

Cycle Time Reduction in Jacket Fabrication Using Lean Tools & Technique

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Abstract

This paper presents a work undertaken in a pressure vessel manufacturing company which produce different model of pressure vessels which are used in chemical industries. There are some issues related to manufacturing of jacket dished, side bracket, Hooke, jacket nozzle, SAW problem and over production of non-standard leg support & many small components. All those components are used in jacket fabrication. The main aim is to reduce cycle time in jacket fabrication department by using kaizen system the issue of tracking the status of on hand inventory was addressed by implementing the kaizen system which helps in reducing cycle time in jacket fabrication department

Keywords: *Pressure Vessel, Jacket fabrication area, standard and non-standard parts, lean tools and technique, kaizen.*

INTRODUCTION

Work study which comprises of method study and work measurement. By method study, one can determine the most effective method of performing the job. Work measurement on the other hand determines the time required by an operator to complete the operation of job for the standard method at the defined level of performance [1]. Basic time has been calculated for each element and then analyzed the obtained data for changes to be implemented on machine. To eliminate the observer's errors in collection of time data, one can implement the automation using handheld computers or video recorders [2]. By making simple changes to the process, it can reduce the time taken for each component to improve the flow and speed up the process [3]. Reduction of waste can also improve productivity. Improving quality at the source will not affect any station, but reduces scrap and rework. After collection of data the bottleneck station was identified. Fishbone diagram is used to identify the causes which reduce the production rate and the remedial measures have been noted to reduce the causes [4]. It can be concluded that the process can be improved based on method study, work procedure and proper utilization of machine and material. It will improve the current process by reducing the number of workstations, transportations; combining the operations and reducing the workers fatigue [5]. The origins of productivity measurement can be traced to the manufacturing sector when its need was immediately realized after the industrial engineers and the behavioral scientists proposed methods, tools, industrial engineering practices, the motivation theories to increase the output per unit of input [6]. By implementing work study and method study and establishing new effective process for particular operation can increase productivity. The line balancing is the key point to increase productivity to particular products.

Kaizen tool has been utilized in this work for reducing cycle time in the jacket fabrication in a pressure vessel manufacturing company.

Lean Manufacturing Tools

Lean Manufacturing, can also be called as Lean Production, is a set of tools and practices that aims for the continuous elimination of all waste in the production process. The main benefits of this are lower production costs, improved output and shorter production lead times. More precisely, some of the goals include:

Defects and wastage: Reduce defects and terminated physical wastage, including excess use of raw material inputs, needless defects, and costs related with recovering faulty items and avoidable product features which are not necessary by customers.

Cycle Times: Reduce manufacturing lead times and production cycle times by reducing waiting times between processing stages, as well as process grounding times and product/model conversion times.

Inventory levels: Minimize inventory levels at all stages of production, particularly works-in-progress between production stages. Lower inventories also mean lower working capital necessity.

Labour productivity: Improve labour productivity, both by reducing the idle time of workers and ensuring that when workers are working, they are using their effort as productively as possible (including not doing unnecessary tasks or avoidable motions).

Utilization of equipment and space: Use equipment and manufacturing space more efficiently by eliminating bottlenecks and maximizing the rate of production through existing tools, while decreasing machine downtime.

Flexibility: Have the ability to produce a more flexible range of products with minimum change over costs and exchange time.

Output: So far as reduced cycle times, increased labor productivity and elimination of bottlenecks and machine downtime can be achieved, firms can generally expressively bigger output from their existing facilities.

Lean tools / Techniques

The basic purpose of Lean Manufacturing is to manufacture the product with minimum waste and continuous improvement of all activity and process involved in any form of work. For that following are key elements which are shown in table 1

Table 1: key elements of the Lean tools

Techniques	Description
Kaizen [continuous improvement]	Kaizen process is based on common sense and lowest approach. Kaizen is the Japanese word. The meaning of this word is continuous improvement.
5S	The 5s is a lean tool which is consists of SEIRI(sort), SEITON (set in order), SEISO(shine), SEIKETSU(standardize), SHITSUKE(sustain) taken from Japanese language which plan Reduce waste hidden in the plant, improve quality and safety, Reduce lead time and cost, Increase profit. It helps create and maintain the efficiency and effectiveness of work area.
Just in Time	Just-in-time (JIT) manufacturing, also known as just-in-time production or the Toyota Production System (TPS), is a methodology aimed primarily at reducing flow times within production system as well as response times from suppliers and to customers. Its origin and development was in Japan, largely in the 1960s and 1970s and particularly at Toyota

Some of the reasons analyze for the delay of Jacket fabrication

- Due to non-availability of Non Standard parts in plate yard.
- According to regular order standard dished parts available and non-availability of NSD jacket dished
- Due to late order placed for raw material to other city thus shortage of raw material in plate yard.
- When parts needed in jacket fabrication like side bracket, leg support shell dished are no available and sometime SAW problem also occurs.

