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Analyzing Current Scenario of an RMG Factory in Bangladesh to Maximize Process Efficiency

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ABSTRACT

Bangladesh earns abundant remittance by exporting RMG products. But it has been observed that less process efficiency in an RMG factory causes lower productivity. So, they are concerned with increasing process efficiency to gain the global market. The purpose of the research is to maximize the efficiency by studying and analyzing the major processes of a selected RMG factory. Especially, the time study has been done on each sewing floor and cutting table to calculate the standard allocated minute (SAM). Those data have been analyzed using line chart, bar chart. The findings shows the efficiency for swing line lies between 47% and 25% and for cutting section lies between 45% and 25%. So, the reasons behind less efficient areas have been identified using motion study and root cause analysis. Then some possible remedies like eliminating unnecessary tasks, redesigning the facility layout were suggested to eliminate those reasons.

1. Introduction

Although Bangladesh has become one of the fastest growing countries in RMG sector, she still faces some difficulties in developing this sector further. Some RMG factories cannot take part in global market as they cannot keep pace with increasing market competition for these difficulties. Huge investment can be one of the ways to overcome these difficulties. But it is very difficult for a developing country like Bangladesh to manage this amount of money. A large amount of organizational profit can make it possible to manage their own money. One way of increasing organizational profit is to increase the efficiency of its major processes. It can be done by reducing its wastes, managing effective manpower to reduce bottlenecks, reducing non-value-added tasks, reducing unnecessary material movement etc.

This research work will be divided into two parts. The first part will work with increasing the major process efficiency such as cutting, sewing, finishing of a selected factory and the second part will with material handling to remove

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excess material movement. A renowned local RMG factory has been chosen for the study of this research. In this study the process efficiency is measured. It can be defined as the capability of human resources to carry out a certain process in the way that ensures minimized consumption of effort and energy. It can be calculated as the output of a business process for a unit of input [1].Work study is used in this research. Because it is employed to ensure the best possible use of human and material resources in carrying out a specified activity. In other words, work study is a tool or technique of management involving the analytical study of a job or operation.

It is a combination of two things. One is Method study which is a systematic procedure to analyze the work to eliminate unnecessary operations. Other is Time study which means a technique for determining as accurately as possible from a limited number of observations the time necessary to carry out a given activity at a different standard of performance. Practically, it studies the time taken on each element of a job [2].

The major objectives of this research are to analyze the current scenario (current efficiency of major process) of selected RMG plant, analyze the available data to find the key factors that hamper process efficiency and finally finding out probable solutions to minimize those factors.

2. Methodology

The research methodology adopted for this study was physical inspection and brain storming. The study was conducted on a knit based ready-made garment factory. At first preliminary investigation and data analysis were carried out at cutting, sewing and finishing to measure the efficiency of respective section. The equation [3] to measure the efficiency of sewing and cutting process is given below:

$$Efficiency = \frac{Earn\ Hour}{Availabe\ Hour} \times 100\ \% \tag{1}$$

Where,

$$Earn\ Hour = \frac{SAM \times Total\ Production}{60} \tag{2}$$

Here Standard Allowed Minute (SAM) is the amount of time required to complete a specific job or operation under existing condition, using the specified & standard method at a standard pace when there is plenty of repetitive work [4]. The equation [5, 6] that is used to measure the standard time or SAM is given below:

$$SAM = Normal\ Time\ (1 + Allowances) \tag{3}$$

Here, allowances include time for unavoidable delays, personal time and rest time to relieve fatigue. And the normal time for a job is the time that should take a qualified worker to perform the essential elements of a job while working at a normal pace. The actual time is the amount of time taken by the particular worker who was studied, at the pace he or she worked during the study. Normal Time can be found by the following equation [5]

$$Normal\ Time = Actual\ Time \times \frac{Performance\ Rating}{Normal\ Efficiency\ Rating} \tag{4}$$

Where, performance rating indicates the dedication of the worker in the work and is determined by observing the working procedure of the individual worker. As normal efficiency rating is usually 100 percent hence

$$Normal\ Time = Actual\ Time \times Performance\ Rating \tag{5}$$

And,

$$Available\ Hour = Total\ Manpower \times Working\ Hour \tag{6}$$

Hence,

$$Efficiency = \frac{SAM \times Total\ Production}{60 \times Total\ Manpower \times Working\ Hour} \times 100\ \% \tag{7}$$

Here actual time means cycle time which is Total time taken to do all works to complete one operation, i.e. time from pick up part of first piece to next pick up of the next piece [7, 8]. Efficiency with respect to time was calculated and Cause-Effect Diagram were used in the analysis part based on physical inspection to show the prominent cause under different section.

