Importance of Sewing line Capacity Study to Improve Productivity in RMG Industry

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Abstract

One of the most effective tools of Industrial Engineering is capacity study & analysis of a sewing line to increase or improve productivity. By using method, time, capacity, and production study, it is possible to improve productivity while reducing wastage. Two important attributes have been considered, one is possible standard method for each process, and another is considerable time. Time study took to record the actual individual capacity of each worker. I have recorded the time to make each process for each worker to find out the optimum number of operator and helper, type of machines, and individual capacity. To find out the (standard minute value) S.M.V, process wise capacity has been calculated, in addition to that I have calculated the target, capacity, manpower, line graph, labor productivity and line efficiency. Line has been balanced considering the bottleneck and balancing process where the balancing process has shared the excess time after the production in the bottleneck process. After applying all those processes, I have compared before & after situation of balancing the line, labor productivity and line efficiency. Finally proposed production layout has been modeled and ensures a better productivity.

Keywords
Capacity Study, Industrial Engineering Tools, Capacity Balancing and Ready-made Garment Industry.

1. Introduction
In Bangladesh RMG industry running with lots of challenges in production area. Due to production losses shipment commitment will be fail, day wise production line cost will not achieve & many more. Also, can't be able to take more orders for making profitability. Now global challenges also to reduce lead time garments supply chain. To face this short lead time orders our production lines productivity need to improve. In most of the factories having traditional approach that increasing working hour to get more production output. There can be a useful scientific tool that to capacity study of a sewing line. So that we can easily understand in which operations we have to increase manpower to balancing line. After balancing the sewing line operations capacity productivity will increase for sure. According to Ammerman and Barsalou (2015), doing root cause analysis is an alternative approach. It is a proven method for problem-solving while identifying the real cause of the problem. By using method related to time saving, its capacity and production study, it is possible to improve productivity while reducing wastage. Two important attributes have been considered, one is possible standard method for each process, and another is considerable time is consumed.

According to ANSI (American National Standard Institute) it is stated that time study is a work measurement technique consisting of careful time measurement of the task with a time measuring instrument, adjusted for any observed variance from normal effort or pace and to allow adequate time for such items as foreign elements, unavoidable or machine delays, rest to overcome fatigue, and personal needs. Time study took to record the actual individual capacity of each worker and process line. The work measurement techniques were applied for recording the times and rates of working in the elements within specific conditions. The results of work measurement for analyzing the data to determine the time necessary for carrying out a job at a defined level of performance. Currently our Readymade garments industries are facing a big challenge to improve their productivity & so that they can be able to get more order booking in capacity. Also, productivity improvement is biggest challenges to accept less Lead time order qty& to minimize production cost as well as to increase profitability.

1.1 Problem Statement

In the current scenario in RMG industry must accept short lead time order qty as per market demand. To manage these challenges, need focus more on productivity improvement by reducing bottleneck & with proper capacity study. Most of the RMG industries are used to practice their traditional approach to increase productivity without doing proper analysis for making improvement.

1.2 Objectives

The objective is to find the real time swing line capacity of a production line operations wise & to reduce bottleneck by doing proper capacity balancing to improve productivity. This is a tool can be applied to make change on capacity balancing of sewing line operations.

2. Literature Review

Ready garment manufacturing industry is facing challenges due to various factors including global competition, production costs increase, less productivity/efficiency, labor attrition, etc. the basic fact that our country has immense strength in human resources itself is the motivating aspect to feel for such an analysis. My analysis arrives at a view that I need better focus and Concentration in identifying the real issues, taking corrective actions suiting to the specific industrial center or unit, empowering the workers, supervisors, Executives, and managers by enhancing their knowledge and ability, analyzing orders effectively and decide whether it is viable for the factory, etc.

First, to clarify the problem statement, conducted a capacity study on the sewing operations. The data for production capacity was collected using a time study. A Time study was done on all the operations to calculate the actual hourly operation production capacity of the production line. In a same operation we have taken data total five different times & converted to average data. This total time study chart also mentioned in below. Second, root cause analysis, a proven method for a durable solution while identifying the real cause of the problem, was conducted. Capacity chart or graph is a standard tool used in garment manufacturing for the root cause analysis. Using root-cause analysis, critical problems related to man, machine, materials, and methods, were identified. (Tiwari & Garg, 2021). Thirdly, to minimize less capacity & over capacity of a sewing line we have balanced proper manpower distribution to line to get inform output. This capacity analysis graph also mentioned on below.

