

Benefits of using Unit Production System (UPS) Line over Conventional Line in the Sewing Section of a Garment Industry

**Md. Atikul Islam
Industrial Engineer**

**Department of Industrial Engineering and Management
Khulna University of Engineering & Technology (KUET), Bangladesh**

Abstract

A production system may be defined as the means by which we transform resource inputs to create useful goods and services as outputs. There is a lot of production system available in the production floor including bundle production system, progressive line production system, Straight line System, Unit production system etc. Each production system has its own specific operational characteristics. The Unit Production System (UPS) can be described as a mechanical system and the essential feature of UPS is the unit of production is a single garment and not bundles, the garment components are automatically transported from workstation to work station according to a pre-determined sequence, the work stations are so constructed that the components are presented as close as possible to the operator's left hand in order to reduce the amount of movement required to grasp and position and component to be sewn. The benefits of this system are bundling handling completely eliminated, time involved in pick-up and disposal is reduced to minimum, output is automatically recorded, and styles can be produced simultaneously on this system.

Keywords

UPS, Unit Production System, Mechanical Production System, Unit Production of Garment.

1. Introduction

The choice of best apparel production system will depend on the product and policies of the company and on the capacities of manpower. Most of the production systems employed in clothing factories includes the progressive bundle production system – batch system. This system is exactly what its name implies, a system whereby the garments are gradually assembled as they move through successive sub-assembly and main assembly operations in bundle form. The principles of this system are: The various sections are positioned according to main operation sequence, with each section having a layout according to the sequence of operations required to produce a particular component. For example, the collar section could contain the following sequence of operations:

1. Run Stitch Collar
2. Collar Turn/Iron
3. Collar Top Stitch etc.

The amount of machinery for each operation would be determined by the output required. A work store is positioned at the start and end of every section of these buffers is used to store work received from a preceding operation, and to hold work completed by that section. Due to these work stores or buffers, each section is not directly dependent on the preceding section, but can absorb slight variations in output via the stocks held within the section.

The progressive bundle system, while being somewhat cumbersome in operation and requiring large quantities of work in progress, is probably one of the most stable systems as regards output. Unless there is serious absenteeism or prolonged special machine breakdowns.

The Unit Production System (UPS) can be considered as a mechanical system. The essential features of this type of system are the unit of production is a single garment and not bundles, the garment components are automatically transported from workstation to work station according to a pre-determined sequence and the work stations are so constructed that the components are presented as close as possible to the operator's left hand in order to reduce the amount of movement required to grasp and position and component to be sewn.

2. Methodology

The operational principles of Unit Production System (UPS) are as follows:

All the components for one garment are loaded into a carrier at a workstation specially designed for this purpose. The carrier itself is divided into sections, with each section having a quick-release clamp, which prevents the components from falling out during movement through the system. When a batch of garments has been loaded into carriers they are fed past a mechanical or electronic device, which records the number of the carrier and addresses it to its first destination. Some of the more intelligent systems address the carriers with all the destinations they will have to pass through to completion.