After identifying the major causes a brainstorming session was carried out with floor manager, quality inspector and workers. According to our observation and literature review some recommendation is provided to improve the condition. Due to time and money constraint, management could not be implement all of the suggestions as recommended.

3. Data Collection and Analysis

3.1 Profile of the Selected Factory

This factory consists of three sections which are cutting, sewing and finishing. Total number of workers are 1737. Cutting section has five cutting tables, four of them are equipped with spreader machine and other one is manually operated. There are eight major sewing lines and one module line followed by eight end line finishing in every sewing floor. Fabric store and super shop is situated at the top floor in which purchased fabrics and semi-finished garments are stored. At the ground floor there is a central storehouse for keeping finished products.

3.2 Overview of the Basic Processes

The basic processes of the selected RMG factory are shown in the figure below:

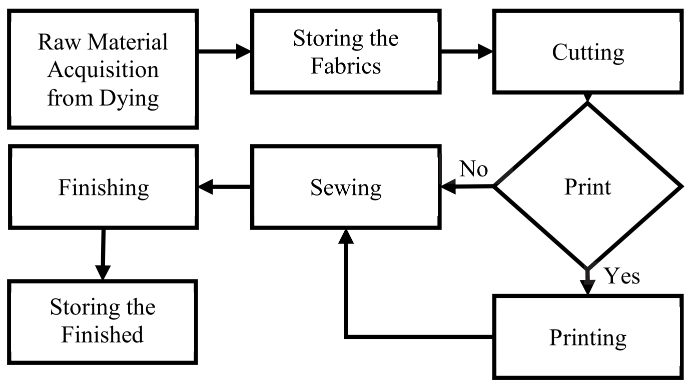

Figure 1. Flowchart of Major Processes of the Factory.

Table 1. Table of Data of Sewing Line 208 at November 21, 2018 Including Calculation for SAM.

Name of Operation	OP/HP	Average Cycle Time (min)	Rating	Normal Time (min)	SAM (min)
Front & Back Part Match	1	0.25	80%	0.20	0.23
Shoulder Join	1	0.26	85%	0.22	0.25
Neck RIB Tack	1	0.23	75%	0.17	0.2
Neck Join	1	0.22	78%	0.17	0.2
Back Tape Attach & Cut with Measurement	1	0.24	86%	0.21	0.24
Front Neck T/S & Threads Cut	1	0.26	79%	0.21	0.24
Back Tape T/S with Loop	2	0.59	81%	0.48	0.55
Sleeve Middle Sharing	1	0.29	83%	0.24	0.28
Sleeve Cut & Pair	1	0.23	89%	0.21	0.24
Sleeve & Body Match	1	0.22	88%	0.19	0.22
Sleeve Join	2	0.57	84%	0.48	0.55
Side Close	2	0.44	88%	0.39	0.45
Sleeve Round Hem	2	0.48	82%	0.39	0.45
Body Hem	1	0.21	81%	0.17	0.2
Final Threads Cut	2	0.51	85%	0.43	0.5
Total Manpower=	20			Total SAM	4.8

3.3 Calculation of Sewing Line Efficiency

Data collected from sewing line 208 are given below at 21 November, 2018.

So based on above data, it can be said that 20 persons (total manpower) produced 1282 units (Total Production) in working hour of 11 hours. Therefore, from equation (7)

Efficiency of sewing line 208 in 21 November. 2018 = $\frac{4.8\times1282}{20\times11}\times100\%$ = 47%

The efficiency of other sewing lines has been measured in similar way for one month. The efficiency of each sewing floor has been calculated by making the average of each sewing line efficiency of that floor which are illustrated in the following figure:

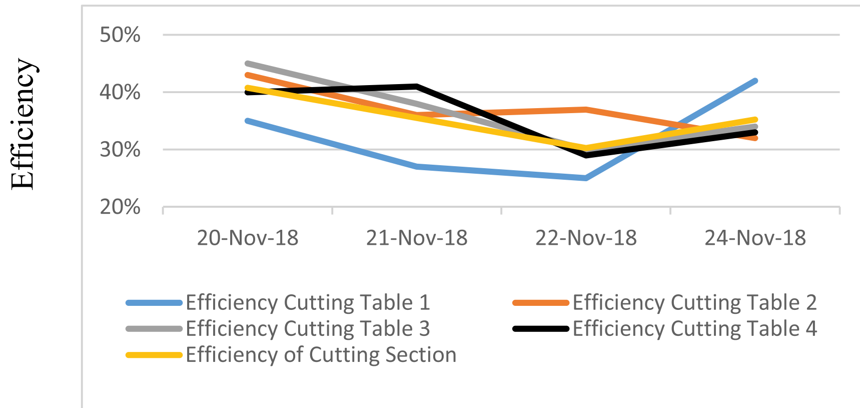

Figure 2. Line Chart Showing the Efficiency of Sewing Floors over November, 2018.

