

# A STUDY ON IMPLEMENTATION OF LEAN AND GREEN MANUFACTURING PRACTICES IN SELECT SME'S OF TELANGANA REGION

**Y. Srinivas Reddy**

Research Scholar, NITTE, Bangalore,

**Dr. Manjunath V. S**

Professor of Management, NITTE, Bangalore.

## ABSTRACT

The present research study is on the analysis of the significant factors for successful execution of lean and green manufacturing concept in SMEs in general and particularly it deals with SMEs in Telegana region, India. To attain the above objective, various SME industries present in and around of Hyderabad region of Telagana State have been used for data collection, where a few ideas of Lean and green manufacturing concept have been executed and the issues looked by them amid usage, additionally the SMEs who are intrigued to apply for the same, the Procedure for that is portrayed in this Paper. Present days, all areas businesses Particularly SMEs are attempting to execute those concepts in their Organization. This Paper endeavors to take care of some normal Problems looked by them during the implementation stage.

## INTRODUCTION

Industrial globalization and the exceedingly competitive world of manufacturing has provided SMEs tremendous opportunities for development and expansion through cost effectiveness and quality enhancement. But that has also impelled SMEs to admit the regulations and restrictions pertaining to their environmental responsibilities and to integrate various manufacturing paradigms which results in zero waste manufacturing (Tan et al., 2014). It demands products and processes to be designed and managed aiming at reduction in volume and toxicity of waste and materials, conservation and recovery of all resources without burning or burying them (Franchetti and Spivak, 2013). Because of an expansion in energy price, contamination and an unnatural weather change, alongside strict execution of rules and regulation identified with environmental execution, there is an earnest requirement for Indian Micro, Small and Medium Enterprises (MSMEs) to plan producing ideal models, for example, lean and green, to stay focused in the globalized market.

Lean manufacturing has been viewed as, acknowledged and broadly executed as one of the systems to handle the issues identified with waste minimization through non-esteem adding activity identification and end to enhance the execution of the association in three dimensions, in particular productivity, benefit and adaptability. The center issue in the present worldwide and aggressive condition is identified with practical development and this can be bridled through usage of systems like green manufacturing. Green assembling is a deliberate, financially determined, and coordinated approach, focusing on all the waste streams related with the outlining, fabricating, working, and additionally transfer of items and materials (Sezen and Cankaya, 2013). To the extent the Indian situation is concerned, the Indian Government has implemented different plans under the umbrella of the National Manufacturing Competitiveness program (NMCP) with the center goal of building up the Indian MSMEs to address worldwide focused weights. In view of this context, the present study is on the analysis of the significant factors for successful execution of lean and green manufacturing concept in SMEs.

### **OBJECTIVES OF THE STUDY**

1. To study the manufacturing practices of SMEs.
2. To analyse the lean and green manufacturing practices of SMEs and its application.
3. To identify the factors of Lean and Green Manufacturing which enhance SMEs efficiency.
4. To suggests measure for better Lean and Green manufacturing in SMEs.

### **REVIEW OF LITERATURE**

Lean assembling encourages the companies to enhance its business execution in terms of lessened assembling lead time as well as cost, enhanced product quality and conveyance time, which thus enhances consumer loyalty and make the company focused. Panizzolo et al. (2012) call attention to different operational execution benefits achieved by Indian SMEs through usage of Lean manufacturing, delegated upstream, down-stream, as well as esteem stream performance. They found that Indian SMEs are hesitant to execute lean assembling hones because of high budgetary speculation and consultancy related costs. Mathur et al. (2012) detailed critical change in efficiency through usage of Single moment trade of kick the bucket (SMED) apparatus in an Indian make to arrange (MTO) SME.

Singh and Khanduja (2010) played out a contextual analysis of an Indian SME to assess the impact of the SMED procedure in lessening setup time. They distinguished that SMED alongside other lean apparatuses, similar to 5S and Poka-burden, diminish process duration altogether and furthermore render budgetary advantages. Mathur et al. (2012) contended that because of poor proficiency and inadequate aptitude of the Indian work drive working in the greater part of the SMEs, lean procedures which request scientific and measurable examination makes leaps in selection and pushed for the apparatus which is basic,

simple to exhibit and apply. The execution measures should assume an affecting part, as opposed to an advising part, and go about as the controlling power of corporate methodology. Expanding CO<sub>2</sub> fixation in the air prompting the nursery impact, inadequacy of vitality and regular assets, arrival of dangerous material and waste age amid the assembling forms required the advancement of an assembling worldview with negligible unfriendly ecological impacts. This prompted the development of green manufacturing (GM).

