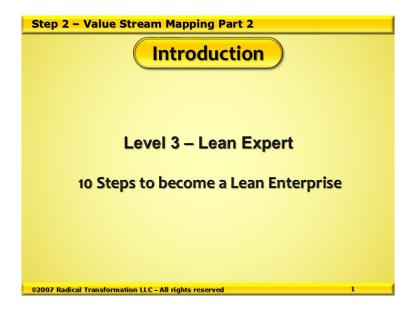
10 Steps to become a Lean Enterprise

Lean Expert Training Course

Step 2
Value Stream Mapping
Part 3

Table of Contents

Welcome	3
Course Objectives	4
Question #5 – Reducing Inventory Levels	5
Question #6 – Is there a single point to schedule production?	7
Question #7 – Is there a better way to order "New Parts"?	9
Question #8 – How many people does Spray Pump Repair Company need?	12
Question #9 - Can Spray Pump Repair Company identify their process loops?	14
Question 10 - What process improvements are necessary?	16
Step 4 of 4 – VSM Implementation Plan	17
Value Stream Implementation Plan	18
When is it finished?	19
Exercise	20
Reference Materials	22
Documents List	23



Welcome.

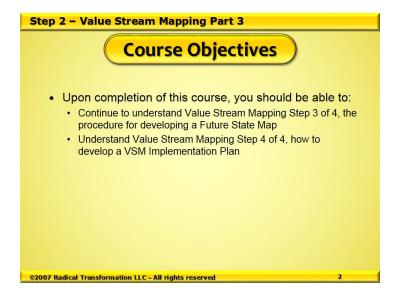
We would like to welcome you back to our next module in this online training course.

This training module is called "Step 2 – Value Stream Mapping Part 3."

This module is a continuation of our Lean Expert online course series called "10 steps to become a Lean Enterprise."

This program has been specifically designed to demonstrate our step by step methodology that will allow any organization to become a Lean Enterprise.

Let's continue your lean journey!



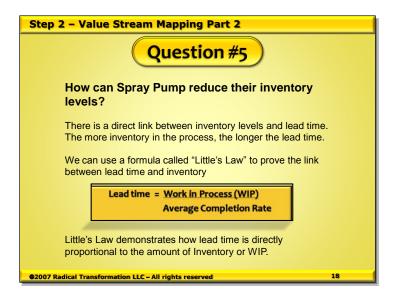
Course Objectives

Here are the course objectives for the Lean Expert Step 2 – Value Stream Mapping Part 3 training module. We specially designed this module so you will get a full understanding of each of the required steps to complete an Enterprise Level Value Stream Map (ELVSM). This is a critical element in the "10 Steps to become a Lean Enterprise" program.

Upon completion of this course, you should be able to:

- Continue to understand Value Stream Mapping Step 3 of 4, the procedure for developing a Future State Map.
- Understand Value Stream Mapping Step 4 of 4, how to develop a VSM Implementation Plan

Now we are going to work through each course objective.



Question #5 – Reducing Inventory Levels

How can Spray Pump Repair Company reduce their inventory levels?

There is a direct link between the amount of inventory and lead time. An increase in the inventory levels will increase the lead time. How can you prove this?

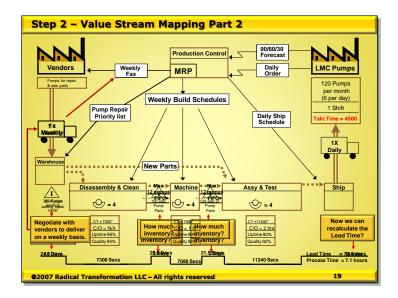
Spray Pump Repair Company's value stream team can use a formula called "Little's Law" to prove the link between lead time and inventory.

Lead time = Work in Process (WIP) Average Completion Rate

Little's Law clearly demonstrates how lead time is directly proportional to the amount of work in process (WIP) and inversely proportional to the average completion rate. In simple terms this means:

- If you reduce WIP while producing at the same completion rate, you will reduce lead time
- If you increase the completion rate while maintaining the same level of WIP, you will reduce lead time.

The only way for the team to prove this formula is to start changing the inventory levels to see what happens to the lead time.



