

Application of Lean Manufacturing system in cutting/ Slitting machine

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1 ABSTRACT

All manufacturing industry has put in continuous effort for its survival in the current impulsive and competitive economy. In order to handle the critical situation, manufacturers are trying to implement new and innovative techniques in their manufacturing process by making it more effective and efficient. This competitive atmosphere of production and high labor cost, motivate companies to use technologies like automation as a mean to increase manufacturing competitiveness. On the other hand companies are aware about cost reductive policies like lean production which has shown noticeable achievements. Consequently some manufacturers tend to follow such systems. In this scenario, in order to have lean enterprise, it is vital to find a clear picture of challenges and potentials of implementing the right amount of automation. If the process of developing automation is not efficient and the manufacturing processes were not analyzed during the time, the result may not be lean. It will be a disastrous situation if the wrong technology was implemented or improper

implementation of proper technology. So, finding the right amount of automation that can be used in developing automation projects is very important. A detailed analysis was conducted on lean manufacturing and automation to identify the importance of each discipline. The aim of this report is to provide a suitable approach to implement lean automation and importance of it. A case study was carried out in order to find the importance of the combination of lean and automation for an automated lean manufacturing.

2 INTRODUCTION

In this chapter the background of the project, problems regarding automated lean manufacturing, research aim and objectives are discussed.

2.1 Problem and justification statement

As it was stated earlier companies in general tend to move towards automation, and have a desire towards higher degree of automation. But, many companies find it difficult to manage automation projects. Implementing automation causes some issues to the manufacturer such as complexity, high investment and challenges in the production area. Disastrous results are caused by the

implementation of wrong technology and the improper implementation of the proper technology.

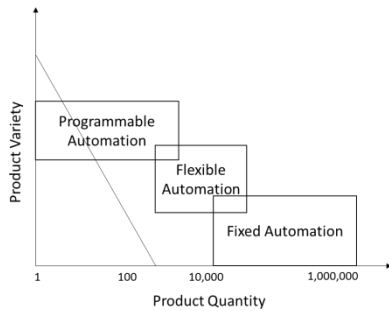
Lean production always emphasizes on the waste reduction and simplifying processes by eliminating non-value added activities while automation creates complexity in the working environment. Although lean might see a cost reduction

strategy, use of particular lean tool does not make a huge difference in the long run. It is this problematic scenario that finding the perfect combination of lean and automation is important. Both lean manufacturing and automation can co-exist to produce lean automation can boost productivity. And in this respect it is vital to find the appropriate level and type of automation to have lean automation. This is the key problem that will be addressed throughout this project. To find a solution for the above mentioned problem it is important to find the level and the type of automation to be used. This increases robustness, reliability and flexibility in the implementation of automation. To find this there should be proper guidelines created within the industry and it is only achieved through lean manufacturing. By following these lean automation strategies companies can be more efficient and be productive.

2.2 aim and Objectives

The aim of this report is to emphasize the implementation of automation in a lean context in production processes to boost productivity and lower the production cost. And identify a systematic approach that can be used in developing automation solutions to have lean results at the end of the project. There were several objectives that were met during the course of this project. Found that lean manufacturing focuses on assembly activities more than production and it is used to reduce lead time, increase efficiency and meet cost reduction. There are several tools available and they fit into assembly in many ways. All these were found after a thorough study on Lean manufacturing. It is only after the study of this section that the next step was proceeded. There are several theories of automation which can be used in both assembly and production. Several technologies are widely used today in the machining sector which has definite advantages but some disadvantages. Automation is a challenging process and

it more challenging in a lean environment. Lean automation has a solution for this and it has been developing day by day. Lean automation was analysed in several dimensions to gather the required knowledge.



A case study was carried out analysing and identifying the difference comparing the current manufacturing practices and identify how lean automation process can be improved. After studying the current practices it was easy for a manufacturer to identify the processes separately and implement lean automation and to improve the implemented technology for betterment of the production. Programmable Automation

In programmable automation, machine is designed with the capability to change the sequence of operations to accommodate different product configuration. The sequence of operation is controlled by programming. New program can be prepared and entered into the machine to produce new products.

