International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 05, May - 2017

Process Time Reduction in an Electrode Manufacturing Plant using Value Stream Mapping Technique

[1]Sriraam S.V, [2]Sridhar.J, [3]Srivanth Viveshwaran S,
[1,2,3]Student,
Kumaraguru College of Technology,
Coimbatore, Tamil Nadu, India.

Guided by Dr. V. R. Muruganantham,
Associate Professor,
Kumaraguru College of Technology,
Coimbatore, Tamil Nadu, India.

***Abstract*— Manufacturing companies throughout the world now interest in TPS or "lean manufacturing" continues to grow and using the Toyota Way to transform technical and service organizations. Today manufacturers around the world are now trying to embrace lean production and are attempting to implement lean production system for speeding up processes, reducing waste, and improving quality. This report based on lean thinking describes an improvement process in order to reduce project lead time. For an implementation of the adaptive project it is important to know about the time needed for detailed planning and production of every production step. This data analysis existing set-up method by identifying the production hours of individual steps required in the process, followed by to identify opportunities to reduce production time in the project. The results of the study suggest followed by a methodical approach to reduce the time in the process, or project in their implementation of continuous improvement, therefore improving throughput.**

Manufacturing throughput time reduction can be a daunting task due to the many factors that influence it and their complex interactions. However, there are basic principles that, if applied correctly, can be used to reduce manufacturing throughput time. The report presents the factors that influence manufacturing throughput time at Kayjay sharp Trendys, the actions that can be taken to alter each factor, and to approach the purpose.

Keywords:, Toyota Way, Toyota Pull System, lead time, project throughput time, throughput time reduction, production hours, number of workers, production planning.

I. INTRODUCTION

The focus of this project is improvement based on lean production and optimization at Kayjay sharp Trendys, a welding electrode rod manufacturing company. In particular, reduction of project lead time and through put time, which is an important issue of an industrial project now. Reductions in manufacturing throughput time and lead time can generate numerous benefits, including lower work-in-process and finished goods inventory levels, improved quality, lower costs, and less forecasting error (because forecasts are for shorter time horizons). More importantly, reductions in manufacturing throughput time increase flexibility and reduce the time required to respond to customer orders. This can be vital to the survival and profitability of numerous firms, especially those experiencing increased market pressures for shorter delivery lead times of customized product. This chapter presents the background, problem statement, method, objectives and limitations of this thesis work in Kayjay sharp Trendys. After literature search in the following chapter, the focus in the project work was analysis of project data, especially focus on production hours and number of workers change in different production time and their interaction in project. On the theory and analysis basis, discussion and conclusion are presented, and followed by suggestion and method for project improvement approach to purposes.

II. 1.1 Background

KAYJAY SHARP TRENDYS is, as its name suggests, a trend-setter in the field of domestic and industrial electrode rod manufacturing. Established in the year 1992, the company began with the modest objective of producing world class electrode rods for domestic use in India. The company has succeeded in carving a niche for itself in the welding electrode rod industry with the quality of its products and, in fact, is exporting its products to foreign countries as well, which has been designing and implementing licensed modular production facilities for the electrode industries. The company focuses on giving their clients the advantage by bringing their facilities into production faster and on time, assuring predictable first-rate results.

In today‟s struggle for a competitive edge, companies are embracing the principles of Lean Manufacturing. Lean Manufacturing is a set of techniques and operating practices aimed at reducing through put time, lowering costs and improving quality by eliminating wastes. The foundation of Lean Manufacturing is built on a repetitive manufacturing model. However, the concept of continuous improvement and elimination of waste applies to all organizations. As with any attempt to improve operations, the critical mind-set is "Always Better, Never Best".

Based on the lean manufacturing principle, project lead time and cost reduction in Kayjay sharp Trendys are the main objectives of this project work. Especially focusing on the project‟s TTPM-total throughput time and TPM-throughput time reduction.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 05, May - 2017

1.2 Problem Statement

Time Is Money, Shorter Lead Time Or Throughput Time Is Always Good Thing For Producer Or Customer. The Production Timing Effort Of Each Planning Step That Gives Information About The Starting And Ending Dates, Which Are Necessary For An Exact Scheduling Of The Whole Production Process. Based On Good Planning That Shorter Project Lead Time Is Easy To Get A Way To Realize. The Presented Project Work In Kayjay Sharp Trendys Is Interestedin Some Research Work In Production Plant, Analysing The Production Data, Trying To Find Out Where The Problem It Is, Showing A Method By Which The Given Task Is Carried Out, Such As Lead Time Reductions.

1.3 Method

There are many ways of improving manufacturing operations and process. Today lean thinking which come from Toyota Way being guide for many manufacturing companies throughout the world. The companies that first mastered this system were all headquartered in one country-Japan. Yet today, the founding Toyoda family is not only succeeded first in the textile machinery business, but also Toyota is regarded by most industry observers as the most efficient and highest-quality producer of motor vehicles in the world.

At the developed method of theory, Toyota‟s principles and Toyota production system are determined by guiding solving the problem in project production. Moreover, the method of practical is visiting the factory, watching the production line, talking with people, knowing the current situation in the factory, and then analysing a practical project example of the manufacturing, pay an attention to analysis of time data and making a diagram of production situation in factory.

Based on literature research and practical analysis work, try to find out where the problem it is, and then get conclusion and work out method for improvement.

1.4 OBJECTIVES

Shorter lead time is always a good thing. In many markets, the ability to deliver sooner will win business away from competitors with similar product features, quality and price. In other markets, quick delivery can justify a premium price and will certainly enhance customer satisfaction. In all cases, shorter lead time increases flexibility, reduces the need for inventory buffers and lowers obsolescence risk. Kayjay sharp Trendys

Team is committed to giving customer‟s business a competitive edge. The company bring their extensive skills and experience to ensure the projects is a smooth, precision operation that delivers top - quality results – on time and to budget. For project, fast project implementation reduces time with 1-2 months compared to conventional construction due to overlapping and parallel activities.

Project leads time Reduction at Kayjay sharp Trendys are objectives of this project work. Lead time can be reduced by doing things faster, or by buffering with inventory-finished goods, semi-finished goods, major assemblies, work-in-process, components and/or raw materials. There is a direct relationship between lead time, inventory investment, and customer service. Lead time are cumulative and bi-directional, that is, order handling, planning, procurement, delivery, inspection, manufacturing, handling, picking, packing, and delivery all contribute to the lead time; and the time it takes to get „signals‟ down the supply chain to initiate each activity adds to the overall time it takes to get the job done. The discussions of this report that follow are focused on strategies and practice for reducing lead time.

1.5 Limitations

A project work depends on a number of key factors and usually needs many resources to deliver its results and the companies restrictions to share few data‟s. A good project analysis work is also based on clear and exact data or information source, and many practical works which you totally know the situation.

The analysis presented here is based on data obtained during the June 2016 – September 2016 visit to the Kayjay sharp Trendys‟s production plant. Kayjay sharp Trendys has office in Kalapatti road, Coimbatore.

