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LEAN MANUFACTURING IMPLEMENTATION IN AUTOMOBILE INDUSTRY

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1. ABSTRACT

Now a days industries require more productivity in less efforts, low cost, less number of employees. For that industries required new moderate techniques. We are studying one productivity improvement technique here. As a KAIZEN implementation.

It is the strategy where employees at all levels of company work together proactively to achieve regular, incremental improvement to manufacturing process.

It holds purpose like Kaizen aims for improvements in productivity, effectiveness and safety. But people who follow this approach often unlock a number of other benefits, too, including: Less– inventory is used more efficiently, as are employee skills.

In KAIZEN there are three main pillars from which we can fulfil requirement of industries. The three pillars of kaizen, for achieving goal

1. Standardization
2. 2. 5S
3. 3. Elimination of waste

Here in this case study we are using technique for Elimination of waste. For this utilization we are using one setup and increasing productivity of manufacturing.

2. INTRODUCTION

Many industries adopted Lean manufacturing as a part of Management strategy to increase the market share and maximize profit. Lean manufacturing is that creates a streamlined, high-quality system that produces products at the pace of customer demand with little or no waste. The aim of Lean Manufacturing is the elimination of waste in every area of production including customer relations, product design, supplier networks, and factory management. Its goal is to incorporate less human effort, less inventory, less time to develop products, and less space to become highly responsive to customer demand while producing top quality products in the most efficient and economical manner possible. Essentially, a "waste" is anything that the customer is not willing to pay for. Typically, the types of waste considered in a lean manufacturing system are Overproduction, Waiting, Inventory or Work in Process (WIP), Processing waste, Transportation, Motion and Making defective products.

The concept of LM was pioneered by a Japanese automotive company, Toyota, during 1950's which was famously known as Toyota Production System (TPS). The primary goals of TPS were to reduce the cost and to improve productivity by eliminating wastes or non-value-added activities. During 1980's there was an intense interest on LM implementation among the western manufacturers because of growing

Japanese imports. It became a serious concern to the western producers. After the oil crises in the early of 1990’s, in a published book named “The Machine” that Changed the World by International Motor Vehicle Programmed (IMVP), such intense interest of LM concept was again aroused. Then, the concept of LM was transferred across the countries and industries due to its global superiority in cost, quality, flexibility and quick respond. LM is a manufacturing strategy that aimed to achieve smooth production flow by eliminating waste and by increasing the activities value. Some analysts even pointed out that if an organization ignores the LM strategy, the company would not be able to stand a chance against the current global competition for higher quality, faster delivery and lower costs.

LM consists of a large number of tools and techniques. Shah and Ward identified twenty-two LM practices that are frequently mentioned in literatures and categorized them into four bundles associated with Just-inTime, Total Quality Management, Total Preventive Management and Human Resource. Some other researchers also categorized the lean tools and techniques according to the area of implementation such as internally and externally oriented lean practices. For example, Paniolo divided the lean practices into six areas which are process and equipment; manufacturing, planning and control; human resources; product design; supplier relationships; and customer relationships. The first four areas are grouped as internal oriented lean practices, whereas supplier relationships and customer relationships are under external oriented lean practices. This study also confirms that, many firms seem to have difficulty in adopting lean tools that concern with external relationships with suppliers and customers even for high performance firms. Empirical results from this study also prove that lean tools in internal areas are adopted most widely in the firms, where the operation and management methods are more direct. The change from traditional manufacturing system to lean manufacturing is not an easy task. Achanta et al. suggested that the success of LM implementation depends on four critical factors: leadership and management, finance, skills and expertise, and supportive organizational culture of the organization. Some researchers also suggested that applying the full set of lean principles and tools also contribute to the successful LM transformation.

Despite the huge benefits gained from LM implementation is highlighted, in reality not many companies are successful to implement this system. There are numerous reported problems and issues regarding the failure of LM implementation. Many researchers believed that the main problem lies on the misunderstanding of the real concept and purpose of LM. Some researcher identified the reason of this misunderstanding is due to cultural differences that occurs during transition or translation of LM. This type of misunderstanding could lead to more major issues such as piecemeal adoption of lean tools and techniques, misapplication of lean tools, and lack of development of lean culture that support the lean development. Study done by Puvanasvaran et al. [17] showed that the company which is in the early stage to become lean, must keep its efforts for an effective communication process at all levels in order to be successful in LM implementation

3. METHOD

3.1LEAN MANUFACTURING METHODS AND TOOLS

Lean manufacturing provides tools and methods that effectively reduce waste once it is recognized in the workflow. Here is a brief summary of some of the tools that producers have used successfully:

• Rapid improvement events (also called "Kaizen") -

This tool involves setting up a cross-functional waste reduction team to focus on a specific problem area. The team (6 to 10 people) usually includes staff from management, engineering, and sales, as well as salaried and hourly production staff. The team sets goals and is guided by an experienced team member. The team follows a proven method to find—and then eliminate—waste in a certain work area within a given time period (typically five days). The team then creates standard work programs so that the gains can be sustained. Producers typically have one or more Kaizen events per month that focus on different areas of the plant or office.

