Improvement of Productivity in Garment Assembly Section by Using Work Aids

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Abstract— In this project trials were conducted for increasing productivity in garment manufacturing while lowering costs is to make sure that you are giving the best achievement for any company. The aim of the study was to investigate whether the presence of sewing work aid affects the production of garments and to which extent it affects the production of that garment. In this study, the manufacturing sequence of different types of bottoms, types of machines used for each process, the number of workers used in a sewing line, working hours of the garments, SMV and daily production of those related garments were enlisted and recorded as well. Those data were collected while the garments were manufactured by using work aid and also when those same garments were manufactured in the sewing line without using sewing work aids. As a result, it was concluded that garments production was hugely affected by the use of garment sewing work aid. In addition, this study also demonstrated that the quality of a garment was also affected by the presence of sewing work aids.

Index Terms— Sewing Work Aid, Machine, SMV, and Production.

1 Introduction

The apparel sector is the highest industrial employment generator and the highest foreign exchange earner to the country's economy. The total export income of the sector for the year 2011 was US$ 4.2 Billion which is equivalent to 39.6%. The export growth in 2011 is 24 percent (BOI, 2014). Readymade garments (RMG) of Bangladesh are powered by young, urbanizing workers where most of them are women. [1]

The industry emerged at the time when Bangladesh began its struggle for achieving economic emancipation and leading the country to prosperity with its limited resources. That time jute industry was the major export product, which contributed to the herculean task of rebuilding the war-ravaged country. But the 'Golden Fiber' lost its golden days.

The readymade garment (RMG) sector emerged after that, which within a short span of time appeared to be crucial to our economy as a source of export earnings and employment generation. Now the RMG sector is a 22-billion-dollar industry that accounts for 79 percent of the country's export earnings and contributes 10 percent to the national economy. Around 4.4 million people are employed in the sector, and 80 percent of them are woman. [2]

In the early eighties, Bangladesh entered into the garments industry. The RMG sector has experienced an exponential growth since 1980. In year1984-85 the number of garments factory were 384 with 0.12 million workers which reached at a total number of garments factory 4306 with 4.20 million workers in year 2014-15[3].

Though, there are various types of garments are manufactured in Bangladesh, but all the readymade garments are classified into two broad categories, where one is woven products and another one is knitted products. Woven

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products include Shirts, Pants, Shirts, etc. On the other hand, knitted product includes T-Shirts, Polo Shirts, Undergarments, Socks, and Stockings etc. [4].

The apparel industry is one of the oldest and largest among the most global industries being primarily concerned with the design and production of clothing and their supply.[5] Bangladesh is self-sufficient for knit fabric as more than 90 percent of knitwear fabric is manufactured in Bangladesh. The capacity of our woven fabric manufacturing and processing is also growing rapidly that has reached 2 billion meters per annum.
Besides, currently we have around 9 million spindles installed that can produce up to 1.7 billion kg of yarn per year. We are also almost self-sufficient for trims and accessories. So, with the expansion of the RMG industry the backward linkage industries developed and have been playing an important role in reducing lead time and offering competitive price in the international market [2].

Work aid is an essential part of any Garments Sewing Section. Sewing work aids adversely affect the production and product quality and also help to decrease production cost [10]. The work aids that are used during sewing operations can be categorized in a number of different ways and they vary in the aspect of their overall purpose that they emphasize some otter greatly increased the speed of working in a situation where quality is already satisfactory. Others give a very little improvement in productivity but the great accuracy of sewing. In terms of their function, the commonest ones are used for guiding or folding materials for trimming threads and other components from garments and for stacking the work after sewing. In terms of their method of working some are purely mechanical, some operate pneumatically, some are photoelectric and some are electronic, some are built into the machine such as a special monitor, some are a variation of a normal machine part such as a special presser foot, and some are a completely separate added part. Guides are used where sewing must take place in a certain position on a garment, usually a certain from a raw edge as in a conventional superimposed where a narrow item such as a lace or braid must be correctly positioned on a garment and where one garment part must be correctly placed on another such as a patch pocket on a shirt skirt or trousers. In their simplest form, they are edge guides, formatting some kind of physical barrier to the fabric being joined together [6]. The extra machine parts which may attach to speed up the production and improved quality in the sewing machine are called work aid [7].