3. Methodology

Methodology applied here is doing time study of sewing process by using stopwatch of a sewing line. This data is an average data of every sewing operation of ready-made garments factory in 2020. This study aimed to find out real time production capacity of a sewing line operation process wise. This study doing time production of that style was running for 25 days. Full factory is woven bottom setup. Data collected total 5 different time (Seconds) of each sewing process by doing time study. Then average time (seconds) & capacity calculated for the process. Also note that we have added 10% allowance with average time as worker movement from the workstation. First operations cycle time data collected of every process of a sewing line by with a stopwatch. Secondly analysis methods conducted from books, articles, online websites, etc. The steps in the research methodology are presented as follows.

4. Data Collection & Survey

To do this study data collected by doing time study of sewing process in 5 different times & calculation done by the average number of every sewing operation. Doing capacity graph find out the bottleneck of the sewing line & balance operational process to increase productivity. Below given data collection & capacity graph (Figure 1).

SL	Operator Name	ID	Operation Name	1st	2nd	3rd	4th	5th	Avrg time(sec)	SMV	Capacity	Total capacity	Remarks
01	Shilpi	22715	LOOP MAKE	16	16	17	18	16	16.60	0.31	195	195	195
02	Rasida	36483	W/B FUSING	16	17	15	16	17	16.20	0.30	200	200	200
03	Beauty	25079	Elastic fusing	16	15	15	15	16	15.40	0.28	211	211	211
04	Marjia	38395	Wb make	16	15	16	17	16	16.00	0.30	203	203	203
05	Arifa	40969	Wb re Iron	16	15	15	17	16	15.80	0.29	205	205	205
06	Hena	3968	Wb mark	17	15	15	18	16	16.20	0.30	200	200	200
07	Suraiya	42048	Wb label att	15	16	18	15	16	16.00	0.30	203	203	203
08	Sopna	41177	Wb fit label att	15	15	15	15	19	15.80	0.29	205	205	205
09	Mamun	6153	ATTACH FRONT FACING TO POCKET BAG	16	18	18	17	18	17.40	0.32	186	186	186
10	Baten	39223	FRONT POCKET BAG OL	18	16	17	18	16	17.00	0.31	191	191	191
11	Dipa	41962	FRONT PKT 1/4 TOP STT	15	16	17	16	16	16.00	0.30	203	203	203
12	Nahar	42054	FRONT RISE OL	16	17	18	16	15	16.40	0.30	198	198	198
13	Sabana	35596	ATTACH FRONT POCKET WITH CORNER CUT	16	17	18	18	16	17.00	0.31	191	191	191
14	Nazma	34988	FRONT POCKET TOP TUCK	16	17	15	18	16	16.40	0.30	198	198	198
15	Lucky	27345	FRONT POCKET BTK TUCK	16	17	15	14	16	15.60	0.29	208	208	208
16	Rehena	40671	S/FLY JOIN & T/S	18	17	15	14	16	16.00	0.30	203	203	203
17	Sapla	41752	ATTACH ZIPPER & FRONT POCKET TACK	15	16	15	15	18	15.80	0.29	205	205	205
18	Sorufa	36246	D/FLY TACK & ATTACH WITH LABEL	16	17	15	18	16	16.40	0.30	198	198	198
19	Chaina	39863	ZIPPER T/S WITH TWO PART JOIN	16	17	18	16	17	16.80	0.31	193	193	193
20	Rupali	36515	Bk pkting OL	16	17	18	16	20	17.40	0.32	186	186	186
21	Josna	15304	DART MAKE	17	15	16	17	16	16.20	0.30	200	200	200
22	Pervin	37487	SEWING BACK WELT POCKET(APW)	24	23	23	23	24	23.40	0.43	139	139	189
23	Shahin	17492	BACK WELT POCKET CUT & TURN	18	17	16	17	16	16.80	0.31	193	193	193