As expressed by Ramayah et al. (2012), for full appropriation of GM hones by SMEs in creating nations, there is a need to exhibit the connection between reception of such practices and relating execution benefits. They additionally led an experimental investigation and found positive effects of GM hones on manufacturing execution. Govindan et al. (2014) proposed a half and half multi-criteria basic leadership instrument to assess green assembling rehearses, specifically, ecological discharge control and effect remediation, reducing, reusing and recycling (3R), green production network hones, and ideal utilization of natural assets. Luthra et al. (2015) distinguished basic achievement factors for GSCM hones in the Indian car industry, which required an expansion in awareness level among society and clients of green items as well as their advantages.

Zhu and Sarkis (2004) have inspected the connection between green supply chain practices along with the ecological and monetary execution of the firm, considering the control impacts of value administration as well as just in time. Sezen and Cankaya (2013) have confirmed the positive effects of GM on the natural and social execution of the firm, and furthermore derived that it can add to lessening the expenses of crude materials and costs towards ecological and word related wellbeing, enhanced creation effectiveness, and corporate picture. Usage of green assembling rehearses in SMEs has contributed decidedly through enhanced execution as far as long haul benefit, market share, image and competitive advantage (Agan et al., 2013), enhanced natural execution by means of waste minimization (Singh et al. 2015), with subjective and quantitative advantages as announced by Sangwan (2011).

The above discussion underpins the way that usage of GM hones prompts producing performance change, yet additionally prescribes the advancement of a structure to set up the linkage between execution of GM practices and execution advantages to urge SMEs to receive GM. Verrier et al. (2014) talked about that in the momentum exceedingly aggressive worldwide market, lean and green assembling can successfully address issues, for example, upper hand and gainfulness, and stressed the requirement for additionally examine in creating models for quantifiable profits with the goal that SMEs can be persuaded to embrace these ideal models in their organizations. The quantitative advantages of lean and green coordination are decreased generation lead time, enhanced esteem included time, diminished carbon impression, i.e. lessened ozone depleting substances discharge and enhanced in general gear productivity (OEE).

## RESEARCH METHODOLOGY

The research design adopted in the present study consists of the following components.

### *Sources of data*

The primary data is composed from employees in the managerial level who is dealing with the concept of lean and green manufacturing and its application. Secondary data pertaining to lean and green manufacturing were collected from published reports, records of SMEs and websites.

### *Data collection and Analysis*

Data is collected with the help of a structured questionnaire. The questionnaire has the following parts.

- Management type, annual turnover, volume of production, area lean applied, duration in days, ROI and many other factors

The questionnaire is administered through online to SMEs present in and around Hyderabad region of Telangana state and respondents are further personally interviewed in a formal way to gather relevant information. The questionnaires are distributed to the 385 SMEs. About 65 could be obtained but only 50 of them are complete in all respects. The statistical tools used in this research work were Descriptive Statistics and t-test.

## RESULTS AND DISCUSSION

### *i. Profile of SMEs*

The results of the study are as follows. Initially in this section, the researcher has presented the profile of the SMEs participated in the study. Around 50 percent of the SMEs following flow type of production in their manufacturing process, 32 percent uses the batch and remaining SMEs follows the job and continuous process in production of the product. A majority of about 60 percent of the respondents had annual turnover of 20-40 lakhs and 64 percent of the respondents have their annual volume of production up to 200000- 300000 lakhs units per year. From the results it can be said that, a majority 64 percent of the SMEs used Lean and green manufacturing concept in the category of Workplace Organization/5S and most of them i.e. 68 percent applied it for the period of 7-12 months. Most of the respondents 58 percent got their return on investment in 2 or more years only. The details are given table-1.

**Table-1 Profile of respondent SMEs**

	<b>Categories</b>	<b>F</b>	<b>%</b>
<b>Production Type</b>	Job	04	8.0
	Batch	16	32.0
	Flow	25	50.0
	Process	05	10.0
<b>Annual Turnover</b>	Below 20 lakhs	09	18.0
	20-40 lakhs	30	60.0
	40-60 lakhs	07	14.0
	60 and above	04	8.0
<b>Volume of Production</b>	100000 units per year	03	6.0
	100000-200000 units per year	14	28.0
	200000-300000 units per year	32	64.0
	300000 and above units per year	01	2.0
<b>Area Lean Applied</b>	Standardized work	18	36.0
	Workplace Organization/5S	32	64.0
<b>Duration in Days</b>	0-6 months	16	32.0
	7-12 months	34	68.0
<b>ROI</b>	Below 1 year	07	14.0
	1-2 yrs	14	28.0
	2 and above	29	58.0

### *ii. Analysis of Lean and Green Practices*

What are the important problems in lean and green practices? Table 2 shows that there are many. Those elements which got a score more than 4 on a 5-point scale of importance are: High expectations with limited time and investment (4.51), Lack of commitment from the management itself (4.23), Team members not taking seriously training programs indicating poor Organizational Culture (4.19), and Lack of Proper people to Lead the teams (4.13) The other important ones are: Team members not devoting time on kaizen projects and Kaizen circle activities (3.82) and Heavily dependent on

Lean and green Consultant only (3.61). Table 3 and 4 show that there are no statistically significant differences across production type and area lean applied.

