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Reducing Production Lead Time and Product Cost Through Value Stream Mapping

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ABSTRACT

In today's competitive business world, companies need lower payroll times, lower costs, and higher levels of customer service to survive. As a result, companies have been making additional efforts to reduce the production of Value stream mapping (VSM) production times that have continued on a large scale over the past decade in large companies such as Toyota and Boeing. This paper examines the pricing of a price distribution map made by a railway company and focuses on the product family, the current map and the future map and the improvements made. The aim is to identify waste and translate waste disposal to improve company performance. With regard to the current map, it is used to find opportunities to use other production tools for reduced tools as a step towards productivity development. The current state map is designed to describe the existing position and various problem areas. The future state map is designed to show the proposed plans for improvement. Successful implementation of value distribution is a reduction in lead time, cycle time and creativity. It has been found that even a small company can make great strides by using the VSM Proposal to reduce unnecessary processes that result in increasing processing time and product costs and changing plant composition to avoid unnecessary asset management process.

Key Words: VSM, Current status map, future status map

I. INTRODUCTION

Rail Spring Karkhana is the largest spring production unit and dedicated exclusively to Indian railways. Founded in 1989 on a turnkey basis by M / S Ernst Komrowski & Co, Germany, Germany's leading spring company. With a value of more than 49 crores, this plant has state-of-the-art production facilities for spring oil production of hot spring steel bars. This plant is capable of producing spring wire dia up to 60 mm and the full height of the limited LPG plant. A plant that produces 90000-100000 (3100MT) spring spring per year. This paper will show how waste minimization can be done processally using a quantitative distribution map to analyze the processes involved in producing and identifying key waste disposal sites and possible solutions to overcome this. Value map calculation has been chosen as a tool to gather information about spring performance because it has been used successfully by a large organization to plan and visualize internal developments. In addition, if used properly it can help the process industry eliminate waste, maintain better asset control, improve product quality, and better financial and operational control. John and Wackack describe Value Stream Mapping as “the simple process of directly looking at the flow of information and objects as it is now summarized by looking at and looking at the future that works best”

The main purpose of VSM is to identify all types of waste in the Stream value and to take action to try to eliminate this. Hosting can be part of a process that takes time and resources but does not add value to the product. Value map editing tools in use of the current “state map” showing current activity. It records information and processes that can be used to identify important waste, problem and opportunities. Once the current state map has been analyzed the future state map can work there with great success. ”

This study is based on a study of spring cases that produced karkhana, in India This is part of a larger study in which the object will identify, develop and revitalize the process of development and effective use throughout the production company.

The aim of this research was to:

- Understand the `current state,, of the manufacturing karkhana.
- Identify the key area of waste, problem and

opportunities across the karkhana

- Develop of „future state vision" of each of the supply chain
- Increase the productivity
- Develop an action plan to achieve the higher production and lead time reduction

II. DATA COLLECTION AND ANALYSIS

This section will describe the processes which take place throughout the factory and will identify problems and issues

The processes which take place throughout the factory have been summarized as follows

- Take a peild bar (metal bar). This bar is made up of different composition of metal like Cr,V, Mo, steel etc.
- Then end tapered bar supplied to bar heating furnace (prepare for coiling), coiler, oil quenching tank, and tempering furnace.
- Then sample check for quench hardness. Coiled and tempered spring are end grinding to provide flat end for proper seating of spring are end grinded to provided flat end for proper for developing residual compressive stress on surface and improving fatigue strength
- Shot penned coiled springs are then tested for crack testing by magna flux testing.
- Then primer coating, scragging pre load testing and black painting are done.
- Rejected part are repitched and hot scragged.
- Finally black painted spring is checked for ultimate tensile test and dimensional test.

Table 1 Summary of the data in the current state map for RSK

Process stages Attributes	End tepering (min)	Coiling+ quenching (min)	temperng (min)	End grinding (min)	Shot peening (min)	Primer paint (min)	inspection (min)
Cycle time	3	30+12	90	30	10	8	8
Value added time	2	12	90	20	5	2	5
Non value added	1	5	00	7	00	00	00
Necessary non value added	1	30	00	5	5	6	3
Change overtime	30	30	00	60	00	00	50
Available time	420	420	420	420	420	420	420
Uptime %	92.85	92.85	100	85.71	100	100	88.09
No. of operator	6	7	2	8	3	6	18
Observe inventory of days	5.89	00	4.81	3	4.8	4.8	5.89
Wip no. of spring	2212	00	1806	1156	1800	1800	2096

Table 2 Root cause analysis & remedial action

.N.	Process	Cause	Corrective action plan
1.	End tapering	Extra movement due to longer distance	Change the place between two end taper machine and inventory
2.	Bar heating and coiling	Large distance	Reduce the distance between two machine
3.	Coiling , quenching, tempering	Delay in process	Parallel inspection process
4.	Grinding process	Extra time on handling spring	Change material handling technique.
5.	Primer paint	Process layout	Change process layout

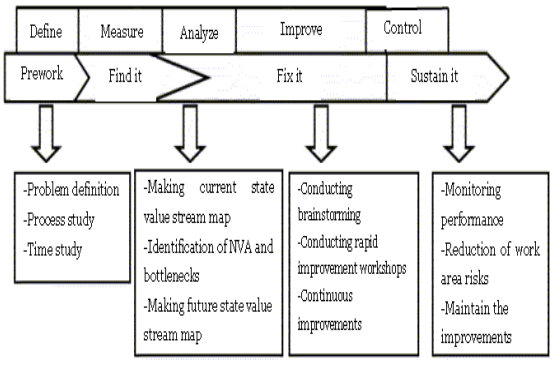
Design / method / method

VSM process symbols are used to discuss small startup processes in the manufacturing industry. The current state of the selected manufacturing sector is remedied with the help of VSM logos and enhancements. Other adjustments to the current status map are proposed and with these changes the future status map is being updated.