CHAPTER 2: THEORETICAL FRAME WORK

This chapter presents studies based on “lean thinking” which comes from The Toyota Way, which acts as a guide for project management in many manufacturing companies throughout the world. Today, Lean Production is so popular that the interest of manufacturing companies throughout the world in “lean manufacturing” and their use of the “Toyota Way” to transform their technical and service organizations continue to grow. The Toyota production system in particular provides the basis that Lean Manufacturing fundamentals were founded on. Project Management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements; these are all essential to a project‟s success.

2.1 Lean Production

We hear frequently today that is lean production. Manufacturers around the world are now trying to embrace lean production. Lean production is

“lean” because it uses less of everything compared with mass production

– half the human effort the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also, it requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products perhaps the most striking difference between mass production and lean production lies in their ultimate objectives. Mass production set a limited goal for themselves – “good enough", which translates into an acceptable number of defects, a maximum acceptable level of inventories, a narrow range of standardized products. Lean productions, on the other hand, set their sights explicitlyon perfection: continually declining costs, zero defects, zero inventories, and endless product variety. Of course, no lean producer has ever reached this Promised Land – and perhaps none ever will, but the endless quest for perfection continues to generate surprising twists.

Lean production focuses on eliminating in processes, including on the waste of work-in- progress and finished goods inventories, which are the earmark of mass production. Lean is not about eliminating people but about expanding capacity by reducing costs and shorting cycle time between customer order and ship date. The Toyota Production System (TPS) is an on-going evolution of solutions designed to achieve the "lean" ideal. Lean is much more than techniques. It is a way of thinking.

Today lean thinking which come from Toyota Way being guide for many manufacturing companies throughout the world. We then look in the Toyota Way at how lean production works in factory operations, product development, supply system coordination, customer relations, and as a total lean enterprise.

2.1.1 Toyota's Principles

Manufacturing companies throughout the world now interest in TPS or

"lean manufacturing" continues to grow and using the Toyota Way to transform technical and service organizations. I will also focus on Toyota

Way to guide for the presented project work. The Toyota‟s principles are organized in four broad categories below:

1. Long-term philosophy
2. The right process will produce the right results
3. Add value to the organization by developing your people
4. Continuously solving root problems drives organizational learning

There are 14 principles that constitute the Toyota Way. According to the current situation in the factory, in this case, the presented project work will pay attention to the following principles:

Principle3: Use "pulls" systems to avoid overproduction

Provide your down line customers in the production process with what they want, when they want it, and in the amount they want. Material replenishment initiated by consumption is the basic principle of just-in-time. Minimize your work in process and warehousing of inventory by stocking small amounts of each product and frequently restocking based on what the customer actually takes away. Be responsive to the day-by-day shifts in customer demand rather than relying on computer schedules and systems to track wasteful inventory.

Principle7: Use visual control so no problems are hidden

Use simple visual indicators to help people determine immediately whether they are in a standard condition or deviating from it. Avoid using a computer screen when it moves the worker‟s focus away from the workplace. Design simple visual systems at the place where the work is done, to support flow and pull. Reduce your reports to one piece of paper whenever possible, even for your most important financial decisions.

Principle13:Make decisions slowly byconsensus, thoroughly considering all options implement decisions rapidly

Do not pick a single direction and go down that one path until you have thoroughly considered alternatives. When you have picked, move quickly but cautiously down the path. Nemawashi is the process of discussing problems and potential solutions with all of those affected, to collect their ideas and get agreement on a path forward. This consensus process, though time-consuming, helps broaden the search for solutions, and once a decision is made, the stage is set for rapid implementation.

Principle14: Become a learning organization through relentless reflection (bansei) and continuous improvement (kaizen)

Once you have established a stable process, use continuous improvement tools to determine the root cause of inefficiencies and apply effective countermeasures. Design processes that require almost no inventory. This will make wasted time and resources visible for all to see. Once waste is exposed, have employees use a continuous improvement process (kaizen) to eliminate it. Protect the organizational knowledge base by developing stable personnel, slow promotion, and very careful succession systems. Use hansei (reflection) at key milestones and after you finish a project to openly identify all the shortcomings of the project. Develop countermeasures to avoid the same mistakes again. Learn by standardizing the best practices, rather than reinventing the wheel with each new project and each new manager.

Toyota‟s principles are a great starting point for lean thinking. Lean is not about imitating the tools used by Toyota in a particular manufacturing process. Lean is about developing principles that are right for your organization and diligently practicing them to achieve high performance that continues to add value to customers and society, means being competitive and profitable.

2.1.2 Toyota Production System

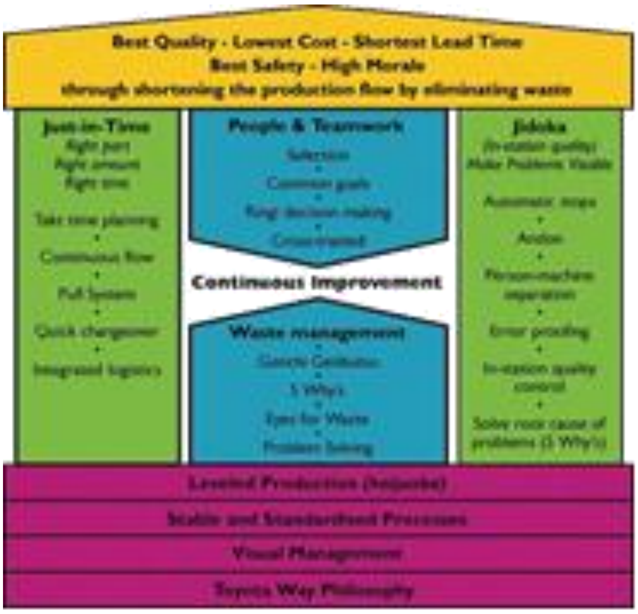
Lean Manufacturing fundamentals were founded on the Toyota Production System, or Just in Time Manufacturing, which embraces the concepts of minimal inventories, and continuous improvement through the identification and elimination of waste throughout an entire

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 05, May - 2017

Company. Outside of Toyota, TPS is often known as "lean" or "lean production", TPS is about applying the principles of the Toyota Way.

This process was developed and mastered by Toyota and remains one to the early examples of world class manufacturing practices.

The heart of the Toyota Production System is eliminating waste. The TPS diagram is seen in figure 2.1, it has become one of the most recognizable symbols in modern manufacturing.



The TPS house is strong only if the roof, the pillars, and the foundation are strong. A weak link weakens the whole system. There are different versions of the house, but the core principles remain the same. It starts with the goals of best quality, lowest cost, and shortest lead time-the roof. There are then two outer pillars-just-in-times, probably the most visible and highly publicized characteristic of TPS, and *jidoka*, which in essence means never letting a defect pas into the next station and freeing people from machines-automation with a human touch. In the centre of the system are people. Finally there are various foundational elements, which include the need for standardized, stable, reliable processes, and also *heijunka*, which means leveling out the production schedule in both stable and to allow for minimum inventory. Big spikes in the production of certain products to the exclusion of others will create part shortages unless lots of inventory is added into the system.

