

## AGILE MANUFACTURING IN SMALL AND MEDIUM SCALE ENTERPRISES

Mr.T.Varun Kumar<sup>1</sup>, Dr.B.Ganesh Babu<sup>2</sup>, Dr.M.Saravanan<sup>3</sup> and Dr.M.Murugan<sup>4</sup>

<sup>1</sup>Research Scholar(PT), Dept. of Mechanical Engg., Roever College of Engg&Technology,Perambalur, INDIA

<sup>2</sup>Principal, Roever College of Engg & Technology, Perambalur, INDIA

<sup>3</sup>Principal, C.R College of Engineering, Madurai, INDIA

<sup>4</sup>Principal, Rathinam Institue of Technology, Coimbatore, INDIA

**ABSTRACT:**-Agile manufacturing is a term applied to an organization that has created the processes, tools, and training to enable it to respond quickly to customer needs and market changes while still controlling costs and quality. An enabling factor in becoming an agile manufacturer has been the development of manufacturing support technology that allows the marketers, the designers and the production personnel to share a common database of parts and products, to share data on production capacities and problems particularly where small initial problems may have larger downstream effects. Understand the roles and responsibilities of Six Sigma practitioners. Identify the benefits of Six Sigma as a business improvement methodology. The various process times for manufacturing a mono block pump were obtained from a pump manufacturing industry. A flow diagram showing the process is drawn to reflect the current state of the operation. This makes the redesigned process more effective and efficient. By reducing wastefulness the proportion of value adding time in the whole process rises and speed is increased. This project addresses the application of agile manufacturing concepts to the small scale pump manufacturing industry for increasing the production time and profit level.

**Keywords:***Agile Manufacturing (AM), Small Medium Enterprise (SME), Value Stream Mapping, Agilty.*

### 1.0INTRODUCTON

India is one of the fast developing countries in the world. Indian economy is mainly driven by small and medium scale enterprises. Because most of the SMEs are owned by Indian citizens. They face a huge challenge due to open economy. Higher productivity, good quality & flexibility to changing market needs are “*The need of the hour*” for SMEs. But usage of agile/lean manufacturing technique is not focused in SMEs.

Implementation of concepts like Agile/Lean Manufacturing in SMEs lack popularity due to the following reasons.

- Lack of training
- Lack of resources
- Huge cost involvement as experts needs to be hired
- Time consuming activity
- Efforts loses focus due to less ROI (Return on Investment)
- More efforts needed for documentation & analysis

Our project mainly focuses on making the implementation of Agile/Lean Manufacturing easy in SMEs. This will play a major role in increasing the quality of the products and productivity of those enterprises.

During the past three decades, majority of the countries have witnessed the globalisation of their markets. As a result of globalisation, the companies restricting their operations within the national markets have been forced to compete with the products and services offered by multinational companies. The other development is that, numerous companies operating in different countries have begun to enter into the markets operating in various countries.

These developments have resulted in the removal of trade barriers which were existing earlier along the borders of the countries. This phenomenon has been forcing the organisations to orient their strategies towards reaching world class manufacturing goals. However, this task is found to be challenging as world class manufacturing requirements demand high degree of quality of products and services at low prices. In order to face these challenges, the manufacturing frontiers have been advocating the adoption of lean manufacturing paradigm.

## **2.0 AGILITY FROM LEAN**

Manufacturing organisations are facing challenges from two directions. In one direction, newer manufacturing technologies emerge to make the existing ones outmoded. In the other direction, today's customers are demanding more and more new products and services within a short period of time. In order to meet these two challenges, today's manufacturing organisations are required to act quickly in accordance with the changing situations. On realising this trend, during the recent years, the manufacturing arena has been inclining towards the new type of paradigm. The researchers have named this paradigm as "Agile Manufacturing". Number of academicians and manufacturers view AM as a new approach. As a matter of fact, agility in manufacturing arena has been occurring as the spontaneous responsiveness to high degree of competition.

As evidence to this statement, the performance of today's mobile phones manufacturing companies can be mentioned. It is a common observation that these companies have been introducing several models very frequently. During the recent years, many automobile manufacturing companies have also been evolving new models at a quicker speed. Researchers had been examining AM issues clearly for more than a decade.

**Agile Manufacturing = Flexible  
Manufacturing System + Lean**

The study of literature in this direction reveals that the birth of AM principles is marked by the constitution of 'Agility Forum' by a group of researchers. Thereafter a few researchers have contributed very valuable AM principles. Some of the meanings and definitions enlisted by them are presented below: Agility means a manufacturing system with

extraordinary capabilities to meet the rapidly changing needs of the marketplace. Agile manufacturing is a vision of manufacturing that is a development from the concept of lean manufacturing. The requirement to become more flexible and responsive to customers led to the concept of agile manufacturing as a variation from the lean concept. This situation persists because majority of the manufacturers are lacking knowledge on AM criteria. Rather they progress towards agility by attempting to implement various criteria using unfocussed and crude methods. This approach results in retarded growth of agility in organisations.