To implement the sub-goals, a group was formed with people from different parts of the organization, all with rich knowledge and experience, Processing, production, and equipment and planning.

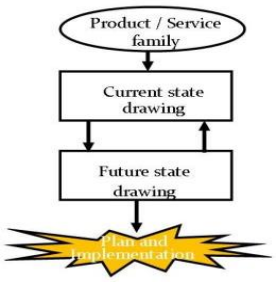
The objectives of the project are:

1. To reduce the level of non-value works available in any way by A variety of reduced tools are used
2. To reduce the duration of the entire Assembly line process in the storefront by improving the order, processing the change step, and by checking the same quality check. A modified approach to achieving the objectives is provided in Figure



Methodology for Lean Implementation

Methodology of implementation of vsm The Complete Value

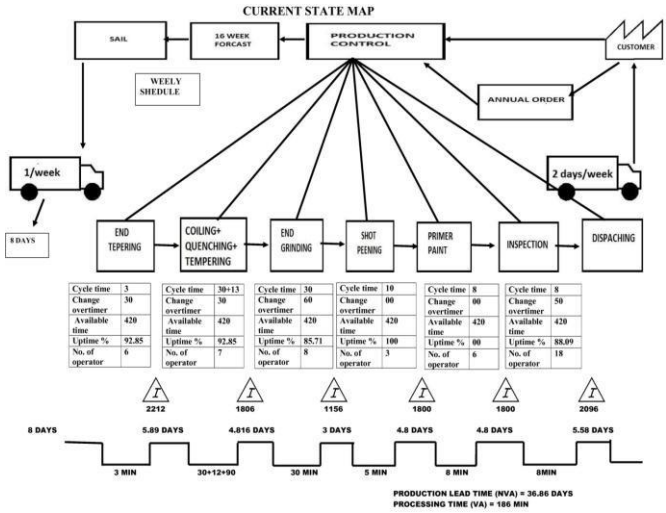


- **Select product / service family**
- **Draw Current State map. Understanding how the process currently operates.**
- **Identify opportunities for elimination of waste and areas of improvement to meet customer's needs.**
- **Draw the Future State map. Design a lean flow using lean techniques.**
- **Develop action plan and implement it.**

Stream Mapping Step

Current state value stream mapping

To construct the current state value stream map, relevant information was collected by interviewing people on the shop floor. As Data relevant to the customer, such as quantity to be delivered, delivery time were observed and information related to the assembly line, such as processing time, inventory storage, inspections, rework loops, number of workers and operational hours per day were collected and documented properly. To complete the value map, a timeline is added at the bottom of the map recording the lead-time and the value-added time. Eventually, the value stream map for the current state is constructed.



Takt time

Takt time can be defined as the time required producing one unit of daily salable quantity. To calculate takt time in the context of present problem, the average demand per three shifts was found to be 375 spring under study. The company runs for three shifts, 60 min per shift excluding break time. This results in a takt time of nearly 3.36 min. Therefore, it is concluded that one spring must come out during every 3.36 min interval.

To increase the productivity the site require some changes it could be used in optimize the floor layout and inappropriate maintenance practice cause machinery to fail there for regular and routine maintenance schedules need be in place to reduce machine error ,down time and minimize energy consumption. By changing the processing sequence minimize the time, rejection, and unnecessary movement on shop floor.

III. DATA ANALYSIS

Here we analyze the data collected by us Basically improvement/modification is done by us in this section.

Here we calculate the value addition percentage in the different process . Also we analyzed the root causes of different problems and suggested their remedial actions. Reducing lead time by improving production

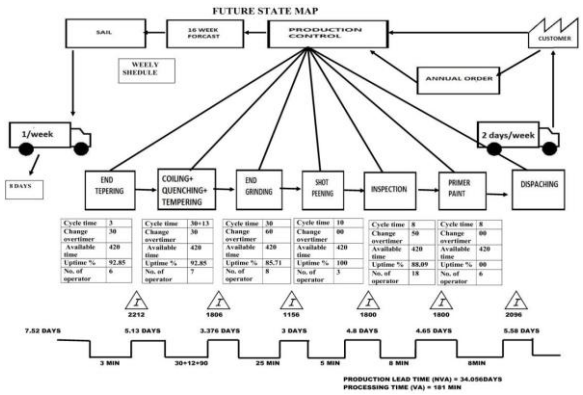
1. End tapering process

As I discussed earlier in this process the cycle time is 3 min and daily average output is 360bar/day, and setup time is 30 min. As I noticed that most of the time spent in handling of material between inventory and machine and machine to machine. I have suggested some implementation area which will improve production as well as reduce inventory.

2. Coiling process

It is found that that in coiling of bar there is scale formation due to oxidation of hot metal surface in air, which causes rejection in coiling in the sense of reducing diameter of coiled bar. There is no further any process to rework it to use again, we suggest that if the distance between bar heating furnace and coiling machine which is 7 mtr.

Future state map



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