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A Study on Implementation of Lean Manufacturing in Sri Kamakshi Industries Pvt Limited, Chennai

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ABSTRACT: This study explores the application of lean manufacturing principles within Sri Kamakshi Industry, a medium-scale production facility based in Chennai, Tamil Nadu. Lean manufacturing aims to improve efficiency by systematically eliminating non-value-added activities and optimizing resource utilization. The study identifies prevalent inefficiencies in the existing production process and proposes actionable solutions based on lean tools such as 5S, Kaizen, Just-in-Time (JIT), and Value Stream Mapping (VSM). Data were collected using interviews, direct observations, and company records. Findings indicate that the implementation of lean strategies has the potential to reduce production delays, enhance workplace organization, and improve overall productivity. The paper concludes with suggestions for sustainable lean adoption and highlights the practical implications for small and medium enterprises (SMEs) in the Indian manufacturing sector.

KEYWORDS: Lean Manufacturing, 5S, Kaizen, Value Stream Mapping, Just-in-Time, Waste Reduction, Process Optimization, SMEs.

I. INTRODUCTION

In the modern industrial landscape, companies face increasing pressure to deliver high-quality products at minimal cost while maintaining operational flexibility. Lean manufacturing has emerged as a strategic framework to meet these demands by emphasizing the elimination of waste (muda), improving process efficiency, and fostering a culture of continuous improvement. Originally developed by Toyota, lean thinking has since been adopted across diverse industries worldwide.

Sri Kamakshi Industry, a component manufacturing unit in Chennai, has experienced challenges typical of many Indian SMEs—high levels of work-in-progress inventory, frequent production bottlenecks, inefficient workspace organization, and inconsistent quality control. Recognizing the need for systemic reform, this study was conducted to assess the feasibility and benefits of implementing lean manufacturing techniques in the organization.

The objective is to map existing workflows, identify areas of waste, and recommend suitable lean tools for improvement. This research is particularly relevant in the Indian context, where many SMEs lack the structured systems needed to sustain operational excellence. Through this case-based approach, the study contributes to the growing body of knowledge on lean adoption in resource-constrained manufacturing environments
Adapted from an article by Alan Bryman in the International Journal of Social Research Methodology: A problem is a statement about an area of concern. It is a condition to be improved upon, a difficulty to be eliminated, or a troubling question that exists in theory or in practice that points to the need for meaningful understanding and deliberate investigation.

The statement of the problem in the steel industry regarding lean manufacturing is that while lean principles are highly effective in improving efficiency and reducing costs, the steel industry presents unique challenges that can hinder their successful implementation. These challenges include large, inflexible equipment, long cycle times, metallurgical constraints, and the need for specialized expertise to apply lean techniques effectively.

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The plant operates with prolonged cycle times, excessive inventory, frequent equipment downtime, and high defect rates—all stemming from scale and complexity in operations. For example, large batch processes and metallurgical constraints result in lengthy heat-up/cool- down cycles and bottlenecks at milling and saw stations
A70.6% increase in throughput.
54%improvementininventoryturnover.
78%reductionintime delays.
63.3%decreaseindowngradedproducts.

Over all lean implementation helps to reduce waste and improve cost and also to avoid bottle neck problem using VSM techniques.

II. OBJECTIVIES OF THE STUDY

- To explore the implementation of lean manufacturing tools at Sri Kamakshi Industry to enhance operational efficiency, reduce waste, and improve process flow. The specific objectives are as follows:
- To study various lean tools and analyze their implementation across different industrial scenarios.
- To implement selected lean tools aimed at improving productivity, quality, and efficiency, particularly in the context of new product development.
- To analyze the current workflow at the Sri Kamakshi workstation and design an optimized layout to minimize cycle time and eliminate bottlenecks.
- To improve visual management by applying lean principles such as 5S, and to implement a two-bin inventory system for streamlined material management and enhanced workplace organization.

