

An Exploratory Study on Implementation of Lean Manufacturing Practices (With Special Reference to Automobile Sector Industry)

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ABSTRACT

At present scenario, Lean Manufacturing has become a world wide phenomenon. It is quite successful in drawing the attention of companies of all sizes. A large number of organizations are following Lean technologies and experiencing vast improvements in quality, production, customer service, and profitability. Lean Manufacturing is a systematic approach to identifying and eliminating waste through continuous improvement. The manufacturing industry in India must also look to leverage its advantages, its large domestic market, good conditions in terms of raw materials and skilled labour, and the quality focus. In India at the state level, there are few companies that are implementing Lean manufacturing techniques. In Dewas city, the industrial town of Madhya Pradesh, some of the automobile companies are vigorously following the Lean manufacturing techniques to eliminate waste and downsize the cost. Hence, all these factors prompted the researchers to analyze and study the implication of Lean Manufacturing Practices in Automobile Industries.

Keywords: *Lean manufacturing, industry, waste, elimination.*

JEL Classification: *M11, L15, L62.*

Yalın İmalat Faaliyetine Yönelik Bir Uygulama (Otomobil Endüstrisi Örneği)

ÖZET

Yalın imalat ile ilgili günümüzdeki senaryo, dünya çapında bir fenomen haline gelmiş olmasındır. Yalın imalat, irili ufaklı tüm şirketlerin ilgisini çekme konusunda başarılı olmaktadır. Çok sayıda firma, yalın üretim teknolojilerini takip etmekte ve kalite, üretim, müşteri hizmeti ve kârlılık konularında büyük yol almaktadır. Yalın imalat, sürekli iyileştirme aracılığıyla üretimde israfı tanımlayan ve ortadan kaldıran sistematik bir yaklaşımdır. Hindistan'daki imalat endüstrisi, avantajlarını, büyük yer pazarı, hammadde ve vasıflı işgücü açısından iyi koşulları ve kalite odaklılığı güçlendirmenin yollarını aramak zorundadır. Hindistan'da eyalet düzeyinde, yalın imalat tekniklerini uygulayan birkaç şirket bulunmaktadır. Madhya Paradesh'in sanayi bölgesi olan Dewas şehrinde bazı otomobil şirketleri, israfı ve maliyeti azaltmak için yalın imalat tekniklerini uygulamaktadır. Özetle, tüm bu faktörlerin, otomobil endüstrisindeki yalın üretim uygulamalarını analiz eden ve çalışan araştırmacılara rehberlik edecektir.

Anahtar Kelimeler: *Yalın imalat, endüstri, atık, yok etmek*

JEL Sınıflaması: *M11, L15, L62.*

Introduction

The Lean Manufacturing approach is meant to transform non-value added activity into value added activity. Lean Manufacturing technology has its impetus and focus on whole operation. Lean Manufacturing methods are inclusive of all employees 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 technologies. Currently, in India about 150 companies in the automobile industry use lean manufacturing, but it is yet to permeate other areas. Some of the hurdles that the country faces, on the other hand, include the lack of scale, and the low investment being made in technology and infrastructure. To safeguard the interest of these manufactures in the long run in the Indian economy, the manufacturers need to be competitive simultaneously maintaining the quality standards which could be possible with implementing lean techniques in their system.

Rationale of Study

The main purpose of this project is to study how Lean Manufacturing Practices are being implemented in Gear Industries located in the industrial city of Madhya Pradesh. The broad objectives are to:

- O1. Identify lean manufacturing tools that can help the gear industries to eliminate waste.
- O2. Find out impact of LMS implementation in the selected Gear Industry.
- O3. Assist manufacturers to improve their company's operations.
- O4. Suggest effective measures for LMS implementation.

Literature Review

The basic ideas behind the lean manufacturing system, which have been practiced for many years in Japan, are waste elimination, cost reduction, and employee empowerment. The term "lean" as Womack and his colleagues define it denotes a system that utilizes less, in term of all inputs, to create the same outputs as those created by a traditional mass production system, while contributing increased varieties for the end customer. Lean Manufacturing started as the Toyota Production System (TPS), developed by the Toyoda (now Toyota) Motor Car Company. In time to follow, Toyoda (now Toyota) began production of engines, small delivery vehicles, trucks, and cars. Jim Womack, Daniel Jones and Daniel Roos (1991) define Lean manufacturing as the systematic elimination of waste. Hayes and Pisano (1994) highlight that Lean uses less, or the minimum, of everything required to produce a product or perform a service. Womack and Jones (1994) elaborate that Lean manufacturing requires that not only should technical questions be fully understood, but existing relationships between manufacturing and the other areas of the firm should also be examined in depth, as should other factors external to the firm. Dankbaar (1997) reiterates that Lean Manufacturing will be the standard manufacturing mode in the 21st century. Shah and Ward

