BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF TEXTILE AND GINNING ENGINEERING

FINAL YEAR PROJECT REPORT

ANALYSIS OF BREAKDOWNS AND IMPROVEMENT OF PREVENTIVE MAINTENANCE ON DRAWFRAME MACHINES

A CASE STUDY

FINE SPINNERS UGANDA LIMITED

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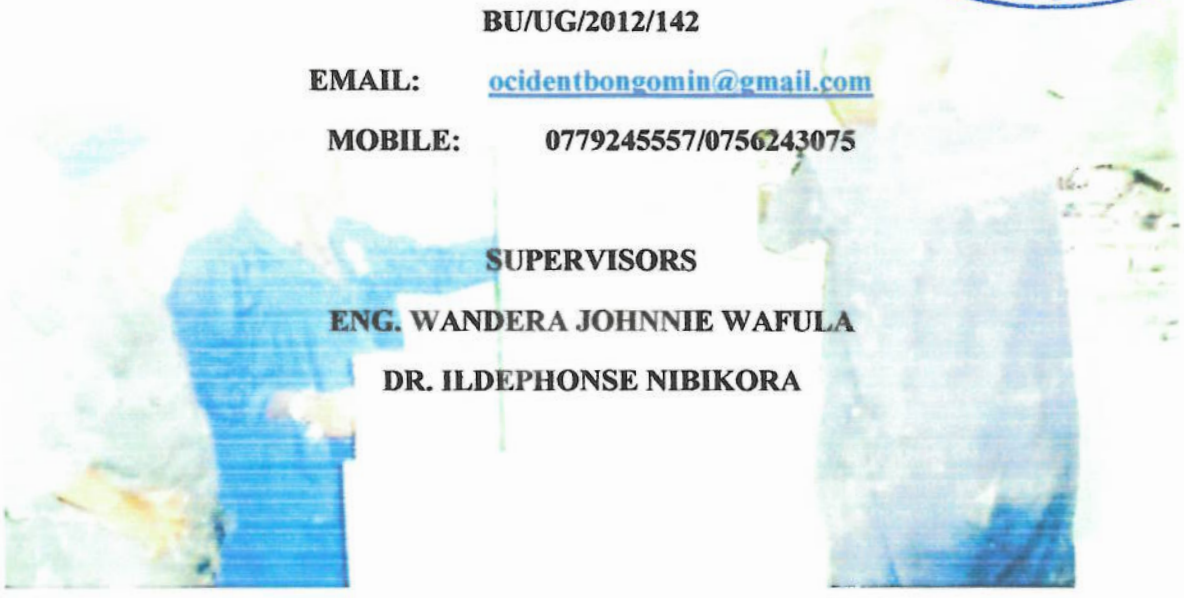

A final year project report submitted to the department of textile and ginning engineering as a partial fulfilment of the Requirements for award of a Bachelor of Science degree in textile engineering.

DECLARATION

I Bongomin Ocident declare to the best of my knowledge that the information in this project report is a result of my research and effort and it has never been presented or submitted to any institution or university for an academic award

Date: 15-MAY-2016

Signature: .....

APPROVAL

This final year project report has been submitted for examination with approval from the following supervisors:

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DEDICATION

I dedicate this project to my beloved uncle who offered me a laptop computer and to my parents who supported me financially and constant guidance granted unto me. So the almighty God who created the heaven and the earth bless them abundantly.

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I am thankful to the almighty God for keeping me healthy until the completion of this dissertation.

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LIST OF ACRONYMS

CFA	Component Failure Analysis
CRT	Current Reality tree
DOE	department of energy
FMEA	Failure Mode and effect analysis
FSUL	Fine spinner Uganda limited
HAZOP	Hazard and operability
ID	Interrelation diagram
MA	machine availability
MORT	Management oversight risk tree
MTBF	Mean time between failures
MTTR	mean time to repair
No.	Number
PM	Preventive maintenance
RCA	Root cause analysis
RCI	root cause investigation
RCM	Reliability centered maintenance
SRNTL	southern range Nyanja textile limited
TAT	Total available time
TNB	tool number of breakdown
TUT	Total utilized time

LIST OF FIGURES

LIST OF TABLE

ABSTRACT

Maintenance is the actions necessary for retaining or restoring a piece of equipment, machine or system to the specified operating conditions to achieve maximum useful life. Preventive maintenance is the set of plan activities that are performed on plant, equipment, machinery and systems before the occurrence of a failure in order to protect them to prevent or eliminate any degradation in their operating conditions. Production may be stopped due to many reasons like breakdown of machine, maintenance work, labour issues, and inventory problem. It is necessary to reduce the breakdown of machine or equipment in the company for efficient production to meet the demands.

