Implementation of Lean Manufacturing in Tablet Tool Manufacturing Company

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Abstract: This paper deals with implementation of lean manufacturing in Tablet tool manufacturing enterprise .Project Company is one of the SMEs located in industrial area in Vasai east. With the importance of being competitive in today's tablet tooling market, company was focusing their efforts towards lean manufacturing for achieving excellence. The main objective of this paper is to provide a background on lean manufacturing, present an overview of manufacturing wastes and introduce the tools and techniques that are used to transform a company into a high performing lean enterprise. Value stream mapping is a main tool used to identify the opportunities for various lean techniques. The focus of the lean manufacturing approach is on cost reduction by eliminating Non-Value added activities .Value Stream Mapping (VSM) is used to map the current operating state for production line, to identify sources of waste and to identify lean tools for reducing the waste .After analysis; a future state map has been developed for the system. Use of Lean tools gave a good understanding of product flow on the floor. Employees came to know exactly where the value is and the lead time associated with building product. Through Kaizen check sheet employees were made to interact and provide their suggestions. Also the elements were identified with the help of Gemba Walk. Finally the travel time of product is reduced by 1045 seconds. Employees became more confident for making small improvements from their side.

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I. Introduction:

After visiting many SMEs in industrial area in Vasai East, it is found that all of them are facing the same kind of problems with different levels based on various factors e.g. unskilled workers, lack of top management commitment, lack of planning, unwillingness to learn and see and resistance to change etc. Many manufacturers are now developing the sense of evaluating their processes to determine their effectiveness in bringing maximum value to customers. Although manufacturing techniques of yesterday are being replaced by more efficient methods that greatly minimize delays, reduce costs, and improve but still the factory management is untouched. Lean Manufacturing methods are inclusive of all employees' quality and involve a major change in the embedded attitudes of the individuals that make up the organizations. In today's highly competitive world, the Indian organizations are striving hard to stay competitive and profitable for a long-term period. They have a golden opportunity to downsize their cost, customer lead-time and cycle time through the application of Lean Manufacturing. Lean manufacturing is a whole- systems approach that creates a culture in which everyone in the organization continuously improves processes and production.

II. Literature review

Rodney S. Rogstad(2010) have utilized the time and motion studies with spaghetti diagram and VSM.LMS have eliminated over 9 minutes of process time per device along with a savings of over $30,000.00 annually which shows that correct implementation of lean principles can have a positive impact within any organization. Through proper training and starting with smaller projects, Kaizen leaders and teams can get a good understanding on how to effectively run and participate in Kaizen events and use the proper tools to find and eliminate the waste that is in any manufacturing process. [1]

Norani Nordin, Baba Md Deros and Dzuraidah Abd Wahab(2010) explored the extent of LM implementation in Malaysian automotive manufacturing firms. Cluster analysis was performed to classify the respondent firms in groups to signify the extent of lean manufacturing implementation or their status from five lean manufacturing practice categories. [2]

Iva Gergova(2010) have proved that the success of 5S depends to a great extent on the in-house education. Apart from the expected improvements such as efficiency, productivity, quality, etc. the marginal result from the implementation of 5S for the employees would be psychological safety and support. Due to the complexity of internal and external practices, the management of which requires high level of coordination and development of network of communication, sharing of information has been identified as essential for the improvement of performance and sustainability of changes.[3]

A.P. Puvanasvaran et al.(2010) focused on reducing lead time of sales order processing. Kaizen steps were used as guidelines and PDCA Cycle was chosen as problem solving approach to conduct the case study. The properly tools and techniques such

as 5why, Work Instruction Sheet, Pareto diagram, Process Mapping, PDCA Cycle and brainstorming were used. The kaizen implementation has reduced the percentage of time losses which is 48.44%. More than that, sales order processing lead time was reduced about 6.98% and production lead time reduced about 14.93%. These results have proved the effectiveness of kaizen methodology.[4]

Wilson (2010) states that Lean system strives to make one piece at a time, this is true one piece flow. Last few years had seen plenty of researches into the area of manufacturing improvement such as lean manufacturing, total quality management, total productive maintenance and their application within various manufacturing companies such as automotives, electronics, plastics components and etc. Majority of research studies have shown lean manufacturing as the best manufacturing system in the 21st century.[5]

T. Karkoszka and J. Honorowicz(2009) focused on each employee's involvement for Kaizen – continuous improvement by the small steps. Kaizen improvements should proceed without any additional investment or through small investments. In the Factory of General Motors Manufacturing Poland during the recent years the number of reported kaizen ideas have fluctuated about 14000 per year; it surpasses about keel of thousand the purposes accepted by the leading management. Such a big number of ideas and high percent of implement ability confirms the correct functioning of kaizen system, the proper manner of awarding and high involvement of employee in improvement of the personal workplace as well as the whole productive process.[6]