Each element of the house by itself is critical, but more important is the way the elements reinforce each other. JIT means removing, as much as possible, the inventory used to buffer operations against problems that may arise in production. Using smaller buffers means that problems like quality defects become immediately visible. This reinforces, which halts the production process. This means workers must resolve the problems immediately and urgently to resume production. At the foundation of the house is stability. Ironically, the requirement for working with little inventory and stopping production when there is a problem causes instability and a sense of urgency among workers. In mass production, when a machine goes down, there is no sense of urgency: the maintenance department is scheduled to fix it while inventory keeps the operations running. By contrast, in lean production, when an operator shuts down equipment to fix a problem, other operations will soon stop producing, creating a crisis. So there is always a sense of urgency for everyone in production to fix problems together to get the equipment up and running. A high degree of stability is needed so that the system is not constantly stopped. People are at the center of the house because only through continuous improvement can the operation ever attaining this needed stability. People must be trained to see waste and solve problems at the root cause by repeatedly asking why the problem really occurs. Problem solving is at the actual place to see what is really going on.

1.2 Problem Statement

Time is money, shorter lead time or throughput time is always good thing for producer or customer. The production timing effort of each planning step that gives information about the starting and ending dates, which are necessary for an exact scheduling of the whole production process. Based on good planning that shorter project lead time is easy to get a way to realize. The presented project work in Kayjay sharp Trendys is interestedin some research work in production plant, analysing the production data, trying to find out where the problem it is, showing a method by which the given task is carried out, such as lead time reductions.

1.3 Method

There are many ways of improving manufacturing operations and process. Today lean thinking which come from Toyota Way being guide for many manufacturing companies throughout the world. The companies that first mastered this system were all headquartered in one country-Japan. Yet today, the founding Toyoda family is not only succeeded first in the textile machinery business, but also Toyota is regarded by most industry observers as the most efficient and highest-quality producer of motor vehicles in the world.

At the developed method of theory, Toyota‟s principles and Toyota production system are determined by guiding solving the problem in project production. Moreover, the method of practical is visiting the factory, watching the production line, talking with people, knowing the current situation in the factory, and then analysing a practical project example of the manufacturing, pay an attention to analysis of time data and making a diagram of production situation in factory.

Based on literature research and practical analysis work, try to find out where the problem it is, and then get conclusion and work out method for improvement.

1.4 Objectives

Shorter lead time is always a good thing. In many markets, the ability to deliver sooner will win business away from competitors with similar product features, quality and price. In other markets, quick delivery can justify a premium price and will certainly enhance customer satisfaction. In all cases, shorter lead time increases flexibility, reduces the need for inventory buffers and lowers obsolescence risk. Kayjay sharp Trendys

Team is committed to giving customer‟s business a competitive edge. The company bring their extensive skills and experience to ensure the projects is a smooth, precision operation that delivers top - quality results – on time and to budget. For project, fast project implementation reduces time with 1-2 months compared to conventional construction due to overlapping and parallel activities.

Project leads time Reduction at Kayjay sharp Trendys are objectives of this project work. Lead time can be reduced by doing things faster, or by buffering with inventory-finished goods, semi-finished goods, major assemblies, work-in-process, components and/or raw materials. There is a direct relationship between lead time, inventory investment, and customer service. Lead time are cumulative and bi-directional, that is, order handling, planning, procurement, delivery, inspection, manufacturing, handling, picking, packing, and delivery all contribute to the lead time; and the time it takes to get „signals‟ down the supply chain to initiate each activity adds to the overall time it takes to get the job done. The discussions of this report that follow are focused on strategies and practice for reducing lead time.

1.5 Limitations

A project work depends on a number of key factors and usually needs many resources to deliver its results and the companies restrictions to share few data‟s. A good project analysis work is also based on clear and exact data or information source, and many practical works which you totally know the situation.

The analysis presented here is based on data obtained during the June 2016 – September 2016 visit to the Kayjay sharp Trendys‟s production plant. Kayjay sharp Trendys has office in Kalapatti road, Coimbatore.

Chapter 2: Theoretical Frame Work

This chapter presents studies based on "lean thinking" which comes from The Toyota Way, which acts as a guide for project management in many manufacturing companies throughout the world. Today, Lean Production is so popular that the interest of manufacturing companies throughout the world in "lean manufacturing" and their use of the "Toyota Way" to transform their technical and service organizations continue to grow. The Toyota production system in particular provides the basis that Lean Manufacturing fundamentals were founded on. Project Management is the application of knowledge, skills, tools and techniques to project activities to meet project requirements; these are all essential to a project‟s success.

2.1 Lean Production

We hear frequently today that is lean production. Manufacturers around the world are now trying to embrace lean production. Lean production is

"lean" because it uses less of everything compared with mass production

– half the human effort the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also, it requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products perhaps the most striking difference between mass production and lean production lies in their ultimate objectives. Mass production set a limited goal for themselves – "good enough", which translates into an acceptable number of defects, a maximum acceptable level of inventories, a narrow range of standardized products. Lean productions, on the other hand, set their sights explicitlyon perfection: continually declining costs, zero defects, zero inventories, and endless product variety. Of course, no lean producer has ever reached this Promised Land – and perhaps none ever will, but the endless quest for perfection continues to generate surprising twists.

Lean production focuses on eliminating in processes, including on the waste of work-in- progress and finished goods inventories, which are the earmark of mass production. Lean is not about eliminating people but about expanding capacity by reducing costs and shorting cycle time between customer order and ship date. The Toyota Production System (TPS) is an on-going evolution of solutions designed to achieve the "lean" ideal. Lean is much more than techniques. It is a way of thinking.

Today lean thinking which come from Toyota Way being guide for many manufacturing companies throughout the world. We then look in the Toyota Way at how lean production works in factory operations, product development, supply system coordination, customer relations, and as a total lean enterprise.

2.1.1 Toyota's Principles

Manufacturing companies throughout the world now interest in TPS or
"lean manufacturing" continues to grow and using the Toyota Way to transform technical and service organizations. I will also focus on Toyota

Way to guide for the presented project work. The Toyota‟s principles are organized in four broad categories below:

Long-term philosophy
The right process will produce the right results
Add value to the organization by developing your people

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 05, May - 2017

Continuously solving root problems drives organizational learning.
There are 14 principles that constitute the Toyota Way. According to the current situation in the factory, in this case, the presented project work will pay attention to the following principles:

Principle3: Use "pulls" systems to avoid overproduction
Provide your down line customers in the production process with what they want, when they want it, and in the amount they want. Material replenishment initiated by consumption is the basic principle of just-in-time. Minimize your work in process and warehousing of inventory by stocking small amounts of each product and frequently restocking based on what the customer actually takes away. Be responsive to the day-by-day shifts in customer demand rather than relying on computer schedules and systems to track wasteful inventory.

