

Productivity Improvement through Lean Principles in an Indian SME

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Abstract— Small and Medium Enterprises (SMEs) are backbone of developing economies like India. However, in an era of liberalization and free economy SMEs are facing the challenge of their existence. Large scales companies have started the fruit of quality and maintenance, management by applying differ strategies like TPM, TQM, Six Sigma, JIT Kanban etc. Techniques and tools for the enhancement of the productivity and quality are not found in SME's which gives success in the longer term and maximize competitive advantage because of its inherent limitations. The aim of this project is to explore and improve production with the focus on lean philosophy. There is direct relationship between lean and qualitative manufacturing. Lean concept is one of the successful improvement concepts and very wide concept also that will be applied to improve production. Here we will mainly focus on the lean principles like 5s, Inventory Management and others for waste reduction. With this SME will be able to improve production rate, increase availability of the monetary fund and reduction in the different wastes.

Key words: Inventory Management, TQM (Total Quality Management), JIT (Just in Time), 5S

I. INTRODUCTION

Large companies continue to dominate international trade today, because they have the critical mass, organizational reach and relevant technologies necessary to access and supply foreign markets as well as domestic ones. But thanks to the Internet, the emergence of new business platforms, and the increasing openness of the global economy, many small and medium-sized enterprises (SMEs) now have the potential to become successful and important domestic and global traders as well. Small and Medium Enterprises (SMEs) are great contributor of every developing economies such as India, China, Russia, Brazil etc. In every country's population of firms, most are small. SMEs account for 93 per cent of enterprises in non-high income, non-OECD countries. Micro firms and SMEs account for over 95 per cent of all enterprises in OECD countries according to the WTO report 2016. They contribute great to the nation in the field of manufacturing and are considered as a very sensible part of any nation. These SMEs on policy changes has a very harsh impact and sees many ups and down compared to the large manufacturing enterprises. They face stiff and tough competition in domestic as well as international markets against the giant developed manufacturers of the developed economy. There is considerable opportunities for Chinese entrepreneur to more fully exploit the economic opportunities provided through international trade. They employ more than 70 per cent of the new entrants to the labor market (Jianjun, 2006) according to the WTO report 2014. Due to this Chinese SMEs play an important role in its development of economy, due to their contribution to GDP. Similarly Indian SMEs contribute the India's economic development. To tackle this stiff competition it is necessary for every Indian SME to increase

its productivity and product quality efficiently to sustain in the market domestically as well as internationally. Lean manufacturing is the most suggested solution for every SME to obtain higher production of best quality. Government of India is also helping SMEs by promoting various schemes on lean manufacturing to increase the competitiveness of Indian SMEs.

A. Introduction to Lean Manufacturing

Initially developed or describing as born in automotive industry of the Japanese, Today the Lean Manufacturing now stands as the main model for companies of great industries as its aim is to reduce waste and improve value, and can be said as customer focused (high quality, low cost, short lead times) by [4]Pettersen (2009). Lean or lean manufacturing or can be stated as lean production, is a way by which the waste could be eliminated within a system of manufacturing in a systematic method causing improvement in production. The lean manufacturing can also be explained as a systematic approach to identify waste such as transportation, time, monetary and vary others and its elimination by variously developed methods such as 5s, TPM, TQM, Inventory Management and many more resulting into increase in work efficiency, quality as well as quantity improvement and also many others. Waste created by overburden and waste created by unevenness in workloads is also taken into account by lean.

The core idea is to maximize product value while minimizing waste and also thereby achieving manufacturing Excellency through the creation of more value with the usage of fewer resources by lean implementation. Waste can be described as any process or activity that is not beneficial to the product or does not increases value of the product. With the removal of different types of wastes in entire manufacturing process rather than by focusing on only one process improvement in companies would make sure to remove human error wherever possible and thereby increasing high quality, lowering down the production cost, also reducing time compared to traditional manufacturing systems.