(2003) mention that Lean manufacturing has become an integrated system composed of highly inter-related elements and a wide variety of management practices, including Just-in-Time (JIT), quality systems, work teams, cellular manufacturing etc. Bhasin & Burcher (2006) remark that Lean is not only tools and techniques, but it should be viewed as a philosophy. It is a 'way of thinking' and not a mechanism to action these thoughts. 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.

Gaps in the Literature Review

Following gaps are identified from the structured review of literature:

Gap 1: Lean Manufacturing Practices in Gear Industries is not fully explored and not much has been done in Indian context.

Gap 2: Very little literature is available on Lean Manufacturing Practices in Gear Industries.

Gap 3: The organizations are not able to reap out the benefits of Lean Manufacturing Practices due to lack of planning and proper awareness.

Research Methodology

The questionnaire - based survey methodology is applied to meet the set objectives of the project work. This project report has its focus on Lean Manufacturing Practices in the Gear Industries. The purpose of this study is to determine how the senior businesses professionals involve in manufacturing process of XYZ Ltd are implementing the Lean Manufacturing Process. It is using lean tool, Kaizen, 5S and Kanban for process and product improvement. Initially the general information of the company is accessed from the website of the company. Subsequently the detailed information is available from the plant visit. The information obtained during discussion with, managers, production in charge, Q.C. manager, Q.C. engineers, supervisors, workers, etc. Information is collected regarding the identifying area and lean which include system of 5S, kaizen, JIT, Quality management. This project report is based on data analysis.

Research Framework

Sampling: - Sampling is that part of statistical practice concerned with the selection of individual observations intended to yield some knowledge about a population of concern, especially for the purposes of statistical inference. The sampling method in this project design is combination of convenience sampling (generally used in exploratory research where the researcher is interested in getting an inexpensive approximation of the truth. As the name implies, the sample is selected because they are convenient) & Judgment sampling (it is a common non probability method. The researcher selects the sample based on judgment. This is usually and extension of convenience sampling).

Sampling Unit: - Sampling unit is that set of elements considered for selection in some stage of sampling. In this research study we have chosen employees of XYZ lmt. which are related to gear manufacturing sector as sampling unit. They constitute a population & a source of information which researcher needed in this project report. These units are representative characters of a sample, which represents this research study.

Sample Size:-The sample size of the study was 100 respondents. The method used for sample technique was random sampling method. This method was used because it was not known previously as to whether a particular person will be asked to fill the questionnaire. Considering the constraints, it was decided to conduct the study based on sample size of 100 respondents. Scientific method was not adopted in this study because of financial constraints and also because of lack of time. Also the basic aim of doing the research was academic; hence most convenient way was selected.

Instrument Development

In this research both primary & secondary data has been used. Primary data has been collected from XYZ Company. Primary data has been collected through survey method. The researcher has used a structured questionnaire (Enclosed as Annexure No.) in the technical language i.e. English, keeping in mind the objectives of the study. The questionnaire (self-administered questionnaire containing closed-ended questions) was designed on an extensive review of the literature, research papers and relevant thesis on Lean Manufacturing Processes. After each stage, feedback was obtained and the questionnaire was modified. Majority of the feedback from the experts gave positive remarks and certify that the questionnaire was acceptable for data collection. Although no new items were added for the data collection phase, but many items were reworded or modified.

Data Collection

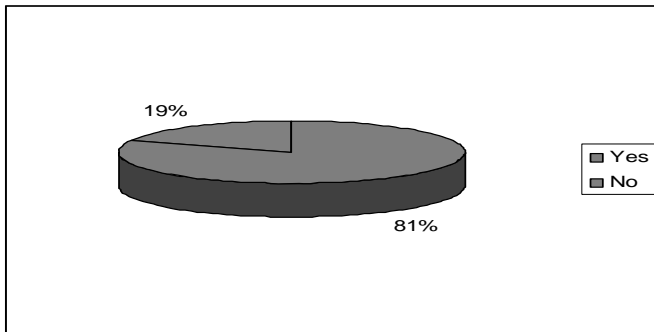
The primary data is collected on the response received from the given questionnaires as the project conduct questionnaire sessions at the office of the company. The respondents include officers, engineers, managers and senior managers from planning production, purchase, quality control, sales, marketing, maintenance, research and development, human resources, store, supply chain, and material department of the XYZ Company. The researcher himself went to the plant of the XYZ Company and interacted with the officers, engineers, managers and senior managers. During the project report initially 150 questionnaires were distributed and 123 were returned. Remaining 27 questionnaires were not returned. Out of 123 returned questionnaires, 102 were filled up completely and properly. Hence to have uniformity in sample only 100 were questionnaires were retrieved for final analysis. The answers were recorded by a notebook & question papers for analysis purposes. The fundamental background of the Lean Manufacturing process and consultant's work execution procedure was learned by information gathering from academic books, the Internet, and various academic journals.

