



A CASESTUDY ON THE IMPLEMENTATION OF 5S IN AN INDIAN CABLE MANUFACTURING SME

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ABSTRACT :

This study delves into the implementation of lean manufacturing in an Indian cable manufacturing SME, focusing on waste reduction and enhancement of operational efficiency. A lean tool namely 5S had been implemented in an organisation situated at Kerala state of India. During the initial stage of the study, key wastes were identified through observation and discussions with higher authorities. It includes unwanted motion, waiting time, and defective product, which were targeted for reduction. Implementing 5S as a lean tool will boost the efficiency by organizing tools and materials for easy access, improving quality through cleaner workspaces that help detect issues early, and reducing waste by optimizing storage and preventing excess inventory. The lean transformation will position the organisation as a more competitive player in the market by streamlining operations and improving responsiveness to customer demands. It also enhances safety, raises employee morale, and establishes a culture of continuous improvement, supporting lean manufacturing and strengthening the organisation's competitive position.

Keywords: Lean Manufacturing, 5S, SME.

INTRODUCTION :

Small and Medium Enterprises (SMEs) can play a vital role in bringing wealth and prosperity to the developing economies [1]. But the success of SMEs depends on the entrepreneurial abilities and enterprising attitude of the personnel owning them [2]. These organisations have to adopt various strategies to improve their capabilities and to survive in the global market. Lean manufacturing is one among this. Lean concepts have been found to help organizations for acquiring competitive strength by adopting waste reduction and value addition approaches. It is a systematic approach to minimizing non-value-added activities within a manufacturing system while ensuring quality and maximizing productivity. Though a section of professionals believe that Ford is the first manufacturer which initiated the basic principles of lean manufacturing, its birth could be traced to the evolution of Toyota production system in the year 1920[3]. According to Oxford dictionary, lean means 'thin and fit'. It also implies as 'strong' and 'efficient'. Various studies reported in the literature have identified nine wastes that occur in organisations [4]. These wastes are reported as overproduction, unnecessary inventory, delay, transportation, processing, unnecessary motion, defective parts, under-utilisation of human resources and under-utilisation of facilities.

The effectiveness of the theoretical concepts can be studied by an implementation study. This paper is reporting an implantation study of a lean tool in a cable manufacturing SME in Kerala. This study focused on implementing 5S as a lean tool. The 5S philosophy focused in creating an organized and efficient workplace with clear, standardized procedures.

LITERATURE REVIEW :

Lean manufacturing has been perfected by Toyota Production System (TPS) and a huge number of companies in developed countries followed suit for their performance improvements [5]. In this study the authors explained that the implementation of lean manufacturing techniques in a labeling and packaging plant in Bangladesh to enhance operational performance. The study utilized value

stream mapping (VSM) to identify and eliminate non-value-added activities, leading to significant improvements in key performance indicators (KPIs) such as lead time, customer complaint rate (CCR), and units produced per labor hour (UPLH). Techniques like Kanban, single-minute exchange of die (SMED), and why-why analysis were employed to reduce waiting time, motion waste, and production defects. As a result, the plant saw a 7.1% reduction in lead time, a 55% improvement in internal complaint rate (ICR), and an 83% reduction in CCR, demonstrating the effectiveness of lean manufacturing in improving productivity and quality [3]. In this study, the authors studied about the implementation of a lean supply chain (LSC) at Ford Motor Company in Taiwan, using a case-based approach to demonstrate its impact on product cost and quality. The study highlighted that Toyota's success comes from its commitment to continuously eliminating waste and focusing on a long-term strategy. The study used value stream mapping (VSM) to pinpoint areas of waste and improve processes, showing clear benefits like reduced costs, better quality, and shorter lead times. The paper also provides actionable tips for using VSM and stresses the importance of sticking with lean principles over the long run for lasting success. In contrast, traditional manufacturing systems are built on the idea of economies of scale.

A key principle of lean manufacturing is the use of visual communication, and one of the most effective tools for this is Value Stream Mapping (VSM), which helps identify and eliminate waste [6]. This article explores how combining Smart Sustainable Value Stream Mapping (SS-VSM) with lean, sustainable, and smart technologies can boost the performance of Small and Medium-sized Enterprises (SMEs). It also introduces a fuzzy-based Preference Selection Index (FPSI) method to select the most effective SS-VSM strategies by considering environmental, economic, and social factors.

The study underscores the importance of VSM in spotting and reducing waste in production processes and highlights the need for SMEs to embrace smart, sustainable practices to remain competitive. The proposed SS-VSM framework aims to improve resource efficiency, sustainability, and operational performance by leveraging real-time data and advanced analytics. Additionally, the paper introduces Cost Value Stream Mapping (CVSM), a new tool that combines the advantages of VSM and Cost-Time Profile (CTP) to address non-value-added activities in both time and cost domains [7]. The study shares a case from an SME in Kerala, India, that manufactures adjustable props. By applying CVSM, the company achieved significant reductions in lead time, work-in-progress (WIP) inventory, and cost investments, resulting in savings of money. The document details the CVSM process, including the creation of current and future state maps, and how lean tools were used to improve efficiency and reduce costs [8].

Another lean manufacturing tool is 5S. The 5S concept was created by Takashi Osada in the early 1980s [9] and is based on five Japanese terms: Seiri, Seiton, Seiso, Seiketsu, and Shitsuke [10]. At its heart, 5S is a system for organizing and managing items so they're easy to find and access. It's designed to help improve quality, speed up services, and reduce waste, making the operations more efficient.