Key features of programmable automation are given as follows,

- High equipment in general purpose equipment
- Lower production rates than fixed automation
- Flexibility to deal with variation and changes in product configurations.
- Most suitable for batch production

Programmable automation used for low and medium volume production. This is suitable for batch production because product can only be produced only once at a time and in order to produce a different product the machine need to be reprogrammed according to that product. This changeover is a time consuming process because it need to set up new tools, change the setup and fixtures. This is a time consuming procedure. Example of programmable automation are numerical controlled machines, programmable logic controllers and industrial robots [13].

3.1 Flexible automation

This is simply an extension of the programmable automation. Programmable automation systems had higher change over time and flexible automation address

this issue. Flexible automated system is capable of producing variety of parts without a change over time from one part to another [13].

Key features of flexible automation are given as follows,

- High investment for a custom engineered system
- Continuous production of variable mixtures of products
- Medium production rates
- Flexibility to deal with product design variation

4 Programmable logic controller (PLC)

Programmable logic controller (PLC) can be defined as a micro-computer based controller uses stored instructions in the programmable memory to implement logic

and arithmetic function through input/output modules, for controlling machines and processes

There are many advantages of using PLC and some of the advantages are listed below.

- Programming the PLC is easier
- PLC can be reprogrammed where other conventional systems need to be re wired
- PLC takes less space
- PLC can easily be connected to a computer system
- PLC can perform greater variety of control options

A PLC consist of several component which is used to perform the functions and they

are much different from the conventional relays systems. Basic components of a PLC is shown in the figure 7 and they are Processor, memory unit, power supply I/O module and programming device.

5 Improvement in production

After producing the plastic and metal components or parts required to make a particular item. This process is done at the machining floor. At this place Kanban system can be used and Kanban bin can be used to look at the requirement of the material to fill each Kanban bin. Maintaining proper records to perform this function is always useful.

It is advisory that the factory use a conveyor system to sort out the runners coming out of injection molding. This reduces the human cost used in this process. This is also an advance quality approach. This is a low cost

solution and is justifiable solution as well.

6 SIX SIGMA METHADOLOGIES

DMAIC Roadmap



7 DISCUSSION AND CONCLUSION

The core concept of this report was to conduct an in-depth study on Lean Manufacturing and Automation and then to find a better way to integrate the two. Considering the aforementioned, implementing automation has advantages and disadvantages. Especially implementing lean manufacturing is a definite challenge.

This is mainly due to the complexity of Automations systems, high initial cost and lack of flexibility. But, lean emphasizes on reducing cost, making process simple and flexible.

In order to overcome these challenge of automation under a lean context and develop automation within lean environment successfully, following points can be taken into account as a conclusion to meet automation efficiency in lean environment.

- Holistic view towards automation
- Clear strategy and long term view towards automation
- Flexibility of solutions and devices.
- Appropriate type of automations solutions
- More attention towards ergonomics, waste

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reduction, reducing walking distance and motion analysis in assembly area

- Simplicity of processes
- Simplicity of automated solutions
- Use of efficient tools such as Heijunka, Kaizen and JIT
- Flexibility of solutions and devices and SMED

And in line with the above noted points it is a vital question to ask what is need to be automated and how it should be automated. Analyzed using lean will show that there is no requirement of complicated robotized systems for automation. Lean manufacturing tools will highlight the simpler options available which are not only

more convenient to work but also cheap to purchase. Furthermore, as highlighted in the above chapters it is beneficial for the manufacturers, depends on the manufacturer situation, it would be possible to produce equipment internally which will help the company to increase internal competence as well.

When implementing automation under lean context in majority of the instances, fully automation is not possible. Because as it was mentioned earlier in this report that lean is a continuously improving tool, it's a never ending loop so fully automation can be achieved after a long process of improvement overtime.

It is strong suggestions for all the manufacturing companies to have a dedicated team with a research and development sector to maintain and monitor lean automation. This team can also innovate flexible automation solutions for the simplicity of the process. And, having the culture of Kaizen is a welcome factor and it is strongly suggested through this report that every employee should work toward the development of the company. It can be concluded that lean automation can be used to increase productivity and lower the production cost. It is also can be concluded that lean principle can facilitate and improve the process of automating production processes.

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