Process optimization of Rasgolla Manufacturing using Lean Manufacturing Tools

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Abstract : *The Lean Manufacturing method developed by Toyota for process optimization and improvement have been an important toll for the manufacturing engineers which enables them to develop a process having minimum wastage of resources through the concept of MUDA, MURA and MURI. The lean manufacturing has been successfully implemented on the Rasgolla manufacturing of Barfiwala. The wastage of resources has been eliminated. The final proposed method had very little difference between the TAKT time and cycle time which indicative of successful implementation of Lean Manufacturing.*

Keyword **– Lean Manufacturing, TAKT time, Cycle Time, Rasgolla.**

I. INTRODUCTION

Lean manufacturing(L.M.), the method to systematically recognize the waste generating factors in the organization and to remove the waste through continuous improvement and harmonizing the product flowhas been developedbyToyota. Nowadays, the items sold quickly and for direct use to the consumers areFast-movingconsumergoods(FMCG)orconsumerpackagedgoods(CPG).The L.M. helps to carry out the process in the sequence to identify the waste and then find new solution to reduce the waste and increase the productivity and reduce the cost.The main principal of L.M. is to reduce the time by removing the waste and also continuous improving the process.

L.M. is helpful for removing waste by its various tools. In lean the waste is divided into three typescalled as 3M. The three types are MUDA, MURA and MURI. The main objective of lean tools is to remove this 3M from the organization. MUDA, a type of waste which consists of eight kinds, such as : Waiting, Defective, Overproduction, Inventories, Transport, Motion, Non-utilized Talent and excess preparing. MURI, over-burden, i.e. using the resources more than limits. Mura, and from expelling excessively Muda (squander) from the procedure. Whenever manpower or machinery are used for over 100% for complete any task, they are overburdened. This imposes breakdowns with regards to machines and non-appearance with reputes to workers. To improve the consumption of machinery & ensure they work suitably, safeguard and selfsufficient boost can be executed. To foresee more repsesentaion of sources. security happens to be the focal point of all procedure outlines & standard work activities.MURA, variability occur in the system due to variation in client demand, cycle time of differentoperator, uneven production strategy, non-standardized work, poor value component will lead to mura which have further leaning to create muri and hence muda.The term ‘lean production’was introduced by. The Machinery that was revolutionary and gave new dimension to the World. Lean production refers to a manufacturing paradigm which is based on the ultimate objective to constantly minimize waste to maximise flow .To cut or to get rid of the waste and nonvalue-added tasks from the process. The principle target of L.M. is to take out waste in human effort, stock, time to market and assembling space to turn out to be exceptionally amiable to shopper request while creating quality items in the most efficient and prudent way. This methodology centers around the end of waste. Waste can be started at whenever and anyplace and it can in numerous structures. In arrangements, methods, process , item structures, and in activities , the waste can be discovered covered up . It doesn't increase the value of the item yet just devours assets.Any material barring minimal measure of gear, effort, materials, parts, reality that are fundamental to increase the value of the item. L.M. is the blend of both mass and specialty generation : Providing a wide scope of items and all the more testing work with a capacity to diminish costs per unit and totally improving the quality . It has been make out certain that the I considerable expense and quality points of interest are with the associations who have learned L.M. techniques as campared to the individuals what my identity is as yet rehearsing customary large scale manufacturing.

2.0 RESEARCH METODOLOGY

Lean tools are made for efficient usage of the all-resources although, tools are of similar in nature and quite generic to understand, application of selected group of lean tools and their sequence must be consider sensibly in a specific circumstance depending upon external and internal operating condition.