• Standardized tasks -

There is usually one way to perform a task most efficiently. The key milestones in a Kaizen event are to find waste, eliminate waste through improved methods, apply the methods to get efficient flow, and then standardize the tasks and methods. The standardized tasks should then be recorded for use in training and for reference.

• Balanced flow (sometimes called "Takt time") –

Once standard tasks are established, process cycle time and standard staffing can be developed. Balancing staffing and material flow to minimize walking, waiting, and repetitive material handling is frequently a source of significant improvement in precast concrete plants. Achieving balanced flow is a fundamental objective.

• Workplace organization (sometimes called "5-S") –

Many producers are familiar with this workplace organization and housekeeping system and have tried it. Unfortunately, many producers have also found that it is easy to slip back into poor habits. Clutter wastes time and hinders standardization.

• Visual controls –

This tool can be as simple as painting lines on the floor to guide the placement and flow of materials. Visual controls communicate essential information without words. They almost seem to make operations and product flow an intuitive process.

• Plant layout –

Most producers find many opportunities to streamline material flow, minimize crane time, and reduce walking. This tool includes an analysis of flow and how it relates to inventory. The carpenter shop and the steel shop are often a good place to start. A thorough analysis, together with Kaizen events, can help to locate substantial waste opportunities and to correct them.

• Mistake proofing –

All processes should be designed so that it is harder to do them wrong than to do them right. For example, it pays to think about the design of cast-ins so they do not look similar and cannot be put in backward or in the wrong place. As another example, common reference point dimensioning should be standard practice on shop drawings.

• Lead time reduction –

Producing a work product in batches that are unrelated to immediate need is almost always a wasteful practice. There are several examples that illustrate this point. Vendors deliver their goods in batches that are frequently unrelated to production needs. Shop tickets are chronically late due to batching in the drawing or approval process. Standard precast concrete products, such as manholes, are built to stock rather than built to a customer order. In the end, improved efficiency comes when operations are closely driven by customer demand.

• Inventory reduction –

Inventory is waste for the following reason: it has to be handled and stored. It is often subject to damage or obsolescence. Someone has to keep track of inventory and find it when needed. It ties up capital that should be earning a return on an investment. To be specific, work-in-process inventory beyond the needs of the immediate casting is waste. There are opportunities to reduce finished-goods inventory and still maintain the accelerated construction schedule the owner demands. For example, during production scheduling, pieces with the same mark number are often batched together. This is a practice that usually results in excessive finished goods inventory.

• Correction at the source –

Quality cannot be inspected into the product; it must be built in. Self-check procedures, accountability, and mistake proofing reduce rework by prevention rather than by inspection and correction. Precast is often subject to repetitive errors. Typically, nonconforming pieces are sent to the "hospital" and not repaired by the casting crew. But, has the root cause been addressed? How often are pieces sent to the jobsite knowing that they will require fieldwork? Plant systems that correct non-conformance by prevention are the most efficient, resulting in a huge payoff for most producers. Most producers are familiar with the "rule of 10" because it speaks to the value of prevention rather than correction: It costs 10 times as much to fix it in the yard as it does to do it right the first time, and it costs 10 times as much to fix it on the job as it costs to fix it in the yard.

• Bed setup reduction –

The schedule for the manufacturing of precast concrete components is typically constrained by bed setup times. Planning, standardization, materials staging, and consciously working to minimize crew movement and walking can reduce bed setup time. Most producers find multiple opportunities to streamline bed setup and reduce the opportunity for error. Streamlined bed setup typically improves flexibility and reduces work in process and finished goods inventory. Improved bed setup often is the key to pairing production closely with customer demand. Here is a sign for management: When the setup crew is spread out over the length of the casting bed, an opportunity for waste reduction exists.

• Total preventative maintenance (TPM) –

This method minimizes downtime created by unscheduled maintenance. Equipment breakdowns create waiting waste, safety issues, and quality problems.

• Team problem solving (TPS) –

Effective lean manufacturing implementation requires the active participation of the work group. There are proven methods and training that significantly aid in team effectiveness. This step requires structured inclusion in Kaizen events, problem-solving meetings at the work-group level, job skills training, and best practices development of standardized tasks. Increased productivity and reduced employee turnover and retraining expenses are benefits reaped by using TPS.