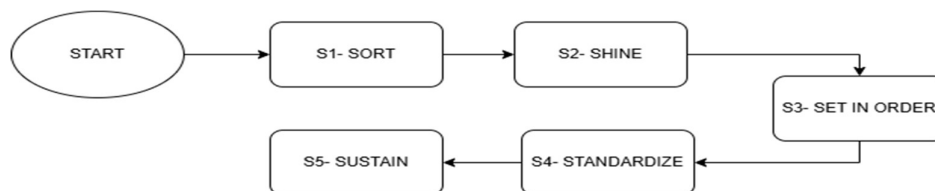


Figure 1: Stages of 5S

The 5S concept is often broken down into five key ideas: Structurise, Systematise, Sanitise, Standardise, and Self-discipline [11]. "Structurise" is about organizing items so that they're easy to find, keeping only what's necessary and removing what isn't. "Systematise" means arranging things

in a way that allows for quick and efficient retrieval. "Sanitise" involves cleaning the workspace by getting rid of unnecessary materials and clutter. "Standardise" is about keeping things orderly by storing items in designated spots, making them easy to access. "Self-discipline" encourages everyone to stick to the rules and routines for organizing and retrieving items. All these practices help reduce waste and improve efficiency, as discussed in the following sections [9].

The role of Small and Medium-sized Enterprises (SMEs) in economic development is well illustrated in the literature. [12,13] Even though SMEs have fewer employees and lower revenues compared to larger companies, they play a vital role in economic growth[14] This study examines how aware SME employees in Malaysia and Indonesia are of lean manufacturing (LM) and ergonomics. By integrating LM and ergonomics, companies can improve productivity and enhance worker safety. Using SPSS and SmartPLS4, the study measures employees' understanding of these concepts and their impact. The results show that Malaysian workers have a better grasp of LM and ergonomics compared to their Indonesian counterparts. The study highlights the importance of ergonomics in LM and suggests that improving employee awareness can help in better implementing these practices. Adopting a lean 5S system helps SMEs to establish a clean, well-organized, and disciplined work environment. A study by Shahriar et.al [15] examines the implementation of the 5S methodology in a plastic bag manufacturing company in Bangladesh to eliminate non-value-adding activities and boost efficiency. The study focused on the blowing and printing operations, identifying and removing unnecessary motions and waiting times. Implementing the 5S steps led to an 8% reduction in operational time for blowing and an 18% reduction for printing. Not only did this improve operational efficiency, but it also enhanced workplace safety and organization, offering a great example for other SMEs. By implementing lean tools like kaizen and 5S, and creating a future state map, the company worked to eliminate waste, reduce cycle times, and improve overall productivity. These lean practices resulted in significant time savings and cost reductions, enabling the company to meet customer demands more effectively [16].

METHODOLOGY:

IMPLEMENTATION OF 1S (SEIRI - Sorting Out) :

Proper sorting makes it easier to find the materials, tools, equipment, and information needed to get the job done. By removing waste, defective products, and damaged tools, it helps keep the workplace clean and organized. This not only streamlines the workflow but also saves time by making everything more accessible and efficient.



Figure 2-Sorting Out

IMPLEMENTATION OF 2S (SEITON – Set in Order)

A well-organized workspace is easier to navigate and more efficient to work in, which is why visualization is so important. Simple techniques like painting the floor can highlight storage areas and pathways, while outlining tool shapes ensures they are always returned to the right spot.

Coloured labels make it easy to identify materials, spare parts, and documents at a glance. Items that aren't used frequently should be stored nearby but outside the main workspace, with their placement based on how often they're needed. Clear markings—such as colour lines, signs, or tool boards—help keep everything easy to find. Once a system is in place, it should remain consistent to maintain order.



Figure 3-Set in Order

IMPLEMENTATION OF 3S (SEISO – Shine)

Regular cleaning not only keeps the workplace neat and organized but also helps spot and eliminate potential issues before they become bigger problems. It includes checking that machines, workstations, and floors are clean, ensuring equipment is in good working condition, and keeping lines, pipes, and lighting free of dust and debris. Clear and legible information is just as important for smooth operations. Plus, maintaining personal cleanliness and tidiness contributes to a healthier and more efficient work environment.



Figure 4-Shine

IMPLEMENTATION OF 4S (SEIKETSU – Standardize)

Having clear standards in place, like procedures and instructions, helps keep the workplace organized and running smoothly. These standards should be simple, easy to follow, and clear to everyone. It's important to involve everyone who's directly working on the tasks in creating and refining these standards, as they know the ins and outs of their work best. When the team is part of developing the guidelines, they gain a better understanding of each step in the process. To make sure



everyone can easily access them, these standards should be displayed in visible and consistent spots around the workplace.

IMPLEMENTATION OF 5S (SHITSUKE – Sustain)

Adopting the 5S approach encourages workers to develop good habits, especially when it comes to regular cleaning and sorting. This helps increase awareness among the team, reduces mistakes or faulty products, and improves overall processes. It also fosters better communication within the workplace, leading to stronger and more positive relationships among colleagues. In addition to these tasks, instruct the team to mark yellow lines around all sides of each machine on an annual basis. Clearly communicate that after using any tools, such as spanners or pliers, they should be returned to their designated place in the tool section. Additionally, emphasize the importance of daily cleaning and organizing of the workspace.

CONCLUSION:

In conclusion, the implementation of lean manufacturing has demonstrated significant potential for reducing waste and enhancing operational efficiency. By focusing on key lean tools, specifically 5S. The project identified major wastes, including motion, waiting, and defects, as primary areas for improvement. The lean transformation is projected to yield substantial benefits in reducing production cycle times, enhancing product quality, and achieving cost savings. This strategic shift is expected to solidify the company's position as a competitive player in the cable manufacturing industry by streamlining operations and responding more effectively to customer demands. Overall, this project underscores the value of lean principles in driving continuous improvement, fostering a culture of efficiency, and elevating operational standards

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