2.1 METHODOLOGY OF IMPLEMENTATION

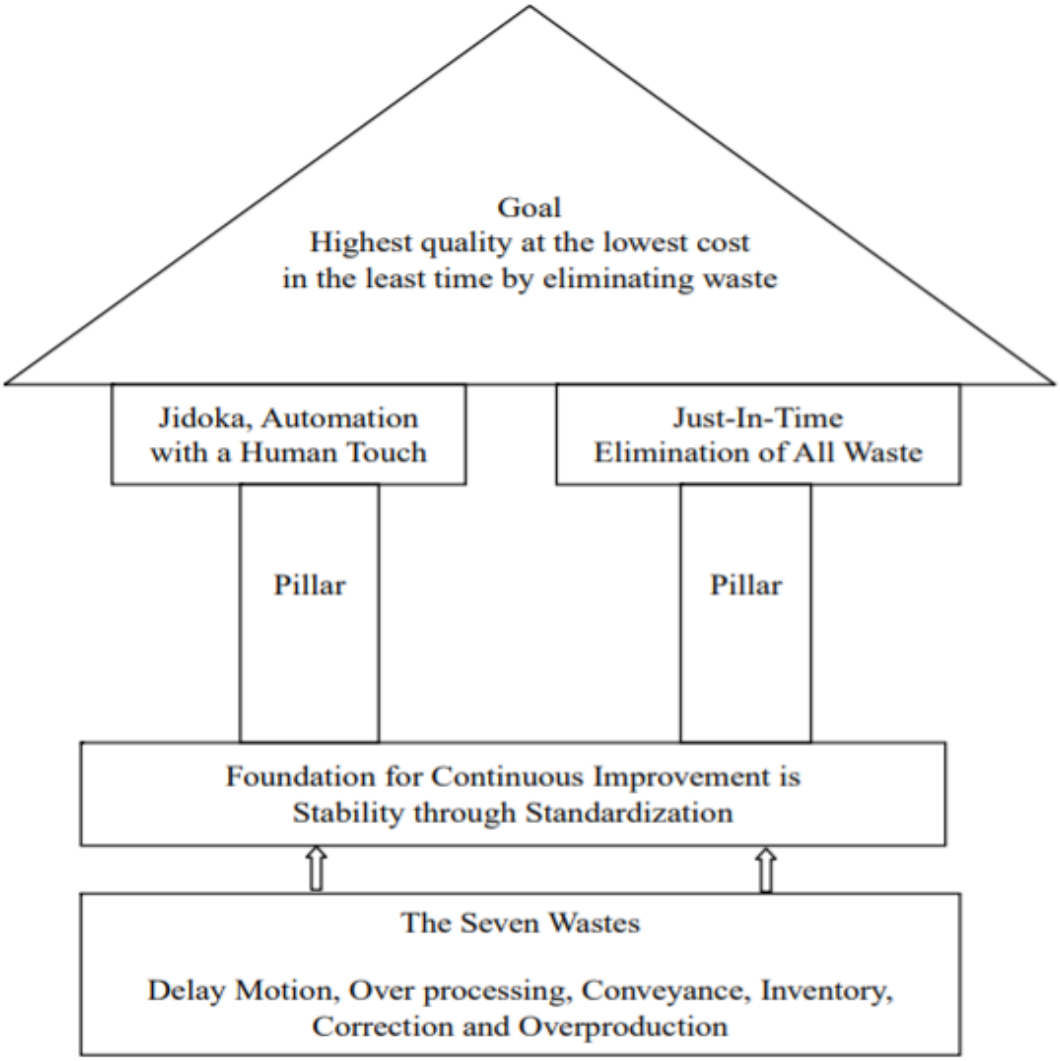


Figure 1 Basic lean concepts and method

The above figure shows the basic lean concepts and method. The main aim of applying the L.M. is to obtain the high quality of product at the least possible cost and also reduce the waste which are not adding any value to the product and obtain the consumer satsifaction. The different waste is to reduced by using different lean tools like JIT (just in time), Kaizen, Kanban, and many more.

3.0 IMPLEMENTATION

The Lean tool implementation is included in this chapter from the data gather by physical observation on the production floor and the past record from the industrial engineering and Bikanerwale planning department and also through some interview. To get the quick inference from the data , the collection of data can be tried to put in some visual forms . By using Microsoft excel and templates , the various execution and function can be done .

Steps involve in implementing a L.M.

1. Waste identification in the system/organisation:

According to this every organisation should know about their wastes hidden in the system.

2. Different types of waste can be present in the system:

Organisation should know about their waste present in the system and also the remedies of the waste. It is the duty of the organisation to identify the waste and rectify them. L.M. helps in rectifying the problem permanently.L.M. uses different tools to reduce the waste from the organization

3. To find out the main cause of the problem:

Using lean tools it is easy to identify the main causes of the problem. Looking at the each process properly help to identify the waste.

