

Effect of Lean Manufacturing Strategy on Factory Time Efficiency of Sugar industry

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Abstract: Today is competition in every sector of business so all the organization would find new strategy to work in a competitive environment that help them to work in a competitive environment, so for in a competitive environment work many strategy is developed from them one is very famous strategy is lean manufacturing which aim is eliminates all the waste and generate more value in customer perceptible. Since every industry have some hidden waste that effect on the productivity of the industry but we cannot find them or ignore them which directly affect the productivity of industry, so from that reason we applied this strategy on the sugar industry which is largest agro based industry of India another then textile. India is the second largest producer of sugar in the world but cost of production is high as compare to the other country which directly impact to the productivity because productivity is taken into account of value, so that reason we applied lean manufacturing to the sugar industry for finding the waste that affect to productivity and eliminate them. In finding the waste and their reason we used root cause analysis a tool of lean manufacturing for identification of main cause and after that we used kaizen approach for eliminate that. Conclusion that the lean manufacturing is directly impact to the productivity of the industry for increasing their productivity for finding waste and developing strategy for eliminate them.

Keywords: - Lean manufacturing, Sugar Industry, Productivity, Root cause analysis, Kaizen.

I. INTRODUCTION

Today is a globalization competition in every sector so that every organization needs to adopt the new approach for working and competition in the market, since organization will work on that to find waste of them and solve the problem for arise of the waste so working a new way from the traditional approach to new approach strategy is developed which named as lean manufacturing which concept is that create value without waste from that statement we work and apply that concept on the sugar industry because it one of the biggest agro based industry of India another then textile, since India is the second largest producer of sugar and largest producer of sugarcane but still there is lack of barrier is arises in production of the sugar that barrier if identified and solve them so we increased our production. This barrier directly affect the productivity of the industry which can increase the cost of production and value of the product decreased. There is an misconception for lean manufacturing is that they can applied only for manufacturing of discrete product but still it is an philosophy which target is a holistic value- added system throughout all division. A single point change which minimized waste is an lean manufacturing so from that we work to apply that strategy for implementation of productivity of industry on sugar industry. Since in an precious decade only few research is only that sector from that research they focused only about that continues process industry and valuable product should produced at the end of the process means sugar, but due to limited time of production period and that period we can achieve our target of production so that we focused on finding the waste of industry and required solution of that waste since no industry is perfect in every industry some type of waste is occur but we could not focused on them if the problem arises in big form then e focused on them because they effect the productivity of industry will be decreased. In India sugar industry does not set to target for only to generate value but still it can also help in rural development of the country because of that India is country on which economy mainly depends on the agriculture sector so it directly impact to the growth of the country.

Lean Manufacturing

Lean manufacturing is defined as a carry out of eliminating waste in every area of production including customer relations (sales, delivery, billing and product satisfaction), product design, supplier network, production flow, maintenance, engineering, quality assurance and factory management. In lean manufacturing, waste is identified as anything that does not add value to the process or service delivered to the customer.

The resounding principle of lean manufacturing is to reduce cost through continuous improvement that will eventually reduce the cost of services and products, thus growing more profits. Lean focuses on abolishing or reducing wastes and on maximizing or fully utilizing activities that add value from the customer perspective. From customer perspective, value is equivalent to anything that the customer is willing to pay for in a product or the service that follow. So the elimination of waste is the basic principle of lean manufacturing.

The Lean approach consists of a variety of practices, which aim to improve efficiency, quality and responsiveness to customers. To defines lean manufacturing as an initiative whose goal is to reduce the waste in human effort, inventory, time to market, and manufacturing space to become highly responsive to customer demand while producing world class quality products in the most efficient and economical manner. Lean manufacturing is about creating more value for customers by eliminating activities that are considered waste. This implies that any activity that consumes resources, adds costs or time without creating customer value is a target for elimination.

II LITERATURE REVIEW

The definition of lean manufacturing is a systematic approach to identify and eliminating waste (non-value-added activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection. (Kilpatrick, 2003)

Furthermore, lean manufacturing is a method that can be defined, refined, and duplicated. It must focus on eliminating waste. Muda, the Japanese term for waste, includes many forms generally overlooked when walking through the plant. The idea of perfection is the "waste-free" cost of manufacturing a product. Identifying and eliminating waste is a "Non-value-added" activity, this means that it requires, action, time, or resources, but adds nothing in the eyes of the customer. The purpose of applying Lean manufacturing is to provide the customer with just what they want when they need it, with no excess cost.