4. OBJECTIVE

Objective is to demonstrate systematically how lean manufacturing tools used appropriately so that industry can eliminate waste. Hence better inventory control, better product quality, and better overall financial and operational procedure can be achieved. To study of opportunities for continuous improvement (KAIZEN) and Conducting study for cost reduction in assembly line.

5. KEY PRINCIPLES OF LEAN MANUFACTURING

Key principles behind Lean Manufacturing can be summarized as follows:

Recognition of waste – Any material, process or feature which is not required for creating value from the customers perspective is waste and should be eliminated.

Standard processes – Lean requires the implementation of very detailed production guidelines, called Standard Work, which clearly state the content, sequence, timing and outcome of all actions by workers. This eliminates variation in the way that workers perform their tasks.

Continuous flow – Lean usually aims for the implementation of a continuous production flow free of bottlenecks, interruption, detours, backflows or waiting. When this is successfully implemented, the production cycle time can be reduced by as much as 90%.

Pull-production – Also called Just-in-Time (JIT), Pull- production aims to produce only what is needed, when it is needed. Production is pulled by the downstream workstation so that each workstation should only produce what is requested by the next workstation.

Quality at the Source – Lean aims for defects to be eliminated at the source and for quality inspection to be done by the workers as part of the in-line production process.

Continuous improvement – Lean requires striving for perfection by continually removing layers of waste as they are uncovered.

6. BACKGROUND:

• Increase in cost • Insufficiency of natural fuels • Options to meet the requirement are: Cost reduction,Waste utilization

7. PROBLEM STATEMENT:

The hot air coming from the heat treatment process through chimney is escaped to the atmosphere whose temperature is near about 200-degree celcius. So, that energy gets waste. There is need to utilize that waste energy in a plant to improve productivity.

8. IMPLIMENTATION OF KAIZEN:

For proper utilization of waste, they use hot air which is coming from heat treatment which is approximately 200-degree Celsius for drying sand and also continue the use of LPG gas but the quantity of LPG gas is much less needed. The sand drying plant is placed near to heat treatment plant and hot air coming from chimney is directly transmitted to the dryer through a pipe which is of MS material and for insulation they use glass wool around that MS pipe.

8.1 BEFORE IMPLEMENTATION OF KAIZEN:

For drying sand, they are using only LPG gas and because of this more time is required, also more LPG gas is needed so ultimately cost also more. Like a fossils fuel, it is also a non-renewable source of energy. It is extracted from crude oil and natural gas hence in future may be there is lack of this source.

• TIME CALCULATION-(PER CYCLE)

Product	Quantity	Time required
Dried Sand	3500 g	150 sec

• COST CALCULATION-(PER CYCLE)

Sand quantity	Fuel quantity	Cost
3500 g	95.84 ml	3.96 Rs.

• PRODUCTIVITY

1. Dryer Productivity = output (dried sand)/input (cycle time)

= 3500/150

=23.34 %

2. LPG productivity = output (dried sand)/input (fuel required)

=3500/95.84

=36.52%

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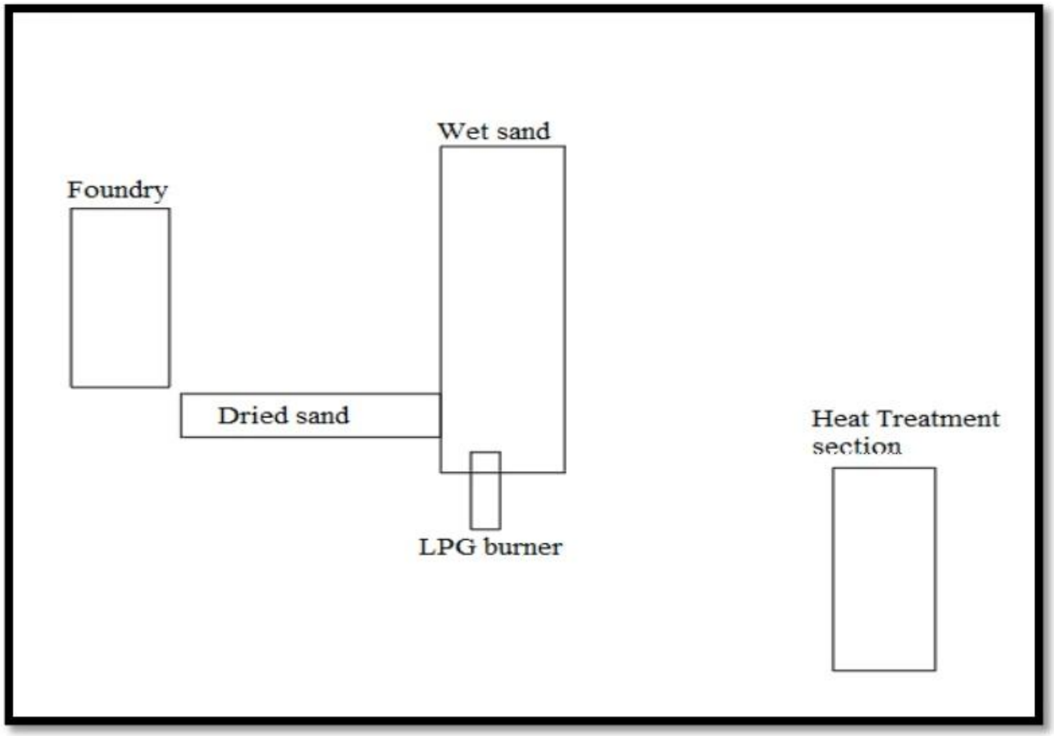
- **LAYOUT**



