IMPLEMENTATION OF LEAN MANUFACTURING TOOL IN GARMENT SEWING PROCESS

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ABSTRACT

Garment industry is an assembly-oriented labour intensive industry. Lean manufacturing helps to identify the wastes and hence reduce the production cost and optimize the production process. The garment manufacturers have to coordinate the demand of quality, delivery, cost and flexibility of garments to achieve customer satisfaction. This study analyses the lean tools used in the Indian garment industry and their awareness level in the industry. Lean manufacturing has a growing importance in the garment industry so that it is able to maintain its competitiveness in the global market. Efforts are taken but they are not enough to transform the industry.

Keywords: Lean manufacturing; Garment industry; Wastes; Awareness level; production cost.

1. INTRODUCTION:

Lean Manufacturing is a theory that helps to simplify and organize the working environment so that the wastes are identified and reduced. Waste is anything that does not contribute to transforming a part to the customer's needs. The aim of lean manufacturing is the elimination of waste in every area of production including customer relations, product design, supplier networks, and factory management. Its goal is to incorporate less human effort, less inventory, less time to develop products, and less space to become highly responsive to customer demand while producing top quality products in the most efficient and economical manner possible. Also, it helps to keep the people, equipment, and workspace responsive to what is needed at the moment. (What is Lean, 2012).

1.1. LEAN MANUFACTURING:

Lean manufacturing is a systematic method that focuses on two major things: optimising production and reduction of waste. "Value" is any action or process that a customer would be willing to pay for. Lean is centred on making obvious what adds value, by reducing everything else.

Garment manufacturing is an assembly- oriented process with a great range of raw materials, product types, production volumes, supply chains, retail markets and associated technologies. The manufacturing process starts from fabric inspection, spreading, cutting, sewing, finishing, inspection and final packing.

Lean is most widely used in industries that are assembly-oriented or have a high amount of repetitive human processes. These are typically industries for which productivity is highly influenced by the efficiency and attention to detail of the people who are working manually with tools or operating equipment. Garment industry is such an example. It is an assembly-oriented labour-intensive industry. The involvement of human element is the major cause of errors. For these kinds of companies, improved systems can eliminate significant levels of waste or inefficiency. Lean manufacturing, therefore, helps in reducing the wastes in the process and improves the efficiencies.

Fig: Working Procedure of UPS

2. REVIEW OF LITERATURE:

Lean production directly descended from and is frequently used as a proxy for Toyota Production System (TPS), Jeffery (2004), which itself evolved from Ohno's (1988) experiments and initiatives over three decades at Toyota motor company. From Toyota point of view, lean manufacturing is a manufacturing philosophy that shortens the time line between the customer order and the shipment by eliminating waste. Manufacturing flexibility is very important for agility (Ngamsirijit, 2011) and can be improved by proper lean implementation. It means that you build what the customer orders as soon as possible after the order and that the total lead time is as short as possible. Any time a product is sitting, just waiting in a queue somewhere, Jeffery (2004) identifies this as a waste. According to Womack and Jones (1996), to become a lean manufacturer requires a way of thinking that focuses on making the product flow through production without interruption, a pull system that cascades back from customer demand by replenishing what the next operation takes away at short intervals, and a culture in which everyone is striving continuously to improve. After World War II, Japanese manufacturers were faced with vast shortages of materials, financial, and human resources. These conditions resulted in the birth of the lean manufacturing concept (Womack et al., 1990). Lean production is generally described from two points of view, either from a philosophical perspective related to guiding principles and overarching goals (Womack and Jones, 1996; Spear and Bowen, 1999), or from the practical perspective of a set of management practices, tools, or techniques that

can be observed directly (Shah and Ward, 2003; Liet al., 2005). This difference in orientation does not necessarily imply disagreement, but it does undermine conceptual clarity.

fig: General Overview of the garments sewing Section of Viyellatex Group

2.1 THE LEAN PRODUCTION GOALS

The principal goal of lean manufacturing is to create a continuous flow of Product from raw material to finished goods and on to the customer – no stoppages, no delays, no Interruptions because of inventory scrap or yield issues, downtime or the other problems that occur in a typical manufacturing operation.

