International Journal of Advance Industrial Engineering
E-ISSN 2320 –5539

Available at http://inpressco.com/category/ijaie/

Research Article

Productivity Analysis of Different Sewing Operators for Singular and Distinctive Assigned Jobs

Md. Mominur Rahman* **and Mohammad Abdul Baset**

Department of Textile Engineering, Daffodil International University, 102 Sukrabad, Mirpur Road, Dhaka-1207, Bangladesh

Accepted 25 June 2016, Available online 30 June 2016, **Vol.4, No.2 (June 2016)**

Abstract

The aim of this study is to show different A-grade sewing operator's productivity and efficiency for different sewing machine for same and different assigned operations. Here the performance of sewing operators of garments industry were analyzed by observed data which is based on to complete the assigned operations to different operators in different sewing machines where operators are of A grade and there were same product manufacturing process in different sewing line. This study revealed that the efficiency and productivity of all A-grade sewing operators are not same or equal because of the variation formed by them in terms of productive and non productive time where data of all operators of a factory are not considered for analysis as well as data collected from three garments factory are considered. It is also provided a framework to eliminate the greater variations of A-grade sewing operator's performance to get more productive time.

Keywords*: Sewing Operator's Performance, Productive time, Non Productive Time, Productivity, Efficiency.*

Introduction

In today's world for every manufacturing industry productivity is one of the most important factors besides quality, efficiency, working environment to sustain in competitive market. Garments industry is labor intensive so not exceptional in this regard. Moreover Bangladeshi readymade garments industries focus more on raw materials and accessories than productivity and efficiency because of available cheap labor. But now it is time to concentrate on this matter to reduce not only lead time but also to meet the commitment i.e. shipment date. So manufacturers should identify and implement different ways to improve productivity, efficiency of operators resulting required quality standards with reduced costs by ensuring safety workplace [Mahmud, Mahbubur and Dr. Nafis, 2011]. By the consideration of the importance of productivity this paper is an attempt to show the variations of productive and non productive time of A-grade sewing operators to analyze productivity and efficiency of operators by their performances.

Literature Survey

Since the late 1970's, Bangladeshi readymade garments industry has been started to develop as export oriented industries and now expanded. Beside this the domestic market is increasing day by day because of the increment of personal income and changing lifestyle. As a result this sector is promising for employment, foreign exchange earnings, economy and contribution to GDP. Though buyer comes for lower price in Bangladesh as $0.11 whereas $0.26 for India, $0.79 for Sri Lanka but according to some experts, productivity in Bangladesh is between 35% and 55% of efficiency with very few exceptions whereas Sri Lanka factories operate at 80% - 90% efficiency [Labor Management in Development Journal, 2001].

So there are scopes to increase productivity of Bangladeshi RMG industries, productivity can be improved by assembly line balancing using work sharing method in apparel industry where cycle time is balanced for various operations and minimized the workstations [N.Morshed and K.S. Palash, 2014]. Where there are some effects of assembly of a product on operator performance where in a fully adjustable ergonomically designed assembly workstation (smart workstation) in terms of assembly products per unit time (units/hour) female are more productive than male [Ibrahim and H. Garbie, 2011]. But overall balanced layout of sewing line has increased the efficiency and labor productivity [R.H. Shumon, K. Arif-Uz-Zaman, and A. Rahman, 2010]. Where production efficiency of readymade garment firms is measured by using Data Envelopment Analysis (DEA) where number of stitching machine and operators are input variables and numbers of produced garments are output variables [R. N. Joshi and S. P. Singh, 2009].