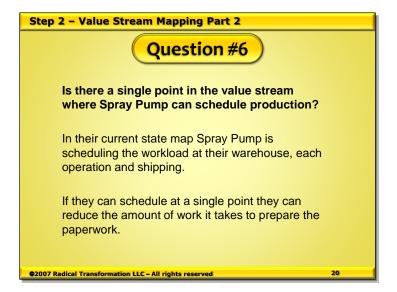
How did Spray Pump Repair Company reduce lead time?

The first area that Spray Pump Repair Company's value stream team has to look at is the flow of work through the Machining area. This requires Spray Pump Repair Company to ask a question: How do we reduce the input (150 pumps) and output (129 Pumps) inventory levels at Machining? There are several options available, but the team decided to implement FIFO (First In, First Out) lanes to allow the pumps to flow in an easily controlled movement. The next question for the team to ask is: How much inventory do we need in each FIFO lane?

The benefit of using a FIFO lane is to control the maximum amount of inventory at any time. The customer demand is 6 pumps per day. Therefore, the value stream team decided to control the inventory levels to a maximum of 12 pumps or a two days' supply.

Next, the team looked at the excessive inventory levels in the warehouse. They identified the root cause of the problem as their vendors delivered pumps, parts, and materials once a month. Spray Pump Repair Company must negotiate with their vendors to deliver weekly. The team decided it was necessary to maintain a warehouse inventory level of 60 pumps or a10 days' supply.

Reducing the inventory levels has reduced the lead time just as demonstrated in Little's Law. Now the team can recalculate the lead time using the new inventory levels. They find it was reduced from 70.6 days down to 14 days, an 80% reduction. This means that one pump can be processed through Spray Pump Repair Company's value stream in 14 days instead of 70 days, which is a significant overall improvement.

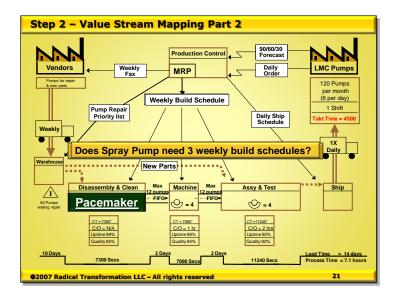


Question #6 - Is there a single point to schedule production?

Is there a single point in the value stream where Spray Pump Repair Company can schedule production?

In their current state map, Spray Pump Repair Company is scheduling their workload at their warehouse, at each operation, and shipping. The amount of time taken to electronically produce these documents is minimal. It's a onetime setup activity to add someone to the report email distribution list. However, the amount of time taken over a year to print out hard copies of these documents for each supervisor and worker might be worth looking into. The value stream team decides they want to look at this to see if there is any waste to be eliminated.

If they can find a way to schedule the production process at a single point they can reduce the amount of work it takes to prepare, print, and distribute the paperwork to all supervisors and workers.



Implementing Single Point Scheduling

Let's take a step back and look at the bigger picture. What has happened so far?

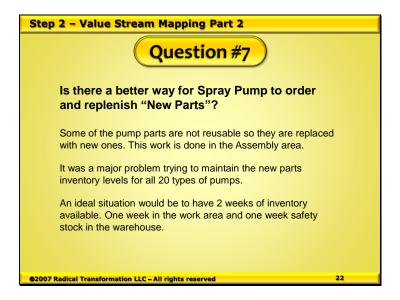
Several production areas have been combined to create work cells. All production cells have been connected together using FIFO lanes to control the flow and quantity of work in the system at all times. Each FIFO lane allows a maximum of 12 pumps in between the production cells. What does this mean in practice?

It means that the Machining and Assembly/Test work cells can only work on a pump as it arrives to them on a first in, first out basis. Providing they follow this process they will be working on pumps that are scheduled and prioritized in the Pump Repair Priority List sent out by Production Control. Every pump has been identified through an order from their customer and needs to be delivered to them.

The next question is: Does Spray Pump Repair Company still to generate 3 weekly build schedules?