2. MATERIALS AND METHODS

3.1. Materials

3.1.1. Fabric selection
For this experiment, 98% cotton & 2% elastic fabric construction has been selected.

3.1.2. Cotton fabric
Cotton is a soft, fluffy staple fiber that grows in a boll, or protective case, around the seeds of the cotton plants of the genus Gossypium in the mallow family Malvaceae. The fiber is almost pure cellulose. Under natural conditions, the cotton bolls will increase the dispersal of the seeds. The plant is a shrub native to tropical and subtropical regions around the world, including the Americas, Africa, and India. The greatest diversity of wild cotton species is found in Mexico, followed by Australia and Africa. Cotton was independently domesticated in the Old and New Worlds. The fiber is most often spun into yarn or thread and used to make a soft, breathable textile. The use of cotton for fabric is known to date to prehistoric times; fragments of cotton fabric dated from 5000 BC have been excavated in Mexico and between 6000 BC and 5000 BC in the Indus Valley Civilization. Although cultivated since antiquity, it was the invention of the cotton gin that lowered the cost of production that led to its widespread use, and it is the most widely used natural fiber cloth in clothing today. Current estimates for world production are about 25 million tonnes or 110 million bales annually, accounting for 2.5% of the world's arable land. China is the world's largest producer of cotton, but most of this is used domestically. The United States has been the largest exporter for many years. In the United States, cotton is usually measured in bales, which measure approximately 0.48 cubic meters (17 cubic feet) and weigh 226.8 kilograms (500 pounds).

3.1.3. Elastic or Stretch fabric
Stretch fabric is a synthetic fabric which stretches. Stretch fabrics are either 2-way stretch or 4-way stretch. 2-way stretch fabrics stretch in one direction, usually from selvedge to selvedge (but can be in other directions depending on the knit). 4-way stretch fabrics, such as spandex, stretch in both directions, crosswise and lengthwise. Stretch fabrics evolved from the scientific effort to make fibres using neoprene. From this 'Lycra') were brought to the market. Stretch fabrics simplify the construction of clothing. First used in swimsuits and women's bras, fashion designers began using them as early as the mid-1980s. They entered the mainstream market in the early 1990s, and are widely used in sports clothing. On a larger scale, the materials have also been adapted to many artistic and decorative purposes. Stretch fabric structures create contemporary looking design elements that have many uses in corporate theatre and event production.

3.1.4. Garment Sewing Work Aids
The term handling is normally used to describe those of those elements that are not sewing and it is this handling along with that dealing with garment bundling where they exist, plus various aspects of machine attention and personal needs, that make up 80 percent of the time spent working by most sewing machinists. The stacking of completed parts by one operator not takes time but may affect the next operator as well. This sewing work aid instrument very much effective for garments production. Such as Plan

Guide, guide, Compensating Foot, Stitching Jig, Specialized pressure foot, Light, Folder, Compressed Air, Slack Feeder, Stacker, Latch Back Device and Thread Cutter has been used for this experiment.

3.1.5. Machines

This project work is done in KDS Group, Chittagong, Bangladesh. There are different types of machine, Such as Stitch Machine, Flat Lock Machine, Feed of the arm, Bar Tuck Machine, KANSAI Special Sewing Machine, overlock Machine has been used for this experiment.

3.2. Method

Operation breakdown for this garment is given below-

1) Attach front pocket open facing.
2) Top stitch front pocket open facing.
3) OL fly, fly box, front rise.
4) Attach front pocket facing to bag.
5) Attach front pocket bag to open.
6) Edge stitch front pocket open.
7) Top stitch front pocket open.
8) Attaching tuck side and waist.
9) Close front pocket bag.
10) Top stitch front pocket bag.
11) Attach fly and edge stitch.
12) Zipper Attach.
13) J-stitch.
14) Fly box attach and top stitch.
15) Tuck front rise.
16) Top stitch front rise.
17) Make back pocket dart.
18) Back pocket hem.
19) Over lock back pocket and coin pocket.
20) Attach back yoke.
21) Attach back rise.
22) Iron back pocket.
23) Mark back pocket attach.
24) Attach back pocket with level.
25) Set front & back part.
26) Tuck in.
27) Inseam over lock.
28) Top stitch inseam.
29) Tuck side seam.
30) Safety stitch side seam.
31) Hip stitch.
32) Attach wash & care level.
33) Loop seas or & mark waistband.
34) Loop Attach.
35) Iron waistband.
36) Iron coin pocket + inner loop.
37) Waistband matching with body.
38) Inner waistband ends tuck.
39) Top stitch.
40) Waistband.
41) Up attach waistband.
42) Top stitch waist band up.
43) Attach.
44) False tuck waist band.
45) Waistband ends scissors.
46) Waistband ends open stitch.
47) Waistband end inner close.
48) Waistband end close top side.
49) Waistband end close 2nd stitch.
50) Bottom hem.
51) Attach coin pocket.
52) Loop truck up & down.

