Can defect occurrence be predicted based on time of year?
- Can defect pattern analysis aid in implementing a preventative maintenance schedule?

Dataset

This dataset is from Kaggle. It contains simulated records of defects that were observed during quality control. Key attributes include defect ID, product ID, defect type, defect date, defect location, severity level, inspection method, and repair costs. Together, these variables will provide the foundation for analyzing defect patterns and developing a more effective preventative maintenance schedule.

Link: Manufacturing Defects

Methods

Descriptive analytics

- Visualizations show defect frequency by type, location, and over time.
- Analyze repair costs by defect type.

- Compare inspection methods vs severity levels.

Predictive analytics

- Build models to estimate defect severity and repair costs using defect type, location, and the inspection method as predictors.

Prescriptive analytics

- Recommend optimal inspection methods for specific defect locations to improve detection and prevention.

Ethical Considerations

- Avoid using defect data to assign blame or punish workers.
- Ensure product IDs cannot be traced back to customers or employees.
- Balance cost reduction with safety to ensure that safety-critical repair costs are not overlooked in the pursuit of cost savings.

Challenges/Issues

- A small sample size may limit the accuracy of predictive modeling.
- Being able to ensure insights discovered are actionable in a real manufacturing environment.

References

Additional references will include online articles that explain the importance of manufacturing quality control and the types of defects commonly found in manufacturing.

Quality Gurus. (2025). *Quality Control: Understanding Its Importance, Benefits, Approaches and Key Strategies*. https://www.qualitygurus.com/quality-control-101-understanding-its-importance-benefits-approaches-and-key-strategies/

HQTS. (2024, September 13). *Explaining the 3 types of quality defects in manufacturing (AQL classification)*. https://www.hqts.com/aql-quality-defects/