Principle7: Use visual control so no problems are hidden
Use simple visual indicators to help people determine immediately whether they are in a standard condition or deviating from it. Avoid using a computer screen when it moves the worker"s focus away from the workplace. Design simple visual systems at the place where the work is done, to support flow and pull. Reduce your reports to one piece of paper whenever possible, even for your most important financial decisions.
Principle13: Make decisions slowly by consensus, thoroughly considering all options, implement decisions rapidly

Do not pick a single direction and go down that one path until you have thoroughly considered alternatives. When you have picked, move quickly but cautiously down the path. Nemawashi is the process of discussing problems and potential solutions with all of those affected, to collect their ideas and get agreement on a path forward. This consensus process, though time-consuming, helps broaden the search for solutions, and once a decision is made, the stage is set for rapid implementation.

Principle14: Become a learning organization through relentless reflection (bansei) and continuous improvement (kaizen)
Once you have established a stable process, use continuous improvement tools to determine the root cause of inefficiencies and apply effective countermeasures. Design processes that require almost no inventory. This will make wasted time and resources visible for all to see. Once waste is exposed, have employees use a continuous improvement process (kaizen) to eliminate it. Protect the organizational knowledge base by developing stable personnel, slow promotion, and very careful succession systems. Use hansei (reflection) at key milestones and after you finish a project to openly identify all the shortcomings of the project. Develop countermeasures to avoid the same mistakes again. Learn by standardizing the best practices, rather than reinventing the wheel with each new project and each new manager.

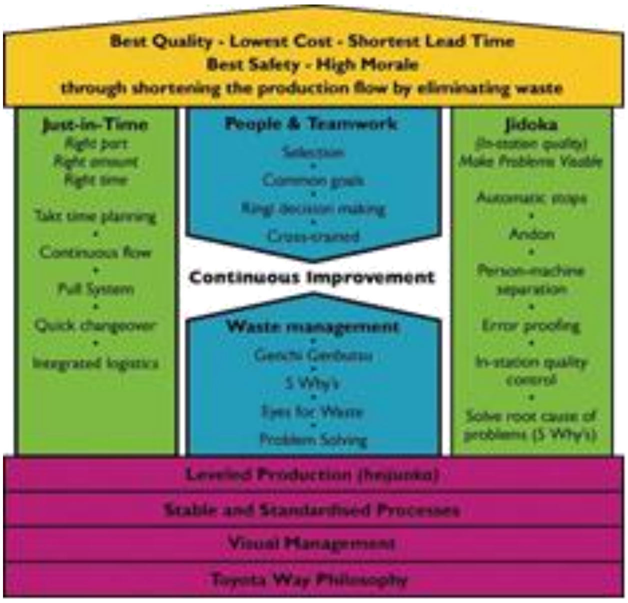
Toyota"s principles are a great starting point for lean thinking. Lean is not about imitating the tools used by Toyota in a particular manufacturing process. Lean is about developing principles that are right for your organization and diligently practicing them to achieve high performance that continues to add value to customers and society, means being competitive and profitable.

2.1.2 Toyota Production System
Lean Manufacturing fundamentals were founded on the Toyota Production System, or Just in Time Manufacturing, which embraces the concepts of minimal inventories, and continuous improvement through the identification and elimination of waste throughout an entire

Company. Outside of Toyota, TPS is often known as "lean" or "lean production", TPS is about applying the principles of the Toyota Way.

This process was developed and mastered by Toyota and remains one to the early examples of world class manufacturing practices.

The heart of the Toyota Production System is eliminating waste. The TPS diagram is seen in figure 2.1, it has become one of the most recognizable symbols in modern manufacturing.



The TPS house is strong only if the roof, the pillars, and the foundation are strong. A weak link weakens the whole system. There are different versions of the house, but the core principles remain the same. It starts with the goals of best quality, lowest cost, and shortest lead time-the roof. There are then two outer pillars-just-in-times, probably the most visible and highly publicized characteristic of TPS, and *jidoka*, which in essence means never letting a defect pas into the next station and freeing people from machines-automation with a human touch. In the centre of the system are people. Finally there are various foundational elements, which include the need for standardized, stable, reliable processes, and also *heijunka*, which means leveling out the production schedule in both stable and to allow for minimum inventory. Big spikes in the production of certain products to the exclusion of others will create part shortages unless lots of inventory is added into the system.

Each element of the house by itself is critical, but more important is the way the elements reinforce each other. JIT means removing, as much as possible, the inventory used to buffer operations against problems that may arise in production. Using smaller buffers means that problems like quality defects become immediately visible. This reinforces, which halts the production process. This means workers must resolve the problems immediately and urgently to resume production. At the foundation of the house is stability. Ironically, the requirement for working with little inventory and stopping production when there is a problem causes instability and a sense of urgency among workers. In mass production, when a machine goes down, there is no sense of urgency: the maintenance department is scheduled to fix it while inventory keeps the operations running. By contrast, in lean production, when an operator shuts down equipment to fix a problem, other operations will soon stop producing, creating a crisis. So there is always a sense of urgency for everyone in production to fix problems together to get the equipment up and running. A high degree of stability is needed so that the system is not constantly stopped. People are at the center of the house because only through continuous improvement can the operation ever attaining this needed stability. People must be trained to see waste and solve problems at the root cause by repeatedly asking why the problem really occurs. Problem solving is at the actual place to see what is really going on.

TPS is a sophisticated system of production in which all of the parts contribute to a whole. The whole at its roots focuses on supporting and encouraging people to continually improve the processes they work on.

2.2 Project Management

Project management is the discipline of planning, organizing, and managing resources to bring about the successful completion of specific project goals and objectives. The primary challenge of project management is to achieve all of the project goals and objectives while adhering to classic project constraints – usually scope, quality, time and budget.

Like any human undertaking, projects need to be performed and delivered under certain constraints. Traditionally, these constraints have listed as scope, time, and cost. These are also referred to as the ***Project Management Triangle***, where each side represents a constraint is shown in figure 2.2.

The time constraint refers to the amount of time available to complete a project. The cost constraint refers to the budgeted amount available for the project. The scope constraint refers to what must be done to produce the project‟s end result. There three constraints are often competing constraints: increased scope typically means increased time and increased cost, a tight time constraint could mean increased costs and reduced scope, and a tight budget could mean increased time and reduced scope.

The discipline of project management is about providing the tools and techniques that enable the project team to organize their work to meet these constraints.

The subject of this project work is project lead time reduction, the focus is in production time.

2.2.1 PROJECT LEAD TIME

The word ***Project*** comes from the Latin word *projectum* from the Latin verb *projicere*, "to throw something forwards". The word "project" thus actually originally meant "something that comes before anything else happens". When the English language initially adopted the word, it referred to a plan of something, not to the act of actually carrying this plan out. Something performed in accordance with a project became known as an "object". This use of "project" changed in the 1950s, use of the word "project" evolved slightly to cover both projects and objects.