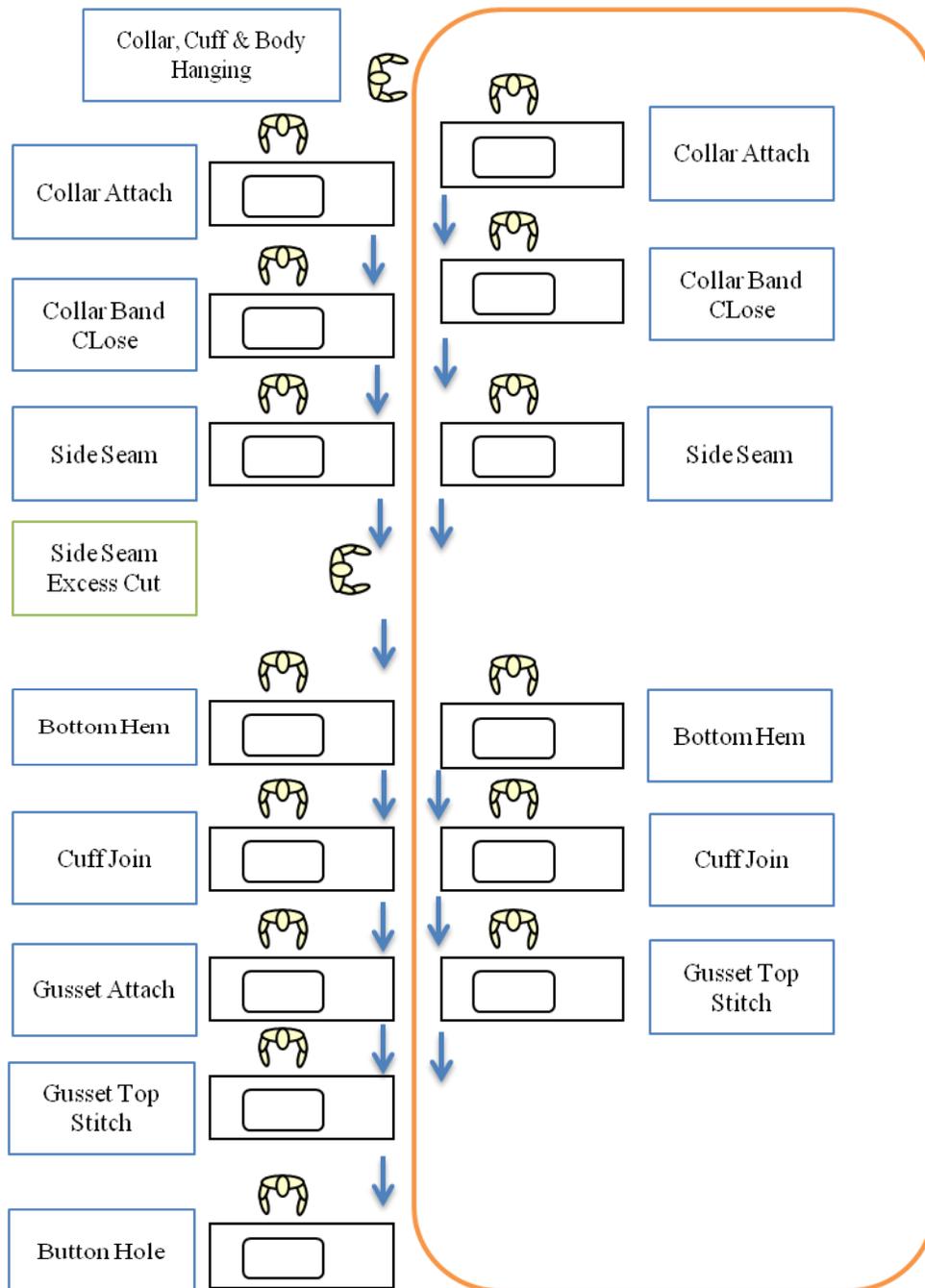


Figure 1: Layout of UPS Line

The loaded carriers are then fed onto the main powered line, which continually circulates by the small pushing by hand. This main, or head, line is connected to each workstation by junctions, which open automatically if the work on a carrier is addressed to that particular station. The carrier is directed to the left side of the operator and waits its turn along with the other carriers in the station.

When the operator has completed work on one carrier, a push button at the side of the sewing machine is pressed and this actuates a mechanism, which transports the carrier back to the main line. As one carrier leaves the station, another is automatically fed in to take its place. When the carrier leaves the station it is recorded on the data collection system, and then addressed to its next destination.



Figure 2: Working Procedure of UPS

3. Research and Findings of the Study

Unit Production System requires substantial investments, which are not always justified by conventional payback calculations. Apart from the measurable tangible benefits, UPS also have many intangible benefits such as a more orderly and controlled flow of work, and the ability via the control computer of simulating the production situation some time in advance. These intangibles are difficult to measure, but in themselves make a very positive contribution to the overall viability of the unit.

All things considered, unit production systems have major advantages over the other entire manual and the mechanical systems used for the mass production of clothing. Most importantly, they provide a clothing factory with the capability to respond quickly to any changes, which might occur. In the fast moving fashion business, this is essential.

The major measurable tangible benefits from UPS line can be summarized as follows

Table 1: Financial Benefits in the point of production

Description	UPS	Conventional
Plan Pieces per Day	1200	1500
Total Manpower for the line component and assemble	75	80
Allocated Manpower at assemble	14	19
Production at 10 hours per operator	86	79
Average pieces gain from UPS per operator per day		7
Total pieces gain from UPS line (7*14)		98
Average CM per		\$ 1.20
Gain of CM per day		\$ 117.6
Total CM gain for a month		\$2822.40

Table 2: Financial Benefits in the point of Manpower

UPS	Conventional
Sewing Manpower Saving	5
Quality Department Manpower Saving	2
Total Manpower Saving	7
Average Cost of One Head	\$ 125.00
Gain of Manpower Saving	\$875.00
Total Gain from UPS line	\$3697.40

The total Standard Minute Value (SMV) gain from Unit Production System (UPS) line can be summarized as follows.