II. LITERATURE REVIEW

[1]R. Sundar, A.N. Balaji and R.M. Sathesh Kumar from their survey reveal that for the successful Lean Manufacturing, system must be integrated and its lean elements must be implemented along with proper sequence. [2]Christer Karlsson and Pär Åhlström suggested that for the implications of the lean enterprise framework for the smaller firm, three basic ideas that run across the different functional areas could be identified and developed.[3]Work of P. Arunagiri and A. Gnanavelbabu was mainly focused on detection of major muda out of 7 types of muda occur in the production environment.“Lean Manufacturing Case Study with Kanban System Implementation” concludes in it that

Kanban system that was conducted in the industry was fruitful due to different benefits which were minimization of scrap and losses of waste and minimization of operational cost.[16]Abhijeet Mohanrao Mane and C.T. Jayadeva in their case study revealed that Indian SMEs were reluctant in implementation of 5s.[6]Mark M.J. Wilson and Ram N. Roy (2009) found out that every of the conditions of lean cannot be met for all SMEs citing different methods and their working[7]K. Sharif from his work suggests that because of the poor cash flow, the materials department was unable to fulfill sufficient budget to procure the required materials.[8]Denisa Ferenčíková showed in his research that Return of Investment was the most often used method for measuring the economic performance and was also influenced by several definite objectives. He thus suggested that those tactical objectives did not always drive ROI in the direction of success as they would often come into conflict with each other.[9]Mohammed AlManei, Konstantinos Salonitis and Yuchun Xu presented that the management or resistance to change or lack of required resources etc could be considered as barriers. Management could play both the roles as a drive or barrier for lean implementation.

III. PROBLEM DEFINITION AND PROPOSED SOLUTION

A. Basic Problem Definition for Present Scenario of Company

The XYZ Company is a jewellery manufacturing and marketing company. It is a leading manufacturer of diamond jewelry in the jewelry sector. Company does not consist of any formal or even informal document representing the company flow chart of the product or process taking place in the company. This causes a serious issue while modification of any department in the company whenever required. During the continuous improvement process of the company, the managing director has to every time reach out to each department executive to know what specific work is been done by them and then they will modify the process accordingly if found any glitch. There is no documented standard procedure given to them to follow and if also any procedure is given, there are no inspections done to regularly check the working of standardized procedure.

Roles and responsibilities of any of the workers or managers are not been mentioned at this period of time in the company. This causes couple of disturbance in the company such as anybody can blame any other for the work not being done accordingly. Due to the communication gap between the two people sometimes the work gets delayed and at this point the blame game starts due to no mentioning of a perfect role of employee. Lack of coordination sometimes causes dispatch of the urgent finished product delayed which occurs due to the misgoverning by the employee.

Misuse of the power given by the management is also a problem as there is no perfect description of the authority given to employee/manager.

1) Proposed Solution

To overcome above limitation and to better understand the product flow as well as the departmental procedure, a hierarchy of the organization chart is to be formed with the departmental procedure carried out in it. According to the Italy Abhuhhav in his book “ISO 9001_ 2015 A Complete

Guide to Quality Management Systems (2017, CRC Press)” describes organization chart as the most basic step for the quality management system in the company. This will lead to the understanding that who will be leaded by whom and who is in charge of it. This will lead to the better understanding of the department as well as the different processes carried out in the department. This could be also very beneficial to the fresher’s who are new to the jewellery industry and does not have any experience. The trainee of the company would get a reference of what the work is to be done and whom they will be reporting their daily activities. This will help to work them more efficiently. The Organization chart helps to decide the structure of the company and make any necessary departmental amendments whenever required in the company.

Roles and responsibilities decides what work should be done by whom and what are they responsible for. This will help in making a single person responsible for the task assigned to them and they would not able to blame any other person. The work load of any person if more or less could be greatly understood with it. Accordingly the judgment of the salary of that person can be done. Increment and promotion of any person can also be decided at a level. The unworthiness of any person to do that assigned work can also be checked and judged. If more than enough work is given and that post is heavily occupied with work than distribution of work or hiring a new employee can be known.