By combining and connecting all the operations, it is unnecessary to have three weekly build schedules. Spray can now remove two weekly build schedules from its MRP distribution list. The only operation that needs scheduling is Disassembly/Clean because they receive pumps direct from the warehouse. Their workload will set the pace of production for the rest of the operations. They are now the **Pacemaker** work cell. Everything is flowing between Disassembly and Shipping.

Production Control personnel will see savings in preparation time for the weekly build schedules and printing hard copies for the supervisors and workers.



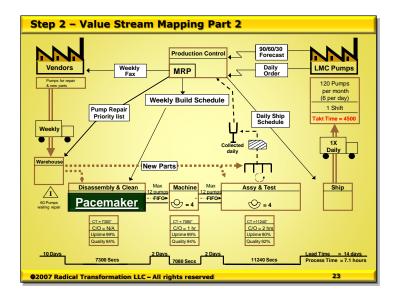
Question #7 - Is there a better way to order "New Parts"?

Is there a better way for Spray Pump Repair Company to order and replenish "New Parts" for their Assembly area?

During the value stream walk the team noted that some of the pump parts are not reusable, so they must be replaced with new ones. This work is done in the Assembly area while the pumps are being re-assembled. The Assembly area has been combined with the Test area during the development of the future state value stream map. The team believes this will improve the workflow through each of these processes.

The Assembly workers told the value stream team that it has been a continuous problem trying to maintain the new parts inventory levels for all 20 types of pumps. They often found themselves without replacement parts because they were not ordered in a timely manner. This created a difficult situation for the assembly workers because they had to reclaim and reuse old parts instead of replacing them with new ones. This was reflected in the 92% quality metric due to the amount of rework required after pumps failed in the Test area.

The value stream team investigated further. They found out that an ideal situation would be to have 2 weeks of inventory available. One week in the work area and one week safety stock in the warehouse. They looked at several solutions to try to eliminate the waste of waiting and over processing (reclaiming the parts). Their final solution is demonstrated on the next screen.



Replenish new parts with a supermarket and kanban.

The value stream team decided to use a supermarket located next to the Assembly/Test work cell. The supermarket would hold a one week supply of new parts for all twenty pumps. The parts would be organized and visually managed using minimum and maximum lines on the part bins. When a bin reached the minimum level it would flag the workers to replenish it.

However, this system has the same problem that existed in the current state. Someone could forget to re-order the parts. How can the value stream team eliminate this problem?

It was necessary to make someone directly responsible for identifying the minimum quantity level and re-ordering the new parts. The team decided to use a kanban post with a signal kanban card. It is a very simple process to implement. When the inventory level for a new pump part in the supermarket reaches the minimum level, a worker removes the kanban card and places it into the kanban post box.

The kanban cards are picked up from the post box daily by a production control person. There is specific information on each kanban card which gives the person who is responsible for purchasing the part the following details:

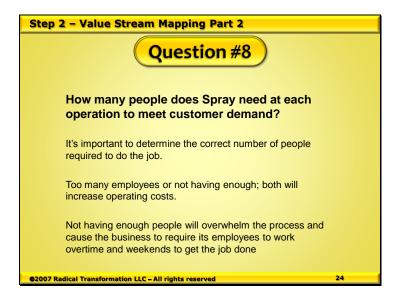
- 1. Information about the parts e.g. part number, part description, etc.
- 2. Quantity of parts to be replenished.
- 3. Name of the preferred vendor e.g. address, phone number, purchase order information, etc.

After the order has been placed with the vendor, the kanban card is placed with a copy of the purchase order, and they are both sent to the receiving department. They will remain there until the new parts are delivered from the vendor.

When the new parts arrive from the vendor, the delivery order is matched with the copy of the purchase order. The kanban card is removed from the copy of the purchase order and attached to the new parts container and sent to the warehouse. The new parts will eventually be delivered to the Assembly cell to replenish the supermarket bin levels.

The kanban card process is repeated every time a part bin reaches the minimum line level.

We go into more detail about the use of kanban and pull systems in Step 6 – Implement a Pull System.



Question #8 – How many people does Spray Pump Repair Company need?