*Corresponding author: **Md. Mominur Rahman**

Table 1: Production Study of Single Needle Plain Machine of Different Operators for Back Tip Joining

Operators no.	Total Output (Pcs)	Max. Productive Time (sec)/Operation	Min. Productive Time (sec)/Operation	Avg. Productive Time(sec)/ operation	Total Productive Time (min)	(%) of Productive Time	Total Non Productive Time (min)	(%) of Non Productive Time
1	74	17	9	13	16	82	3.3	18
2	72	16	9	13	16	80	4	20
3	80	17	9	13	17	87	2.2	13

Again job switch is very common character for professions but frequently change make the system interrupted and has impact on production in garment sector of Bangladesh [N.K. Kaikobad, and Z.A. Bhuiyan, 2012]. And productivity is measured by achievement toward established goals based on relationships between inputs and outputs where an operation is one of the steps in a process that must be completed to convert materials into a finished garment [G. E. Kunz, G. E. Ruth, 2012].

There are different tools used to increase productivity like value stream mapping and production control tools is used in printing section to identify the bottleneck problems which results the reduction of excess motion and non value added works. As a result total processing time for final output is decreased i.e. productivity is increased [A. Habib, A.M.M.N. Ahsan, and B. Amin, 2013]. Beside different tools ergonomics is an important factor, the goal of ergonomics is to get higher productivity with lower cost while ergonomics play an important role for increasing productivity, reducing the risk factors and injuries related to musculoskeletal disorders [N. Saini, 2015]. Not only tools and ergonomics but also a well designed workstation is very crucial for increasing production. Most workers in garments industries produce garments by repeating the same or similar operations for the entire production lot of a order in which, if he can perform efficiently and quickly, can result the higher productivity [M. Muhundhan, 2013]. Again productivity affects by extended worker hours like levels of productivity changes at different time during normal working hours in garments industries where fatigue influences the daily production and lowers average productivity. As the overall daily performance of each worker is not same, the changes in their performance defer from one to another because of bottleneck problems in the assembly line [Mahmud, Mahbubur and Dr. Nafis, 2011]. There is negative effect of overtime hours on worker productivity i.e. overtime hours lowers average productivity which is determined as output products per working hours, for almost all of the manufacturing industries [E. Shepard and T. Clifton, 2000].

The manufacturing of garments is mainly based on the production line concept where the utilization of the workforce of garments industry at an optimum level through a model reduces the time taken to produce a unit of product, which increases the profits [W. K. I. Fernando and D. J. C. Suriyaarachchi, 2008]. Like other tools SMV and such like others tools can be effectively applied to garments industries for better increasing production in which the work provides some ways of improvement to increase the line efficiency by applying time study and line balancing techniques [F. Nabi, R. Mahmud and M. Islam, 2015]. Again Kaizen is a continuous process of improving production by increasing efficiency and productivity of a sewing floor of luggage manufacturing plant through Kaizen technique. Where it is shown efficiency has been improved up to 7% and Defect per Hundred units has also reduced [. Akter, F.R. Yasmin, and A. Ferdous, 2015]. There are different constraints for higher productivity like the prominent constraint against the higher productivity is the variation in individual capacity of operators which is the cause of improper line balancing and bottle neck process which results lower efficiency. The research shows that this balanced layout model has increased the efficiency by 21%, and labor productivity by 22% [R.H. Shumon, K. Arif-Uz-Zaman, and A. Rahman, 2012].

Previous research regarding productivity and efficiency shows that productivity is increased due to assembly line balancing by proper work sharing, ergonomically set up workstations etc. As well as different tools like Kaizen, SMV etc. are analyzed to increase productivity. Beside these there are also some factors analyzed like working hours, ergonomics, proper worker station design, job switch, bottleneck problem which affect productivity and efficiency. Again some researchers describe some techniques to measure productivity and efficiency. Previous researches limit in case of productive time, non productive time of operators. This paper is to show the variations of different A-grade sewing operator's performances for different sewing machine in case of same product manufacturing on the basis of their productive and non productive time variations which are the most important factors to increase productivity and evaluate their performances.