A project usually needs resources to deliver its results. A project work depends on a number of key factors, a project is a carefully defined set ofactivities that use resources (money, people, materials, energy, space, provisions, communication, etc.) to meet the pre-defined objectives, project‟s ***Lead Time*** is the period of time between the initiation of any process of production and the completion of that process. Thus the lead time associated with ordering a new car from a manufacturer may be anywhere from 2 weeks to 6 months. In industry, lead time reduction is an important part of lean manufacturing. In project management, Lead Time is the time it takes to complete a task or a set of interdependent tasks. The Lead Time of the entire project would be the overall duration of the critical path for the project.

2.2.2 Project Throughput Time

Throughput Time - TPT is the total elapsed time from the start of the process flow to the service delivery. Throughput time is the metric you should use for continuous improvement, focusing on reducing or eliminating the activities of your process. Process Improvement-Improvements in cost, quality, flexibility, and speed are commonly sought. The throughput time (sometimes called the flow time) is also defined as the interval that elapses as the manufacturing system performs all of the operations necessary to complete a work order. This throughput time has many components, including move, queue, setup, and processing times. Reducing the throughput time has many benefits, including lower inventory, reduced costs, improved product quality (process problems can be found more quickly), faster response to customer orders, and increased flexibility. In addition, a shorter throughput time means that the first

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 05, May - 2017

batch of finished goods will reach the customers sooner, which helps reduce the time-to-market. The product design, which requires a specific set of manufacturing operations, has a huge impact on the throughput time

2.2.3 Project Throughput Time And Total Throughput Time At Kayjay Sharp Trendys

In this case in Kayjay sharp Trendys AB, *Throughput Time* – TPT is the total elapsed time installation process, which is depending on increased pre-fabrication, product development, process orientation, single module delivery; *Total Throughput Time* - TTPT is the total elapsed time from the start of the detail design to transportation, which is depend on standardization, reuse, stable systems and process orientation .

2.3 The Abb T50 Program

The T50 program was developed by the ABB Company in the early 90‟s. It is developed by MIT university in America.

2.4 Value Stream Mapping Concept

Value stream mapping is a lean-management method for analysing the current state and designing a future state for the series of events that take a product or service from its beginning through to the customer. At Toyota, it is known as "material and information flow mapping". It can be applied to nearly any value chain. Value stream mapping has supporting methods that are often used in lean environments to analyse and design flows at the system level (across multiple processes). Although value stream mapping is often associated with manufacturing, it is also used in logistics, supply chain, service related industries, healthcare, software development, product development and administrative and office processes. Value stream mapping is a recognised method used as part of Six Sigma methodologies. The standard symbols used in value stream mapping are represented in the figure below:

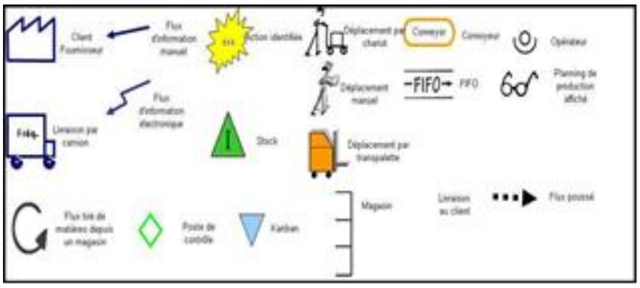


Figure 2.5 List of the standard symbols used in value stream mapping concepts

CHAPTER 3: PRESENT SITUATIONS AT THE COMPANY

This chapter is the most important part of this report. Based on visiting

Kayjay sharp Trendys‟s head office in Kalapatti, company presentation is shown; 15 days survey in the factory, production plant visiting, converse with people, the present situations at Kayjay sharp Trendys as I know are presented and described in details in this chapter.

3.1 Company Presentation

KAYJAY SHARP TRENDYS is, as its name suggests, a trend-setter in the field of domestic and industrial electrode rod manufacturing. Established in the year 1992, the company began with the modest objective of producing world class pumps for domestic use in India. The company has succeeded in carving a niche for itself in the pump industry with the quality of its products and, in fact, is exporting its products to foreign countries as well. Which has been designing and implementing licensed modular production facilities for the pumps and electrode industries. The company focuses on giving their clients the advantage by bringing their drug facilities into production faster and on time, assuring predictable first-rate results.

3.1.1 Kayjay Sharp Trendys Factory

One of Kayjay sharp Trendys‟s factories is not far away from Kalapatti, which produces modular living quarters and service facilities for the welding and pump industry. The presented project work is based on production plant in this factory.

Figure 3.2 The production plant is seen in the above image, it is very clean and organized, and some workers work in the modular and install relevant equipment which customer ordered.

3.1.2 Production At Kayjay Sharp Trendys

The Company‟s operations are based on a proprietary modular concept that includes everything from design and fabrication to documentation, training and service. The Company‟s business focus and accountability reside mainly in three divisions, each of which is focused on its own particular market segment: Kayjay sharp Trendys, makes modular facilities for the manufacture of welding electrode rods.

Kayjay sharp Trendys is one of companies following this idea - focus on giving clients the advantage by bringing their facilities into production faster and on time, assuring

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 05, May - 2017

predictable first-rate results. Today the efficient project process in Kayjay sharp Trendys is seen in the following:

From project start, the customer URS (User Requirement Specification) are reviewed and requirements incorporated; All detailed specifications, shop drawings and installation drawings need for fabrication and documentation of the facility are developed using tools. They manufacture plant indoors under controlled conditions in an assembly line manner. Process equipment‟s as well as clean utilities are installed in their final positions at Kayjay sharp Trendys‟s production sites. Pre-qualification tests are performed on the process and utility installations prior to shipment. Activities are run in parallel to save time and increase quality.

3.2 Production In The Factory
One of Kayjay sharp Trendys‟s factories produces modular living quarters and service facilities for the oil and gas industry. In factory, the ultimate goal of manufacturing is to apply the ideal of one piece flow to all business operations, from product design to launch, order taking, and physical production. After 15days survey work in this factory, production plant visiting, converse with people, present situations and production at Kayjay sharp Trendys are presented and described in details in following.

3.2.1 Production Planning
To launch a product on the market, every product has to pass through two main planning phases. The product development phase consists of design and process planning and operating phase – production consists of production planning and control.
Process planning basically acts as the bridge between design and manufacturing and involves a number of steps or operations. The process plan is a kind of road map to be followed in transforming raw materials into the finished products.

The work effort for each task is estimated and those estimates are rolled up into the final deliverable estimate. The tasks are prioritized, and this information is documented in a project schedule, it is planning.