III. SCOPE OF THE STUDY

- The scope of this study on lean manufacturing encompasses multiple dimensions, each vital for a holistic understanding of lean implementation at Sri Kamakshi Industry. The scope has been carefully delineated to ensure clarity of focus and relevance of findings.
- on the manufacturing sector, particularly component production units. Lean principles are analyzed in the context of medium-scale Indian manufacturing operations, where cost-efficiency, resource optimization, and cycle time reduction are critical concerns.
- This research centers on Sri Kamakshi Industry**,** specifically analyzing lean implementation across its production, quality, maintenance, and procurement departments. The study also considers support functions such as utilities, stores, and layout planning.
- The geographic focus is confined to Chennai, Tamil Nadu, where the organization is located. However, the findings offer insights applicable to similar industrial units across India facing operational inefficiencies.
- A mixed-method approach is employed, combining both qualitative and quantitative methods. Techniques include process mapping, value stream analysis, time studies, and structured interviews. Tools such as 5S audits and VSM (Value Stream Mapping) are also used to gather actionable insights.
- The study explores the application of specific lean tools including 5S, Kaizen, JIT, and Two-Bin Systems. It also examines:
- Value stream flow, from raw material intake to casting, rolling, and finishing stages (including galvanizing, if applicable).
- Support functions such as procurement (lead time mapping), layout design, and maintenance.
- Applicability to a single production line, specific departments, and broader implications for entire plant-level transformation**.**

This comprehensive scope enables the study to serve as both a practical intervention model for Sri Kamakshi Industry and a reference point for similar enterprises in the manufacturing sector seeking lean transformation.

IV. REVIEW OF LITERATURE

Lean manufacturing has its origins in the Toyota Production System (TPS), which emphasized the elimination of waste, standardization, and continuous improvement (Womack & Jones, 1996). Over time, these principles have evolved and been applied globally to various manufacturing and service sectors. The core philosophy of lean focuses on improving customer value by removing non-value-added activities across processes.

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The implementation of 5S—Sort, Set in order, Shine, Standardize, Sustain—forms the foundational step in workplace organization and discipline (Hirano, 1995). Research by Imai (1986) on Kaizen emphasizes the role of incremental improvements in building long-term efficiency. Similarly, Just-in-Time (JIT) principles, pioneered by Taiichi Ohno (1988), stress the importance of reducing inventory and producing only what is needed, when it is needed.

Value Stream Mapping (VSM), as described by Rother and Shook (2003), is an analytical tool used to visualize current processes and identify bottlenecks and waste. Studies by Shah and Ward (2007) have confirmed that lean implementation leads to significant gains in productivity, cost control, and customer satisfaction in both large and small-scale industries.

However, challenges remain in effectively implementing lean practices, particularly in SMEs. These include resistance to change, lack of training, and insufficient top management commitment (Bhasin, 2012). Despite these barriers, numerous case studies (e.g., Singh & Ahuja, 2015) highlight that lean tools can be customized and scaled to suit the unique constraints of small enterprises.

V. RESEARCH METHODOLOGY

This study follows a descriptive research design, which is appropriate for exploring current practices, identifying patterns, and drawing logical conclusions based on observations and empirical data. The purpose of the study is to develop a thorough understanding of the lean manufacturing practices implemented at Sri Kamakshi Industry and to assess the perceptions of both employers and employees regarding their effectiveness.

To evaluate the feasibility of conducting this research at Sri Kamakshi Industry Private Limited, Chennai, a preliminary pilot study was undertaken. The researcher engaged in a discussion with the company's Accounts Manager to gain initial insights into the lean manufacturing strategies currently in place and the challenges associated with them. The outcomes of this discussion provided a logical framework upon which the final questionnaire was developed, ensuring the research instrument was relevant and context-specific.

Data for the study were gathered using both primary and secondary sources.
Primary data were collected directly from employees through structured questionnaires designed to assess lean practices, employee perceptions, and operational challenges. The researcher also used personal observation during factory visits to complement the data collected via questionnaires.

Secondary data included company documents, industry reports, research articles, and records that provided background information on lean practices and operational benchmarks.

Structured Questionnaire: Used to collect detailed responses on lean implementation from various departments.

Observation Checklist: Utilized during on-site visits to validate responses and assess real-time operational efficiency and visual management practices.

Secondary data refers to information that has already been collected, published, or processed by other researchers or organizations. In this study, secondary research was conducted to support and supplement the findings from primary sources. This method involved reviewing previously published materials to provide context, validate insights, and guide the development of the research tool.

Secondary research is particularly useful for identifying industry benchmarks, understanding theoretical frameworks such as lean principles, and gaining insights from prior case studies and academic publications. While it differs from primary data in terms of originality and specificity, it plays a vital role in framing the research direction and comparing organizational practices with broader industry trends.

Sources of Secondary Data:
Research Papers – Scholarly articles, journals, and case studies related to lean manufacturing and operational improvement.