Data Presentation and Analysis

This study deals with the data analysis of production of different jobs in different sewing machine including same operations performed by different A-grade operators with same sewing machine for same product manufacturing. The data is represented based on 20 minutes observations in different days to complete the assigned job. The data regarding production study of different sewing machine is given below-

Table 2: Production Study of Over lock Machine of Different Operators for Sleeve Joining

Operators no.	Total Output (Pcs)	Max. Productive Time (sec)/Operation	Min. Productive Time (sec)/Operation	Avg. Productive Time(sec)/ operation	Total Productive Time (min)	(%) of Productive Time	Total Non Productive Time(min)	(%) of Non Productive Time
4	93	16	7	9.92	15.38	76.75	4.22	23.25
5	95	14	8	10.81	17.12	87.1	2.18	12.9
6	97	14	8	11.75	19	92.75	1	7.25

Table 3: Production Study of Flat lock Machine of Different Operators for shoulder top seam

Operators no.	Total Output (Pcs)	Max. Productive Time (sec)/Operation	Min. Productive Time (sec)/Operation	Avg. Productive Time(sec)/ operation	Total Productive Time (min)	(%) of Productive Time	Total Non Productive Time(min)	(%) of Non Productive Time
7	106	16	6	10.22	18.06	90.3	1.54	9.7
8	112	14	7	10.18	19	95	1	5
9	95	14	8	10.99	17.4	87	2.2	13

Table 4: Production Study of Flat Bar Machine of Different Operators for Half Piping

Operators no.	Total Output (Pcs)	Max. Productive Time (sec)/Operation	Min. Productive Time (sec)/Operation	Avg. Productive Time(sec)/ operation	Total Productive Time (min)	(%) of Productive Time	Total Non Productive Time(min)	(%) of Non Productive Time
10	92	15	7	11.33	14.3	71.5	5.3	28.5
11	93	17	7	11.21	18.5	92.5	1.1	7.5
12	99	18	8	11.39	19.2	96	0.4	4

Table 1 shows the production study of single needle plain machine of different operators for back tip joining where three works performed the mentioned job. During this, operator 3 is of best efficiency than operator 1 and 2 because the productive time of operator 3 is greater i.e. less non productive time than other two though he has the maximum productive time per operation than operator 2. Again operator 1 is much efficient than operator 2 though the average productive time per operation is greater for operator 2 than operator1.

Table 2 shows the production study of over lock machine of different operators for sleeve joining where operator 6 has the best efficiency than other two because he wastes less non productive time i. e. less non productive percentage or because of greater utilization of productive time resulting greater output though his average productive time per operation is greater than other two.

Table 3 shows the production study of flat lock machine of different operators for shoulder top seam where operator 8 has the highest efficiency than operator 7 and 9 because of greater productive time or percentage i.e. lower non productive time or percentage with lowest minimum productive time per operation and lower average productive time per operation than other two.

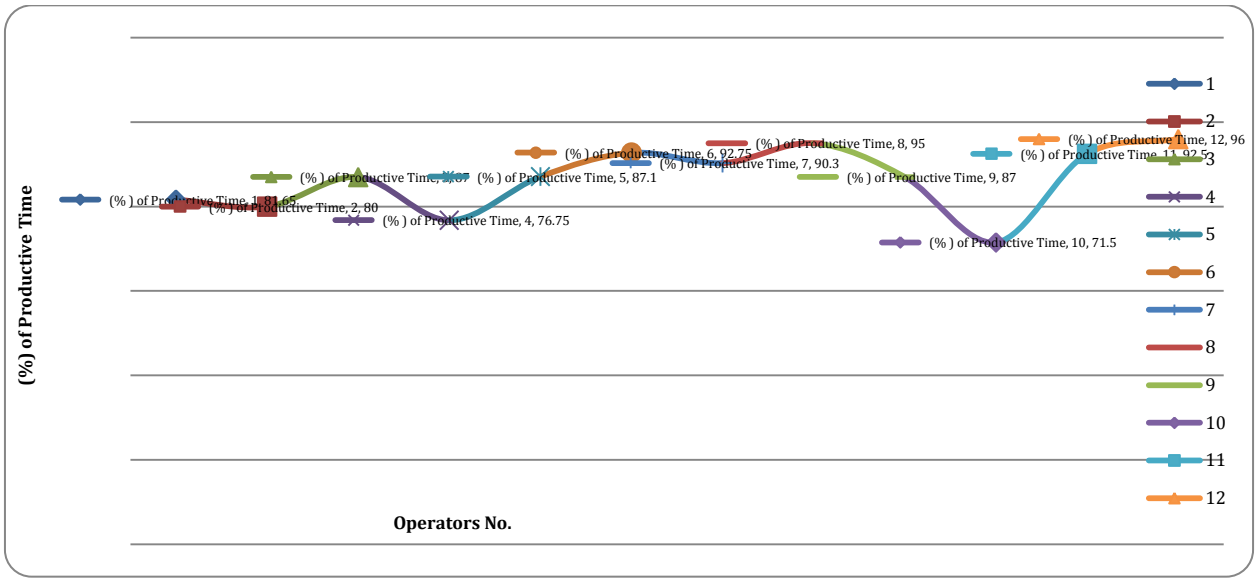
Table 4 shows the production study of flat bar machine of different operators for half piping where operator 12 is of greater efficiency because of utilizing more productive time i.e. less non productive time percentage though the average productive time per operation with maximum and minimum productive per operation is little bit higher than operator 10 and 11.