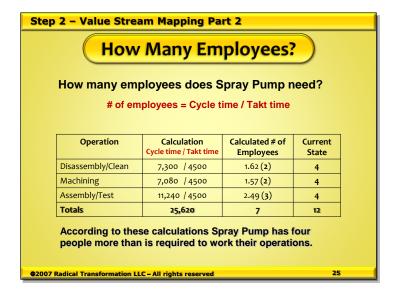
How many people does Spray Pump Repair Company need at each operation to meet the customer demand?

It's important to determine the correct number of people required to do the job. This is a critical decision because it can determine if a business will be a financial success or a failure.

A business with too many employees, or equally with not enough employees, will increase their operating costs. How is this possible?

Not having enough people will force the workers to become overwhelmed by the process and the business will not be able to meet customer demand. It will force the business to require its employees to work overtime and/or weekends to produce enough items to meet the customer demand. This will increase operating costs because the business will have to pay overtime premiums to the employees.

This is often an acceptable short term fix to help a company get over a small problem that was the result of a machine breakdown, quality issue, etc. It is never a successful long term strategy because it will hit the bottom line and reduce profits.



How many employees does Spray Pump Repair Company need?

To determine the correct number of employees for each work area Spray Pump Repair Company must use the following formula:

Number of employees = Cycle time ÷ Takt time

On this screen, you can see the formula and a table with the calculations for each work cell and the number of employees. The calculated numbers are rounded up.

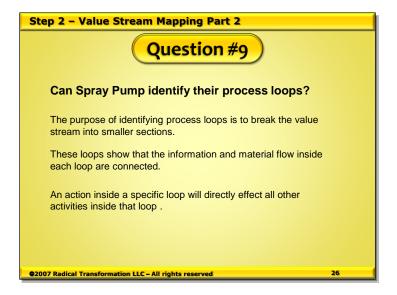
Spray Pump Repair Company needs the following employees in each work cell:

Disassembly/Clean
 Machining
 Assembly/Test
 2 employees
 3 employees

According to these calculations, Spray Pump Repair Company has five people more than they actually need to work in their operations. However, it must be realized that Spray Pump Repair Company has to implement the future state map to reduce these numbers.

Why did Spray Pump Repair Company end up with too many employees?

These five employees were added because of Spray Pump Repair Company's inability to identify and eliminate waste in their processes. A clear example of "you can't change anything if you can't see it." These additional employees can be redeployed to other work areas if positions are available.



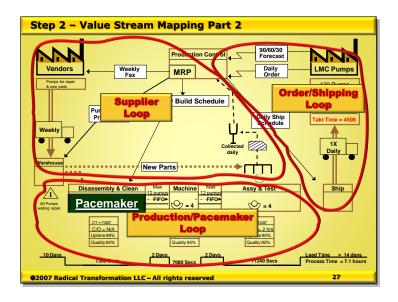
Question #9 - Can Spray Pump Repair Company identify their process loops?

The purpose of identifying process loops is to break the value stream into smaller chunks or sections. This helps a company to manage their value stream improvements by areas or loops. In an ideal situation, a value stream manager would be assigned the responsibility for each loop.

These loops show that the information and material flows inside each loop are connected. The process loops will be different for certain types of companies. A make to order (MTO) business will have different process loops than a make to stock (MTS) organization.

An action inside a specific loop will directly affect all other activities inside that loop and eventually other process loops. The value stream is a closed loop system with overlapping or interactive process loops.

Some companies decide to miss this step, but it does help to prioritize, focus, and manage organizational resources.



Overview of Value Stream Loops

The value stream team at Spray Pump Repair Company decided to break out the value stream into three separate loops:

- 1. Supplier Loop
- 2. Pacemaker Loop
- 3. Order/Shipping Loop

Supplier Loop:

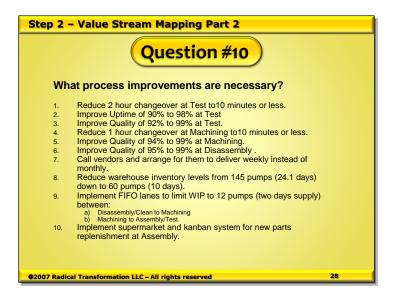
This loop identifies all the supplier or vendor activities between Spray Repair Pump Company's Production Control department and their warehouse.