"maximizing value (give the customer what they exactly need)"

"Minimizing waste (eliminate anything not needed for delivering value)"

2.2. LEAN MANUFACTURING TOOLS & TECHNIQUES:

Here are some of the most important tools of lean, ones that a typical lean practitioner must be proficient it and capable of applying:

- Value Stream Mapping
- Takt Time
- EPE
- Leveling (Heijunka)
- Pull Systems
- Setup Reduction
- Pokayoke (Mistake Proofing)
- 5S
- Seven QC Tools
- JIT
- Kanban

2.3. 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.

2. METHODOLOGY:

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.

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.

3.1. ASSEMBLY SECTION OPERATION IN BATCH PRODUCTION FOR BASIC ROUND NECK T-SHIRT

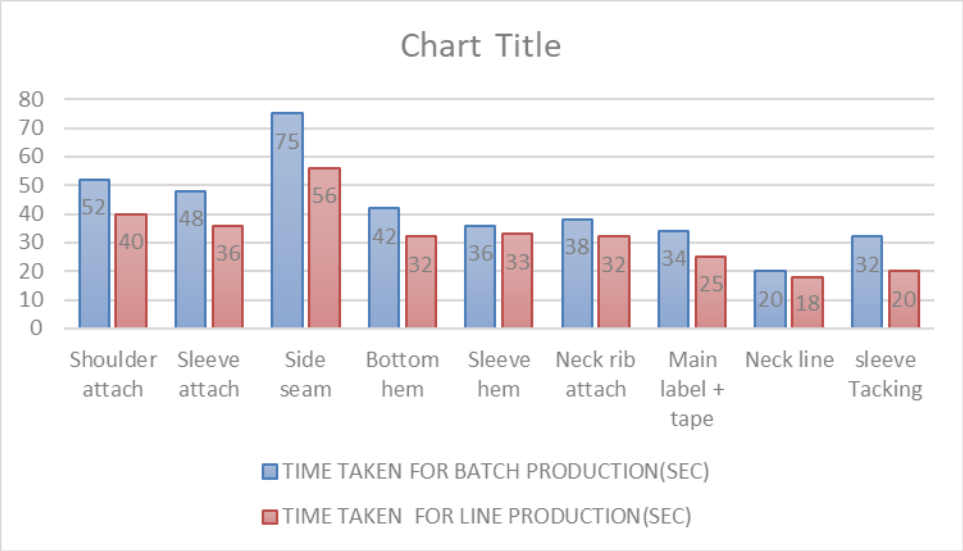
S.NO	OPERATION DESCRIPTION	TIME TAKEN(SEC)
1	Shoulder attach	52
2	Sleeve attach	48
3	Side seam	75
4	Bottom hem	42
5	Sleeve hem	36
6	Neck rib attach	38
7	Main label + tape	34
8	Neck line	20
9	sleeve Tacking	32

3.2. ASSEMBLY SECTION OPERATION IN LINE PRODUCTION FOR BASIC ROUND NECK T-SHIRT

S.NO	OPERATION DESCRIPTION	TIME TAKEN(SEC)
1	Shoulder attach	40
2	Sleeve attach	36
3	Side seam	56