Discussion of Results

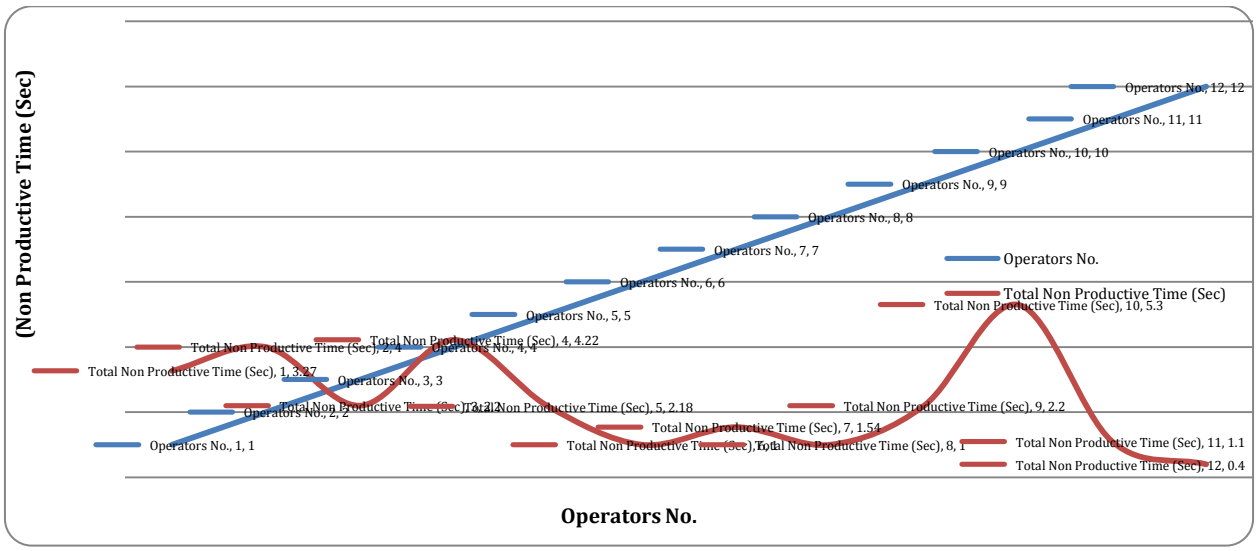
In assembly sewing lines, there are a number of workers performing same and different jobs in a same or different sewing machine to produce a same product. But there are variations of their performances and efficiencies though they are performing same assigned jobs as well as categorized as A-grade operators.