**Table 2 Problems of SMEs in implementation of Lean and Green concepts**

S. No	Problems	Mean*	SD
1	High expectations with limited time and investment	4.51	0.64
2	Lack of commitment from the management itself	4.23	0.45
3	Lack of Proper people to Lead the teams	4.13	0.44
4	Team members not taking seriously training programs indicating poor Organizational Culture	4.19	0.43
5	Team members not devoting time on kaizen projects and Kaizen circle activities	3.82	1.15
6	Heavily dependent on Lean and green Consultant only	3.61	1.19

\*5 –point Scale: 1=Very Unimportant, 2=Unimportant, 3=Neutral, 4=Important, 5=Very Important.

**Table 3 Important Problems faced – across Area Lean Applied**

S. No	Trends	Standardized work		Workplace Organization/5S		t-value
		Mean	SD	Mean	SD	
1.	High expectations with limited time and investment	4.59	0.49	4.29	0.90	1.88
2.	Lack of commitment from the management itself	4.25	0.47	4.19	0.40	0.50
3.	Lack of Proper people to Lead the teams	4.12	0.42	4.14	0.47	0.15
4.	Team members not taking seriously training programs indicating poor Organizational Culture	4.18	0.43	4.24	0.43	0.53
5.	Team members not devoting time on kaizen projects and Kaizen circle activities	3.86	1.08	3.71	1.34	0.48
6.	Heavily dependent on Lean and green Consultant only	3.59	1.14	3.67	1.35	0.25

\*5 –point Scale: 1=Very Unimportant, 2=Unimportant, 3=Neutral, 4=Important, 5=Very Important.

**Table 4 Important Problems faced – across Duration in Days**

S.No	Trends	0-6 months		6-12 months		't' value
		Mean	SD	Mean	S D	
1.	High expectations with limited time and investment	4.48	0.74	4.54	0.51	0.45
2.	Lack of commitment from the management itself	4.33	0.47	4.11	0.40	2.15
3.	Lack of Proper people to Lead the teams	4.10	0.37	4.17	0.51	0.76
4.	Team members not taking seriously training programs indicating poor Organizational Culture	4.17	0.43	4.23	0.43	0.63
5.	Team members not devoting time on kaizen projects and Kaizen circle activities	3.60	1.03	4.09	1.25	1.88
6.	Heavily dependent on Lean and green Consultant only	3.29	1.01	4.00	1.28	2.72

\*5 –point Scale: 1=Very Unimportant, 2=Unimportant, 3=Neutral, 4=Important, 5=Very Important.

### iii. Factors of Lean and Green manufacturing which enhance production efficiency

The respondents were given seven statements that represented factors that can enhance production efficiency. The responses on 5 point scale of influence are converted into mean and standard deviations. Table 5 presents them. As mean scores above 3 indicate strong influencers, the following factors can be put under the category of influencers.

- Standardised work (3.86)
- Workplace Organisation/5S (3.52)
- One piece flow (3.22)

**Table 5 Factors of Lean and Green manufacturing which enhance production efficiency**

S.No	Factors	Mean*	SD	Rank
1	Standardised work	3.86	0.77	1
2	Workplace Organisation/5S	3.52	0.60	2
3	Visual factory (VF)	2.96	0.60	4
4	Point of use storage	2.15	0.91	6
5	Kaizen	2.78	0.06	5
6	Quick changeover / Single minute exchange of dies (SMED)	2.10	0.83	7
7	One piece flow	3.22	0.06	3

\*Scale: 5- very much 1 – very less

### *Suggestions*

- Standardized Work is one of the key instruments of Lean, which gives a premise to change. Tact time ought to be computed and care ought to be taken to decide appropriate work arrangement and to discover the in procedure stock.
- Lean Consultants ought to be formally prepared and appropriately affirmed by a national accreditation office like QCI or some other skilled body
- Lean mindfulness battle ought to be propelled at national level

### **CONCLUSIONS**

This paper has depicted the key elements for effective usage of lean assembling inside SMEs. The investigation uncovers that because of absence of satisfactory financing numerous SMEs not ready to contract a perfect administration group, so they experience the ill effects of absence of legitimate authority and arranging. The financing and authority insufficiencies restrain other efficiency activities, for example, workforce preparing, change in information, abilities and social mindfulness. Among the lean practices that require minimum money related speculation are 5S, visual control and show, institutionalization of activity, Statistical Process Control (SPC) and Kaizen circle. Thus, SMEs ought to apply these practices first and afterward took after with different practices, for example, kanban card, pokayoke. These can be actualized once the generation stream is effectively run, with least machine breakdown and quality issues. These means if will be taken could assist SMEs with improving their execution slowly.



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