4	Bottom hem	32
5	Sleeve hem	33
6	Neck rib attach	32
7	Main label + tape	25
8	Neck line	18
9	Sleeve tacking	20

COMPARISON

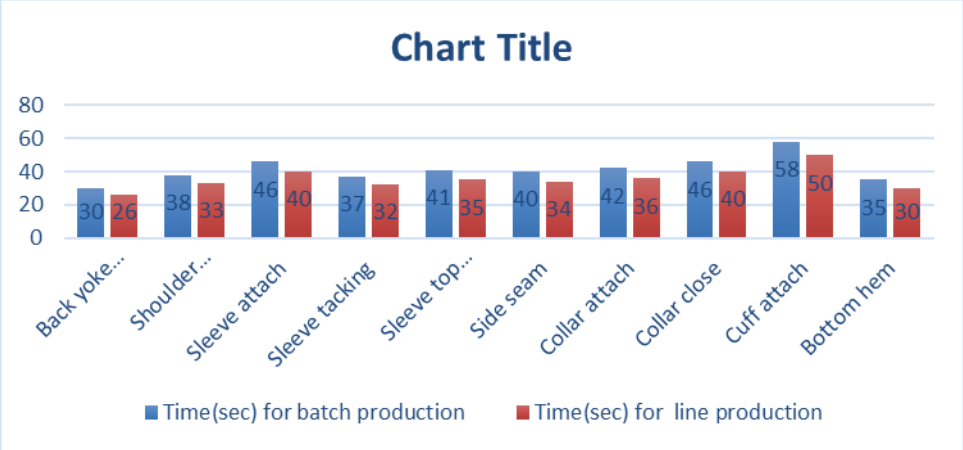


3.3. ASSEMBLY SECTION OPERATION FOR POLO T-SHIRT IN BATCH PRODUCTION

S.NO	OPERATION	TIME IN SECONDS
1	Back yoke attach	30
2	Shoulder attach	38
3	Sleeve attach	46
4	Sleeve tacking	37
5	Sleeve top stitch	41
6	Side seam	40
7	Collar attach	42
8	Collar close	46
9	Cuff attach	58
10	Bottom hem	35

3.4. ASSEMBLY SECTION OPERATION FOR POLO T-SHIRT IN LINE PRODUCTION

S.NO	OPERATION	TIME IN SECONDS
1	Back yoke attach	26
2	Shoulder attach	33
3	Sleeve attach	40
4	Sleeve tacking	32
5	Sleeve top stitch	35
6	Side seam	34
7	Collar attach	36
8	Collar close	40
9	Cuff attach	50
10	Bottom hem	30



4. 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.

REFERENCES:

1. Ruth E. Glock, Grace I. Kunz. ; (2005) , Apparel Manufacturing: Sewn Product Analysis (4th\ed.), P. 345.

2. Doeringer, P., & Crean, S. (2006). Can fast fashion save the U.S. apparel industry? Socio-Economic Review, 4, 353-377.

3. Monacarz, H.T. (1992), Information technology vision for the U.S. fiber/textile / apparel industry (NISTIR No. 4986). Gaithersburg, MD: U.S. Department of Commerce.

4. Park, H., & Kincade, D.H. (2011). A historic review of environmental factors and business strategies for U.S. apparel manufacturing industry, 1973-2005. Research Journal of Textile and Apparel, 15(4), 102-114.

5. Anonymous (May 14, 2011). Moving back to America: Multinational manufacturers. The Economist.

6. Friedman, A. (2012, September 5). Back in the U.S. they are WWD, Section II. Retrieved fromhttp://www.wwd.com

7. Kim, Y., & Rucker, M. (2005). Production sourcing strategies in the U.S. apparel industry: A modified transaction cost approach. Clothing and Textile Research Journal, 23 (1), Pg.1-12.

8. Su, J., Dyer, C.L., & Gargeya, V.B. (2009), Strategic sourcing and supplier selection in the U.S. textile-apparel-retail supply network. Clothing and Textile Research Journal, 27 (2), Pg.83-91.

9. G. Pan, (2014), A Quantitative Analysis of Cellular Manufacturing in Apparel Industry by Using Simulation, Journal of Industrial Engineering and Management, Vol :7 Iss: 5, Pg.1385-1396.

10. H. Eberle, et al.; (2008), Clothing Technology: From fiber to fashion, (5th ed); Pg. 128.

11. H. Eberle, et al.; (2008), Clothing Technology: From fiber to fashion, (5th ed) ; Pg. 128.
ed.), Pg. 346.

12. Ruth E. Glock, Grace I. Kunz.; (2005) Apparel Manufacturing: Sewn Product Analysis (4th

13. The Indian Textile Journal (http://www.indiantextilejournal.com/articles/FAdetails.asp?id=1988)

14.B.Sudarshan, D. Nageswara Rao ; (2013) "Application of Modular manufacturing System in Garment Industries" International Journal of Scientific & Engineering Research ; Vol 4 ; Is 12; Pg: 2083-2089.

15. V. R. Babu; "Garment production systems: An overview"; The Indian Textile Journal.

16. Pasqual, D. S. (2010). A origem do SPFW. Retrieved from http://sp.fashionweek.com.br/post/65-a-origem-do-spfw/

17. X. Wang, CH. Chiu, and W. Guo (2014), "Improving the Performance of Modular Production in the Apparel Assembly: A Mathematical Programming Approach", Mathematical
Problems in Engineering, Vol 2014, ID 472781, Pg.7.