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Age Group	Number rof Respondents	Percentage
22–25	31	44.9%
26–35	36	52.2%
36–45	2	2.9%
46–55	0	0%
Total	69	100%

b) Internet Sources – Reputable websites, industrial databases, online whitepapers, and government/industry portals containing relevant information about manufacturing practices and lean implementation strategies Even though the department wise strength of the executives was made available to the researcher, it was not possible to adopt "Stratified Random Sampling "(department wise) for the selection of sampling units due to organizational constraints. Same way it was also not possible to have a proportionate selection of units on the basis of department wise strength. On the other hand it was suggested by the organization to ascertain with the executives in each department about their willingness to fill in the questionnaire and those who are willing to do so, were asked to be included in the data collection. Accordingly, adopting the "Convenience Sampling" procedure, a total of 69 respondents were covered by the study.
The confirmation at later stage regarding the executives covered by the study and their department of work is understand to be as follow.

Questionnaire is the tool adopted by the researcher for collecting the data. It refers to securing answers for a set of reconstructed form of questions to be filled in/ answered by the respondent. This method is followed because it is
Cost effective.
Free from bias of the interviewer.
Rating will be done based on the respondents own thinking.
Enough time is available for filling the questionnaire.

VI. DATA ANALYSIS AND INTERPRETATION

Interpretation:
The majority of respondents(52.2%)are aged 26–35, followed by44.9% aged 22–25. Very few (2.9%) fall in the 36–45 age group, and none in the 46–55 range.

Shows the Gender of the respondents
The age distribution shows that the workforce at Sri Kamakshi Industry is predominantly composed of young professionals. Over half of the respondents (52.2%) are in the 26–35 age group, followed by 44.9% in the 22–25 range. Only 2.9% are between 36 and 45 years, and none fall within the 46–55 category. This indicates a relatively young and dynamic employee base, which can be advantageous when introducing change-oriented practices such as lean manufacturing. Younger employees often exhibit greater adaptability and are more receptive to process improvement initiatives, though the lack of older, more experienced personnel could pose challenges in mentoring and leadership continuity.

The department of the respondents:

Department	**No. of Respondents**	**Percentage (%)**
Production	43	62.3%
Maintenance	10	14.5%
Quality Control	6	8.7%
Storage and Inventory	6	8.7%
Dispatch and Logistics	4	5.8%
Total	69	100%

Interpretation
Majority (62.3%) of respondents are from the Production department. Other departments like Maintenance (14.5%), Quality Control, and Storage & Inventory (8.7% each) have moderate

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Shows the year of experience:

Years of Experience	No .of Respondents	Percentage(%)
Morethan2years	32	46.4%
Morethan5years	30	43.5%
Morethan10years	4	5.8%
Morethan15years	3	4.3%
Total	69	100%

Interpretation:
The data reveals that a significant portion of respondents (90%) have between 2 to 5 years of work experience. This suggests a workforce with substantial hands-on exposure to the manufacturing processes and operational routines of the organization. The presence of only a small group (4%) with over 10 years of experience indicates limited long-term retention or possibly a younger average workforce age. The 2–5 year range appears to represent the core employee demographic, making them an essential group for targeted lean training and anticipation in continuous improvement initiatives.

THE DEPARTMENT OF THE RESPONDENTS:

Department	No. of Respondents	Percentage (%)
Production	43	62.3%
Maintenance	10	14.5%
Quality Control	6	8.7%
Storage and Inventory	6	8.7%
Dispatch & Logistics	4	5.8%
Total	69	100%

Interpretation
Majority (62.3%) of respondents are from the Production department. Other departments like Maintenance (14.5%), Quality Control, and Storage & Inventory (8.7% each) have moderate representation. Dispatch and Logistics has the least (5.8%).

VII. FINDINGS OF THE STUDY

1.The age distribution indicates that the majority of respondents fall within the 26–35 age range (52.2%), while nearly the other half (44.9%) are aged 22–25. Only a small fraction (2.9%) are in the 36–45 category, and no respondents fall within the 46–55 bracket. This suggests that the workforce is predominantly composed of young professionals. The youthful demographic may be more adaptable to change and responsive to new initiatives such as lean manufacturing, which often requires a shift in culture, mindset, and work practices.
2.The analysis indicates that the vast majority of respondents (approximately 90%) possess between 2 to 5 years of work experience. This suggests that the workforce has a solid foundation of hands-on knowledge and operational familiarity with the company's production processes. Such experience is valuable when implementing lean manufacturing, as employees with practical exposure are more likely to understand inefficiencies, contribute meaningful feedback, and adapt effectively to process improvements.,
3.73.9% confirmed receiving training or orientation on Lean tools like 5S,TPM, Kaizen, or Kanban
4.A majority of the respondents (68.1%) correctly identified the primary goal of lean manufacturing as the elimination of waste and the improvement of operational efficiency. This reflects a commendable level of awareness among employees regarding the core principles of the lean philosophy. Such understanding is essential for successful lean implementation, as it ensures that employees are aligned with organizational objectives and are better equipped to actively participate in and support continuous improvement initiatives..
5.56.5% are very familiar with Lean Manufacturing principles
6.The findings suggest that respondents tend to primarily use operational-focused lean tools, such as 5S, Total Productive Maintenance (TPM), Just-in-Time (JIT), and Value Stream Mapping (VSM). This indicates a practical orientation toward tools that directly impact shop floor efficiency, equipment reliability, inventory control, and process