3.4 Data Analysis for Sewing Section

The efficiency of sewing line 208 at November 21, 2018 was 47 percent which is quite low. The root causes of lower efficiency were found by Root-cause analysis. They are shown in cause effect diagram which is provided below:

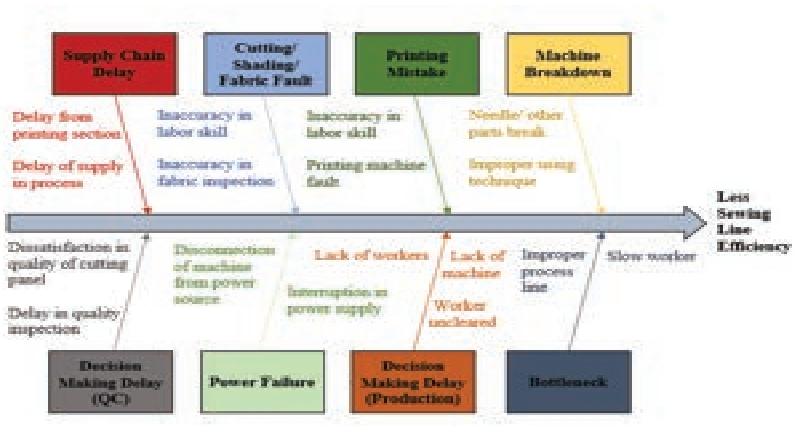

Figure 3. Cause-effect Diagram of Root Causes of Less Efficiency in Sewing Section .

3.5 Calculation of Cutting Table efficiency

Data collected from cutting table-4 at November 24, 2018 are given below:

Table 2. Data of Cutting Table-4 at November 24, 2018 Including Calculation for Earn Hour.

Lay Qty	Marker Pcs.	Cutting Qty	Time (min)
133	28	3724	148
103	22	2266	133
100	11	1100	133
55	14	770	98
110	28	3080	125
100	11	1100	119
100	11	1100	120
Total Time Required (Earn Hour)			876

Here, Earn Hour = 876 mins = 14.6 hours As total manpower = 4,
so Available Hour = 4×11=44 hours

So, the efficiency of cutting table-4 at November 24, 2018 $= \frac{14.6}{44} \times 100\% = 33.2\%$

Efficiency of other cutting tables were measured in similar way for four days. The efficiency graph of four cutting tables and overall cutting floor over four days is given Fig. 4:

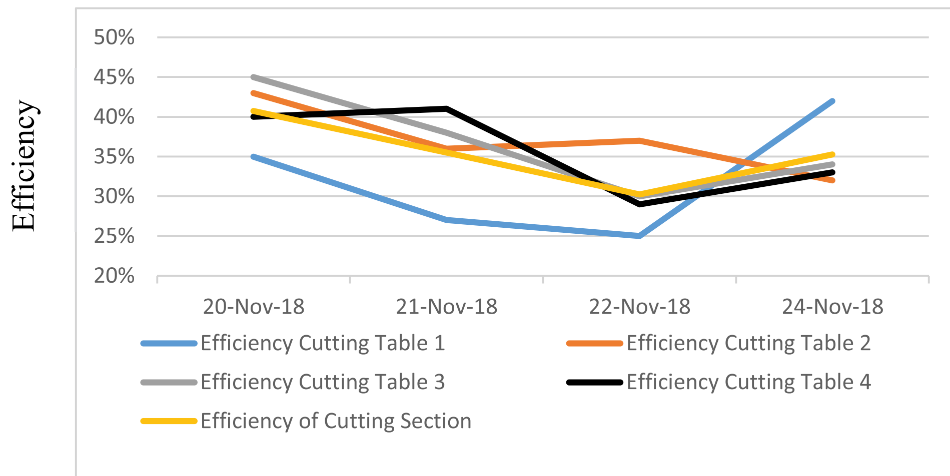

Figure 4. Graph of Efficiency of Cutting Section for Four Days.