4. Testing of the solution:

After finding the solution then it can be implemented. L.M. gives advantage against those companies which are not using L.M. system.

3.1. VALUE STREAM MAPPING

The discrete production line of rasgullas of the value stream mapping has been shown in this division. By physical observation and some question at the workplace,the various data can be obtained through it .

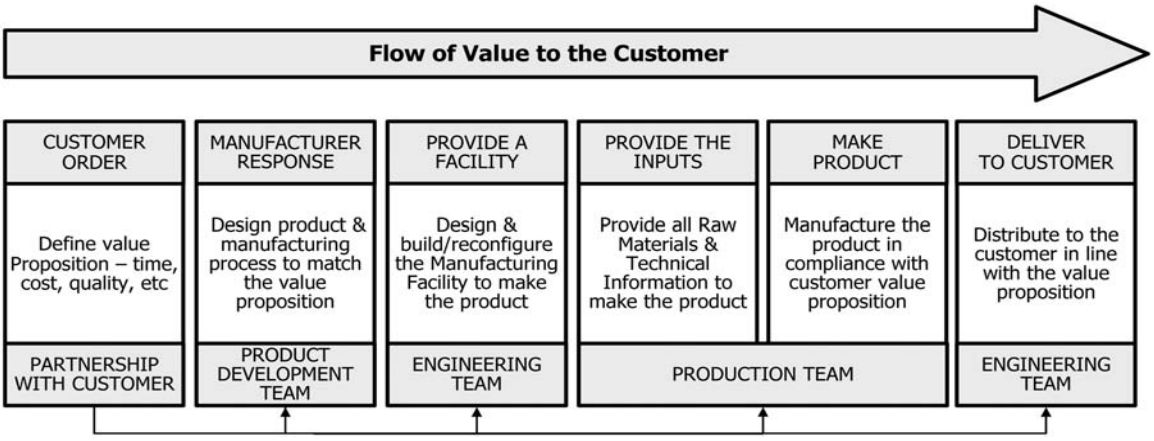


Figure 2 A simple value stream.

3.1.1 VSM of Rasogolla

Table 1 Cycle Time Calculation for rasgullas

Activities	Making of balls	Heating	Packaging
1	5	62	28
2	4	60	26
3	4	58	27
4	4	60	27
Average	4.25	60	27

The different parameters requried to obtain the value stream mapping is gathered from the physical observtion. The requried parameter includes cycle time, process time and change over time.

$$\text{Cycle time} = \frac{\text{Process time}}{\text{Product produce in that time}}$$

Table 2 Process time and change over time for rasogolla

Activities	Process time(minutes)	Change over time(minutes)
Boiling	9	16
Paneer Filtering	8	7
Maida Mixing	6	11
Making of ball	10	11
Heatinf/frying	.98	16