Table 3: SMV Gain from UPS line

SL No.	Operation Name	SMV (UPS)	M/P (UPS)	SMV (Conv.)	M/P (Conv.)
1	Collar & Body Hanging	0.23	0.61		
2	Collar Attach	0.29	0.77	0.55	1.47
3	Collar Band Close	0.36	0.96	0.65	1.73
4	Side Seam Join	0.45	1.20	0.68	1.81
5	Side Seam Excess Cut	0.26	0.69	0.45	1.20
6	Sleeve Hem	0.62	1.65	0.75	2.00
7	Bottom Hem	0.48	1.28	0.65	1.73
8	Button Hole	0.41	1.09	0.62	1.65
9	Bar Tack	0.16	0.43	0.20	0.53
11	Shoulder Join & Top Stitch	0.83	1.00	0.93	1.00
12	Sleeve Attach	0.65	2.00	0.85	2.00
13	Arm Hole Outline	1.04	1.00	1.16	1.00
	Total Gain from UPS line	5.78	12.69	7.49	16.13

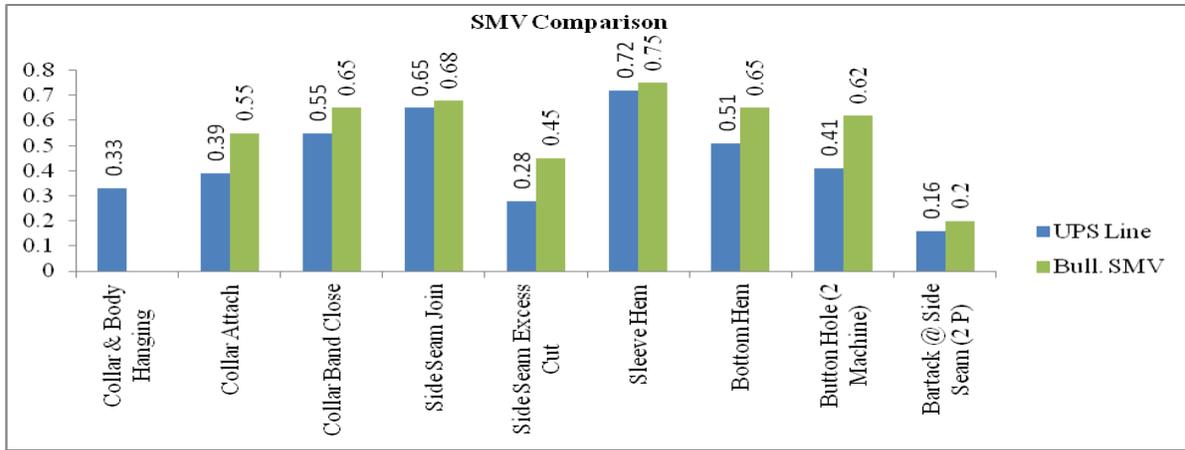


Figure 3: Operation wise SMV Gain from UPS Line

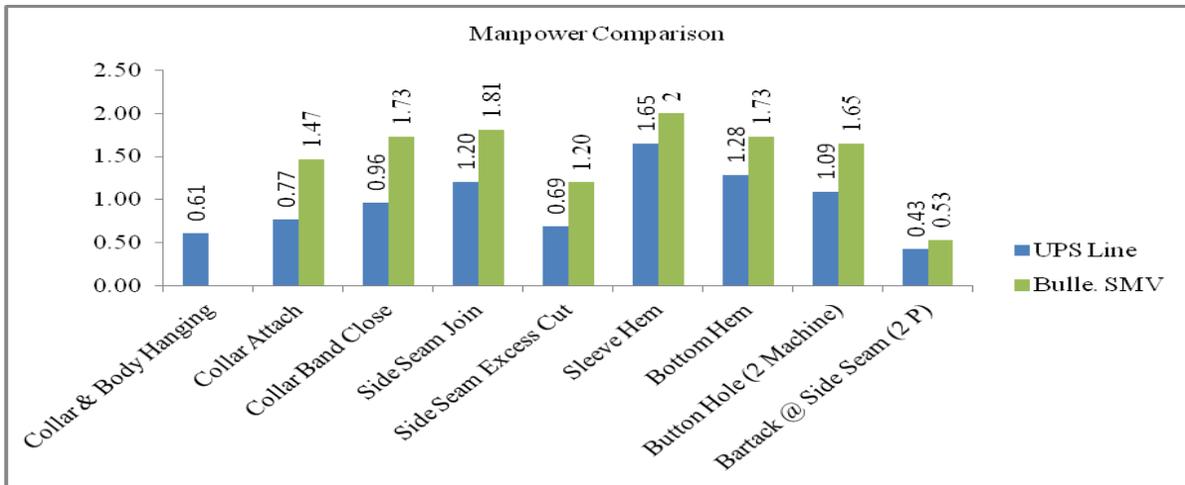


Figure 4: Operation wise Manpower Gain from UPS Line

The hourly output progress of the ups line is much more practical than conventional line. The hourly output progress is smooth and rises in a constant manner for new styles.

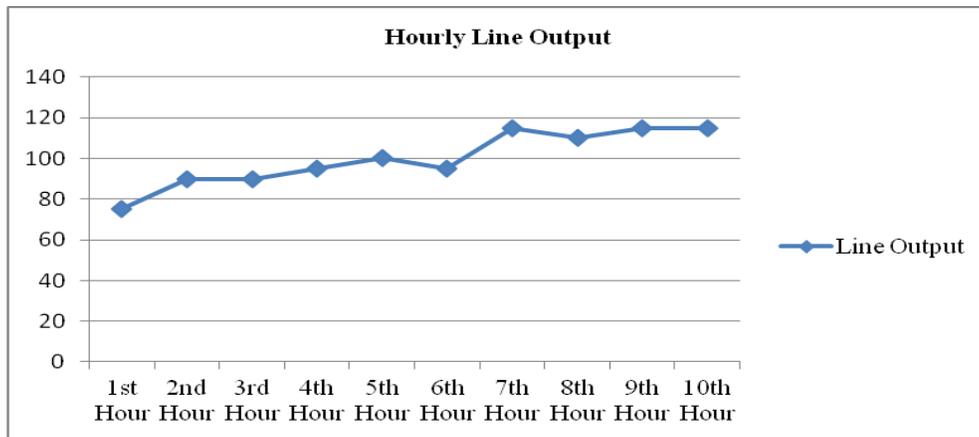


Figure 5: Hourly Output progress of UPS Line

The intangible benefits from ups line can be summarized as follows.

1. Bundle handling completely eliminated.
2. The time involved in the pick-up and disposal is reduced to minimum.
3. Output is automatically recorded, eliminates the operator to register the work.
4. Up to 40 styles can be produced simultaneously on one system.
5. Quick response sewing system.
6. Quick response sewing layout.
7. No chance of serial and sequence mistakes.
8. Better handling of garment without touching floor.
9. Better monitoring environment.
10. Smooth production can be achieved.
11. The quantity of each component is checked during the individual operation itself, and the quality is good.
12. There is no problem with WIP. Because smooth production helps to control WIP.

The ups line has some major disadvantages. By taking preventive measures these disadvantages can be avoided.

1. Unit production system requires high investments.
2. The payback period of the investment takes long time.
3. Proper planning is required to be effective.
4. Operators need to train first.
5. Balancing the line is difficult and this problem is solved by an efficient supervisor.
6. Proper maintenance of equipment and machinery is needed.
7. Proper planning requires for each batch and for each style, which takes a lot of time.
8. Improper planning causes labor turnover, poor quality, less production, etc.
9. Increase in WIP in each section increases the inventory cost.
10. Planned and proper layout should be made to make the system effective, i.e., smooth flow of material.
11. Variety of styles & less quantity are not effective in this system.
12. Shuttle operators and utility operators needed in every batch to balance the line effectively.

4. Future Recommendations

The unit production system used here is not automated. For that reason, the operators were not initially interested to it. Initially the operators complained that it requires much force to move those chains. If the movement of chains can be made automated by using air compressor or vapor compressor then the time required for handling the garment with the chain from one workstation to another workstation will be less. Operators will be more interested in working with ups line and the overall speed of work will be enhanced.

