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Improving the Productivity by Lean Manufacturing Practices

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Abstract - In the current trends of manufacturing industries, the Lean manufacturing is one of the most powerful manufacturing control systems. By using the lean manufacturing, the production time and cost can be reduced. In this Globalization world, the pump manufacturing companies need the techniques to reduce the waste in time and cost. So the lean manufacturing practices have been in this work. In this paper, the 5s process (Seiri, Seiton, Seiketsu, Seiso & Shitsuke), Muda and Kaizen were applied. The 5s process means sort, straighten, shine, standardise & sustain. Also the unnecessary movement of parts within the process have been reduced by the rearrangement of process layout in the machining line. By using Value Stream Mapping, the non-value added time was reduced and value added time was increased. The productivity of the machine shop has been increased.

Index Terms— Lean, cost, time, 5s, productivity

I INTRODUCTION

Lean manufacturing thinks about the reducing the waste. Because of this technology or process, the productivity is increased. A pump manufacturing company produces various pumps like centrifugal pump, mono block pump, jet pump etc. The centrifugal pump is used for domestic and agriculture purpose. The pump has various component and operation process. Some companies have their own foundry section or they buy the components from their vendors. In operation process, we are going to introduce the lean manufacturing process. All the operations are carefully watched and the wastes are found out. By implementation of lean, we can remove the root causes the waste. The company recognized the benefits of lean manufacturing and they decided to implement the lean manufacturing. An action plan developed for step by step of lean implementation in manufacturing which is based on eliminating the waste time. The productivity is the ratio between the

output of the company and the inputs given for making the product. By eliminating wastages, the productivity can be improved.

II LITERATURE REVIEW

In the past years, many literatures have been documented about the implementation of the lean manufacturing in manufacturing sector. The lean is a systematic approach for identifying and eliminating waste through continuous improvement by following the product at the pull of the customer in pursuit of perfection. In 1990, James Womack, Daniel Jones and Daniel Roos wrote the book called *The Machine that Changed the World*. It was now revolutionizing the world industry. Pravin Shaswat et al. (2005) reduced the work in process and lead time. They applied the value stream mapping (VSM) in the bearing industry. In this 5s and kanban system were applied to reduce lead time and work in process. Santhosh Kumar et al. (2014) applied the lean tool to reduce the cycle time in truck body assembly line that helped to improve productivity. They concluded that the lean is a business philosophy that improves the process continuously which involves in manufacturing. According to Dinesh Seth, the lean manufacturing eliminates the waste by continuous improvements. He eliminated the waste in the cotton seed oil industry by using the value stream mapping tool. He identified the waste and eliminated the waste with some modification, thereby the productivity was improved.

III PROBLEM IDENTIFICATION AND METHODOLOGY

The Fig.2 shows the flow of the operation done in the workshop. In this layout, the operation takes more travelling time to finish the operation. So the productivity is decreased. The sheet metal cutting machine and the lathe-2. By changing the positions of the machines the productivity is increased.

The main objective of this work is to increase the productivity by eliminating wastages and rearrangement of plant layout.

The unnecessary movement of parts within a process are eliminated by the implementation of lean manufacturing techniques; thereby the wastes will be reduced. As we said early the pump many major components we are going to find out waste which was carried out in the movement between the components by reducing the was using lean manufacturing techniques the productivity was improved.

The clear methodology of improving productivity in the machining line of pump industry is given in Fig.1 Improving the productivity is done by identifying the root causes of wastes and then removing them by using lean manufacturing practices. First the complete survey in the machining line of the pump industry was taken to identify the problems. Then the wide literature was made to solve the problems. The lean manufacturing practices were implemented and the layout of plant was rearranged.

IV LEAN MANUFACTURING PRACTICES

Lean manufacturing

- “It is very hard to deal with raw material suppliers if we fully depend on customer order.”
- “It takes too much discipline.”
- “It takes too long to implement.”
- “My process is too complex; I have to deal with too many uncontrollable variables, like late supplier shipments, sick people, etc.”
- “My process requires a large batch size.”
- “It doesn’t make sense in my industry.”
- “It’s unclear to me how lean will work with my MRP system.”

VSM

The various tools does not better then the VSM. The VSM helps to understand work of streamline the process using of tools and the lean manufacturing of techniques. A goal of VSM is to decrease the wastes in process. So it is often used to demonstrate and decrease to the amount of wastes in manufacturing system. Generally VSM has major four steps as follows.

- Product
- Current state drawing
- Future state drawing
- Developing work plan for implementation of the future state.

5s CONCEPT

It is the name of workplace organization method that uses a list of five Japanese words - Seiri, Seiton, Seiso, Seiketsu and Shitsuke. They describe how to organize work place for high efficiency and effectiveness by identifying and storing the items used, maintaining the area and items, and sustaining the new order.

Sort (Seiri)

- Make work easier by eliminating obstacles.
- Reduce chances of being disturbed with unnecessary items.

- Prevent accumulation of unnecessary items.
- Evaluate necessary items with regard to cost or other factors.
- Remove all parts or tools that are not in use.
- Segregate unwanted material from the workplace.
- Define Red-Tag area to place unnecessary items that cannot immediately be disposed of. Dispose of these items when possible.
- Need fully skilled supervisor for checking on a regular basis.
- Waste removal.
- Make clear all working floor except using material.

Set In Order (Seiton)

- Arrange all necessary items so that they can be easily selected for use.
- Prevent loss and waste of time by arranging work station in such a way that all tooling / equipment is in close proximity.
- Make it easy to find and pick up necessary items.
- Ensure first-in-first-out FIFO basis.
- Make workflow smooth and easy.
- All of the above work should be done on a regular basis.
- Maintain safety.
- Place components according to their uses, with the frequently used components being nearest to the work place.