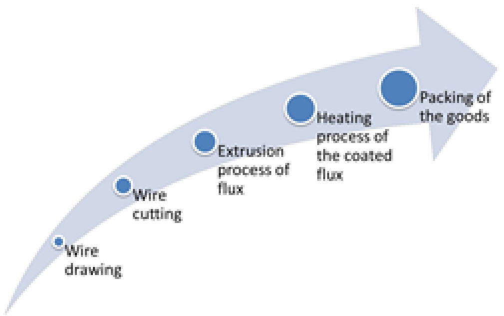
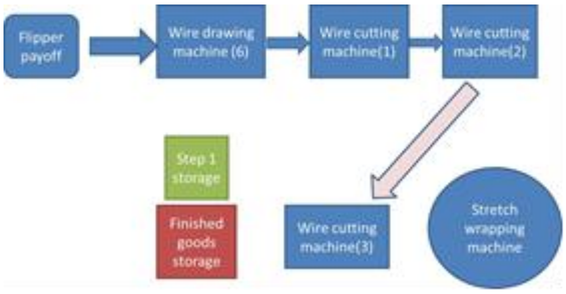
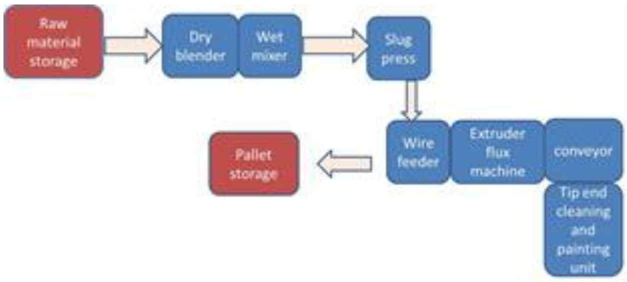


Figure 3.4 Process involved

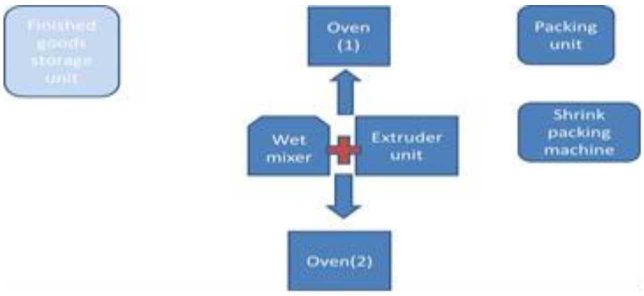
PLANT 1 OPERATION



PLANT 2 OPERATIONS



PLANT 3 OPERATIONS



3.2.3 Architecture
The architecture group starts work when it receives the basic design map or layout. There are often many changes by the time that the final design is reached; this is considered a normal part of the process. Some of this work is usually given to sub-contractors who do not know each other before the project begins, and who thus need more and better communication throughout the course of the project. Daily meetings are a very important part of the work.
guaranteeing on-time deliveries

„ Effective communication, one example of this being daily morning meetings

„ Reliable information, as supplied by the Construction Department and other departments in the organization.

From the basic design, the architecture group has already started the architect work when it receives the basic design map or layout without more details. They push the work like bulldozer, they do lots of different part that they can do and lots of different modular simultaneity, it can be saved time well. In their opinion, they‟d like assembly the whole big modular together, and then correct to get final conclusion.

Dependable information from construction is also very important to architect‟s work. For example if especially a new project comes from U.S. which have different standard, it‟s new for everybody in architect‟s group. The only thing they can do just held up and waiting for the exactly information from construction. They will push work consciously after get confirmed information from construction.

Process And Utility

Architects are constant participants in the project, from beginning to end, others are unlikeliness. During the production process, some other teams simultaneously work together and of course affect each other. If any part of the project is delayed by materials or other problems, the part of projects work is held up, it will Influence the progress of project.

3.2.4 Material Planning

Good material planning's progress to project includes to the pass important of influence. For material flow, Construction and purchase department will give proposal to material planning in the factory for pull material and production planner for operation material. Material planner will give order to supplier after get proposal. Sometimes in processing project, ordered material still missing, in this situation, material planner will talk to production planner and plant manager holding on for material coming later or change supplier as soon as possible.

3.3 Production Limitations

The main objective of this project work is to lead time reduction to get across evaluation of production in Kayjay sharp Trendys to identify strengths, weaknesses and opportunities for project improvements. A survey report, which based on talking with different people, that will help us to assess the current status, and limitations in the production.

3.3.1 CUSTOMER DEMAND

The greatest problem is that it is often difficult to get sufficient or dependable information from the layout because of customer‟s requirement and design change. Worker do not always feel that they can trust the basic design, there are delays while they seek more information. Redesign and rework happens often in project process.

3.3.2 Suppliers

After purchase made, delivery time and material quality are purchaser and producer concentrated. If supplier provide material with good quality and delivery it on time, it„s very contribute for the project. The circumstance that Kayjay sharp Trendys facing now is some suppliers can't provide goods in time after order, or supplying good have some problems sometimes perhaps. It‟s not difficult to change and find a new supplier, the problem is that not only takes time to reorder, but also need more time to build up new relationship with new suppliers.

3.3.3 People

In addition to problems with redesign, rework, material and suppliers, they may also have problems with employee error. For example, this can occur when someone orders material by phone instead of using the computerized system; in such cases, when materials arrive, nobody knows who ordered it or for what reason, and so place it in storage indefinitely. At the same time, the person who made the order is waiting for the material and complains that it takes too long time for delivery and increasing wastes time for the project.

CHAPTER 4: ANALYSIS OF PROJECT LEAD TIME

In this chapter analysis of project lead time is presented, using excel table or diagram. According to the objectives of this project work and the project data that I got from the company, thereby we will focus on production hours and number of workers involved in the project.

4.1 Project Lead Time Calculation

1 roll of raw material gives = 1950-2000 electrodes.

Also here, process done in each plant is independent of the process done in the other plants.

From the time calculated,

TIME REQUIRED FOR PRODUCTION OF 2000 ELECTRODES=

36 WORKING HOURS (4 DAYS)

1. 1000 electrodes of type 1 packaging = 31 working hours(1 MIN /PIECE)

2. 1000 electrodes of type 2 packaging = 32 working hours

SOURCE	DESTINATION	TIME	DESCRIPTION
STORAGE AREA	FLIPPER PAY OFF	20 MINUTES	LOADING OF RAW MATERIAL
FLIPPER PAY OFF	WIRE DRAWING MACHINE	4 HOURS/ ROLL	REDUCTION OF DIAMETER OF THE WIRE TO THE REQUIRED SIZE
WIRE DRAWING MACHINE	STORAGE AREA	30 MINUTES	UNLOADING OF RAW MATERIAL
STORAGE AREA	WIRE STRAIGHTENING MACHINE	10 MINUTES	LOADING TO CUT THE RAW MATERIAL TO THE REQUIRED SIZE
WIRE STRAIGHTENER	WIRE CUTTING	100 MINUTES/ROLL	CUTS THE WIRE TO REQUIRED SIZE AT 60 CUTS/MIN.
WIRE CUTTING	STORAGE AREA	10 MINUTES	MOVING THE CUT PIECES TO THE