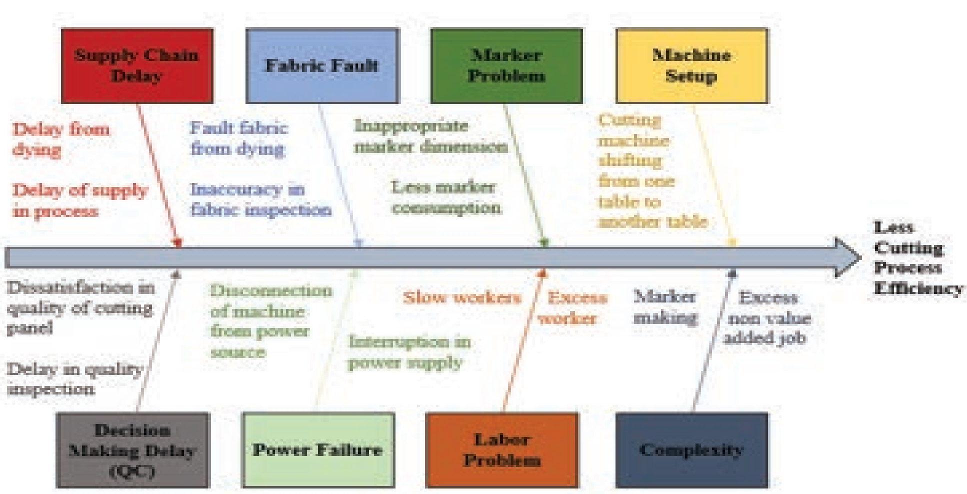

Figure 5. Cause-effect Diagram of Root Causes of Less Efficiency in Cutting Section.

3.6 Data analysis for Cutting Section

The root causes of the process being less efficient are shown in the Fig. 5 cause effect diagram:

3.7 Efficiency of Finishing Process

The tasks in finishing process are relatively faster than other processes. So, efficiency was not calculated for finishing section. Motion study was conducted on the tasks instead. Data acquired by motion study are given below:

Table 3. Identification of task as value adding tasks, necessary non-value adding tasks and non-value adding tasks in cutting process.

Name of The Process	Sample Qty	Required Time (sec)	Type of Time
Garments Counting from Sewing & Distribution to Iron Table	72	120	Necessary Non-value-added
Ironing	72	2520	Value Added
Final Check post	72	2400	Non-value-added
Goods Sent to Spot Room & Rectifying Garments	If necessary	900	Non-value-added
Measurement & Get-Up Check	72	1152	Non-value-added
Sizing	72	240	Non-value-added
Hangtag Attach	72	720	Value Added
Barcode Check	72	240	Non-value-added
Metal Detector Pass & Garments Count	72	116	Necessary Non-value-added
Receiving Garments from Metal Detector Pass & Counting	72	120	Necessary Non-value-added
Hangering	72	360	Value Added
Sizer Attach on Hanger	72	240	Value Added
Folding	72	432	Value Added
Assortment	72	405	Value Added
Polying	72	162	Value Added
Poly Mouth Close with Tape	72	130	Value Added
Carton Making	1	35	Value Added
Cartoning	72	150	Value Added
Carton Close with Tape	1	45	Value Added
Country Round with Sticker	1	15	Value Added
Carton Numbering	1	20	Value Added
Barcode Sticker	1	20	Value Added

3.8 Data Analysis for Finishing Section

Although the finishing process was faster it had too much non-value-added time. The percentage of value adding, non-value-adding and necessary non-value-adding time is given below:

Table 4. Percentage of different types of time in Finishing Section.

Type of Time	Total Processing Time	Value Added Time	Non-value-added Time	Necessary Non-value-added time
Total Time(sec)	10542	5254	4932	356
Percentages	100%	49.84%	46.78%	3.38%

Table 5. Material Movement Parameters Using 1st Sewing Floor.

Source	**Destination**	**Length (ft)**	**Average Time (sec)**
Ground Floor	Fabric Store (6th Floor)	211	129.96
Fabric Store (6th Floor)	Store on Cutting Table (5th Floor)	207	94.7
Store on Cutting Table (5th Floor)	Cutting Table (5th Floor)	50	14.345
Cutting Table (5th Floor)	Bundling Table (5th Floor)	39.5	12.41
Bundling Table (5th Floor)	Panel Quality Check Table (5th Floor)	30	12.1
Replaceable Cut Table (5th Floor)	Panel Quality Check Table (5th Floor)	16	10.35
Panel Quality Check Table (5th Floor)	Super Shop (6th Floor)	137	85.84
Panel Quality Check Table (5th Floor)	Ground Floor for Printing	171	102.93
Ground Floor from Printing	Printing Section on Cutting Floor (5th Floor)	282	129.63
Printing Section on Cutting Floor (5th Floor)	Super Shop (6th Floor)	248	113.77
Super Shop (6th Floor)	Store (6th Floor)	40	37.426
Store (6th Floor)	Sewing Super shop at 1st Floor	243	116.433
Sewing Super shop at 1st Floor	Line Input (1st Floor)	143	50.23
Line Input (1st Floor)	Iron Table/Hang Tag Table (1st Floor)	9	3.23
Iron Table/Hang Tag Table (1st Floor)	Final Finishing Section (1st Floor)	22	6.48
Final Finishing Section (1st Floor)	Central Godown (Ground Floor)	238	92.139