Shine (Seiso)

- Clean your workplace on daily basis completely or set cleaning frequency
- Use cleaning as inspection.
- Prevent machinery and equipment deterioration.
- Keep workplace safe and easy to work.
- Keep workplace clean and pleasing to work in.
- When in place, anyone not familiar to the environment must be able to detect any problems within 50 feet in 5 seconds.

Standardize (Seiketsu)

- Standardize the best practices in the work area.
- Maintain high standards in workplace organization at all times.
- Maintain orderliness. Maintain everything in order and according to its standard.
- Everything in its right place.
- Every process has a standard.

Sustain (Shitsuke)

- Not harmful to anyone.
- Also translates as "do without being told".
- Perform regular audits.
- Training and discipline.
- Training is goal-oriented process. Its resulting feedback is necessary monthly.
- Self discipline
- To maintain proper order

KAIZEN

Kaizen is a Japanese word it means of continuous improvement. It is lean manufacturing tool that improves quality, productivity, safety, and work place culture .kaizen is focus on applying small and daily changes that result in major improvements over time. It works by

eliminating Muda and work processes that are overly difficult .there are several things to mind ideas, to do, doing, done. Start with training. Everybody needs to know of work place culture. Employees need to that they will get support when they need it. Let employee implement their own suggestions when possible.

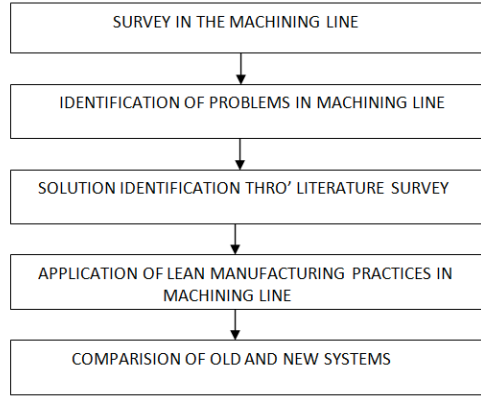


Fig.1 Methodology

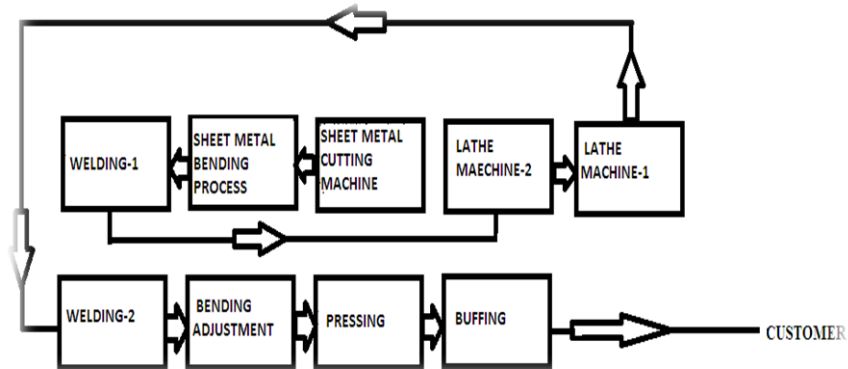


Fig.2. Old Layout of machines in machining line

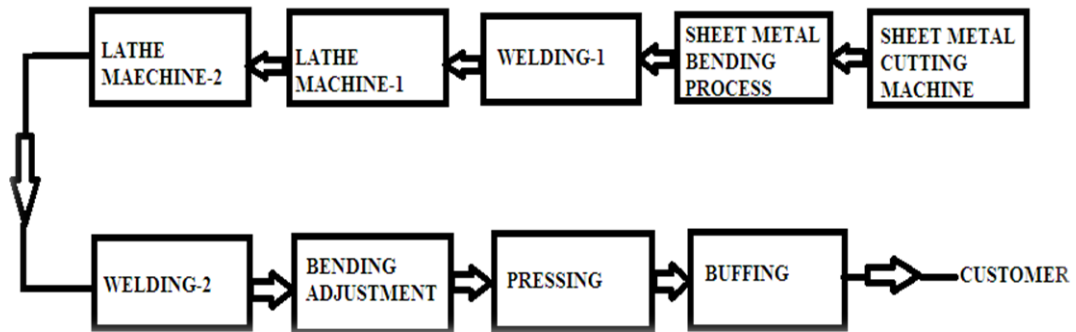


Fig.3. New Layout of machines in machining line

V NEW LAYOUT

The productivity is increased by changing the machine position. The machines in the machining line were arranged in order and adjacent to each other to avoid travel time. The order of machines are Sheet metal cutting machine, Sheet metal bending machine, Welding-1, Lathe machine-1, Lathe machine-2, Welding-2, Bending adjustment, Pressing, Buffing. The travelling time is reduced by changing the position of the machine. Since the travelling time is reduced, the productivity of machining line is increased.

VI CONCLUSION

The problems were identified in the machining line of pump industry. The productivity was improved by using the lean manufacturing tools like 5s, Muda, Kaizen. The unnecessary movement between the parts have been reduced and the productivity has been improved. The 5S is implemented in the company. The Value Stream Mapping was created and proved to be the effective way to analyze the industries current production state map and controlled to reduce the travelling distance. The visual nature of VSM was done by combining information and material flow on the map. By this, the non-value added activity by the travelling time for each operation was controlled by VSM mapping. By using Value Stream Mapping, it is found that the non-value added time was reduced by 11% and value added time was increased by 11%. Finally the productivity of the machining line was improved.

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