18. J. T. Dunlop and D. Weil (1996), "Diffusion and performance of modular production in the U.S. apparel industry," Industrial Relations, vol 35, no 3, Pg. 334–355.

19. P. Berg, E. Appelbaum, T. Bailey, and A. L. Kalleberg (1996), "The performance effects of modular production in the apparel industry," Industrial Relations, vol. 35, no. 3, Pg. 356–373,
1996.

20. D. Kincade, J. Kim, & k. Kanakadurga (2013). An empirical investigation of apparel production systems and product line groups through the use of collar designs. Journal of Textile
and Apparel, Technology and Management, vol 8, iss 1, Pg. 1- 15.

21. Ready-to-wear apparel analysis, P. Brown/J. Rice, Merril Prentice Hall.

22. Clothing Technology, Verlag Europa, Lehrmittel Nourney, Vollmer GmbH & Co.

23. Introduction to Clothing Manufacture, Gerry Gooklin, BSP.

24. Introduction to Clothing Production Management, HJ Chuter, BSP

25. Computers in the Fashion Industry, P.Taylor, Heinemann

26. Carr & Latham's Technology of Clothing Manufacture, DJ Tyler, Blackwell Science.

27. Abecassis-Moedas, C. (2006). Integrating design and retail in the clothing value chain: an empirical study of the organization of design. International Journal of Operations & Production Management, 26(4), 412-428. doi: 10.1108/01443570610650567

28. Abernathy, F. H., Dunlop, J. T., Hammond, J. H., & Weil, D. (1999). A stitch in time: lean retailing and the transformation of manufacturing: lessons from the apparel and textile industries. New York: Oxford University Press. From Garment to Fashion Production

29. Agência Brasileira de Promoção e Exportações e Investimento. (n.d.). Grupo Moda. Retrieved from http://www.desenvolvimento.gov.br/arquivos/dwnl1259152949.pdf AMC Textile Ltda. (n.d.). Grupo. Retrieved from http://www.menegotti.com.br/novo_site/por/index.php

30. Associação Brasileira da Indústria Têxtile de Confecção. (2013). Monitor ABIT: conjuntura da industrial têxtile de confecção brasileira. Retrieved from
http://www.abit.org.br/adm/Arquivo/Servico/023119.pdf

31. Berger, S. (2006). How we compete: what companies around the world are doing to make it in today's global economy. New York: Currency Doubleday.

32. Bonacich, E., & Waller, D. V. (1994). Mapping a global industry: apparel production in the Pacific Rim triangle. In E. Bonacich, L. Cheng, N. Chinchilla, N. Hamilton, & P. Ong (Eds.), Global production: the apparel industry in the Pacific Rim (pp. 21-41). Philadelphia, PA: Temple University Press.

33. Buxey, G. (2005). Globalization and manufacturing strategy in the TCF industry. International Journal of Operations & Production Management, 25(2), 100-113. doi: 10.1108/01443570510576985

34. Carta, P. (2009, dezembro). Editorial: um homem e uma mulher. Vogue Brasil, 376, pp.710.
Charmaz, K. (2006). Constructing grounded theory: a practical guide through qualitative analysis. Thousand Oaks: Sage Publications.

35. Cheng, L., & Gereffi, G. (1994). U.S. retailers and Asian garment production. In E. Bonacich, L. Cheng, N. Chinchilla, N. Hamilton, & P. Ong (Eds.), Global production: the apparel industry in the Pacific Rim (pp. 63-79). Philadelphia, PA: Temple University Press.

36. Cholachatpinyo, A., Padgett, I., Crocker, M., & Fletcher, B. (2002). A conceptual model of the fashion process – part 1: the fashion transformation process model. Journal of Fashion Marketing and Management, 6(1), 11-23. doi: 10.1108/13612020210422428

37. Costa, A. C. R. da, & Rocha, E. R. P. da (2009). Panorama da cadeia produtiva têxtile de confecçõesea questãoda inovação (Relatório BNDES Setorial nº 29), Rio de Janeiro, RJ, Banco Nacional de Desenvolvimento Econômico e Social.

38. Currid, E. (2006). New York as a global creative hub: a competitive analysis of four theories on world cities. Economic Development Quarterly, 20(4) 330-350. doi: 10.1177/0891242406292708