J. Michalska and D. Szewieczek(2007) put stress on trainings of productive workers for implementing 5S. The need of executing the routine inspections of usage the 5S rule is emphasized in research work. Check List and graph of the 5S served the estimation of the workplace. The inspection of realization of the 5S rule was executed once a month by chosen team implementing the 5S rule. On the basis of research it is concluded that introducing the 5S rules bring the great changes in the company i.e. Process improvement by costs' reduction, increasing of effectiveness and efficiency in the processes, maintenance and improvement of the machines' efficiency, safety increasing and reduction of the industry pollution, proceedings according to decisions.[7]

In the literature, value is simply defined as what the customer is willing to pay for. Non-value added activities are generally understood to be either waste, or incidental activities that are necessary but add no value to the product. The best example of a non-value added activity is quality assurance. Quality inspections do not add value to a product; they merely detect defects before they reach the consumer. The foundation of the lean system is *stability* and *standardization* (Dennis, 2007).[8]

The lean transition is, at its core, an organizational culture transition and it follows that managing lean, particularly during the initial phases, is actually more about managing the change process than managing lean tools and techniques (Csokasy & Parent, 2007). By initial phases we are referring to the time period in takes to create a culture that does not automatically revert back to the "old ways of doing work" when faced with a challenge. Until the desired new behaviors become firmly established, that is to say that the culture has been truly changed, they are at risk of being subordinated by the old behavior and disappearing. Culture change takes time; it cannot be accomplished overnight or in a few weeks. With hard work and determination combined with a little luck, significant culture change might be accomplished in a few years.[9]

Venkatesh et al. (2007) listed the following difficulties in implementing JIT in Indian: Lack of cooperation of suppliers in correctly supplied material, the lack of resources to invest in direct linkages with vendors, Lack of formal cross training programs for workers, Lack of formal training/education, Lack of cooperation from vendors in the form of inconsistent lead times and capacity constraints imposed by suppliers, Lack of an accurate forecasting system, Lack of strategic planning, Problem in maintenance time reduction through machine, modification or replacement of existing equipment, Quality problems with supplied material, Lack of cooperation of suppliers in timing of supplied materials, Reduction in the levels of work load variability, Problems with machines (Machine failures and reliability, Lack of information and communication with suppliers, Inability to meet schedule, Lack of communication between workers and management, Problem in line balancing, Lack of performance measure, Problem in lead times reduction, Problems in layout modification, Lack of team work spirit, Departmental conflicts, Poor quality.[10]

Ashish Agarwal and Ravi Shankar(2005) developed a system dynamics model to understand the dynamic behavior of customer satisfaction, cost minimization, lead-time reduction, service level improvement and quality improvement which plays a major role in improving the performance of supply chain and also observed that with the improvement rate for delivery speed, data accuracy, centralized and collaborative planning, market sensitiveness the behaviour was very slow initially and later increases. Similarly the value of inhibitors such as lack of trust, uncertainty and resistance to change is quite high in the beginning but gradually decreases and concluded that as the impact of inhibitors reduces the influence of enablers on SP Index gradually improves .[11]

Fullerton and McWatters(2002) stated that in contemporary highly challenging environment, a reliable production system has been considered as a crucial factor for competitiveness.

The recent competitive trends have been leading manufacturing managers to think about the ways to reduce the cost of product without compromising with the quality. One of the approach to enhance manufacturing performance is adoption of world-class, lean and integrated manufacturing strategies such as Just-In-Time (JIT) manufacturing [12]

According to *Talha (2002)* in order to compete effectively, companies must be capable of manufacturing high quality products at a low cost, and also provide a first class customer services. In addition, they must have the flexibility to cope with short product life cycles, demands for greater product variety from more discriminating customers and increasing international competition. In South Africa, small and medium enterprises (SMEs) in the manufacturing sector are faced with a great challenge of fighting competition with large established businesses. To compete in such an environment continuous improvements both in Operations, quality and customer service are essential and these require access to and management of a sustainable financial resources. In addition to the competition with large businesses, SMEs in South Africa are faced with another problem of financial constraints.[13]

Larson,Cutis E(1998) provided the different methods of Kaizen implementation that may be used immediately. A computer simulation is also supplied to recognize the need of Kaizen efforts for a particular situation. Author has clearly explained the ProModel Student Software and Constant Failure Rate Model. According to Larson , Kaizen should not be considered as cutting cost tool instead it should be viewed as means of continuous improvement.[14]