24	Hamida	42063	WELT PKT CORNER TUCK	18	17	16	17	16	16.80	0.31	193	193	193
25	Kartik	40568	PRESS WELT POCKET	18	17	15	17	16	16.60	0.31	195	195	195
26	Taslima	39865	WELT FACING CLOSE WITH MARK	15	17	15	17	16	16.00	0.30	203	203	203
27	Jewel	41113	EYELET HOLE ON BACK & TUMMY PAIR MATCH	18	17	16	17	16	16.80	0.31	193	193	193
28	Rasida	23133	BACK WELT HIDDEN STT	32	35	34	35	33	33.80	0.63	96	96	192
29	Shova	39112		32	35	34	35	33	33.80	0.63	96	96	
30	Roji	29990	BACK POCKET BAG 1/4 T/S	38	34	38	39	42	38.20	0.71	85	85	212
31	Shanta	29442		40	41	42	41	38	40.40	0.75	80	80	
32	Sajeda	41036		70	68	66	68	72	68.80	1.27	47	47	
33	Alpona	41908	STAY STITCH ON BACK POCKET & HIGH LOW MARK	16	17	15	16	15	15.80	0.29	205	205	205
34	Zillur	37671	BARTACK ON BACK WELT POCKET	16	18	15	16	15	16.00	0.30	203	203	203
35	Shati	40266	ASSEMBLY	16	18	15	16	15	16.00	0.30	203	203	203
36	Fatema	32936	WB MATCHING	16	18	15	16	15	16.00	0.30	203	203	203
37	Khadiza	36358	SIDE SEAM JOIN	35	34	35	35	38	35.40	0.65	92	92	185
38	Mukty	40982		35	34	35	34	35	34.60	0.64	94	94	
39	Minhaj	32768	INSEAM OVERLOCK	32	33	31	34	32	32.40	0.60	100	100	200
40	Afjal	36680		32	33	31	34	32	32.40	0.60	100	100	
41	Monir Pada	41223	HIGH TACK	18	15	16	15	16	16.00	0.30	203	203	203
42	Mahfuj	36131	BK RISE JOIN	15	18	17	16	18	16.80	0.31	193	193	193
43	Morjina	10148	WB HI LOW MARK	17	15	18	20	17	17.40	0.32	186	186	186
44	Sumi	23786	LOOP ATT	35	34	38	33	34	34.80	0.64	93	93	191
45	Salma	14623		34	34	33	32	33	33.20	0.61	98	98	
46	Nurjahan	42231	ATTACH W/B TO BODY	51	50	52	51	52	51.20	0.95	63	63	184
47	Khushi	32119		54	52	57	54	53	54.00	1.00	60	60	
48	Fahima	7849		51	52	53	51	59	53.20	0.98	61	61	
49	Surma	32137	MOUTH TACK L	17	16	17	17	18	17.00	0.31	191	191	191
50	Jahanara	42275	MOUTH TACK R	17	16	17	17	16	16.60	0.31	195	195	195
51	Nilufa	30176	W/B TACK - 4	48	48	51	50	51	49.60	0.92	65	65	195
52	Khadiza	33497		24	26	25	24	26	25.00	0.46	130	130	
53	Sahin	37770	W/B DEEP STITCH	51	50	50	48	50	49.80	0.92	65	65	190
54	Morjina	28734		51	60	61	51	50	54.60	1.01	59	59	
55	Sayed	20773		47	50	50	51	50	49.60	0.92	65	65	
56	Morjina	39277	J STT	15	15	15	16	15	15.20	0.28	213	213	213
57	Salma	26384	MOUTH TUCK	27	26	25	26	27	26.20	0.48	124	124	190
58	Nasima	37585	BOTTOM HEM	33	34	30	32	33	32.40	0.60	100	100	201
59	Rasida	23266		33	33	31	30	33	32.00	0.59	101	101	
60	Rokeya	40540	1/4 BTK	35	34	32	34	35	34.00	0.63	95	95	191
61	Alpina	37333		35	34	32	34	35	34.00	0.63	95	95	
62	Alpona	33954	LOOP BTK	38	35	36	34	35	35.60	0.66	91	91	182
63	Sumi	30477		38	35	36	34	35	35.60	0.66	91	91	
64	Sufiya	36144	EYELET HOLE ON WAIST	20	22	23	20	21	21.20	0.39	153	153	200
65	Rita	32315	GARMENT CLEAN	22	18	24	26	24	22.80	0.42	142	142	205

Figure 1. Capacity Study of sewing line operation wise.

5. Results and Findings

During this study observed that production related concern is not aware to use industrial engineering tools to increase productivity. Production staffs are not that much of technically sound & they are used to with traditional approach for their daily basis productivity follow up. After completing the study explained to all production staffs to make them understand.