Table 4.1 *Production time calculations in hours for Plant-1*

SL.NO	SOURCE	DESTINATION	TIME	DESCRIPTION
1.	PREPARATION OF POWDERED FLUX IN DRY BLENDER		2 HOURS	PREPARING THE RAW POWDERED FLUX BY COMBINING 10 CHEMICALS IN THE REQUIRED PROPORTION
2.	POWDERED FLUX	WET MIXER	25 MINUTES	MAKING THE POWDER FLUX IN LIQUID FORM
3.	WET MIXER	SLUG PRESS	40 MINUTES	HAND PRESSING THE FLUX TO PREVENT SOLID FORMATION
4.	CUT WIRE FROM STORAGE AREA AND FLUX FROM SLUG PRESS	TIP END CLEANING AND PAINTING	30 SECONDS/ PIECE	INCLUDES COATING THE FLUX ON THE WIRE, CLEANING THE EDGES, FACING THE EDGES AND PAINTING. MACHINES: HORIZONTAL WIRE FEEDER, CONVEYOR BELT.
5.	PAINTED WIRE	PALLET STORAGE	30 SECONDS/PIECE	STORING THE WIRE IN SEPARATE PALLETS.

Table 4.2 *Production time calculations in hours/minutes for Plant-2*

SL.NO	SOURCE	DESTINATION	TIME	DESCRIPTION
1.	ARRANGING THE PALLETS IN HEAT TREATMENT MACHINE		15 MINUTES	PALLETS ARE PLACED IN THE OVEN
2.	HEATING IN THE OVEN		45 MINUTES	HEATING THE FLUX COATED WIRE AT 400 DEGREES TO REMOVE MOISTURE
3.	COOLING THE HEATED ELECTRODE		8-10 HOURS	COOLING THE ELECTRODE AT ROOM TEMPERATURE
4.	MOVING TO STORAGE AREA		15 MINUTES	

Table 4.3 *Production time calculations in hours/minutes for Plant-3(Stage 1)*

SL.NO	SOURCE	DESTINATION	TIME	DESCRIPTION
TYPE -1	STORAGE	PACKED IN BOXES	30 SECONDS	PACKED AT 10 PIECES PER BOX
TYPE -2	STORAGE	PACKED IN BOXES	1 MINUTE	PACKED ACCORDING TO THE WEIGHT
1.	BOXES	SHRINK PACKAGING	30 SECONDS/BOX	COVERING THE BOX WITH PLASTIC LAYER TO PREVENT MOISTURE FORMATION
2.	SHRINK PACKAGING	STORAGE	20 SECONDS	MOVED AND STORED ACCORDING TO THE SIZE & TYPE
3.	STORAGE	CONTAINERS	10 MINUTES	
4.	CONTAINER	DESPATCH AREA	30 MINUTES	

Table 4.4 *Production time calculations in hours/minutes for Plant-3*

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 05, May - 2017

CHAPTER 5: PLANT LAYOUT MODIFICATION BY VSM

5.1 Plant 1 Existing

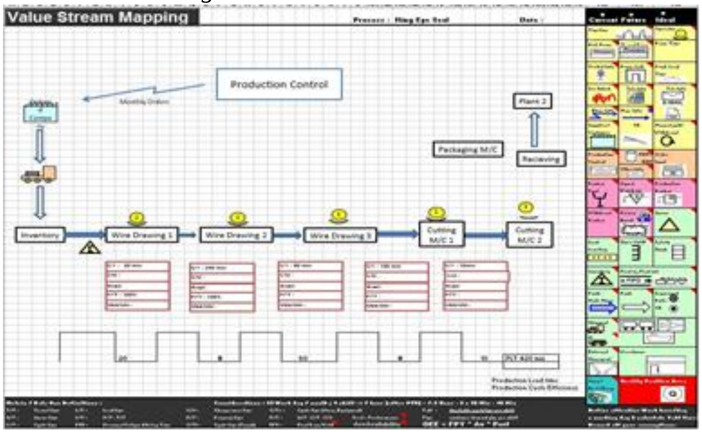


Figure 5.1 Plant 1 existing Value Stream Model

The above figure 5.1 represents the existing layout and the process line of plant 1 in the unit. The above sketch was mapped using the value stream mapping software.

5.2 Plant 1 Modified

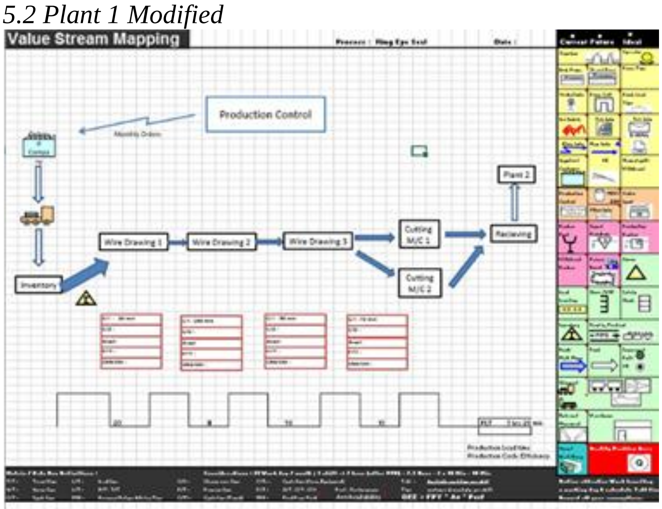


Figure 5.2 Plant 1 modified Value Stream Model

The above figure 5.2 represents the modified layout and the process line of plant 1 in the unit. The above sketch was mapped using the value stream mapping software. By comparing both the existing and modified sketches of plant 1, we can interpret that by using value stream mapping concepts the operations of the wire cutter has been parallelised which will result in an significant reduction in the lead time of the plant.

5.3 PLANT 1 ANALYSIS

PROCESS	EXISTING TIME	MODIFIED TIME
WIRE DRAWING	240 MINUTES	240 MINUTES
WIRE CUTTING	130 MINUTES	50 MINUTES
TOTAL TIME FOR PLANT 1	420 MINUTES	320 MINUTES
TOTAL TIME REDUCED IN PLANT 1		100 MINUTES

Table 5.1 *Plant 1 Analysis*

By comparing the data obtained from plant 1 before and after modification of the plant the above values has been obtained and by comparing both the values, it is found that total time reduced by modifying the plant has been calculated as 100 minutes.

By comparing the data obtained from plant 1 before and after modification of the plant the above values has been obtained and by comparing both the values, it is found that total time reduced by modifying the plant has been calculated as 100 minutes.