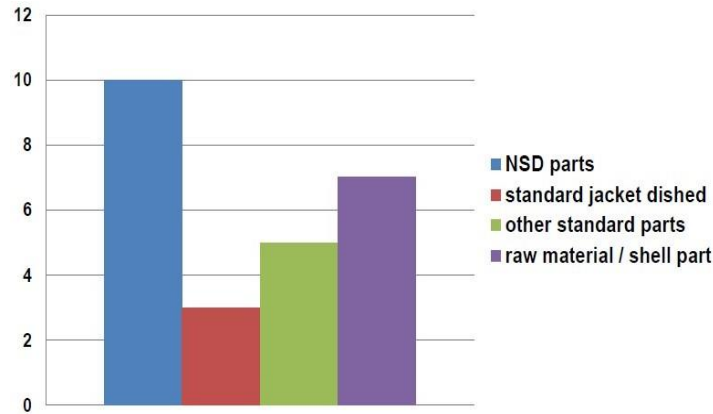


Fig 1: Most number of times reason for delay is due to delay in nonstandard parts.

Reduce cycle time in jacket fabrication department by using kaizen

Principle of Kaizen

1. Throw out all your old fixed ideas on how to do things.
2. No blame—treats others as you want to be treated.
3. Think positive—don't say can't.
4. Don't wait for perfection. 50% improvement now is fine.
5. Correct mistakes as soon as they are found.
6. Don't substitute money for thinking—creativity before capital.
7. Keep asking why until you get to the root cause.
8. Better the wisdom of 5 people than the expertise of 1.
9. Base decisions on data not opinions.
10. Improvement is not made from a conference room.

Why kaizen??

Kaizen Improves - product quality, use of capital, production capacity, communications, space utilization and employee retention.

Kaizen is small-small continuous improvement without any investment / small investment in any types of industry.

Jacket fitting area has maximum time consuming so that improving phase required improving with kaizen

Kaizen Activity sheet



<h1>Kaizen Activity Sheet</h1>	
Plant : jacket fabrication department	
Kaizen theme : improvement in jacket fabricatiuon deaprtment	Idea:- reduce cycle time in jacket fabrication department
Problem/present status : Because of the NSD parts, jacket dished, side bracket, leg support are not delivered to jacket fabrication department when needed. This problem lead to delay in releasing job from the jacket fabrication department	Pictorial representation (Schematic Diagram)
Analysis : At the time of drawing issue all the parts must be starts cutting in the plate yard. According to order placed to company plate yard supervisor release the date of delivery all the parts that are needed in jacket fabrication department. after making the drawing , production memo is make for needed components according to drawing and it must be signed by respected department supervisor time to time and have to release parts accordingly.	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>BEFORE Non availability of jacket dished side bracket and other NSD parts at the time of jacket fabrication</p>  </div> <div style="width: 45%;"> <p>AFTER : At the time of drawing issue all the NSD parts start cutting in plate yard and issue of non availability of those parts at the time of jacket fabrication is solved.</p>  </div> </div> <p>Results : mostly 120-130 order placed monthly to company but due to the mention reason order is not full filled and short by 25 to 30 order monthly but after implementation of kaizen and suggestion, 40 to 50 % delay is reduced and orders are full filled at satisfactory level</p>

Fig 2: kaizen activity sheet

Analysis of the delay data

After the conforming of drawing all the issued parts must be ready after cutting in the plate yard. According to order placed to the company, plate yard supervisor release the date of delivery for all the parts that are needed in the jacket fabrication area. After the drawing production memo is made. Production memo helps in identifying the standard and nonstandard parts of that specific shell.

Production memo is just the ‘w’ series with the specific numbers accordingly.

The following photos show the w-abcxyz number which helps in identifying the shell and its respective standard and non-standard parts.



CONCLUSION

For the reduction of Cycle time for the fabrication of jacket used in pressure vessel, Kaizen technique has been utilized. Successful results are obtained at the end of this study where before the implementation of Kaizen tool, considerable delay is reduced in the production. It is found that before the implementation of Kaizen tool, the orders out of 120-130 during a month, 25-30 orders were not fulfilled but after the implementation of Kaizen tool, 40 to 50% delay is eliminated and orders are fulfilled at satisfactory level.

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