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flow visualization. The preference for these tools also reflects a foundational stage of lean implementation, where organizations typically focus first on stabilizing operations before progressing to more advanced lean practices.

7.According to the respondents, the most significantly improved area as a result of lean practices was waste reduction, reported by 66.7% of participants. This was followed by improvements in product quality, cited by 13% of respondents. These findings highlight that lean implementation at Sri Kamakshi Industry has had the greatest impact on minimizing non-value-added activities and enhancing production efficiency. Although improvements in quality are also noted, the data suggests that waste elimination remains the most tangible benefit perceived by the workforce.Mostparticipants(66.7%)reportedfacingchallengesduringLeanManufacturing implementation.

8.Frequent issues reported by respondents include implementation difficulties**,** lack of understanding of lean concepts, and coordination problems among departments**.** These challenges indicate gaps in communication, training, and cross-functional collaboration—factors that are critical to the successful adoption of lean manufacturing. Without adequate understanding and alignment, lean initiatives risk being poorly executed or unsustainable over time.

9.In addition, a majority of respondents acknowledged that ongoing support from management **and** employee involvement are crucial for the effectiveness of lean practices. This underscores the need for consistent leadership commitment, structured training programs, and clear communication strategies to ensure the long-term success of lean implementation.

10.A majority of respondents (**72.5%**) believe that **employees at all levels are actively involved** in lean improvement initiatives. This suggests a positive organizational culture where continuous improvement is not limited to management or supervisory roles but is embraced across the workforce. Such widespread participation is essential for the long-term success of lean manufacturing, as it fosters ownership, accountability, and a shared commitment to operational excellence..

11.The majority of respondents (**81.2%**) indicated that **training** is the most critical support needed for the successful implementation of lean practices. This finding underscores the importance of equipping employees with the necessary knowledge and skills to understand and apply lean tools effectively. Without adequate training, even well-designed lean initiatives may face resistance, misapplication, or failure to deliver desired outcomes. Therefore, ongoing training programs are essential to build internal capabilities and ensure sustainable lean transformation..

12.A majority of respondents (68.1%) reported observing improvements in process efficiency after implementing lean manufacturing.

VIII. SUGGESTIONS

- Focus on Key Waste Areas: The primary sources of waste identified during the study were related to inventory management**,** process time**,** product quality, and workforce efficiency. To address these, specific lean tools should be implemented with structured action plans targeting the root causes of these inefficiencies.
- Performance Monitoring and Evaluation: It is recommended that the performance of lean initiatives be systematically monitored before, during, and after **i**mplementation. This ensures data-driven decision-making and continuous feedback for improvement.
- Expected Performance Improvements: Based on comparative case studies from similar industrial environments, notable improvements have been recorded following lean implementation, such as:

  - Throughput increased **by** 70.6%
  - Revenue from by-products rose by 459%
  - Inventory turnover improved b**y** 54%
  - Operational availability increased by 45%
  - Plant availability rose by 41%

Reduction in Inefficiencies: Additionally, reductions were observed in key inefficiency metrics:

- Time delays reduced by 78%
- Man-hours per ton decreased by 52.4%
- Downgraded product output declined by 63.3%

These figures highlight the measurable benefits of applying lean principles and validate the importance of a structured and committed approach to lean transformation. For Sri Kamakshi Industry, adopting similar strategies could yield significant gains in productivity, cost efficiency, and product quality

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IX. CONCLUSION

The implementation of Lean Manufacturing within the steel industry will harmonize operational practices with global standards of efficiency. By prioritizing the eradication of waste, fostering employee engagement, and promoting a culture of continuous improvement, this initiative will facilitate quantifiable advancements in productivity, quality, and employee morale.Moreover, embracing Lean Manufacturing principles will not only streamline processes but also cultivate a robust framework for sustainable growth. The integration of systematic problem-solving methodologies and data-driven decision-making will empower organizations to respond adeptly to market fluctuations and customer demands.

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