### **3.0 DESIGNING AN USER FRIENDLY TOOL FOR FLOW ANALYSIS**

- Selection of pilot company
- Study of the process
- Video shoot of the process
- Extract information from video by using Subtitle Edit Software
- Design template for calculation using a statistical software
- Analysis using statistical software
- Presentation to management
- Training to their employees

#### **3.1 SELECTION OF PILOT COMPANY**

The first step involves the selection of pilot company to implement the new tool designed for flow analysis. Another important process before this is to select the field in which the flow analysis has to be done. So we decided to choose pump manufacturing sector. As this project's main aim is to implement the flow analysis tool in small and medium scale industries, we selected pump assembly in SME.

#### **3.2 STUDY OF THE PROCESS**

To know about the flow analysis, the assembly process of pump has to be studied. So we have to take a keen look on the assembly process undergone in the company. This will give us a brief idea about the flow of process in the selected company.

#### **3.3 VIDEO SHOOT OF THE PROCESS:**

The main aim of video shooting of the process is to replace the traditional method of calculating the assembly process time by using stopwatch. This traditional approach is a time consuming method and also less accurate. To overcome this time consuming method instead of using stopwatch, video camera can be used. It required less skilled labour and also minimizes the time. This involves the video shooting of all the assembly process.



Fig. 1 Video Shoot During Process

### 3.4 EXTRACT INFORMATION FROM VIDEO BY USING SUBTITLE EDIT SOFTWARE

After shooting the flow process, it should be arranged according to process flow. To calculate the process time, software called “subtitle edit” is used. By using the process flow as input to the software, videos are sub-titled according to the flow process. After the sub-title process, exporting of the subtitle text with time to notepad. Then this should be transferred to an excel sheet. By using the basic formulas, the process time of the process can be found in the excel sheet. This will help us to find the time taken for any process that is video shot.

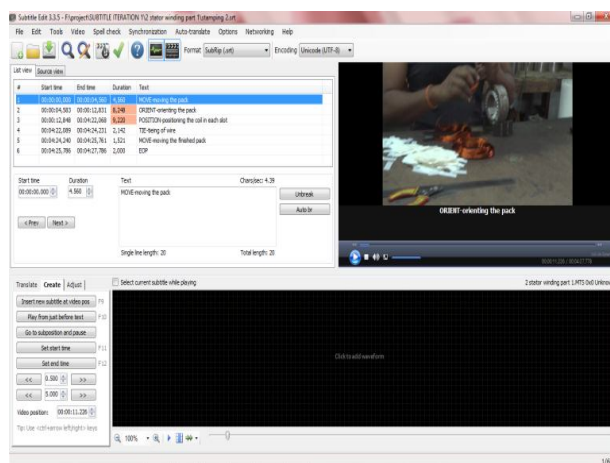
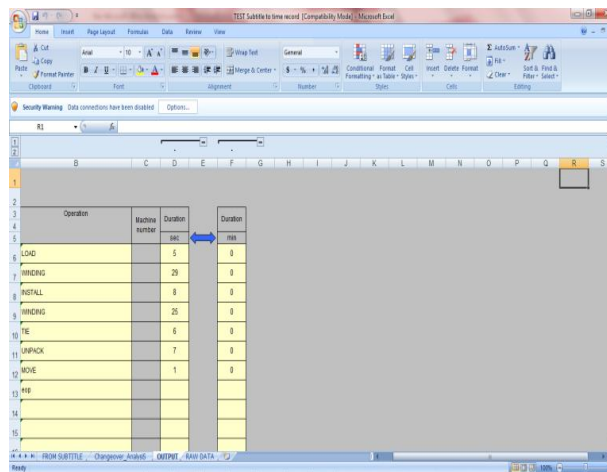


Fig. 2 Videos Imported to Software

### 3.5 DESIGN AND ANALYSIS OF TEMPLATE FOR CALCULATION USING STATISTICAL SOFTWARE

A template is created to calculate the value or non-value added processes. This sheet is created by using the statistical software namely Microsoft Excel. After creating the template, the subtitle text is imported into it. From this the cycle time can be found. Then another template is created to find non-value and value added processes. This can be done by importing the cycle time from the first template.



