KEY FACTORS INFLUENCING THE OPTIMUM PRODUCTION BY THE GLOVE KNITTING MACHINE IN A PRIVATE COMPANY IN SRI LANKA

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May 2021

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Thesis submitted in partial fulfilment of the requirements for the degree Master of Science in Mathematics

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Declaration

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Abstract

Knitting Machines of leading rubber manufacturing company was fully booked with glove knitting orders. So, the Excess capacities were outsourced within Sri Lanka or outside of Sri Lankan region. Since the company is Customer Centric Factory, the Profit margins came down due to the outsourcing the Capacity. So, the aim of this study was to analyse and determined key factors influencing the optimum machine production for specific products. Designed experiment was used to perform this analysis. Number of defectives used as the response variable. This will allow company to do the production in-house without outsourcing. This project contains study of four main factors and its effect on production and efficiency of the flat knitting machine based on minimal defect rate. The machine base, machine servicing activity, speed of the machine and the machine type plays an important role in knitting defects.

The defect rates of knitted gloves were investigated using full factorial experimental design. The effect of machine base, machine servicing activity, machine speed and the machine type have been studied under four cases based on pareto principle. The four cases namely, Case I: 15G - Nylon, Case II: 13G - Thermostat, Case III: 13G – HPPE (High Performance Polyethylene), Case IV: 10G – HPPE. The results show that the machine base and the machine servicing have significant impact on the defects rate for all four cases, whereas, machine speed became significant for case II, III, and IV, as well as the machine type became significant impact for case IV based on linear terms. For 2-way interaction term, the machine base and the machine type have significant impact on the defects rate for case IV. The p-values of all four controlled parameters have been determined using ANOVA. The optimum parameters that correspond to the lower defects rate have also been evaluated.

Keywords: *Knitting, Design of Experiment, DOE, Optimum Parameter, Defect Rate*

Acknowledgement

This report would not have been possible without the guidance and the help of several individuals who in one way or another contributed and extended their valuable assistance in the preparation and completion of this study.

First, I would like to express my heartfelt gratitude to Mr. T M J A Cooray previous co-ordinator of the MSc in Operational Research and educate us by giving a wise knowledge on Operational Research related subjects.

Next, I would like to extend my gratitude to Dr. P M Edirisinghe supervisor and co-ordinator of the MSc in Operational Research for the all the guidelines given for the thesis and other all related requirements and all the members of staff for their precious advices and support.

Next, I would like to extend my gratitude to all the Panel of Lecturers who have enlightening us by giving a wise knowledge regarding Operational Research Methodology and related areas.

And next, I thank Organisation's Management Team and My Team members for their faith in me and allowing me to get their information as needed.

And also, I would like to appreciate the support given by my own batch mates for providing their helping hands throughout the journey. And, last, but not least, I would like to thank my loving family, my wife, my parents and all my family members who always stood behind and helped to make this effort a success.

Furthermore, I would like to offer my special thanks to every other who helped and not mentioned above in names.

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List of abbreviations

ANOVA	-	Analysis of Variance
CAGR	-	Compound Annual Growth Rate
COVID	-	Coronavirus Disease
DOE	-	Design of Experiment
EDB	-	Export Development Board
ERP	-	Enterprise Resource Planning
HPPE	-	High Performance Polyethylene
MS	-	Mean Square
MSE	-	Mean Square Error
PPE	-	Personal Protective Equipment
RPM	-	Revolutions per Minute
UNIDO	-	United Nations Industrial Development Organization
UV	-	Ultraviolet
UPF	-	Ultraviolet Protection Factors