Breakdown Analysis of Cutting Facility in a Manufacturing industry

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Abstract **- In this thesis work, breakdown maintenance of cutting machine has been carried out using the technique Root Cause Analysis. It has been used to rectify faults causing breakdown and thereby improve productivity of the machine. In this project methodology of breakdown maintenance has been applied and analyzed. It is the process of identifying causal factors using a structured approach with techniques that will provide a focus for identifying and resolving problems. Tools that assist individuals or groups to identify the root cause of problems are known as root cause analysis tools. Every equipment failure happens due to a number of reasons. There is a definite progression of actions and the resulting consequences that lead to a failure. Root cause for productivity and its related problems needs to be analyzed as it's a complicated process especially in multistage manufacturing. It shows how the solutions will prevent the problem from recurring. The Root Cause Analysis methods could be used according to prevalent conditions and situations. It can be observed that after application of Breakdown Analysis, the productivity of the cutting machine has improved.**

Index Terms **- Breakdown Analysis, Cutting, Productivity, Root cause analysis**.

I. INTRODUCTION

The output from the cutting machine was decreasing as there were continuous breakdowns involved. Root cause Analysis was carried out to know the factors responsible for breakdowns and for that Overall Equipment Effectiveness of the cutting facility was to be measured. This was done by considering factors like Availability, Quality and Performance. The Overall Equipment Effectiveness is measured as the product of Availability, Quality and Performance

II. WORK DONE

The overall equipment effectiveness of the cutting machine is calculated .Using Anova, the probability is analyzed for the machine failure and using the results it is predicted whether the breakdown analysis done and the suggestions given made the maintenance work successful. The Operational Equipment Effectiveness is 33.19% which is far below of the global standard (85% for manufacturing industry).The OEE is 33.09% which is below the Global standrad.From OEE calculation it can be noted that the OEE of the cutting machine is far below the global standards. So the major causes for low Operational Equipment Effectiveness were to be identified.

Table 1: Operational Equipment Effectiveness Calculation.

Factors	Calculation	Calculated data	Percentage
Availability	Actual Production Time / ~~Planned Production Time~~	386 / ~~800~~	0.4825 =48.25%
Performance	Ideal Operating Time / ~~Actual Operating Time~~	630 / ~~827~~	0.7617 = 76.17%
Quality	Good pieces / ~~Total pieces~~	560 / ~~620~~	0.9032= 90.32 %

A pie chart was constructed for major breakdowns and it could be seen that Chain slipping was the major cause of breakdown.

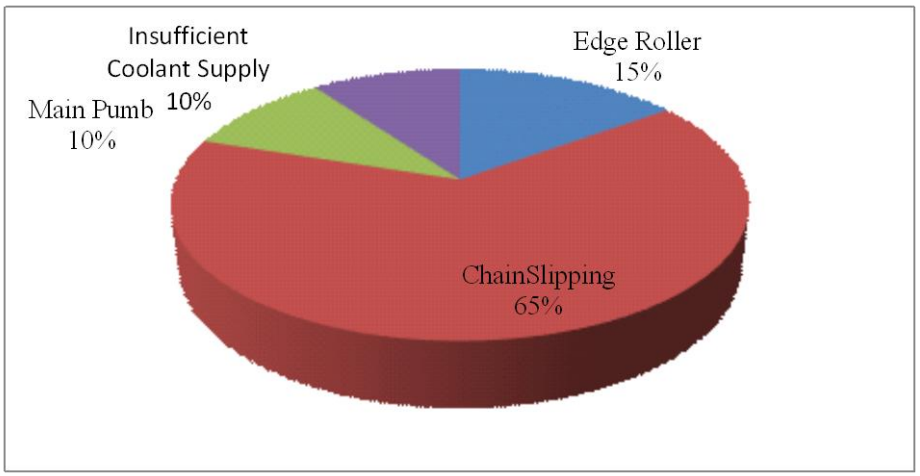

Fig 1: Major Breakdowns

A Pareto chart was constructed as per the frequency of occurrences of each causes of chain slipping. From the chart it is clear that pinion breakage is the major cause of the breakdown due to chain slipping.

