Implementation of Lean Manufacturing System At KVH Steel Doors And Windows, Vattambalam, Mannarkkad

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Abstract- *This article explores the implementation of a Lean Manufacturing system at KVH Steel Doors and Windows, a leading manufacturer in the industry. Lean Manufacturing, a methodology aimed at minimizing waste and maximizing efficiency, was adopted to address inefficiencies in production processes, reduce costs, and improve product quality. The implementation involved a comprehensive analysis of existing workflows, identification of waste sources, and the application of Lean tools such as 5S, Kaizen, and Value Stream Mapping. Key strategies included workforce training, process standardization, and continuous improvement initiatives.The data collection was done throughsurveys, personal interaction with workers, andObservations.*

Keywords- lean manufacturing, wastes, continuous improvement, manufacturing industry, inventory control.

I. INTRODUCTION

Lean Manufacturing is a systematic approach to streamlining production processes by minimizing waste and maximizing value. Originating from the Toyota Production System, Lean focuses on creating more value for customers using fewer resources. This methodology involves identifying and eliminating non-value-adding activities, leading to significant improvements in efficiency, productivity, and quality. The key principles of Lean Manufacturing include defining value from the customer's perspective, mapping out the value stream for each product, ensuring smooth flow of value-creating steps, implementing a pull system based on customer demand, and striving for continuous improvement. Lean tools and techniques such as 5S, Kaizen, Value Stream Mapping (VSM), and Kanban play crucial roles in this process. 5S focuses on workplace organization to improve efficiency and safety, Kaizen promotes continuous, incremental improvement involving all employees, VSM provides a visual analysis of the flow of materials and information, and Kanban controls the logistical chain and inventory. The benefits of Lean Manufacturing are substantial, including increased efficiency, improved quality, cost savings, enhanced employee engagement, and greater customer satisfaction. Implementing Lean Manufacturing can transform an organization by fostering a culture of continuous improvement and excellence, leading to significant competitive advantages.

II. INDUSTRY PROFILE

The steel doors and windows manufacturing sector in Kerala, India, represents a specialized segment within the construction industry, catering to the state's unique architectural and climatic requirements. While specific statistics on this sector in Kerala may not be readily available, we can provide insights into broader trends and market dynamics within India's steel doors and windows industry.

In India, the steel doors and windows market has been growing steadily, driven by increasing urbanization, infrastructure development, and a shift towards modern and durable building materials. According to industry reports, the market for steel doors and windows in India was valued at approximately $1.2 billion in 2020 and is projected to grow at a compound annual growth rate (CAGR) of around 5% to reach $1.5 billion by 2025.

Kerala, with its focus on quality construction and durability, is a significant contributor to the demand for steel doors and windows within the Indian market. The state's construction sector, driven by residential, commercial, and institutional projects, has spurred the adoption of steel doors and windows due to their superior strength, security features, and weather resistance.

III.COMPANY PROFILE

KVH, a prominent manufacturer of steel doors and windows in Kerala, was established in 2017 in Mannarkkad, Palakkad.KVH’s primary activity involves manufacturing**,** specifically in the sub-category of fabricated metal products (excluding machinery and equipment)**.** Their focus centers on

crafting doors, windows, frames, shutters, and rolling gates. Classified as a micro-enterprise during the financial year 2020-21, KVH operates through three branches located in Shornur, Cherppulassery, and Kalladikkode**.** The factory boasts an impressive array of automated machinery, including laser cutting machines, CNC bending machines, milling machines, lathes, power presses, and band saws, contributing to their robust production capacity.

IV. REVIEW OF LITERATURE

A framework for lean manufacturing implementation Sherif Mostafa, JantaneeDumrak& Hassan Solta (2013)

This paper has presented two contributions. First contribution is an evaluation methodology that is applied on the lean initiatives studied. Second contribution is a project-based framework structured to fit lean implementation. A set of rules for evaluation has been established to understand the association between the initiatives and their success factors. Moreover, this study has established a conceptual association between the success of lean initiative, initiative elements and organisational practice through the three constructed formulae. To overcome the limitations of the existing frameworks, the paper has proposed a lean implementation framework which covers all success factors found in the previous studies. The proposed framework has integrated project-based processes and been divided into four phases. The first phase mainly involves human factor while the remaining three phases are mainly technical. As an updated base of lean data, information and knowledge become an essential part of the process, it must be considered in the first phase of the proposed framework. This phase energises the continuous learning on lean, specifically for the implementation team and improves the process control. Attained leanness level should be measured, as set at end of the third phase, to verify the results before setting new standard, which ensure the continuous improvement

Lean Manufacturing Case Study with Kanban System Implementation, Nor Azian Abdul Rahmana, Sariwati Mohd Sharifb, Mashitah Mohamed Esa (2013).