Data Analysis and Interpretation

Data analysis in qualitative research is a challenging and highly creative process. It starts with data collection. The researcher is intimately involved with the respondents and the data that are generated. This chapter focuses on the presentation and analysis of data obtained from research. That is, data from all returned questionnaires are used to study Lean Manufacturing practices in Gear manufacturing Industries. It may be argued that the lack of a statistical test would deprive the study of objectivity, but it is submitted that the level of details provided by the respondents more than compensate for any deficiency in this regard. Any potential bias is further mitigated by the systematic documentation and presentation of the data collected. The questionnaire responses were analyzed and discussed in this chapter.

Q.1. Are the employees aware about LM Practices in the organization?

Fig No. 1: Awareness towards Lean Manufacturing Practices



Source: On the basis of questionnaires

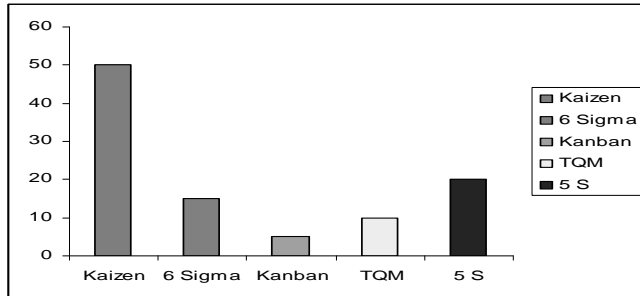
Data Analysis and Interpretation

An analytical study of Questionnaire highlights that 81% employees are well acquainted about the process & functions of LMS which is being practiced by the organization. Contrary to this, only 19 % employees are less informed or unaware about it. It is very revealing to note that some employees are not aware about a system that can be handy for there professional growth and betterment of working environment.

Q.2 Rank the methodology which is used to implement LM practices

- | | | |
|----|---------|---|
| a. | Kaizan | 1 |
| b. | 6 sigma | 3 |
| c. | Kanban | 5 |
| d. | 5 S | 2 |
| e. | TQM | 4 |

Fig No. 2: Methodology used to implement Lean Manufacturing Practices



Source: On the basis of questionnaires

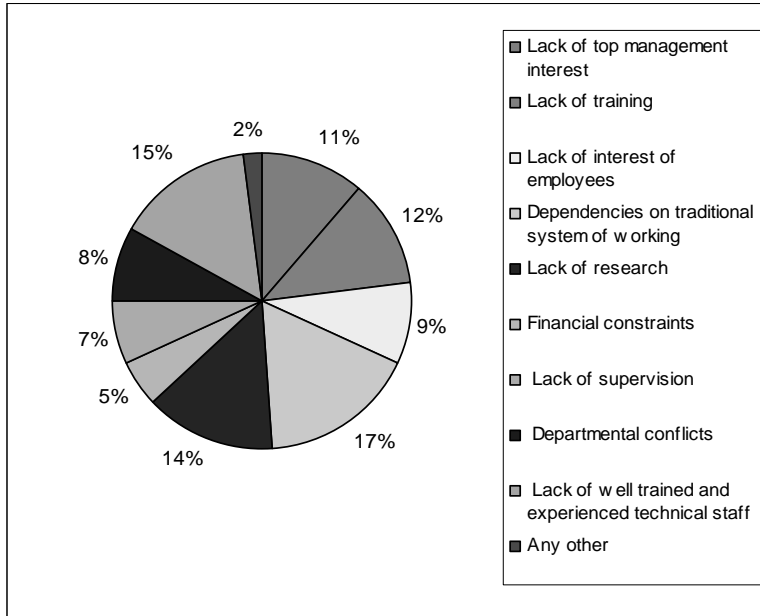
Data Analysis and Interpretation

The study reveals that the selected organization Kaizen is being used mostly (50%) which is followed by other methodologies like as 5S (20%), Six Sigma (15%), TQM (10%) and Kanban (5%). Kaizen can play a leading role in making lean process successful one as it helps the organization to meet the challenge of doing more with the same - or less - resources. This is achieved by eliminating unnecessary steps in achieving that end.

