OEE (Overall Equipment Efficiency) Analysis and Recommendations based on up-time data at a Crane Manufacturing Unit

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Capstone Project – Business Data Management

Report by:

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Declaration Statement

I am working on a Project titled **"OEE (Overall Equipment Efficiency) Analysis and Recommendations based on up-time data at a Crane Manufacturing Unit"**. I extend my appreciation to **Sanjyot Engineering Works**, for providing the necessary resources that enabled me to conduct my project.

I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analyzed to assure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the principles of academic honesty and integrity, and I am receptive to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. I thus affirm that I am not engaged in any form of collaboration with other individuals, and that all the work undertaken has been solely conducted by me. In the event that plagiarism is detected in the report at any stage of the project's completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I understand that all recommendations made in this project report are within the context of the academic project taken up towards course fulfillment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Abhishek Guru

Date: 02/02/2025

Executive Summary:

Sanjyot Engineering Works is a B2B Manufacturing Firm which specializes in the manufacture of EOT (Electrical Overhead Traveller) Crane, Tyre Curing Press and Water Pumps. It is associated as a supplier with many industry giants such as Ceat Tyres and Mukand Limited to name a few.

- The firm, being a heavy equipment manufacturer, faces down-time of its various machineries very frequently. Some machines require more frequent maintenance breaks than the others and some are slower in terms of performance as compared to the newer machines installed by the firm. Machine breakdown and maintenance breaks at times lead to an unprecedented gap in productivity, which in turn leads to loss of business or business opportunities.
- Another big problem that this firm faces is the shortage of skilled labour in this industry. It takes months to train the labourers and at times it is diffcult to retain the ones that have been trained due to high demand of trained workers. Due to this shortage, the firm finds it difficult to hire more workers and any unavailability of the existing workers leads to loss of productivity.

The firm has agreed to share the data related to machine maintenance/down-time, sales and worker availability. I intend to analyse the data provided by the company and look for ways to enhance the OEE (Overall Equipment Efficiency) of the firm by applying the knowledge gained from Business Data Management theory course and find the root causes of these problems and recommend the solutions based on the analytical study of the data.

Organization Background:

Sanjyot Engineering Works is a heavy industrial equipment manufacturer located in Thane, Maharashtra. The sole proprietorship firm has two manufacturing facilities, one located in Thane and the other in Navi Mumbai. It operates domestically as a B2B supplier of industrial equipments, supplying to a vast number of businesses including some giants like Ceat Tyres and Mukand Limited. The clientele currently includes 70+ businesses and the number is consistently growing.

The main focus areas of Sanjyot Engineering Works are manufacture of EOT (Electrical Overhead Traveller) Cranes, Water Pumps and Tyre Curing Presses. The firm also manufactures wheels of heavy industrial vehicles and trains. The firm possesses some advanced, state-of-the-art machines such as 32-feet Lathe Machine, 2.5-meter VTL Machine, 26-feet Lathe Machine, EOT Crane of 25-tonne capacity, Milling Machine, 16-feet Lathe Machine, Slotting Machine of 20-inch capacity, 1.5-meter VTL Machine, Industrial Drillers and many more. The firm plans to add 3 more machines in the next financial year to boost productivity and meet demands.

Problem Statement:

A detailed interaction with the business helped me identify the following problems:

- The business faces a problem of frequent breakdowns and maintenance breaks leading to a gap in overall productivity and efficiency.
- A shortage of skilled labourers and difficulty in retaining them, which leads to delays and losses of business and opportunities.

Background of the problem:

1. The firm uses more than 20 heavy industrial machines in its two manufacturing units. Out of these, at least 8 machines are more than 5-years old and at least 3 are less than 2-years old. Some of these machines are slower and less efficient in comparison with the other machines installed. The firm absolutely wants to mitigate the down time of these machines as far as possible because the productivity goes down significantly even if one machine remains out of work for several hours. Some of these machines rely on the other machines to continue operating. Hence, one machine going down can affect the productivity of more machines which rely on it to perform continuously. The firm expects the data analysis to be done in such a way that the root causes of these problems could be identified more clearly and a solution could be arrived at, based on the analysis.
2. The firm operates in an industry that heavily relies on the availability of skilled labour. As the firm uses various heavy machines, it takes a very long time to train these operators. The firm often loses trained operators to competitors, who are difficult to replace. An unavailability of operators costs the firm a lot because there are very few operators in the firm who are capable of operating more than one machine. The firm expects us to analyze the data and suggest ways to address this problem.