The Kanban system implemented in this manufacturing company was found to be adequate due to the many benefits such as the operational costs, wastes, scraps and losses were minimized, over production stocks were controlled with flexible work stations. The factors that hinder SME companies from implementing the Kanban system are identified as ineffective inventory management, lack of supplier participation, lack of quality improvements and quality control and lack of employee participation and top management commitment.

A Review on Lean Manufacturing Implementation Techniques R.Sundar,A.N.Balajib,R.M.SatheeshKumar (2014)

this survey reveals that the successful Lean Manufacturing System implementation needs integration and simultaneous implementation of Lean elements along with proper sequence. The survey also proposes the detailed implementation Road Map which gives a unified theory for Lean Manufacturing System implementation.Thus, the proposed implementation structure reduces the implementation duration and reduces manufacturing system divergence. As a result, it is proposed that the Lean Manufacturing System can be sustained in competitive business environment. Future research should try to find Scheduling structures in-line with EPEI pull system by considering the whole lean elements.

V. OBJECTIVES OF THE STUDY

Primary objective

- Implementation of lean manufacturing system.

Secondary objectives

- Identify the percentage of wastage.
- Identify the product with highest wastage rate.
- Identify the area where the wastage is happening.
- Implementation of lean management technique

VI. RESEARCH METHODOLOGY

For this study, descriptive research design is used. Descriptive research design is a type of research design that aims to obtain information to systematically describe a phenomenon, situation, or population. Descriptive research is instrumental in implementing Lean Manufacturing systems as it provides a detailed understanding of current operational processes, inefficiencies, and areas for improvement within an organization. Through methods like observation, surveys, and interviews, descriptive research identifies performance metrics and potential barriers to Lean adoption, enabling tailored strategies for overcoming challenges. By establishing a baseline for performance, organizations can measure the impact of Lean initiatives and track progress towards enhanced efficiency, productivity, and quality, ultimately driving successful organizational transformation.

VII. DATA ANALYSIS

WASTAGE CALCULATION FOR MARCH

WINDOWS:

SI. NO	ITEM NAME	SIZE	COST PER UNIT	ITEM USED	WASTAGE IN KG	WASTAGE %	WASTAGE IN COST	WASTAGE STATUS
1	GI Sheet	6*4 ft	110 Rs/kg	29	16	2%	1,760	Wastage Under Control
		7*4 ft		17	21	4%	2,310	Wastage Under Control
		8*4 ft		06	14	7%	1,540	Accepted Wastage
		9*4 ft		31	29	2.4%	3,190	Wastage Under Control
		10*4 ft		38	142	8.5%	15,620	Over Wastage
2	Pipe	6m	Rs. 400	238	69	6%	27,600	Wastage Under Control
3	Shutter Pipe	6m	Rs. 850	129	84	6.5%	71,400	Wastages Under Control

DOORS:

SI. NO	ITEM NAME	SIZE	COST PER UNIT	ITEM USED	WASTAGE IN KG	WASTAGE %	WASTAGE IN COST	WASTAGE STATUS
1	GI SHEET	7*4	110 /KG	176	1182	22%	1,30,020	Over Wastage

Interpretation:

In March, the wastage analysis for KVH Steel Doors and Windows highlights several critical areas. For windows, the GI sheets in various sizes exhibit varying wastage percentages, with 6*4 ft at 2%, 7*4 ft at 4%, 8*4 ft at 7%, 9*4 ft at 2.4%, and 10*4 ft at 8.5%. The financial impact of this wastage is significant, particularly for the 10*4 ft sheets, which incurred a wastage cost of Rs. 15,620. Most sizes show wastage under control, except the 8*4 ft (accepted wastage) and the 10*4 ft sheets, which are categorized as over wastage, indicating a critical area for improvement. Additionally, the 6m pipes and shutter pipes, costing Rs. 400 and Rs. 850 per unit respectively, have wastage percentages of 6% and 6.5%. Although their wastage statuses are under control, with costs amounting to Rs. 27,600 and Rs. 71,400, there is potential for further waste reduction.