3.9 Efficiency of Material Handling

Layout of a facility greatly impacts on the material handling parameters as well as material handling efficiency. Facility layout of selected factory was functional based. The major material handling parameters that have impacts on material handling efficiency are length, time and worker required for material movement. Decreasing of these three parameters can greatly increase the material handling efficiency as well as corresponding process efficiency. The length and time required for material movement in selected industry using 1st sewing floor are given in Table 5.

3.10 Data Analysis for Material Handling Process

From the table and graph the data shows that for some steps the required time and length are much larger than that of other steps. The causes of that are shown in the following cause effect diagram:

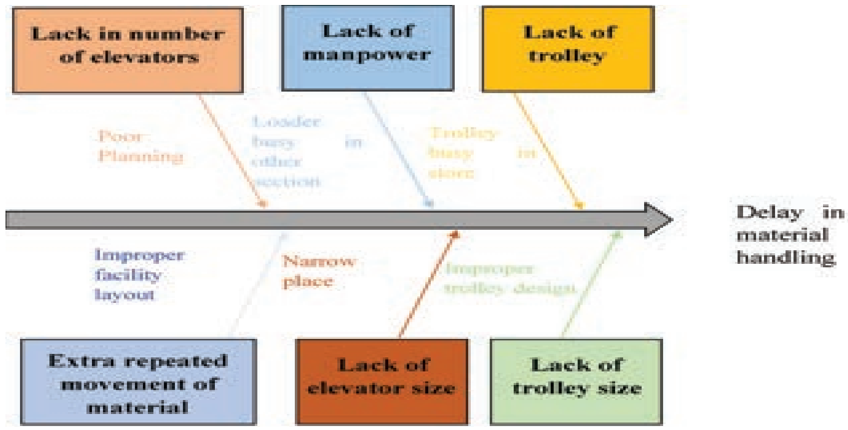

Figure 6. Cause-effect Diagram of Root Causes of Less Efficiency in Material Handling Process.

4. Results and Discussion

The efficiency of major processes of selected ready-made garment plant were analyzed. The process efficiency is not up to the mark because the cutting, sewing and finishing section cannot meet their target efficiency. Every section suffers from different types of complexities. Based on this analysis the reasons behind less efficiency of these processes were identified by using root cause analysis.

The findings show that the efficiency of sewing section varies between 50 to 70 percent. This section suffers due to some root causes. Making proper schedule with printing section, ensuring efficient material handling method, making the process of changing of needle and parts of sewing machine as simple as possible, showing proper machine using technique to worker to reduce machine breakdown idle time, ensuring availability of worker and machine and line balancing are some steps are needed to be taken to improve the efficiency of the sewing processes of the selected factory.

But the cutting section has a very low efficiency but it still can achieve the target quantity. Some possible solutions like performing proper inspection in dying section to reduce fabric fault before cutting process, proper marker making in first step and checking of marker, assigning more tasks to a worker for reducing required number of workers, simplifying cutting preparation process can be recommended.

For the purpose of achieving a good material handling method some parameters were analyzed. This analysis shows that there are some reasons behind delay in material movement. Some Suggestions were like redesigning the facility layout, relocating the functional department according to project base and setting up a new elevator having enough space to increase the loading capability are some recommendation for improving material handling method

The analysis of the finishing section shows that there are so many non-value-added jobs are present in this process. Some recommendations to avoid these non-value-added jobs like eliminating Barcode checking in finishing section, combining measurement check and sizing task can be were suggested to improve the efficiency of finishing and section.

6. Conclusion

The analysis of process efficiency of major processes of the selected factory and reasons behind less efficiency were presented in this research. The result shows that efficiency of every major process is not to the standard level. In some cases, the efficiency is too low which indicates high waste of resources specially manpower. For achieving better performance in industrial process the factory must increase their process efficiency by reducing waste of resources and by taking necessary steps. So implementation of some steps in each section as recommendation can help the factory to achieve better process efficiency than current situation.

But due to time and financial limitation only one RMG plant was considered for this research work. And as these recommendation did not implemented, implementation of these steps and their affects can be studied further.

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