Problem Solving Approach:

Sanjyot Engineering Works has been facing challenges that have been detrimental to its growth. A data-driven analytical study can help the firm in the following ways:

1. **OEE (Overall Equipment Efficiency) analysis:** OEE is calculated on the basis of three important factors, viz. availability, performance and quality. The formula to arirve at OEE is **availability x performance x quality**.

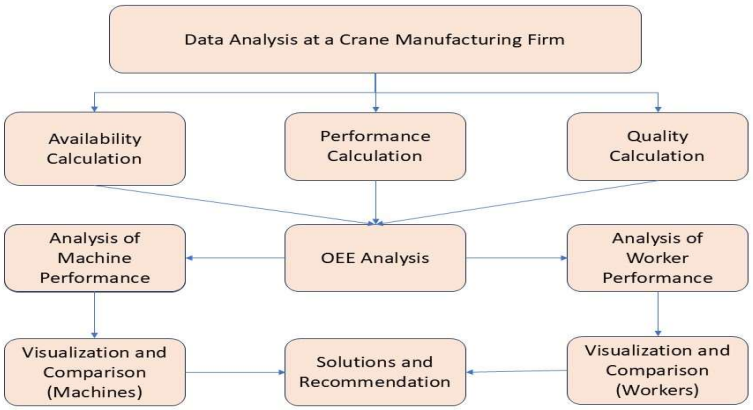
- **Availability** is the percentage of time a machine actually works compared to its expected working time. It is also called uptime.
- **Performance** is the ratio of ideal cycle time to the runtime.
- **Quality** is ratio of number of good units produced to the total number of units produced.
- OEE is a **KPI (Key Performance Indicator)** that indicates how well a machine is performing. It can help determine if a company's equipments, workers and systems are meeting industry and operational standards.

- OEE analysis in this scenario can give us a clear picture on how well the machines and workers of Sanjyot Engineering Works have been performing as compared to the expected standards.
- This will help us come up with suggestions for the both the problems the firm is facing at present.

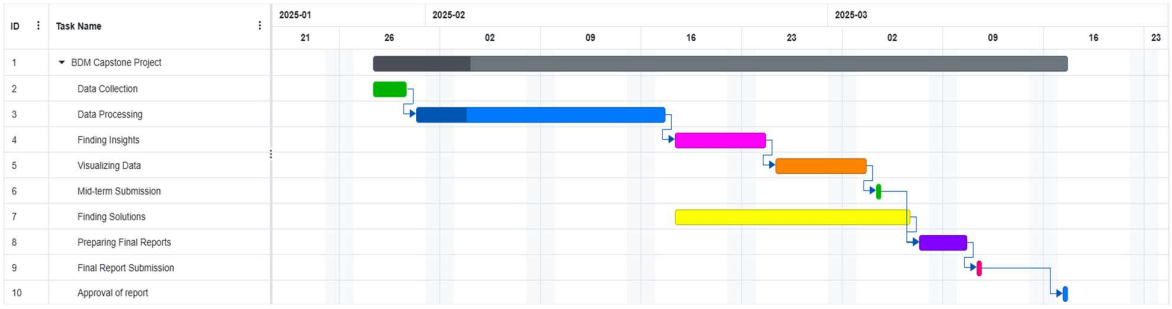
2. Data analysis to check if machine age is affecting its performance and how many machines are underperforming at present.
3. Data analysis to check if the attrition is happening because of low wages and if incentivizing or coming up with a loyalty benefit programme can help the firm retain workers and improve profitability and productivity.
4. Data analysis to check if launching a training programme can be a feasible solution for the firm.

Expected Timeline:

1. Work Breakdown Structure:



2. Gantt Chart:



Expected Outcome:

1. Finding out the root cause of underperformance of machinery as well as workers.
2. Offering a solution based on OEE Analysis in order to help improve uptime and productivity.
3. Exploring the possibility of incentivizing work hours and/or running loyalty programmes to reduce attrition.