For doors, the GI sheets of 7*4 ft size show a substantial wastage percentage of 22%, leading to a high wastage cost of Rs. 1,30,020, marked as over wastage. This indicates a pressing need for targeted waste management strategies. Overall, while some areas have managed to keep wastage under control, others, particularly in larger GI sheets for both windows and doors, require significant attention to reduce excessive wastage and associated costs.

WASTAGE CALCULATION FOR APRIL

WINDOWS:

SI. NO	ITEM NAME	SIZE	COST PER UNIT	ITEM USED	WASTAGE IN KG	WASTAGE %	WASTAGE IN COST	WASTAGE STATUS
1	GI Sheet	6*4 ft	110 Rs/kg	33	23	2.5%	2,530	Wastage Under Control
		7*4 ft		26	32	4%	3,520	Wastage Under Control
		8*4 ft		11	26	6.8%	2,860	Wastage Under Control
		9*4 ft		23	32	3.5%	3,520	Wastage Under Control
		10*4 ft		31	104	7.5%	11,440	Over Wastage
2	Pipe	6m	Rs. 400	196	52	5.4%	20,800	Wastage Under Control
3	Shutter Pipe	6m	Rs. 850	102	61	6%	51,850	Wastages Under Control

DOORS:

SI.NO	ITEM NAME	SIZE	COST PER UNIT	ITEM USED	WASTAGE IN KG	WASTAGE %	WASTAGE IN COST	WASTAGE STATUS
1	GI SHEET	7*4	110/KG	187	1165	20%	1,28,150	Over Wastage

Interpretation:

In April, the analysis of wastage for KVH Steel Doors and Windows reveals significant insights. For windows, the GI sheets in various sizes (6*4 ft, 7*4 ft, 8*4 ft, 9*4 ft, and 10*4 ft) show wastage percentages of 2.5%, 4%, 6.8%, 3.5%, and 7.5%, respectively. The wastage costs for these sizes are Rs. 2,530, Rs. 3,520, Rs. 2,860, Rs. 3,520, and Rs. 11,440, respectively. While most sizes have their wastage under control, the 10*4 ft size exhibits over wastage, indicating a need for targeted waste reduction efforts. Additionally, the pipes and shutter pipes, each 6 meters in length and costing Rs. 400 and Rs. 850 per unit respectively, have wastage percentages of 5.4% and 6%. The wastage costs for these items are Rs. 20,800 and Rs. 51,850, both of which are under control but still present opportunities for further improvement.
For doors, the GI sheets of 7*4 ft size display a substantial wastage percentage of 20%, resulting in a high wastage cost of Rs. 1,28,150, which is marked as over wastage. This indicates a pressing need for more effective waste management strategies to reduce excess wastage. Overall, while the majority of the materials for windows are managing wastage effectively, the higher wastage in the larger GI sheets for both windows and doors highlights critical areas requiring focused intervention to enhance material efficiency and reduce costs.

VIII. CONCLUSION

In summary, the study focuses on implementing a lean manufacturing system in KVH Steel Doors and Windows, a steel doors and windows manufacturing company presents a significant opportunity to drive profound improvements in operational efficiency. By addressing identified sources of waste and inefficiencies through lean principles, the company aims to enhance production processes, quality control, and overall competitiveness within the industry. The findings underscore the importance of optimizing operations, resource utilization, and fostering a culture of continuous improvement to meet evolving customer needs and market demands.

Furthermore, this project offers valuable learning experiences for students interested in lean manufacturing and operational excellence. Engaging with real-world challenges and applying lean concepts within a manufacturing setting provides students with practical insights into process optimization, problem-solving, and change management. Collaborating with industry professionals and gaining exposure to lean methodologies enables students to develop essential skills relevant to future careers in manufacturing and operations management.

Ultimately, the success of this endeavour relies on strong leadership, cross-functional collaboration, and a commitment to ongoing improvement. Embracing lean principles and implementing sustainable practices not only drives operational efficiencies but also fosters a culture of innovation and continuous learning. This project exemplifies the transformative impact of lean manufacturing and underscores the potential for organizations and students alike to thrive in a dynamic and competitive business landscape through operational excellence.

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