Comparison of productive time percentage among different operators shows that operator 3, 6, 8, 12 have the greater efficiency for individual assigned jobs with different sewing machine comparatively than other two group operators who are also done the same job in same machine, because of their higher productive time percentage i.e. 87%,92.75%, 95% and 96 % respectively. Again among all operators from all four machines operator 12 is of greater efficiency because of greater productive time percentage i.e. 96% while operator 4 has the lower efficiency because of lower productive time percentage i.e. 76.75% [Graph 1].

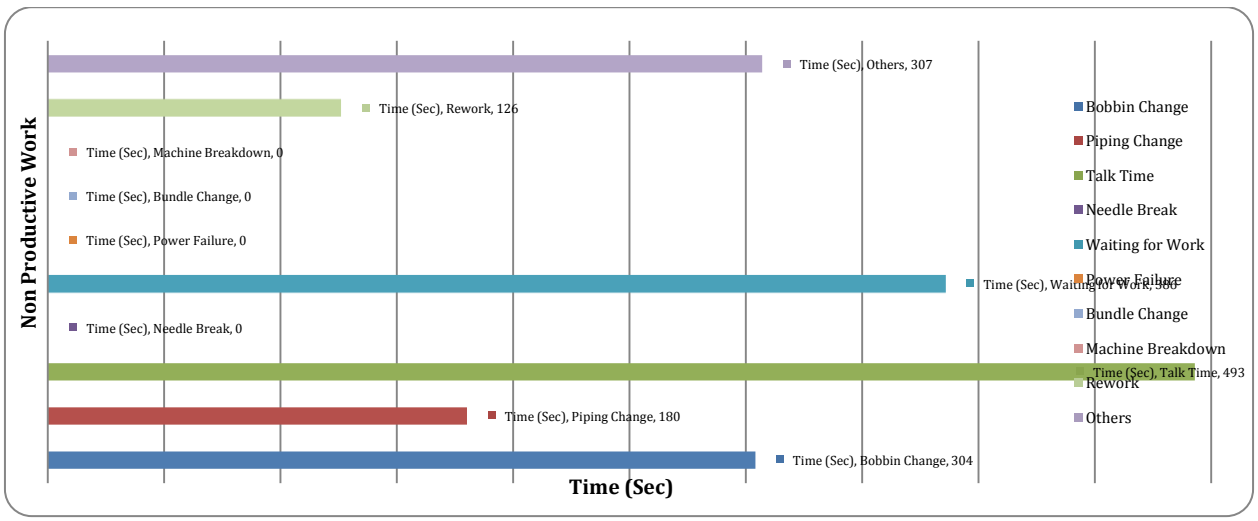
Beside this comparison of non productive time (Sec) among different operators shows that operator 2, 4, 9, 10 spent much time in non productive time i.e. 4 sec, 4.22 sec, 2.2 sec and 5.3 sec respectively for individual assigned jobs with different sewing machine comparatively than other two group operators who are also done the same job in same machine resulting the lower productivity from them. Again among all operators from all four machines operator 4 has the greater non productive time i.e. 4.22 sec and operator 12 has the lower non productive time i.e. 0.40 sec [Graph 2].



Graph 1: Comparison of Productive Time Percentage among Different Operators



Graph 2: Comparison of Non Productive Time (Sec) among Different Operators



Graph 3: Comparison of Different Non productive Time for all Operators

Again Graph 3 shows the comparison of different non productive time for all operators where they spent larger non productive time as talk time (493 sec) and respectively they spent a great account of non productive time as bobbin change (304 sec), waiting for work (386sec) and others non productive time like wash room, guided by supervisor etc. (307 sec). Comparatively they spent lower non productive time during rework (126 sec) and piping change (180 sec). It is also found that there is no wasting of time regarding machine breakdown, bundle change, power failure and needle break.

Conclusion

1. Performance, productivity and efficiency of A-grade sewing operators for same assigned jobs in same machine are not equal or same. It varies due to their variation of non-productive time and productive time.
2. Productivity of different sewing operators (A-grade) for different assigned jobs in different sewing machine are not also same.
3. Efficiency of operators is largely dependent on their productive and non-productive time.
4. By reducing non-productive time mostly of reducing talk time, efficiency of A- grade operators can be increased significantly.