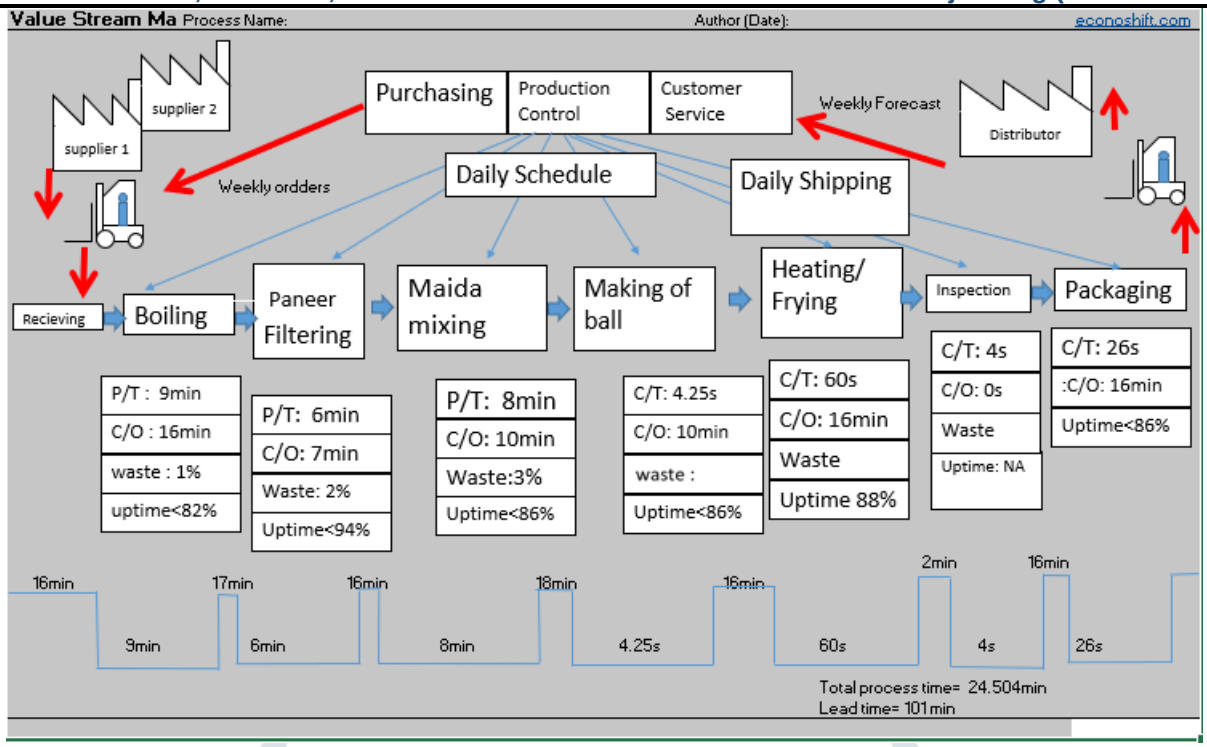


Figure 3: VSM of Rasgolla

The current state value stream mapping of rasogollamaking in the shop floor is shown in the above figure 4.2 . The weekly demand of costumer for the making the rasogollaare 4300kg which is to be fulfilled by the plant . The working of rasogollamanufacturing is for 9hr in a day and to 6 days per week. The sugar and milk is mainly consisted by the supplies delivery. Due to the difference in process time of each the accumulation of large WIP take place , the manufacturing is done in batch

starting with 200 litres of milk various process on the raw material is performed. The completed products from the previous machine device held up before start of handling at the following stage however the machines were never kept sit still. In Shipping Area, the prepared parts were then kept where they held up to be dispatched. The stream had a great extent push in nature. The full procedure is very much discrete manufacturing. From the batch is transported from one process through other the batch is transported due to which the large transportation of material internally has a lead increase. It is very low for the cycle time of ball making and very high for the process time for mixing maida by which sometime machine is unable to utilize to the full capacity so it remains idle. The defect in making balls during the ball making is high the defect generally aredevelopment of crack on the surface low binding characteristics etc. The shipment of rasgulla can be done daily to the distributor.

3.1.2 TAKT time calculation for Rasgullas

The Takt time is defined as the ratio of total time availabe to the consumer demand.

Total time available(A.T.) = Taken time(T.T)

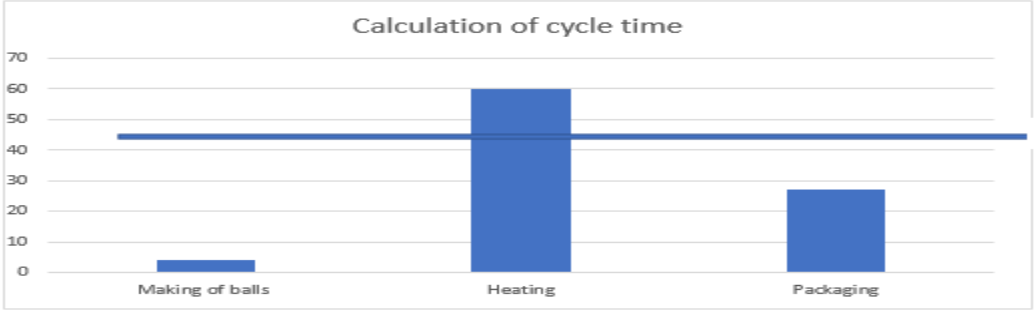
Consumer demand(C.D)