Authority of any person in the company is the most important thing that ensures quick work flow and easy handling of any situation in the company by any employee or manager. Authority to any person given helps them to quickly resolve any glitch coming directly under his/her working area. It helps to solve any problem on the manufacturing area by any employee or their head manager and the management is not disturbed for the small problems. This also ensures more time for the management to work on other irregularly issues occurring in the company. By properly deciding the authority, the departmental clash can also be solved if happening any. For this management must also ensure proper distribution of power among the different departmental head and their employees. Manager must not misuse their power to harass any employee or mutual revenge and a mechanism to report every error or problem to the management must be present. By this better trust and coordination between the employee and the manager as well as the management will take place without any conflict as everyone has an assigned task with their authorities in the company.

B. Problem defining and 5S Solution implementation in Storage Room, Management Office and Production

Storage room condition	Problems
	<p>Tube lights are seen placed in a box where it can break.</p> <p>Wires are not organized occupying more area.</p> <p>No labelling is done.</p>

	<p>No objects are definitely organized at proper place.</p> <p>Files can be seen disorganized.</p> <p>Stationary items are totally mixed.</p>
	<p>Upper shelves can be seen as a complete mess.</p> <p>Clutter can be seen on right hand side downwards.</p>

Table 1: Storage Room Condition and its problems

Operational Problems	Proposed solution
<p>Items are not clearly visible in the storage room.</p> <p>Every time is very difficult to find different items that are misplaced.</p> <p>Time increased in tool issuing.</p> <p>No method of procuring tools from the market.</p> <p>After procurement placing tools at its place becomes difficult.</p> <p>Misplaced item causes uneasiness in working on the table.</p> <p>Traffic in storage room due to the more issuing time.</p>	<p>Allocate proper space for the definite item in the drawer to be made available, to place the item at its place.</p> <p>Proper labeling should be done on boxes and drawers with the visible stickers on it.</p> <p>Images should also be shown along with the labeling.</p> <p>Arrangement of the items should be based according to its daily requirement/usage.</p> <p>Starting from the weekly basis audit must be done to ensure that the new improved system is properly followed.</p> <p>Penalty system or point system if required should be implemented.</p>

Table 2: Storage Room Operational Problems and its Proposed Solutions

1) Management Office

Operational Problems	Proposed solution
<p>No perfect labeling on the files.</p> <p>No proper place for the different parcel boxes.</p> <p>No lockers for the jewellery in the different department.</p>	<p>Proper allocation of space for the files, stationary, gold boxes and other vouchers to be made available to place them at its place.</p> <p>Proper labeling should be done on the files and drawers.</p>

<p>Misplacement of different stationary items.</p> <p>There are no allocated places for the different boxes and jewelry items.</p>	<p>Images should also be shown along with the labeling on the drawer.</p> <p>Regular check at monthly period should be carried out by the manager to get it maintained in the company.</p>
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Table 3: Management Office Operational Problems and its Proposed Solutions

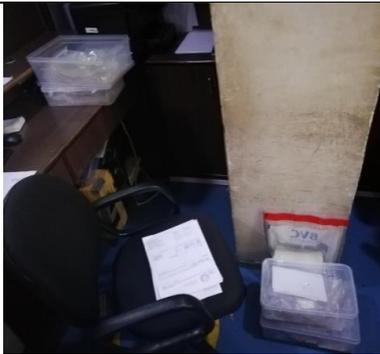
Management Office condition	Problems
	<p>Boxes are not placed properly according to their size and difficulty in finding required size of box.</p>
	<p>There is no proper place for box where they should be kept.</p>
	<p>Boxes of jewelry these boxes were not proper.</p> <p>Without placing the documents properly employee went to other department.</p>
	<p>Files were found not labelled.</p> <p>Files were not arranged properly</p> <p>Everting is in the clutter form.</p>

Table 4: Management Office Condition and its Problems

2) Production

Production Condition	Problems
	In this image we can see that the sticker is worn out and so numbers are not visible.
Demo Solution	Proposed Outcome
	The new lable as shown in the photo is clearly visible. Numbers are typed in computer so there is no chance of miss interpretation.