Moreover, lean manufacturing is a method that depends greatly on flexibility and organization; it is ideal for companies that want new and fresh manufacturing methods. Additionally, lean techniques eliminate large capital outlays for dedicated machinery until automation becomes completely necessary. (Bosh Rexroth Corporation, 2009)

Traditionally, studies develop Lean implementation models focusing on technical elements of the implementation. However, many of the studies of Lean production implementation or transformation are not explicitly framing the relationship between organizational change management issues and Lean production implementation. (Nordin, Deros, Wahab & Rahman 2011, 862).

The implementation of change is very crucial in Lean production. The implementation of change must be aligned with the operational issues, so that people in the organization can understand how they will affect and what must be done to address challenges in the organization. The ability to quantify the effort and progress towards Lean should enable more successful and longer lasting change. (Nordin, Deros, Wahab & Rahman 2011, 862.)

Management support plays a strong role in Lean production implementation (Worley & Doolen 2006, 242). Management failures often share some common characteristics. If the employees are not provided with enough information why Lean production is needed, failure is probable. Employees also need resources such as time and materials in order to successfully participate into the effort. Moreover, employees need to see the results, or disillusionment may occur. (Worley & Doolen 2006, 239.)

For the transformation towards Lean system, people should have a better understanding about Lean and also need to be aware about change management principles. For successful organizational change towards Lean organization, the critical factors are strong leadership, capable team, and effective communication. Failure in recognizing the required organizational change factors to be adapted in lean transition may hinder the long-term benefits of the company. (Nordin, Deros, Wahab & Rahman 2011, 862.)

In the last decades lean has been a major channel for organizational and process innovation in manufacturing companies. Despite successful applications being reported in several industrial sectors, concerning food and beverage industries these have been lacking. The characteristics of these sectors may have led to resistance in changing companies' practices and embracing new management philosophies such as LM. (Rui Borges Lopes 1*, Filipa Freitas 2, Inês Sousa 3, 2015)

In small and medium-sized enterprises get on a big wall in implementing Lean concept. The most common proportion structure of answers to the question about the problems in the implementation of Lean concept [%] Source: author's elaboration problems are inter alia: a barrier in relations between management and employees, lack of standardization, short-term financial goals, lack of information about the effects of activities and identification of Lean with a decrease in employment. Unfortunately, such an approach known as short-termism is a common mistake made by small and medium-sized enterprises. A big obstacle is the lack of knowledge of the techniques and tools used in Lean. As indicated by the respondents it is the result of lack of training or inadequate training detached from practice. In case of small and medium-sized enterprises problems in the implementation of Lean apply to a lesser extent technical issues, and to a greater extent management and control. This is related to the fact that in many cases the solutions applied in stable production, characteristic for large companies, cannot be used. Analysis of questionnaire surveys showed that there is great potential and demand for Lean solutions in the field of small and medium-sized enterprises. In Poland there are about 1.8 million companies out of which 99.8% are small and medium-sized enterprises. Based on questionnaire surveys, the most successful SMEs in implementing Lean in the analyzed group have been found among enterprises employing more than 50 employees, and the least successful employing up to 10 employees. This is related to limited financial resources, which makes that the changes made in the processes in SMEs have temporary or short-term character and repeatedly take the form of inconsistent with each other projects. (Robert Ulewicz, Robert Kucęba, 2016)

III OBJECTIVE OF THE STUDY

1. To increase the productivity of the industry which directly lead to value.
2. To identify the problem and make the help of lean tools short out that.
3. To maintain the continuo's flow of production eliminate the barrier of production.
4. Utilization of all the resources.

IV RESEARCH METHODOLOGY

The research methodology are used for the case study steps shown in the Figure 1

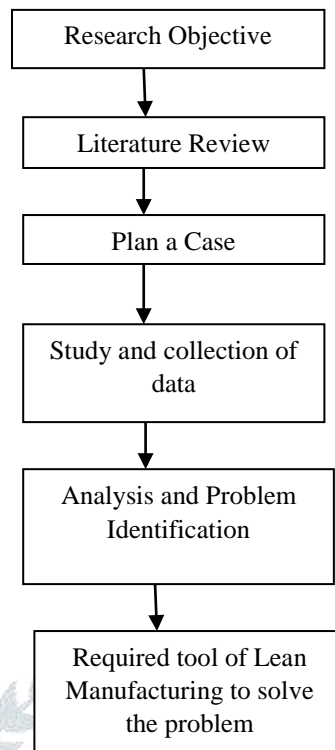


Figure 1 Cycle chain of research methodology

Step 1 To start the research firstly to set required objective what can the purpose of the study means that are we taken to achieve in research from our project we taken in account that lean manufacturing what effect on the factory time efficiency.

Step 2 After set the objective we can study various research papers about lean manufacturing to developed the conceptual frame work for the knowledge and application of lean manufacturing be used for purpose that from the study we find that lean manufacturing is effectively used for increase the productivity of the industry.