3.2.1. Calculation of SAM or SAM through Time Study

Step 1: Select one operation for which you want to calculate SAM.

Step 2: Take one stopwatch. Stand by the side of the operator. Capture cycle time for that operation. (Cycle time – total time is taken to do all works needed to complete one operation, i.e. time from pick up part of the first piece to next pick up of the next piece) [8] [9]. Convert this cycle time into basic time by multiplying cycle time with operator performance rating. [Basic Time = Cycle Time * Performance Rating].

Step 3: Performance rating. Now you have to rate the operator at what performance level he was doing the job seeing his movement and work speed. Suppose that operator performance rating is 80%. Suppose cycle time is 0.59 minutes. Basic time = (o.59*80%) = 0.472 minutes.

Step 4: Standard allowed minutes (SAM) = (Basic minute + Bundle allowances + Machines and personal allowances). Add bundle allowances (10%) and machine and personal allowances (20%) to basic time [8] [15].

To convert cycle time to normal or basic time needs to multiply it with operator performance rating. Now allowances for machine, fatigue and personal needs etc have been added. Machine allowance only to those elements where the machine is running, fatigue and personal needs to all elements are added .Finally, standard time for each element in seconds is found by summing up all elemental time and then seconds is converted into minutes. This is known as Standard Minute Value (SMV) [10].

3. RESULT AND DISCUSSION

3.1 Analysis the Comparison of Style wise SMV variation of with and without sewing work aid

Table 1: Variations of SMV for with sewing work aid and without sewing work aid in sewing section for different styles

Style No	SMV (min) Value		Variation of SAM (A-B) = (C)
	With Sewing Work Aid (A)	Without Sewing Work Aid (B)	
1st Garment	43.2	53.16	9.96
2nd Garment	43.3	53.43	10.13
3rd Garment	43.6	53.56	9.96

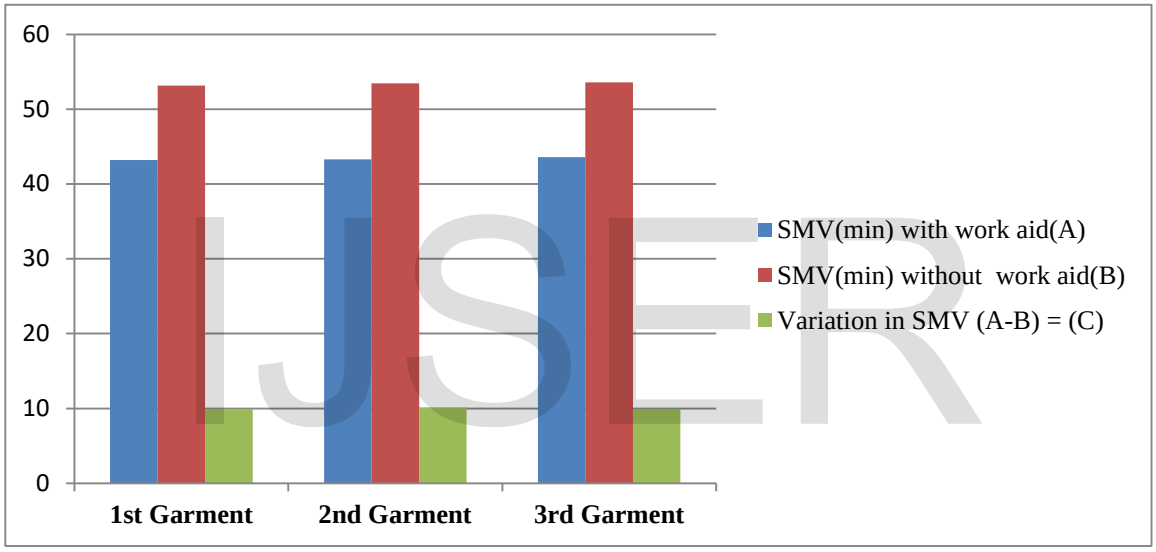

Figure 1: Comparison of Style wise SMV variation of with and without sewing work aid