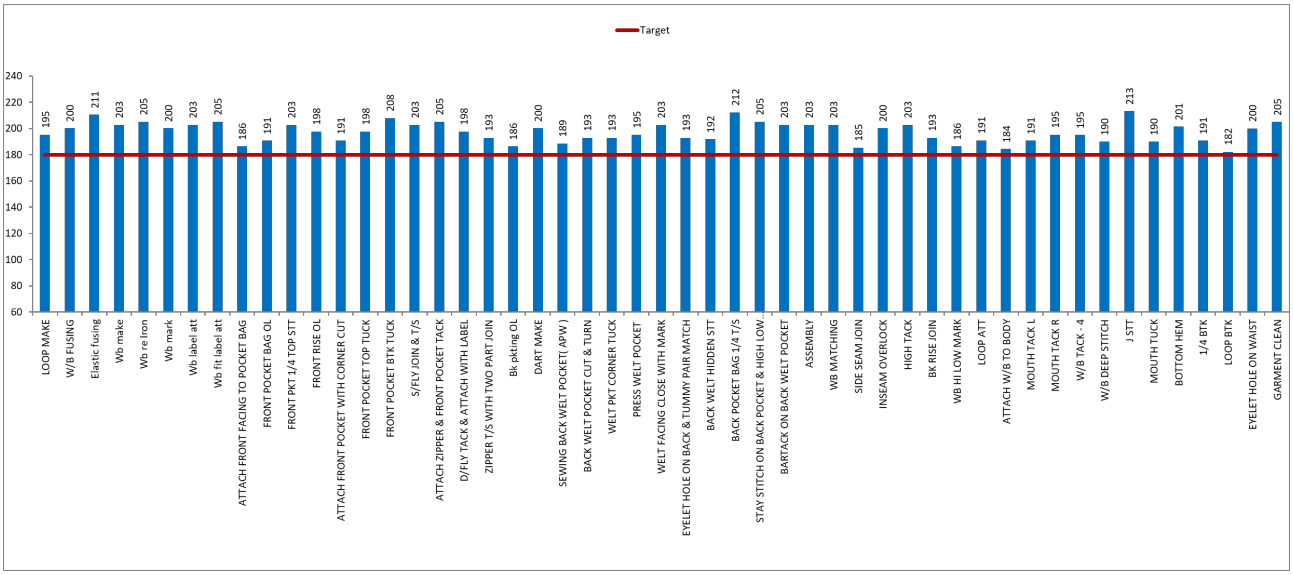

Figure 2. Capacity graph of a sewing line

Summary Result achieved with the survey are –

- By doing capacity study can be able to understand the process wise capacity.
- With this capacity study graph can decide easily to reduce operation bottleneck.
- To make inform capacity balancing of every process this capacity graph will give right picture.
- In this Figure 2 is reflecting to make understand to set a inform base target of line output.
- Capacity study will help to understand to manpower balancing operations.
- Also, can be able to reduce additional manpower from the overcapacity process.
- It is reflecting the capacity study graph in Figure 2 that we can deploy manpower if any operations having low capacity from the based plan target.
- Production staffs are very clear on this analysis & successfully implemented for all sewing line.

6. Discussion and Conclusion

6.1 Discussion

At present lots of RMG industries are not practicing proper industrial engineering tools & techniques to analyze the productivity improvement issues, where management or concern persons can find out the actual reason. As this high time to implement industrial engineering tools & techniques to increase productivity in RMG industry. As we must go with more advancement in RMG industries for digitization & automation to convert in industry 4.0. This sewing line capacity study is proven method to balance sewing line & to improve productivity. Only thing is people need to train up properly to apply & continue using this tool to improve sewing line productivity.

6.2 Conclusion

It can be concluded that, capacity study is effective tool that we can analyze the real time capacity status of a sewing line. Also, can easily identify process bottleneck to make line balance for the inform final line output. Currently entire global manufacturing system is upgrading to Industry 4.0. Also, with lots of high-tech technology like robotics technology, cloud computing, IOT etc. But it is observed that in Bangladesh RMG industries huge number of people are not properly skilled to adopt the new global upcoming industrial technical culture. Also, Company management need to arrange technical training sessions to develop or skilled their manpower. Capacity study, other

industrial engineering tools & technics can make positive change finance also. This analysis tools (Data collection & presentation) can convert it in digitally (Automatic) by using different types of MIS tools.

6.3 Limitations and Future Scopes

During this study faced issue from production supporting team. Only highlighting lots of problems. Need to motivate people to change their mentality or thinking to accept teamwork culture production floor. There are lots of RMG industries where we can share productivity improvement & process optimization techniques. We can use MIS tools to get this type of data & analysis in every day. Also, we have huge opportunity to convert our factories to Industry 4.0

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Biographies

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