Step 3 The planning of the cases had as a criterion for the Plant selection, its organizational and technological innovation initiative for the development of the management of production systems. In this sense, the possibilities of assimilation of the philosophical principles of LM and its tools are desirable to meet an increasingly competitive market. It is noteworthy also that the chosen plant is located.

Step 4 For study and collection of data visited to the plant then start from the questionnaires that for understanding the working condition of the industry and collect the previous year data which is used for the purpose of the study from that if we cannot collect the previous year data then we cannot understand the productivity of the industry for comparing from that year.

Step 5 Analyzing the data and to see the current process cycle of the industry help to identify the problem which is effect the productivity of the industry from that we check that which tools used for solve the problem.

Step 6 Required lean tools which help to solve the problem and that give the suggestion to the organization head that must solve the problem of the industry which affect the productivity of the industry.

V Problem identification and required solution by using lean manufacturing tools

From observing all the process of sugar industry we can find that sugar industry is a intermediate industry means that they can generate electricity self and produced sugar and molasses. Since in the sugar industry have production cycle can be done in three stage firstly continues process, middle in batch and after that in continues process. So for observing all the process we see that the critical parts of the industry is crushing section from which all the cycle is dependent on that cycle if any interference in this cycle is directly impact to the whole industry productivity the productivity in term of sugarcane can also be calculate in term of capacity utilization which can be based on three factor actual number of ton crushed of sugarcane in day, recovery rate and actual crushing of sugarcane in a season. Since sugar industry can work only four to six month because availability of raw material means sugarcane. So from the observing the working of the study we find that most of the time the industry production stop due to lack of raw material for late delivery in the supply that effect directly to the productivity of the industry because if the crushing section is stop of the industry then for again start it required a long set up time for the identification of the cause we used a root cause analysis a tool of lean manufacturing which help to identify main cause of problem.

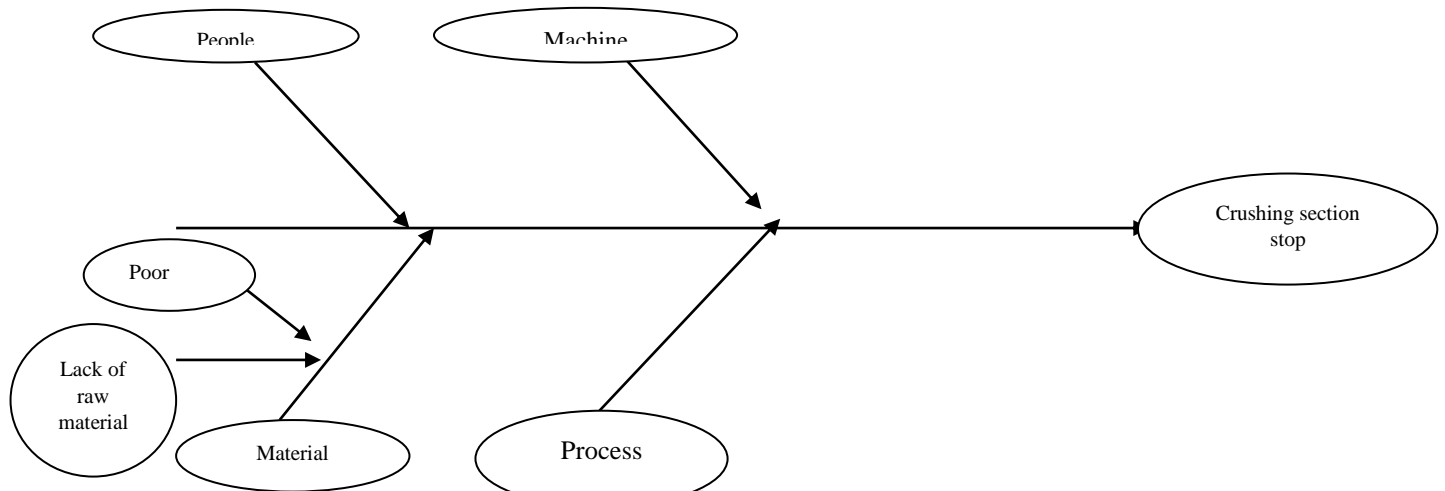


Figure 2 Root cause analysis by ishika diagram (Fishbone diagram)