8.2 AFTER IMPLIMENTAION OF KAIZEN:

Now they are drying of sand by using hot air from heat treatment along with LPG gas so the cycle time required is comparatively less. And because of reduced need of LPG gas the cost also reduced.

Product	Quantity	Time required
Dried Sand	3500 kg	120 sec

COST CALCULATION

-(PER CYCLE)

Sand quantity Fuel quantity Cost

- TIME CALCULATION-(PER CYCLE)
-

3500 kg 76.67 ml 3.16 Rs.

• PRODUCTIVITY

1. Dryer Productivity = output (dried sand)/input (cycle time)

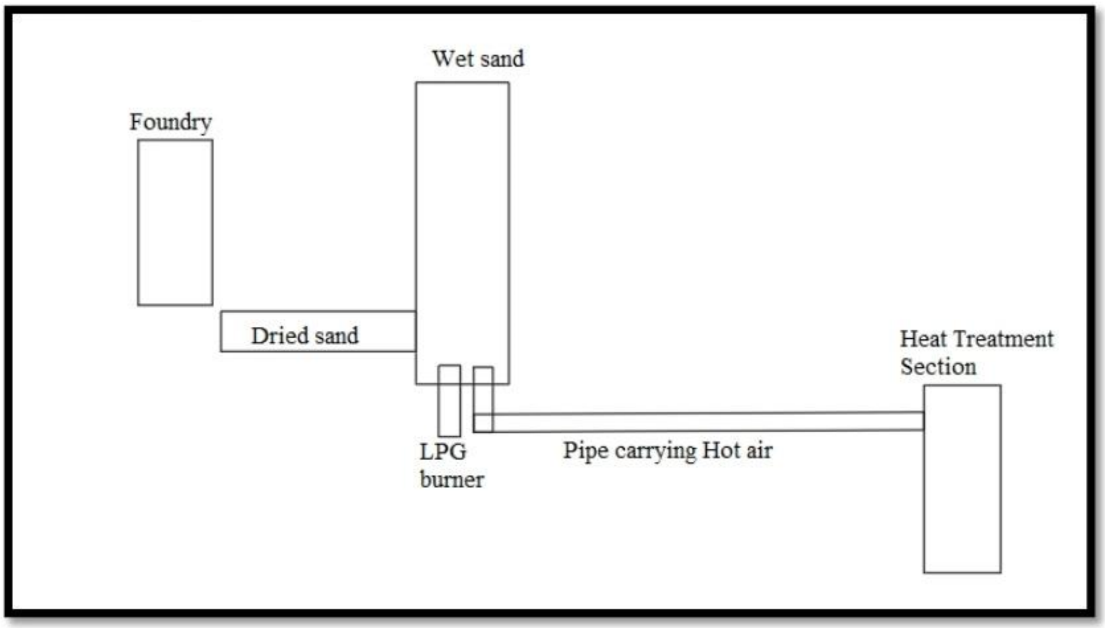
= 3500/120

= 29.17 %

2. LPG productivity = output (dried sand)/input (fuel required)

=3500/76.67
=45.65%

- **LAYOUT**



9. RESULTS

Productivity (%)	Before	After
Machine	23.34	29.17
Material	36.52	45.65

10. BENEFITS

- Reduced cycle time by 30 sec.
- Reduced fuel quantity.
- Because of reduction in fuel quantity cost also gets reduced. • Reduced working hours.

11. SUGGESTION FOR IMPROVING PRODUCTIVITY

As we have used hot air from heat treatment process, in addition to this we can use heat energy from molten metal of mould. For implementation of this, we can transfer heat from bottom of mould through pipes by using fluid which have good thermal conductivity.

If we implement this the cycle time will reduce to some extent because we get more heat from the molten metal. So ultimately, the quantity of LPG required will also be reduced.

12. CONCLUSION

In this case study the implementation of KAIZEN causes reduction in cycle time by, cost and also improved productivity by.