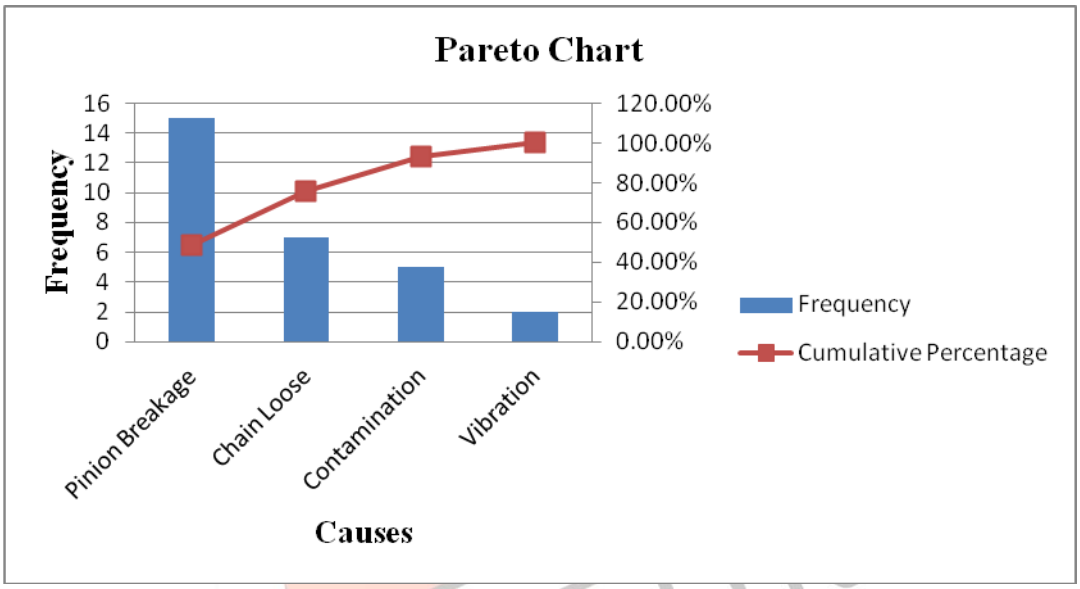

Fig 2: Pareto chart

The data of plates cut before suggestions were recorded for the three torches A1, B1and C1 for 5 weeks before suggestion and breakdown analysis. The normality of the data is tested to know whether the productivity of the spindle plates follow a normal distribution.

Table 2: Production data before suggestion

Production Averages	**Week 1**	**Week 2**	**Week 3**	**Week 4**	**Week 5**
Torch A1	188	200	181	170	210
Torch B1	200	188	170	195	184
Torch C1	197	220	198	183	200

The spindles cut are noted after the suggestions have been made and it's implemented and the production is noted down.

Table 3: Production data after suggestion

Production Averages	Week 1	Week 2	Week 3	Week 4	Week 5
Torch A2	210	230	230	230	246
Torch B2	220	220	210	226	215
Torch C2	238	250	239	228	236

The data needed to be checked for the distribution of data points and to know the homogeneity of data points. So graphs were plotted using Minitab. In order to know if the data is normally distributed Anderson darling Test is carried.

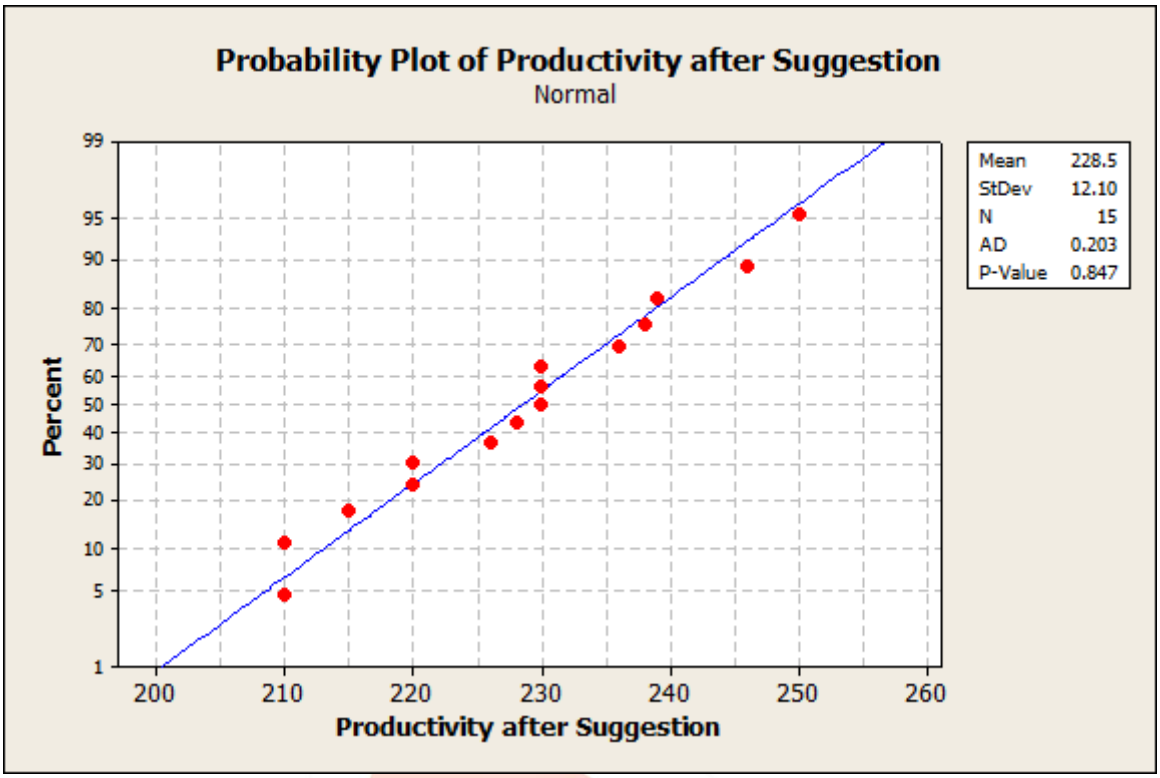

Fig 3: Probability Test

III. RESULT

The Result of production data has been tabulated with the help of software. The production of the 3 torches has been compared after the breakdown maintenance.

Table 4: Descriptive Statistics

Level	N	MEAN	Standard Deviation
Torch A2	5	229.20	12.77
Torch B2	5	218.20	6.02
Torch C2	5	238.20	7.89

Table 5: ANOVA Table

Source	Degree of Freedom	Sum of Squares	Mean of Square	Critical Value F	P value
Torch After	2	1003.3	501.7	5.75	0.018
Error	12	1046.4	87.2		
Total	14	2049.7			

IV. CONCLUSION

It can be concluded that the production averages of the torches is significant with that of Torch C being greater compared to Torch B and Torch A. So Torch C has better output than the other two torches. So torch C can be used by keeping Torch A and Torch B idle.

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