Total weekly available time = 6 × 9 × 3600s = 194400s

Weekly consumer demand = 4300kg

By using the above data and the equation the takt calculated as

$$\text{Taken Time} = \frac{194400}{4300} = 45.209\text{s}$$



. Figure 4: TAKT time vs Cycle time

Table 3 Frequency and Cumulative Frequency for plotting Pareto Chart

Sr. No.	Name of the Activity	frequency	cumulative frequency	percentage
1	Making of ball	125	125	64.86%
2	Cutting and rolling	30	155	83.78%
3	packing	18	173	93.51%
4	inventory	12	185	100.00%

The figure is shown between the activity the cycle time. So from the figure we can understood the heating of the rasogolla take more time than the takt time so to moderate the effect of this proper change in value stream map should be taken.Pareto chart determines that in a system 20 percent of the factors cause 80 percent of waste which is based on the rule of 80-20 . This technique is tried to find out the dominating factor in the value stream mapping which are responsible for 80 percent of the factors

3.1.3 Pareto chart

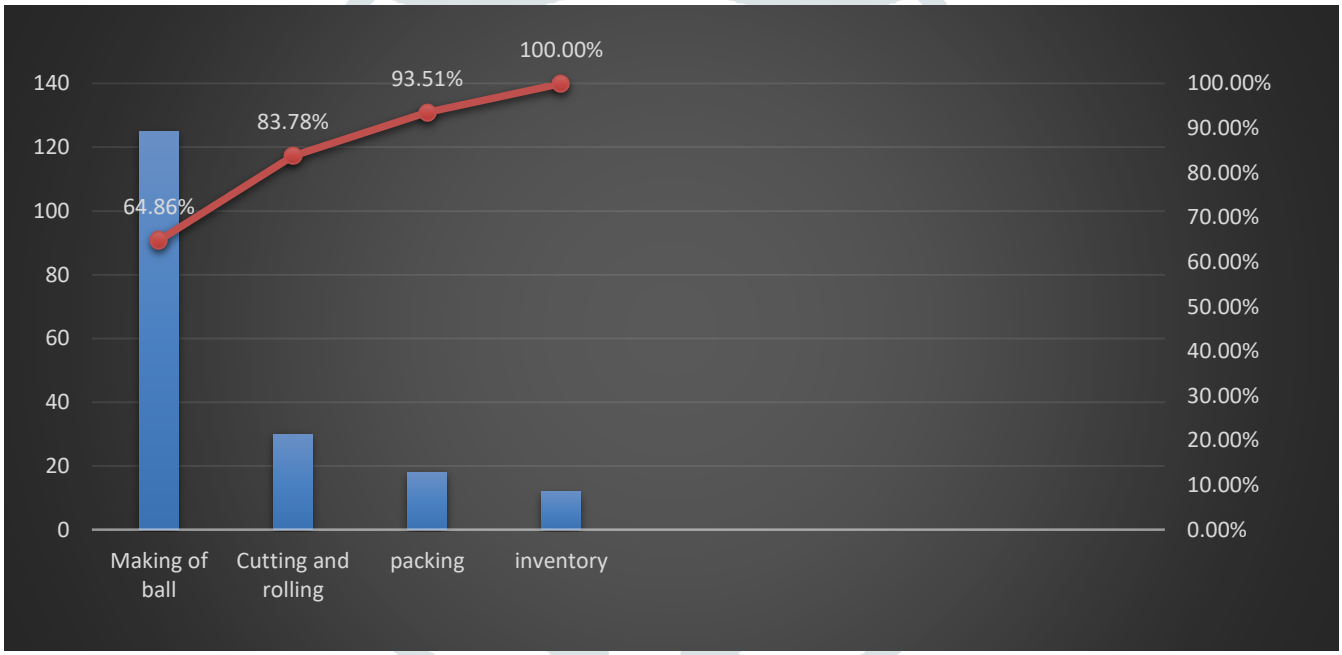


Figure 5: Pareto Chart for rasogolla

Conclusion:

The ballmaking, rolling and cutting together contributes the 84 percent of waste so to reduce those 80 percent of waste producing we must manipulate the waste production through these factors.

