TT 05/13

LB/DON/87/2015

STUDY ON SETUP TIME EFFECT ON SMALL ORDER QUANTITIES IN APPAREL MANUFACTURING

LIBRARY
UNIVERSITY OF MORATUWA, SRI LANKA
MORATUWA

Mohomed Haniffa Mohomed Haris

(109129B)

Degree of Master of Science in Textile & Clothing Management

Department of Textile and Clothing Technology

University of Moratuwa

Sri Lanka

December 2014

677"14"
677:65(043)

University of Moratuwa
109291

109291

CD-ROM
TH2940

109291

STUDY ON SETUP TIME EFFECT ON SMALL ORDER QUANTITIES IN APPAREL MANUFACTURING

Mohomed Haniffa Mohomed Haris

(109129B)

Thesis submitted in partial fulfilment of the requirement for the degree

Master of Science

Department of Textile and Clothing Technology

University of Moratuwa

Sri Lanka

December 2014

DECLARATION

"I declare that this is my own work and this thesis does not incorporate without acknowledge any material previously submitted for a Degree or Diploma in any other university or institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

Also, I hereby grant to University of Moratuwa the non-exclusive right to reproduce and distribute my thesis, in whole or in part in print, electronic or other medium. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature: *UOM Verified Signature* Date: 10-08-2015

The above candidate has carried out research for the Masters thesis under my supervision.

UOM Verified Signature

Signature of the supervisor: Date: 10.08.2015.

Abstract

As apparel manufacturers in today's context, it is vital to concentrate on improving productivity by applying tools that can increase the efficiency of sub processes. It is a true fact that Sri Lankan apparel industry has a long history, but it is surprising that when comparing Sri Lanka's ability with the regional countries/competitors in producing value added products, within a short lead time. Smaller order quantities are becoming increasingly demanding by the western world to sustain in the global apparel business.

Due to product variation and small order quantities, it can be seen that there is a strong need to introduce a tool that can monitor the setup time taken to feed new styles without reducing the labour efficiency .This research tries to analyse, setup time in small quantity orders in apparel manufacturing industry through implementing single minute exchange of dies (SMED) with the selected factory. Some of the main importance topics of literature related to setup reduction, labour efficiency and employee related discussions are carried out in this survey. It further emphasized the paramount importance of the subject topic by collecting data from the selected manufacturing unit to study the setup time losses.

Data collection of this study was through questionnaire and interviews with executives and middle management staff in the selected organization covering various departments. Setup related documentations such as style feeding charts, and other tools such as labour capacity study were used to analyse data. Collected data to cover Setup issues and related factors to understand the delays were collected from different sewing lines which produces variety of styles. Objective of the study will be concentrated to find out reasons to understand high setup time during style changes in sewing floor as well as to reduce setup time by implementing SMED techniques. Data interpretation confirmed the Setup time and its correlation between finance performances of the organization. Implementation of SMED tool is after analysing the collected data proves the hypothesis of the survey confirming that the setup time impacts on financial performance of the organization.

UNIVERSITY OF MORATUWA LIBRARY SRI LANKA

ACKNOWLEDGEMENT

Special thanks to Ms.Vijitha Ratnayake, Senior lecturer of University of Moratuwa for her invaluable guidance to complete this Thesis, for granting me the opportunity to undertake the study under their supervision, and her kind interest in this project, timely suggestions along the way and for being good teachers with continuous encouragement were splendid.

I would like to extend my gratitude to Dr.T.S.S.Jayawardena, Coordinator of MSc program, Dr. Gamini Lanarolle and Dr. Ujithe Gunesekera of Department of Textile and Clothing Technology, for encouragement given to complete the project successfully.

A sincere appreciation to Sectional Managers and executives of the respective manufacturing plant where the research was carried out and for their suggestions and points was really helpful to carry out the research more deeply.

Finally I appreciate and a great thanks to my wife Shakeela Hussein for all the help and supporting actions rendered during my studies and research by documentation, organizing and computer related activities. Also I must not forget to mention my work place colleague Miss Kanishka Sahanmalee, who helped me in finding data and documents from internet and libraries.