Q.3 Rank the following obstacles which are often faced while implementing LM Practices

- | | | |
|----|--|----|
| a. | Lack of top management interest | 5 |
| b. | Lack of training | 4 |
| c. | Lack of interest of employees | 6 |
| d. | Dependencies on traditional system of working | 1 |
| e. | Lack of research | 3 |
| f. | Financial constraints | 9 |
| g. | Lack of supervision | 8 |
| h. | Departmental conflicts | 7 |
| i. | Lack of well trained and experienced technical staff | 2 |
| j. | Any other | 10 |

Fig No.3: Impediments in Implementing Lean Manufacturing Practices



Source: On the basis of questionnaires

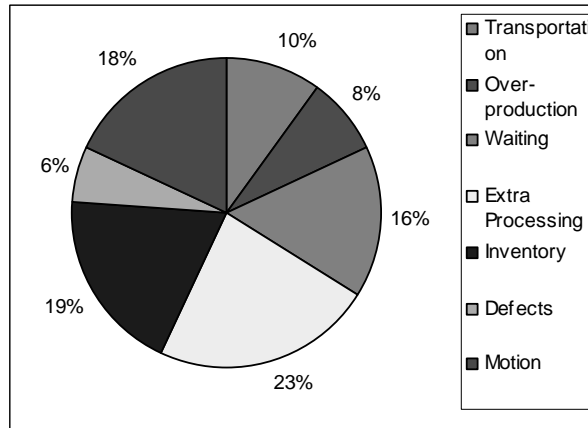
Data Analysis and Interpretation

The study made an attempt to mark the impediments which are often faced by the organization while implementing LM Practices. 17% respondents believe that dependency on traditional system of working is one the biggest barrier in the implementation of LMS. 15% respondents consider that modern organizations are lacking in the trained and experienced technical staff. 14% respondents think that the organizations do not have adequate research facility to implement LMS successfully. 12 % respondents regard that the organization is lacking in training of employees. 11% employees find lack of support from top management as an obstacle in the implementation LMS. 9% respondents recognize that employees do not show enthusiasm and interest in the process of LMS. Departmental conflicts and lack of supervision are also considered as hurdles by 8% and 7% respondents respectively. 5% respondents express that financial constraints are also obstacles in the implementation of LMS.

Q.4 Rank the kinds of waste that LM Practices eliminate in your organization -

a. Transportation	5	e. Inventory	2
b. Over-production	6	f. Defects	7
c. Waiting	4	g. Motion	3
d. Extra Processing	1		

Fig No.4: Elimination of Waste through Lean Manufacturing Practices



Source: On the basis of questionnaires

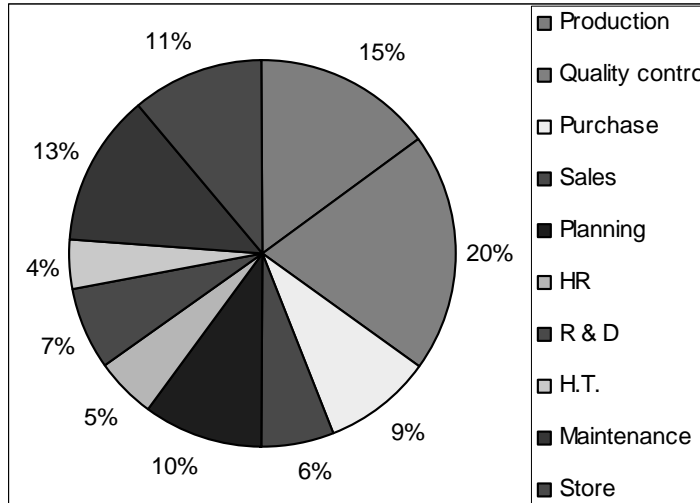
Data Analysis and Interpretation

The present study reveals that in the selected organization LMS eliminates waste pertaining to extra processing higher than elimination of other wastes i.e. 23%. 19% respondents find that LMS eliminates waste generated through inventory. 18% respondents think that LMS is quite handy in eliminating the waste of motion. 16% respondents consider that waiting can be eliminated by adopting LMS. By eliminating waste, quality is improved, production time and cost is reduced. 10% respondents recognize that LMS is very effective tool in eliminating waste caused due to transportation. 8% respondents believe that over-production can be eliminated with the adequate application of LMS. 6% respondents confirm that defects can be overcome by following LMS.