References

Mahmud, Mahbubur, Dr. Nafis, (2011), Study the Impact of Fatigue and Optimizing Productivity of an Assembly Line of Garment Industry, *International Journal of Scientific & Engineering Research,* Vol. No. 2, Issue 11, ISSN 2229-5518.

Labor Management in Development Journal, (2001), Vol.2, Number 7, P.5.

N.Morshed, K.S. Palash, (2014), Assembly Line Balancing to Improve Productivity using Work Sharing Method in Apparel Industry, *Global Journal of Researches in Engineering: Industrial Engineering,* Vol. No. 14 Issue 3 Version 1.0, Online ISSN: 2249-4596 & Print ISSN: 0975-5861.

Ibrahim, H. Garbie, (2011), An Experimental Study on Assembly Workstation Considering Ergonomically Issues, *Proceedings of the 41st International Conference on Computers & Industrial Engineering*.

R.H. Shumon, K. Arif-Uz-Zaman, A. Rahman, (2010), Productivity Improvement through Line Balancing in Apparel Industries, *Proceedings of the 2010 International Conference on Industrial Engineering and Operations Management Dhaka, Bangladesh.*

R. N. Joshi, S. P. Singh, (2009), Measuring Production Efficiency of Read made Garment Firms, *Journal of Textile and Apparel Technology and Management,* Vol. No. 6, Issue 2.

N.K. Kaikobad, Z.A. Bhuiyan, (2012), Job Switching Of Garment Workers Decreasing Productivity: An

Analytical Research, *IOSR Journal of Business and Management (IOSR-JBM),* Vol. No. 4, pp. 01-07, Issue 4.

G. E. Kunz, G. E. Ruth, (2012), Apparel Manufacturing Sewn Product Analysis, *4th Edition. Pearson Publication,* ISBN 978-81-7758-076-1.

A. Habib, A.M.M.N. Ahsan, B. Amin, (2013), Improving Productivity of Apparel Manufacturing System using Value Stream Mapping and Production Control Tools Focusing on Printing Section, *IJRET: International Journal of Research in Engineering and Technology,* Vol. No. 02, Issue: 09.

N. Saini, (2015), Ergonomics for Improving Productivity in Clothing Industry, *Global Journal for Research Analysis,* Vol. No. 4, Issue 6, ISSN No 2277 – 8160.

M. Muhundhan, (2013), Improved Work Station Design for Improved Productivity, *International Journal of Scientific Engineering and Technology (ISSN: 2277-1581),* Vol. No. 2, pp : 225-227.

E. Shepard, T. Clifton, (2000), Are Longer Hours Reducing Productivity in Manu-facturing?, *International Journal of Manpower*, Vol. No. 21, pp.540 – 553, Issue 7.

W. K. I. Fernando, D. J. C. Suriyaarachchi, (2008), Efficient Utilization of Employees in the Garment Industry Using Operations Research, *4th International Conference on Information and Automation for Sustainability* ,pp. 267 - 270 ,ISSN : 2151-1802, E-ISBN : 978-1-4244-2900-4 , Print ISBN: 978-1-4244-2899-1.

F. Nabi, R. Mahmud, M. Islam, (2015), Improving Sewing Section Efficiency through Utilization of Worker Capacity by Time Study Technique, *International Journal of Textile Science,* Vol. No. 4,pp. 1-8.

S. Akter, F.R. Yasmin, A. Ferdous, (2015), Implementation of Kaizen for Continuous Improvement of Productivity in Garment Industry in Bangladesh, *American Academic & Scholarly Research Journal,* Vol. No. 7, No. 3.

R.H. Shumon, K. Arif-Uz-Zaman, A. Rahman, (2012), Productivity Improvement through Balancing Process using Multi-skilled Manpower in Apparel Industries, *International Journal of Industrial and Systems Engineering,* Vol. No. 11, pp.31 – 47, No.1/2.