TABLE OF CONTENTS

Declaration i

Abstract ii

Acknowledgement iii

Table of contents iv

List of figures vi

List of tables vi

List of abbreviations viii

List of appendices ix

1 . Introduction 1

1.1 Background 1

1.2 Research question 4

1.3 Problem statement 5

1.4 Aim 5

1.5 Objective 5

1.6 Methodology 6

1.7 Scope and limitations 6

1.8 Conclusions 7

2.Litrature review 9

2.1 Apparel companies and its customers 9

2.2 apparel export performances in the recent past 10

2.3 Importance of labour productivity 13

2.4 Cost per minute 15

2.5 Factors related to lower productivity 17

2.6 Transform to lean principles 17

2.7 Apparel production systems 18

2.8 Bundle system and progressive bundle system 18

2.9 The progressive bundle system 18

2.10 Modular production system 19

2.11 Single minute exchange of dies SMED 20

2.12 Single minute exchange of dies implementation 21

2.13 Effects of implementation 23

2.14 Shingo model 27
2.15 SMED implementation in apparel 29
2.16 Reducing style changeover in apparel 30
3. Research methodology 42
3.1 Introduction 42
3.2 Conceptual framework 42
3.3 Methodology 42
3.4 Literature survey 43
3.5 Data collection and analysis of data 43
3.6 Poor working condition 44
3.7 Sample selection 45
3.8 Current process observation in the organization 45
3.9 Analysis of data 45
3.10 Data interpretation and discussion 46
3.11 Sample selection and implementation 46
3.12 Draw conclusions 46
3.13 Brief history of company A 46
3.14 Conclusion 47
4. Data collection and analysis of data 48
4.1 Introduction 48
4.2 Data collection and analysis 48
5. Data interpretation 58
5.1 Introduction 58
5.2 Discussion of findings and recommendations 58
5.3 Implementation of SMED in sewing line 63
5.4 Feeding plan 67
5.5 Profitability gain after implementation of SMED 72
6. Conclusion 74
6.1 Difficulties during data collection 75
6.2 Poor systems in place 75
6.3 Suggestions to improve 76
References 78

LIST OF FIGURES

Figure 1.1	The effect of setup operations on the line output	3
Figure 2.1	Exports to worldwide as a percentage from Sri Lanka	11
Figure 2.2	Exports to USA from Sri Lanka	11
Figure 2.3	World market share top 5 and top 10 countries	15
Figure 2.4	Formal method of SMED	25
Figure 2.5	SMED implemented method	25
Figure 2.6	Elemental breakdown of setup	34
Figure 2.7	Elemental breakdown of setup II	35
Figure 2.8	Style changeover time after SMED implementation	40
Figure 2.9	Elemental breakdown of style changeover – before and after SMED	41
Figure 3.1	Conceptual framework	42
Figure 4.1	Summarized setup time loss graph	52
Figure 5.1	SMED tool implemented machine layout	66
Figure 5.2	Graphical presentation on improved setup time Vs. after SMED implementation	79
Figure 5.3	Line capacity graph	71

LIST OF TABLES

Table 1.1	Production plan company A	7
Table 2.1	Export of apparel January to June 2014	11
Table 2.2	Example sum of labour efficiency calculation	14
Table 2.3	Cost per minute calculation examples	16
Table 2.4	Changeover time process analyse	21
Table 2.5	Key elements to observe	26
Table 2.6	The current status of the changeover process	36
Table 2.7	Detail discussion of the summery	37
Table 2.8	Batch setting time	38

Table 2.9	Demonstration time	39
Table 4.2	Results of the questionnaire	49
Table 4.3	Results of setup time loss	51
Table 4.4	Profitability loss due to delay in setup time	54
Table 4.5	Bundle by bundle study sheet	56
Table 5.1	Summarized setup activities	60
Table 5.2	Company A performance on labour productivity	61
Table 5.3	Company A performance on defects and CPM	62
Table 5.4	Attachment and folders as per technical committee discussion	65
Table 5.5	Setup improvement before and after SMED implementation	68
Table 5.6	Setup time loss time minutes by category after SMED implementation	69
Table 5.7	Profitability analysis and CPM gain after SMED implementation	72
Table 5.8	Performance after implementing SMED	72
Table 5.9	Questionnaire distributed to understand the SMED benefits	73
Table 6.1	Comparison of results with previous performance indicators	76

LIST OF ABBRIVIATIONS

CPM	Cost per minute
DHU	Defects per hundred units
EDB SL	Export development board of Sri Lanka
EU	European Union
FRS	Fixed repairing Schedule
GSP	Generalized system of preference
GDP	Gross domestic production
LTO	Labour turnover
LI	Line in charge
LS	Line Supervisor
MFA	Multi fibre agreement
PBS	progressive bundle system
PM	Production manager
QA	Quality assurance
SMED	Single minute exchange of dies
SMV	Standard minute value
USA	United States of America
USD	United states dollar
WIP	Work in progress

LIST OF APPENDICES

Appendix A	Analysis of questionnaire	80
Appendix A.1	Feeding plan	83
Appendix B	Feeding start confirmation report	87
Appendix C	Labour turn over for the year 2014 January to June	91
Appendix D	Questionnaire & summarized answers on a like a scale form to identify impotency of setup reduction	92