The clamps used initially were not able for mass production. After one month of implementation of ups line some permanent clamps are ordered specially so that clamp becomes much easier and does not require huge pressure. Using the new clamps the production increased about 35%. Before starting to plan a ups line the accessories need to manage first and the ups should be fully automated so that it creates interest among the workers first. Before starting the operators need to train first about the working procedure and system that will be maintained. If the ups line can be made automated so that the chains move automatically then the production can be increased to another 30%.

5. Conclusion

This mechanically automated ups line requires high investment at the beginning but successful implementation of it can provide us better result if we make it fully automated by vacuum or vapor compressor. The production is quite smooth and constant. The learning time for new operators working in ups line is high but once they get used to it, it provides better production then conventional line. Although the ups line was designed for 80 pieces per hour production but after running one month we achieved 120 to 130 pieces per hour. This is much more than expectation. And although the payback period was calculated 7 months but within 4 months the high investment recovered. The space required is also less compared to conventional line. For sewing lines the assembly sections only made ups. Due to this the number of lines increased 25% due to less space requirement. Finally, the ups line is highly beneficial if it can be installed successfully and maintains it properly.

Acknowledgements

I am very grateful to Mr. Hasitha (IE Manager) and Mr. Abhijit (COO) of the company for giving me the opportunity to work with the ups line and for giving me the support in learning about the unit production system. I am also grateful to all workers in the ups lines for giving me the support about achieving the desired targets daily and also to the quality section which helped me a lot to take all kinds of preventive actions to be done and achieving desired quality.

References

- Prasanta Sarkar., *Comparison between Progressive Bundle System and Unit Production System (UPS)*, Available:<http://www.onlineclothingstudy.com/2011/02/comparison-between-progressive-bundle.html>, July 15, 2013.
- Prasanta Sarkar., *Which production system is better - A Conventional line Or A Modular line?*, Available:<http://www.onlineclothingstudy.com/2011/02/comparison-between-progressive-bundle.html>, July 15, 2013.
- Ramesh, V., *Garment production systems: An overview Jones*, Available: <http://www.indiantextilejournal.com/articles/FAdetails.asp?id=28> July 15,2013.
- Khadem, M., Ali, A., and Seifoddini, H., Efficacy of lean metrics in evaluating the performance of manufacturing system, *International Journal of Industrial Engineering*, vol. 15, no. 2, pp. 176-184, 2008.
- Rajgopal, J., and Needy, K. L., Paper Submission Instructions for IERC 2001, August 15, 2000.
- Shetty, D., Ali, A., and Cummings, R., A model to assess lean thinking manufacturing initiatives, *International Journal of Lean Six Sigma*, vol. 1, no. 4, pp. 310-334, 2010.
- Son, Y., and Venkateswaran, J., Hierarchical Supply chain planning architecture for integrated analysis of stability and performance, *International Journal of Simulation and Process Modeling*, in press, 2006.
- Venkateswaran, J., and Son, Y., Information synchronization effect on the stability of collaborative supply chain, *Proceeding of the Winter Simulation Conference*, December 4-7, Orlando, Florida, pp. 1668-1676, 2005.
- Venkateswaran, J., and Son, Y., Production and distribution planning for dynamic supply chains using multi-resolution hybrid models simulation, *Submitted*, 2005.
- Venkateswaran, J., Production and distribution planning for dynamic supply chains using multi-resolution hybrid models, *Ph.D. Dissertation*, The University of Arizona, 2005.

Biography

Md. Atikul Islam is a Deputy Executive in Industrial Engineering Department of Pearl Garments Company Limited (PGCL) a sister concern of EPIC Group a Hong Kong based Multinational Garment Industry. He earned B.Sc. in Industrial and Production Engineering from Khulna University of Engineering and Technology, Bangladesh. He has published conference papers on International Conference on Mechanical, Industrial and Energy Engineering (ICMIEE) in the field of Supply Chain Management. Md. Atikul Islam has done research projects and Undergraduate thesis project with Kazi Badrul Hasan, Assistant Professor of the Department of Industrial Engineering and Management (IEM) of Khulna University of Engineering & Technology (KUET). His research interests include Supply Chain Management, Manufacturing, optimization, Operations Management, Operations Research, and Lean Manufacturing.