Q.5 Rank the department according to the use of LM Practices in eliminating waste -

a.	Production	2
b.	Quality control	1
c.	Purchase	6
d.	Sales	8
e.	Planning	5
f.	HR	9
g.	R & D	7
h.	H.T.	10
i.	Maintenance	3
j.	Store	4

Fig No.5: Departments Practicing Lean Manufacturing Practices



Source: On the basis of questionnaires

Data Analysis and Interpretation

The present study highlights that quality control department of the selected organization is the most efficient in the elimination of the waste which is clearly indicated by 20% respondents. Eliminating any waste, no matter how much, will add up and make things more productive. Kaizen methodology appears to be very significant and result oriented in eliminating such kinds of waste. Kaizen involves 1) first understanding one's work in great step-by-step detail, 2) seeing problems where the prescribed steps don't pan out exactly as expected and 3) realizing the waste involved in doing the job or created to others by the way we do the job so that 4) the person thinks of ways to solve the problems or find another way of doing the work which minimizes the waste.

It is also disclosed that production department is also quite watchful about the elimination of waste related to production. Higher production is always touted as a good thing, but higher production means nothing if there is any demand for the product. Otherwise, it simply represents the amount of money tied up in producing the product. It has a vital role restraining over production. 15% respondents confirm this view. It is very imperative to maintain the man and machine. The onus lies on maintenance department to maintain the symphony in the different operations. 13% respondents consider the role of maintenance department very crucial in removing the waste. 11% respondents acknowledge store department as the main department in reducing the waste. Planning department is regarded as the back bone for any organization. 10% respondents feel that by sound performance of planning department eradication of waste can be managed in a well balanced manner. Purchasing of raw materials and other production stuff must be done with utmost care otherwise it may hamper the manufacturing process. 9% respondents ranked purchase department is

instrumental in get rid off waste. Research and development is nowadays of great importance in business as the level of competition, production processes and methods are rapidly increasing. 7% respondents believe that function of this department is inevitable in eliminating the waste. 6% respondents find that sales department also renders its great help in removing the waste. It is very necessary for any organization to use human resources at the optimum level. 5% respondents feel that a well structured human resource department can be a big helping hand in mitigating waste. 4% respondents consider responsibility of H.T. department is very vital in eliminating the waste.

Conclusions

To implement LMS successfully, the XYZ Company should customize its communication programs take employees well beyond their day-to-day perspectives and move them to understand, own and commit to associated initiatives. An effective communication plan should be built to create and maintain involvement and buy-in from people at all levels. Management must work with and educate people to align their thinking and behaviors with the redesigned processes, systems and management approaches to achieve positive change. It is also observed that the XYZ Company has non-effective use of staff talents and under utilization of expertise, skills, creativity, innovation, leadership, Motivation, drive. It is better to empower and give them responsibility to manage their work areas.

It is disclosed that quality defects prevent the customers from accepting the defected product. Defects, rework, scrap, corrections come under this category of waste. The defects are caused by parts mismatch, forgotten parts in assembly, Scratches on parts (material quality), Spoiled parts, useless because dirty, or scratched, poor instructions, lack of training, not following the right sequence, lack of maintenance. Defects lead to waste of money, decrease in throughput and in some instances loss of customers. To resolve these issues, the XYZ Company should apply prevention prior to detection, failure mode effects analysis, building quality at source, root cause analysis and error proofing.

Suggestions

Implementing a lean program is not an easy task. It requires extensive work both within and outside the organization but at the end it will yield long-term benefits. Tools & techniques should be applied successfully in order to attain the objective of LMS. This can be achieved with the integrated approaches of LMS. Being systematic about eliminating waste will give the XYZ Company a better chance at sustaining the momentum when someone engages and eliminates waste in its work. To reduce the waste of waiting, it should reduce queue size, point of use storage, deployment of visual systems, improving planning and load. There are certain obstacles in the implementation of Lean Manufacturing Practices. But they can be overcome by successful planning. This research study is quite successful in marking following problems that are being faced by the XYZ Company along with their remedial measures in form of proposed

methodology. Use of Lean tool Kaizen, avoided the problem of wastage of broaching oil during reloading the component in trolley after broaching. Kaizen drive the XYZ Company's employees to look out for new opportunities to improve their work, workplace resulting in productivity improvement. The management has to be very cautious at the time of implementing Kaizen.

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