From the above **Figure-1**, it is seen that SMV of the 1st Garment of 1st style produced using sewing work aid and without using sewing work aid. As a result, the 1st garment of SMV is lower than the same garment produced without using work aid.The matter is same for both 2nd garment and 3rd garment.

3.2 Analysis the Comparison of Production per Day with and without Work Aid

Table 2: Production per Day with and without Work Aid

Observed Garment No.	No .of Operator	Working Hours	Calculated Production		Difference	Average
			With Sewing Work Aid	Without Sewing Work Aid		
1st	60	8	667	542	125	
2nd	60	8	664	539	125	
3rd	60	8	661	538	124	124

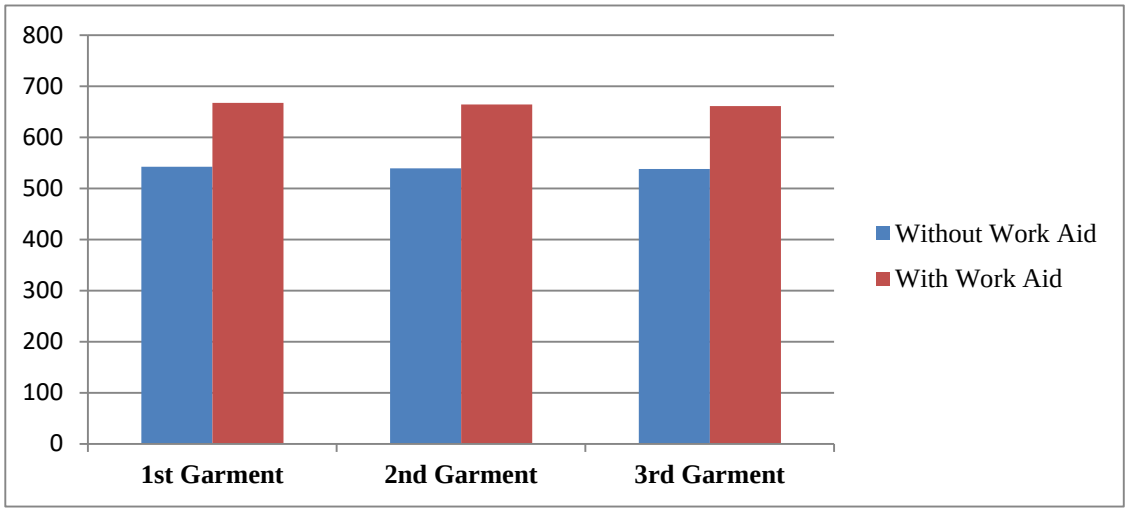

Figure 2: Comparison of Production per Day with and without Work Aid

From the above **Figure-2**, it is seen that SMV of the 1st Garment of 1st style produced using work aid is lower than the same garment produced without using work aid. As a result, the calculated production of the 1st garment of 1ststyle is higher than the same garment produced without usingwork aid. The matter is same for both garment 2 and garment3 of 1st style. The difference of daily production with and without using work aid was 124 on an average which was huge. Work aid ensures a better quality and increase the productivity of a garment manufacturing process Step. So, it is seen that Sewing works aid production higher than without sewing work aid production.

4. CONCLUSION

Working aid is an important and essential part of any Garments Industry. Working Aid is one of the most effective sewing tools. In the domestic production of garments, 50% of the time is wasted for the handling of fabric. Other 50% used for sewing. To reduce this wastage in industrial production of garments work aids required. These work aids are not only used to reduce the handling time but also used to improve the quality of the garments. The extent of process control in maintaining the processing parameters at desired level can be reduced thereby maintaining quality &increasing productivity. For this purpose, this research project will be very helpful.

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