5.4 PLANT 2 EXISTING

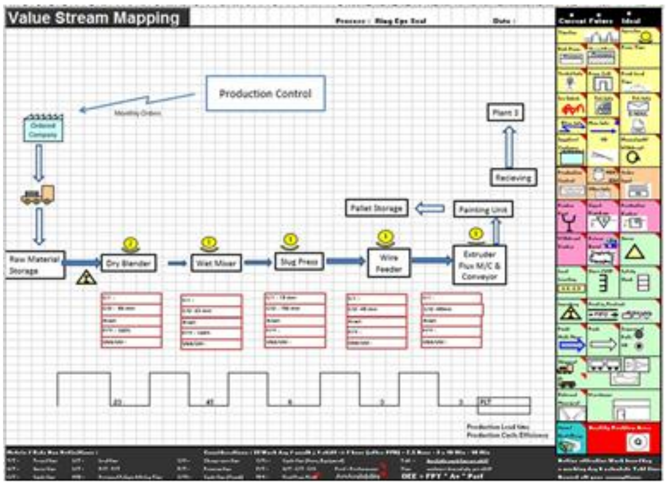


Figure 5.3 Plant 2 existing model

The above figure 5.3 represents the existing layout and the process line of plant 2 in the unit. The above sketch was mapped using the value stream mapping software.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 05, May - 2017

5.5 Plant 2 Modified

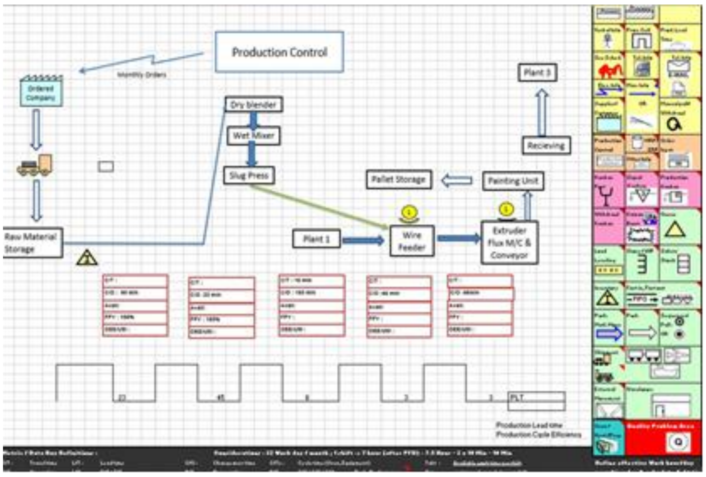


Figure 5.4 Plant 2 modified model

The above figure 5.4 represents the modified layout and the process line of plant 1 in the unit. The above sketch was mapped using the value stream mapping software. By comparing both the existing and modified sketches of plant 1, we can interpret that by using value stream mapping concepts the process line of the plant has been modified for the easy flow of raw materials. In order to reduce the time involved in plant 2 operations, the dry blending phase of the

plant 2 operations is carried out in parallel to the plant 1 operations with an additional increase in the workforce by 2 which show a major impact in the time that can be saved. From the analysis it was found that the time consumed by parallelizing the operation was 180 minutes.

5.6 PLANT 3 EXISTING

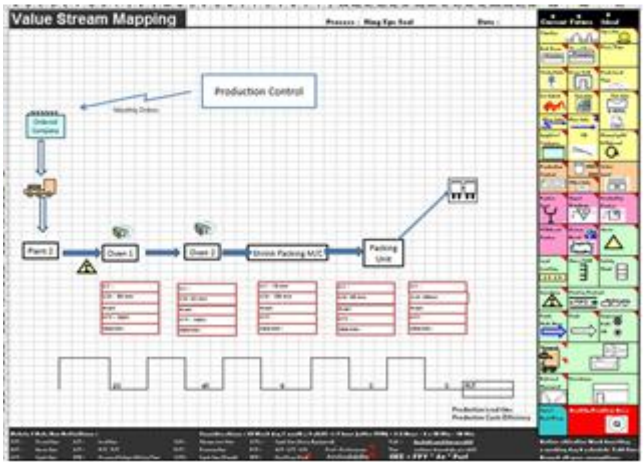


Figure 5.5 Plant 3 existing model

The above figure 5.5 represents the existing layout and the process line of plant 2 in the unit. The above sketch was mapped using the value stream mapping software. After an through analysis of the plant 3 operations by using various concepts, it was found that the plant 3 was operating to its fullest efficiency and thus plant 3 requires no modification in the existing layout.

CHAPTER 6: CONCLUSION

We have calculated the lead time involved in each plant and the operations of each machine in the plant were studied in detail. The continuous improvement processes was undergone in the company and we have decreased the lead time involved in the manufacturing process by using value stream mapping concept.

6.1 TOTAL TIME TAKEN IN THE PLANTS

	EXISTING TIME	MODIFIED TIME	REDUCED TIME
PLANT 1	420 MIN	320 MIN	100 MIN
PLANT 2	480+180=660 MIN	480 MIN	180 MIN
PLANT 3	840 MIN	840 MIN	-
TOTAL	2160 MIN	1880 MIN	280 MIN

Table 6.1 Time Taken in the plants

The above table 6.1 shows us the overall lead time of the plant before and after modification of the plant. From the above table we can see that the overall lead time before plant modification was 2160 minutes which was reduced to 1880 minutes after modification by the use of value stream mapping concepts. Thus the total time reduced in the overall operation of the plant amounts to 280 minutes.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 6 Issue 05, May - 2017

6.2 TOTAL PRODUCTIVITY INCREASE

	EXISTING	MODIFIED
PRODUCTIVITY/YEAR	1,50,000 RODS	1,69,000 RODS
CONSIDERING 300 WORKING DAYS		
PERCENTAGE INCREASE IN PRODUCTIVITY	13% PER YEAR	

Table 6.2 Productivity

From the above table 6.2, we have calculated the total productivity increase in the plant for an year and from the table it can be inferred that before the plant modification the productivity of electrode rods were 1,50,000 rods per year and after the modification, the plant shows that the yearly production has increased to 1,69,000 rods. Thus due to plant modification, there is a yearly increase in the rods manufactured and it has increased by 19,000 rods which amounts to a 13% increase in the productivity of the plant per year.

REFERENCES

[1] Emiliani, Bob, David Stec, Lawrence Grasso, and James Stodder. Better Thinking, Better Results: Using the Power of Lean as a Total Business Solution. Kensington, CT: Center for Lean Business Management, 2002.
[2] Huntzinger, Jim. The Roots of Lean: Training within Industry: The Origin of Kaizen. Target, Vol. 18, No. 1, First Quarter 2002.
[3] James P. Womack, Daniel T. Jones & Daniel Roos. The Machine That Changed the World. Simon & Schuster UK Ltd, 2007.
[4] James P. Womack, Daniel T. Jones. Lean Thinking: Banish Waste and Create Wealth in Your Corporation. New York: Simon & Schuster, 1996.
[5] Jeffrey K. Liker. The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. McGraw-Hill, 2004.
[6] Liker, Jeffrey. (Ed.). Becoming Lean: Inside Stories of U.S. Manufacturers. Portland OR: Productivity Press, 1997.
[7] Ohno, Taiichi. Toyota Production System: Beyond Large-Scale Production. Portland, OR: Productivity Press, 1988.