4.0 FUTURE STATE VSM OF Rasogolla

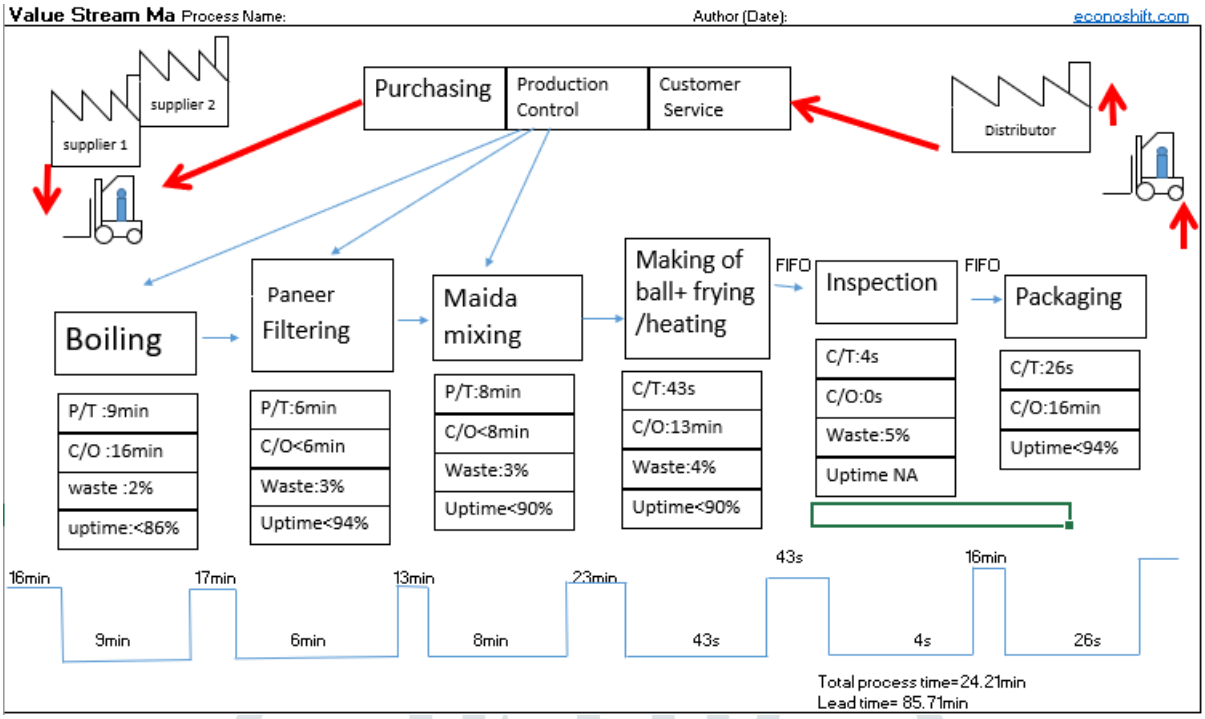


Figure 6: Future State VSM of rasogolla

The above figure showing the future state map of rasgulla making in this map various implementation of supermarket KANBAN and FIFO is done so that continuous production between the different processes is possible and combining of two process is done by which there is high reduction in lead time occur also the system created a philosophy of consumer pull system by using the supermarket concept. The KANBAN cards are control by production control so that the consumer demand is met by the manufacturing unit. It has also been observed that heating of sweet balls takes more time then the takt time, by combining the two process ball making and heating a reduction in the cycle time of process occur also great reduction in changeover time happen which further reduces the lead time.

5.0 CONCLUSION

FMCGs have a vast field of application of lean tools but it is great for the food industrial company for waste management in implementation in mass production. Pull based generation are being laid on the establishments of a lean creation framework to limit inventory conveying costs and lessen the general space prerequisite for setting up the plant. Under the observation, in the plant the discrete manufacturing function is done for the production of sweets which is challenging to bring lean study lean tools over them. In the organization, by using the current state map of value stream the VSMs application lead us to find factors causing waste. By the guidance of the Pareto chart, it guides us to the major factor for the production of defect in the organization although cause and effect diagram leads us to the possible causes. By utilizing the lean tools,the future state map is drawn like supermarket KANBAN pull system, FIFO lane for creating a consumerpulls continuous production governed and at high capacity, utilizing the resource leading to zero overproduction. By using future state map and the involvement of employee for making the process less prone to defect using poka yoke and kaizen there is a possible reduction in lead time and cycle time. Although under the specific limitations,as a lean procedure, VSM can be effectively used to recognize and turn away wastage in a production system.

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