Table 5: Production Condition and its Problems

After successful implementation of proposed solution there should be a checklist formed, so as to carry out the audit whether implementation is followed or not. A rating system must also be present to analyze implementation quality.

C. Inventory Management

1) Current Position

At this point of time the company XYZ has no specific procedure for the procurement of the tools from the market. The head of the tools room buys the tools whenever requirement arises by verifying from the software its quantity, or say during its shortage in the tools room. There is no defined procedure that the manager should buy this amount of product only, according to the requirement by the company. There is no calculation done by them to in which quantity any product should be procured in the company and what will be its holding cost and interest rate if bought in large quantity.

After the procurement there is a complete tracking of which worker used how much tool and in what quantity in a month. The life of any tool in the company can be easily traced and also the wastage sold to any dealer can also be traced. Thus there is only one point, procurement where there is no procedure.

2) Proposed Solution

This is a point where we can help to the company, as we studied about inventory management in our industrial engineering. The formulas of the inventory management could help to segregate which product to be bought in the company when. This will help to get the optimum lot size of any of the product and when it is to be ordered and also in

what amount the safety stock be kept in the company. Inventory management will also help in making the calculation of number of orders to be placed per year.

There are certain limitations of the formula which we came to know only after we implemented it in the company product. The tools which are very costly have to be procured twice or thrice in a month which is practically not possible. This problem is overcome by the market condition. Local market condition is that if any product is bought in a month the bill will be dated to 1st of that month only and the payment can be done at the end of that month. So requirement of the whole month can be bought in one purchase only. The formula and the procedure for inventory management is mentioned below,

Formula details for the Software for the procurement of the tools according to the shortage in the storage/tools room.

Annual Demand (D) is the amount of product or tool required in a single year by the tools department in the company.

Cost of ordering (C_o) is the cost barred by the company to order the product such as mail cost, telephone cost, transportation cost and custom's cost if bought from international market etc.

Cost of handling (C_h) is the cost caused to the company after it is bought which is due to the charges like storage, damage during its movement and interest rate if it is bought on loan amount etc.

Optimal lot size (Q^*) is the amount of order to be placed by the purchase department during buying of the product to gain maximum profit for the product with minimum rate of interest.

The formula for the optimal lot size is as given below

$$Q^* = \sqrt{\frac{2CoD}{Ch}}$$

Total optimal cost per year is the cost occurred to the company for the product by ordering the optimal amount of quantity in a lot size.

Total optimal cost per year = $D * C + \sqrt{2CoDCh}$
Number of orders to be placed in a year is represented by the symbol n_o .

$$n_o = \frac{D}{Q^*}$$

Time in days Original (TIME) is the original time required to get a required tool or product from the market when the requirement arises.

(Time + 1) is the original time + 1 extra day if the delivery got late or not obtained after the required time. Safety stock is the number of pieces of product or tools to be required from the ordering date to the delivery date by considering time (TIME + 1) in mind.

$$\text{Safety Stock} = \frac{D}{365} \times (\text{TIME} + 1)$$

Average lead time is the time from the product arrived to the safety stock time.

Average lead time = $[(300 / n_o) - \text{Safety stock time (TIME+1)}]$

Maximum inventory level is the maximum amount of any of the tools or product that can be allowed, to be purchased by the purchase department.

Maximum Inventory Level = $(\text{Avg. Lead Time} * (D/300)) + (\text{Safety stock})$

Reorder Level is the time at which the tools room executive should order the optimal lot size required for that item.

Reorder level = Safety Stoke + ((Time + 1)* (D/300))

IV. CONCLUSION

Management played a very key role in implementation of the lean practices in the XYZ Company. With the implementation of the three important tools QMS, 5S and Inventory Management Company attained more flexible structure, easiness through the 5S and a more dependable way for the procurement of the tools. Roles and Responsibilities helped in achieving more comfortable and quarrel free company environment with more functional ability. Reduction in time and money loss was also a major achievement through the 5S and Inventory Management.

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