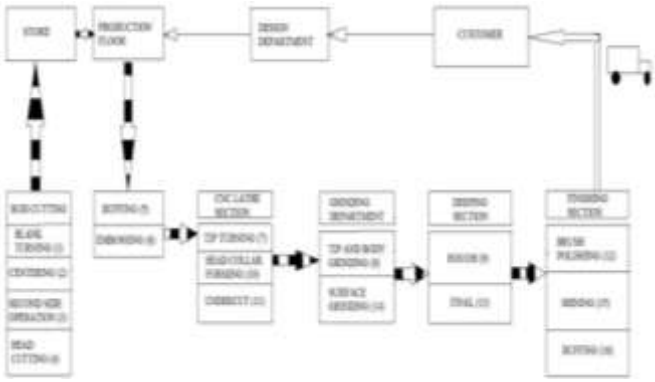
III. PROBLEM STATEMENT

Pacific Private Limited was facing different problems though this fact was not acceptable by the employees and management. It is sufficient for them to consider their company a successful one if they are capturing the customer demands. But when it was studied thoroughly different problems were caught. They are listed below:

1) Unnecessary motion of material was taking place due to random placement of machines.
2) There is no clear plan or layout for travel of material (WIP).
3) There are helpers to shift material from one department to another which is creating the energy wastes in non-value adding activities.
4) There is no provision to utilize the skills of workers as they are not involved in decision making.
5) Workers are not so skilled.
6) Rejection at inside the company and sometimes from customer.
7) Poor housekeeping.
8) There is no provision to educate the worker's skill.
9) No safety to in-process jobs as they are carried into containers manually. Always there is risk in handling. If the container fall on ground and small damage incurred then the jobs are rejected.

VALUE STREAM MAPPING

The current state value stream map is drawn considering the numbers given in analysis table (1) as reference number.



Considering only the machining process, time required for every process is summarized in following table:

Note: Travel time is the time required to reach the material at work station from previous station.

SR.NO.	PROCESS	MACHINING TIME (In secs)	LOADING AND UNLOADING TIME (In secs)	CHANGEOVER TIME (In secs)	TRAVEL TIME (In secs)	NO.OF OPERATOR	TYPE OF MACHINE
1	TURNING	60	15	1200	0	1	A
2	CENTERING	20	10	10	180	1	M
3	SECOND SIDE OPERATION	120	20	600	180	1	A
4	HEAD CUTTING	20	15	600	0	1	A
5	BUFFING	240	0	0	10	1	M
6	EMBOSSING	60	60	0	5	1	M
7	TIP TURNING	60	20	600	5	1	A
8	HARD GRINDING	180	20	10	10	1	M
9	DEEPING	20	0	0	5	1	M
10	HEAD COLLAR FORMING	90	20	600	5	1	A
11	UNDERCUT	20	35	600	0	1	A
12	BRUSH POLISHING	25	0	0	180	1	M
13	FINAL DEEPING	15	0	0	5	1	M
14	SURFACE GRINDING	50	10	0	180	1	M
15	SHINING	40	0	0	180	1	M
16	BUFFING	300	0	0	180	1	M

As per the above table time required for one round lower punch is as follows:

Machining time = 1320sec

Loading and unloading time = 225sec

Travel time (between machines) =1125sec

After studying the current situation in which travel time loss is highlighted a new plant layout is drawn after discussion with Mr. Ganesh (Floor Manager). In new layout the machines are kept in order to reduce or eliminate the non-value added activity (travel). The table which summarizes the above analysis for new layout is as follows:

SR.NO.	PROCESS	MACHINING TIME (In secs)	LOADING AND UNLOADING TIME (In secs)	CHANGEOVER TIME (In secs)	TRAVEL TIME (In secs)	NO.OF OPERATOR	TYPE OF MACHINE
1	TURNING	60	15	1200	0	1	A
2	CENTERING	20	10	10	10	1	M
3	SECOND SIDE OPERATION	120	20	600	10	1	A
4	HEAD CUTTING	20	15	600	0	1	A
5	BUFFING	240	0	0	5	1	M
6	EMBOSSING	60	60	0	0	1	M
7	TIP TURNING	60	20	600	5	1	A
8	HARD GRINDING	180	20	10	5	1	M
9	DEEPING	20	0	0	5	1	M
10	HEAD COLLAR FORMING	90	20	600	5	1	A
11	UNDERCUT	20	35	600	0	1	A
12	BRUSH POLISHING	25	0	0	10	1	M
13	FINAL DEEPING	15	0	0	0	1	M
14	SURFACE GRINDING	50	10	0	10	1	M
15	SHINING	40	0	0	10	1	M
16	BUFFING	300	0	0	5	1	M

IV. Conclusion:

The travel time is reduced by (1125-80) seconds i.e. 1045 seconds.

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