The main objective of this project is to analyse the breakdown and improve the preventive maintenance on drawframe machines. The drawframes are the last quality improvement machines in spinning process in textile industry. Breakdown history for four drawframe machines (DO/6 no.1, DO/6 no.2, RSB 951 no.1 and RSB 951 no.2) were analysed and noticed that DO/6 no.2 and RSB 951 no.2 have higher downtime and therefore contributed major production loss to the company. Hence detailed study was carried out to minimise production loss. The machine breakdowns were studied using different analysis and inspection tools like fishbone diagram, why-why analysis, Pareto analysis, and counter measures to determine the root causes of the breakdown and develop preventive corrective actions. The machine availability (MA) was determine by MTBF and MTTR. Based on the problems, root cause analyses were carried to develop and improve new preventive maintenance schedule and checklist for a machine. After implementation of root cause analysis and new preventive maintenance schedule, the machine availability was increased by 2.26% and Mean time between failures (MTBF) was increased by 29.58% and Mean time to repair (MTTR) was reduced by 34.48%.

Keywords: machine availability, fishbone diagram, why-why analysis, preventive maintenance, corrective action, Pareto analysis, root cause analysis, breakdown and downtime.

TABLE OF CONTENT

CHAPTER I INTRODUCTION

1.0 INTRODUCTION

1.1 Background

Textile industry belongs to the oldest industrial branches and maintaining its sustained growth for improving the quality of human life. Despite of being old, spinning process is still developing and very essential for the production of most of the textile fabrics. The main objective of the staple yarn spinning process is to achieve the highest possible yarn evenness with minimum imperfections, which impart uniformity in yarn strength(Dan et al. 1997). An overview of spinning process illustrates drawframe as the last quality improvement machine. Its performance is greatly affected by breakdowns (Chang 2012).

Breakdown is a function of availability, performance rate, and quality rate. It is one of the six major categories of losses that affect overall equipment effectiveness (OEE) (Kiran et al. 2013). According to Mishra and Pathak breakdown is a failure of machine to function or an occurrence in which a machine stops working(Mishra & Pathak 2012). Machine breakdowns are caused by either external or internal factors. The internal factor refers to aging (time usage)or physical causes while external factor consists of environmental causes, human errors and management system/latent causes(Sachs 2012). When unplanned breakdown or unexpected failure happen due to equipment failure the production will automatically stop. Therefore it would be expensive to bring the production system into running condition under emergency situation without maintenance (Kotwal 2015).

Maintenance is the combination of activities to restore the component or machine to a state in which it can perform its designated functions(Mishra & Pathak 2012). It is gaining importance in textile industries because of the need to increase reliability and to decrease the possibility of production loss due to machine breakdowns(Praveen & Rudramurthy 2013). According to the study reported by Mobley about 15% to 40% (average 28%) of the total production cost is due to maintenance activity in the factory(Mobley 2002). A good maintenance program requires company-wide participation and support by everyone ranging from the top executive to the shop floor personnel (Krar 2013). One of the maintenance strategy is preventive maintenance which is a set of activities that are performed on plant, equipment, machinery, and systems before the