From the root cause analysis we find that the problem of stop in crushing is occurred due to lack of raw material the problem arises due to poor management in the raw material inventory management from that reason that we can apply Kaizen approach means change for good. Since in the sugar industry we see that improper flow of information between production department and material department the problem that directly effect to the productivity of the industry and poor inventory management and supply of raw material cause that problem since sugar industry is continues process industry that factor for that it required proper inventory management if improper amount of raw material that cause suddenly stop of production and large inventory of raw material if we used then it also effect in productivity due to loss in production due to poor recovery of sugar for Stale of sugarcane then from that we suggest to industry head to change in supply and inventory management of sugar industry because if we does proper change the system then the problem is arise in future is big since used combination of MRP and JIT for the maintain the inventory of the system since in the industry supply of sugarcane from two types of sources first is human harvested sugarcane it required minimum 8 hours for supply and mechanical harvested cane which required 2 hours for supply in the industry so we used combination of that for maintain the inventory level of the industry by using Kanban signaling since crushing capacity of the industry is 2000 TCD (Tone CRUSHING DAY) for that it required 300 trailer of the sugar cane for proper running then we establish an Kanban signaling for that since human harvested cane required 8 hours of delivery and Mechanical harvested cane required 2 hours to supply then we used that kanban signaling system that if the 250 trailer is done for crushing we immediacy inform to material department by signaling kanban that he informed Mechanical Harvested cane supplier for supply of sugar cane to industry then from that our industry cannot stop due to lack of raw material that combination can work and the productivity of the industry increased for the calculation we used change that we compare from previous year capacity utilization.

VI CALCULATION

For effect of lean manufacturing system what can change in productivity of the industry we compare present data of year production to the precious data of production be used because it is fact that realize that how much effect of the industry will be found on the change in some point of to maintain and running industry we used capacity utilization a systematic developed method calculating the productivity of the sugar industry be used.

$$\text{Capacity Utilization} = \frac{\text{Cane crushed (MT) during season}}{\text{Available days} \times \text{daily installed capacity TCD}} \times 100$$

Capacity utilization (2016-17) = $\frac{215000 \text{ MT}}{160 \times 2000 \text{ MT}} \times 100 = 67.18\%$

Capacity utilization (2017-18) = $\frac{355000 \text{ MT}}{160 \times 2000 \text{ MT}} \times 100 = 110.9\%$

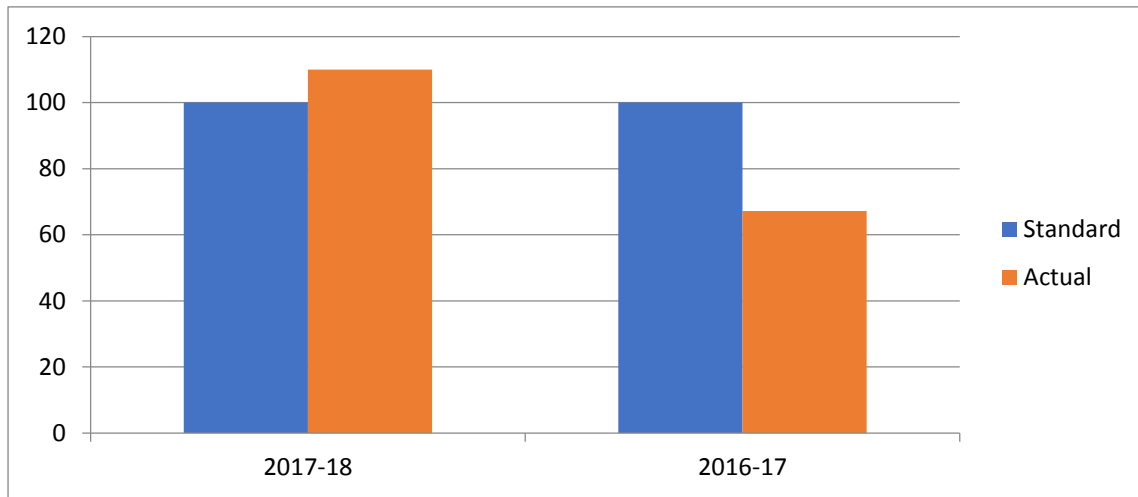


Figure 3 Comparison Chart of capacity utilization

VII RESULT

Year	Capacity Utilization	Difference
2017-18	110%	42.82 %
2016-17	67.18%	

From the result we see that year 2016-17 the capacity utilization of the industry goes to down from the norms which minimum 100% for the capacity utilization for running in proper manner from that we find that for effectively use of lean manufacturing strategy the capacity utilization in year 2017-18 can increase to 110% that it can be effectively used in sugar industry.

VIII CONCLUSION

From the study of lean manufacturing and application on the sugar industry we find that it can work in sugar industry for effective utilization of the capacity of the industry it directly impact to productivity of the industry for that if the sugar industry cannot be utilized the capacity then it effect to the productivity which goes increases the cost of production then for that we change the environment of the industry we used lean manufacturing strategy which directly impact to the productivity of the industry. Root cause analysis a tool of lean manufacturing can be utilized in any simulation for identification of the problem and Kaizen which means change for good can be used in any process or situation for change the system. The function of lean manufacturing is eliminate waste and generate more value for customer perceptive.

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