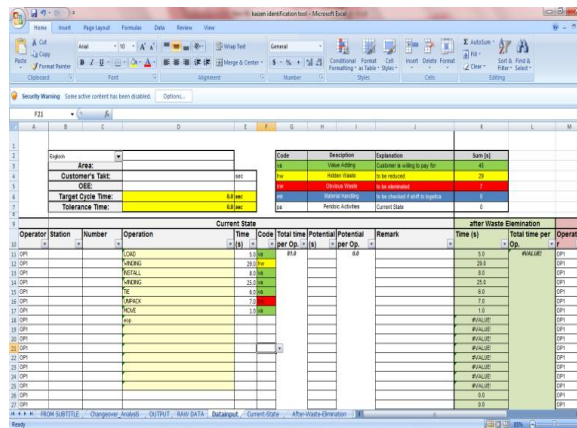
**Fig. 3 Creating the Templ**

### 3.6 PROCESS AND CYCLE TIME

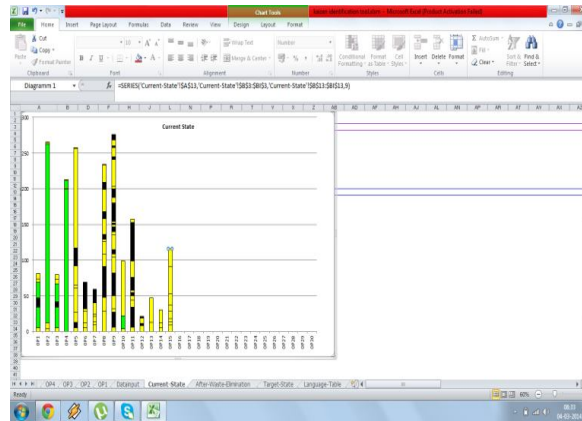
Here we have listed the process cycle time for the production of parts and they are:

Process	(Sec)
Coil forming part 1	81
Stator winding part 1	265
Coil forming part 2	81
Stator winding part 2	213
Starting and running winding	
Insulation lead out and binding	312
Winding final testing	69

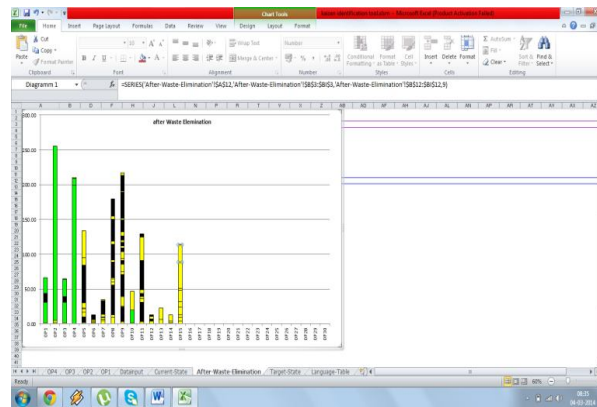
Stator core pressing in to body	64
Stator final assembly	257
Pump pre assembly with stator and	
Rotor	284
Pump final inspection	99
Pump final assembly	250
Labeling	21
Name plate fixing	47
Plastic wrapping	30
Final packing	119



**Fig.4 Cycle time Calculation Using Excel Sheet**



**Fig.5 Value and Non -Value added time is Identified**



**Fig.6 Final Value and Non -Value added time**

### 3.7 PRESENTATION TO MANAGEMENT

After finding the solution to the problem, all the non-value added process is reduced. Then it should be presented to the management of that company to get their approval. This includes the explanation of all the procedures done by us to reduce the non-value added time.

### 3.8 TRAINING TO THEIR EMPLOYEES

After getting the approval, the proposed method is to be implemented with the help of employees. This can be done by conducting training sessions to the employees for making them to understand the new techniques and use it.

#### **4.0 IMPLEMENTATION OF AGILE IN SME**

In small medium enterprise level many of the workers are lack about agility and following agile manufacturing is costlier and no owners come forward to practice the system. SME is one of the backbone to our nation and most of Indian owners have practicing the SME. If we providing a simple tool in an easier way, many of SME will come forward and follow the system which leads to the drastic change in the quality and production environment. Thus considering this factor we have created a effective and dynamic tool for the lead time reduction in the pump industry.

#### **5.0 CONCLUSION AND FUTURE WORK**

This project can be extended by trying to formulate a Value Stream Mapping (VSM) for each sections present in a particular SME. Through the so far done process the NVA (Non Value Added) process are identified and are eliminated to decrease the cycle time. The cycle time can be immediately reduced, by removing the bottlenecks in the system. All the data needed for VSM has been gathered. A future state map should be developed along with a current state map. The future and current state maps are compared and the bottlenecks are identified and focus will be on to eliminate those and implement the future state map in the SME and reduce the lead time. This project will bring a great improvement in the SME economy which ultimately helps the country's economy grow. This also helps in popularizing the field of Lean techniques which brings a major increase in productivity. A company's sustainability mainly depends upon the QCDDM (Quality, Cost, Delivery and Morale) factor. This also has been improved to a considerable extent.

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