REFERENCES

1. Anderson, B. & Fagerhaug, T., 2000. *Root Cause Analysis: simpliflied tools and technigues*, ASQ Quality press.
2. Chandrakar, J. & Rejesh, K., 2015. Reduction of breakdown in food processing plants through failure analysis. *International journal of Advanced engineering research and studies*, 4(02), pp.212–214.
3. Chang, L., 2012. *An investigation of yarn hairiness, Deakin University Australia, Ph .D Thesis*,
4. Charles, E.E., 1996. *An Introduction to Reliability and Maintenance Engineering*, McGraw Hill College Divison.
5. City Process Management, 2008. Cause and Effect Analysis using the Ishikawa Fishbone. , 44(0), pp.1–4.
6. Dan, J.M., Ralph, W.F. & James, H. Booterbaugh Everett, E.B., 1997. *Short Staple Yarn Manufacturing*, Durham, North Carolina: carolina academic press.
7. Dean, L.., 2007. *comparison of common Root cause analysis Tools and methods. Apollo Root cause analysis* 3rd ed., A new way of thinking.
8. Dew, J.., 1991. n search of the root cause. *Quality progress*, 24(3), pp.97–107.
9. Dhillon, B.S., 2002. *ENGINEERING MAINTENANCE, a modern approach*, New york, washington, D.C.: CRC Press.
10. DOE, G., 1992. *Root cause Analysis Document*, Washington: US Department of energy.
11. Doggett, M., 2004. A Statistical Comparison of Three Root Cause Analysis Tools A Statistical Comparison of Three Root Cause Analysis Tools. , 20(2), pp.1–9.
12. Dr. Zoltan, S. & Szaloki, 1998. *Drawing, Combing and Roving:Institute of Textile Technology*, Virginia, USA: Charolttesville.
13. Faltin, F. & Kenett, R., 2007. Bayesian Networks.
14. Hingve, T.S. & Rothe, R.G., 2015. Fault Detection & Diagnosis of Air-Separator Breakdowns in Ginning Industry using Root Cause Analysis. , 3(02), pp.2232–2235.

15. Ishikawa, K., 1986. Preview CAUSE & EFFECT DIAGRAM (Fishbone or Ishikawa Diagram) Preview , contd ... Why use it ? What does it do ? How do I do it ? How do I do it ? contd ... How do I do it ? contd ...
16. Kiran, M., Mathew, C. & Kuriakose, J., 2013. Root cause Analysis for reducing breakdown in a manufacturing industry. *international journal of emerging Technology and advanced engineering*, 3(01).
17. Kotwal, A., 2015. Evaluation of Machine Downtime and Failure Analysis of Components in Paint Manufacturing Unit : Review Paper. , 3(1), pp.170–174.
18. Krar, S., 2013. The IMPORTANCE of MAINTENANCE. , pp.1–3.
19. Mahto, D. & Kumar, A., 2008. Application of root cause analysis in improvement of product quality and productivity. *Journal of Industrial Engineering and Management*, 1(2), pp.16–53.
20. Manoj, M. & Mallesh, G., 2014. BREAKDOWN AND ROOT CAUSE ANALYSIS OF CRITICAL MACHINE- A CASE STUDY. , (02), pp.250–260.
21. Mishra, R.. & Pathak, K., 2012. *Maintenance engineering and managemnt*, PHI learning pvt.Ltd.
22. Mobley, R.., 2002. *An introduction to predictive maintenance*, BUtterworth Heinemann.
23. Moubray, J., 1997. *Reliability Centred Maintenance* 2nd ed., Elsevier.
24. Parida, A. & Kumar, U., 2012. Maintenance performance measurement(MPM) issues and challenges. *journal of quality in maintenance Engineering*, 12(3), pp.239–251.
25. Piotrowski, J., 2001. Pro-Active maintenance for pumps. In pump-zone.com.
26. Praveen, K. & Kumar, 2013. Analysis of Breakdowns and Improvement of Preventive Maintenance on 1000 Ton Hydraulic Press. , 3(8), pp.636–645.
27. Rausand, M., 2005. Hazard and Operability Study. , pp.1–44.
28. Rosmaini Ahmad, 2007. Development of Decision Model for Maintenance Analysis of Non-Repairable Component by Considering the External factor.
29. Sachs, N.W., 2012. Reliability Center , Inc . Reliability Center , Inc . , pp.1–5.
30. Scutti, J.J., Mcbrine, W.J. & Corporation, A., 1990. *Introduction to Failure Analysis and Prevention*,
31. Street, C., 2000. Decision Analysis and Resolution Guidelines.

32. Tomi, B. & Brki, V.S.Ć., 2012. EFFECTIVE ROOT CAUSE ANALYSIS AND CORRECTIVE ACTION PROCESS. , 1(1), pp.16–20.

33. Tools, P.A., Pareto, S. & Table, D., 2004. Pareto Diagram. , pp.1–4.

34. Valyakala, A. et al., 2013. Root cause analysis for the failure of a forced draft fans in a petrochemical indury. *International Journal of engineering research and development*, 6(05), pp.84–90.

35. Vessely, W.E. & Roberts, N.H., 1981. *FaulttreeHandbook_USNRC.pdf*,