Pacemaker Loop:

This loop identifies all the production activities between Spray Repair Pump Company's warehouse and their Shipping department.

Shipping Loop:

This loop identifies all the shipping and customer ordering activities between Spray Repair Pump Company's Shipping department, Production Control department, and their customer, LMC Pump.



Question 10 - What process improvements are necessary?

At this point in the value stream mapping process it is important to document and bring all of the opportunities for improvement together. This makes it easier to organize and manage each improvement. Here is a list of improvements that Spray Pump Repair Co. must implement to achieve their future state:

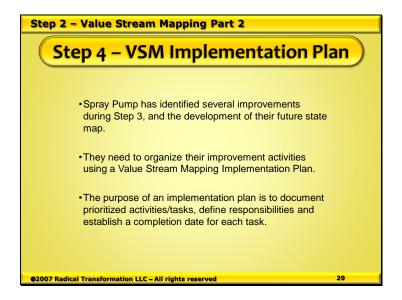
- 1. Reduce 2 hour changeover at Test to less than 10 minutes.
- 2. Improve Machine Reliability of 90% at Test to 98%
- 3. Improve Quality of 92% to 99% at Test.
- 4. Reduce 1 hour changeover at Machining to less than 10 minutes.
- 5. Improve Quality of 94% at Machining to 99%.

6.

7. Improve Quality of 95% at Disassembly to 99%.

8.

- 9. Call vendors and ask them to deliver weekly instead of monthly.
- 10. Reduce warehouse inventory levels from 145 pumps to 60 pumps (10 days supply).
- 11. Implement FIFO lanes to limit WIP to 12 pumps (two day supply):
 - a. Disassembly/Clean to Machining.
 - b. Machining to Assembly/Test.
- **12.** Implement a supermarket and kanban system for new parts replenishment at the Assembly cell.



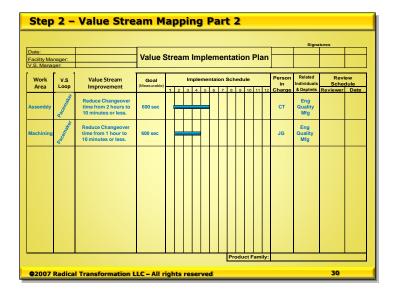
Step 4 of 4 – VSM Implementation Plan

Spray Pump Repair Company has identified several improvements during Step 3, and the development of their future state map. It is critical to document these improvements to ensure they are actually being implemented.

The next phase is to organize the improvement activities using a value stream map implementation plan. There is an example of an implementation planning document on the next screen. It demonstrates the layout for a typical plan and the types of information to populate it.

The main purpose of generating a value stream map implementation plan is to document each prioritized activities/tasks, define responsibilities, and establish a completion date for each task.

If a value stream map implementation plan is not created, the work done by the team will not be implemented. Planning is a crucial part of any business strategy. Without a plan, no one knows what, where, when, who, or how it is going to happen. Do not skip this critical activity.



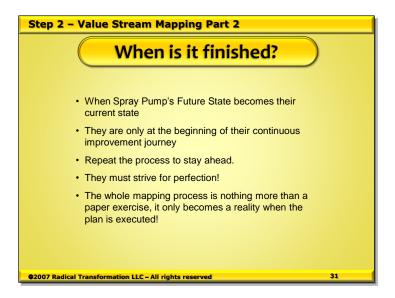
Value Stream Implementation Plan

On the screen is an example of a value stream implementation planning sheet. The sheet has several sections to enter information about each improvement.

This value stream implementation planning sheet will be the main document used by the Spray Pump Repair Company's leadership team to manage the improvement projects and events. Any other departments or people will use the same document.

It defines several items:

- Date
- Facility Manager's name the person responsible for the business value stream.
- Value Stream Manager's name is responsible for the pump repair value stream.
- Signatures for those with leadership responsibility to sign the sheet.
- Work Area to identify the specific location for improvement.
- Value Stream Loop to identify which loop the improvement directly impacts.
- Value Stream Improvement description of the actual improvement.
- Goal a measurable future state condition for each improvement to achieve.
- Implementation Schedule an annual calendar to plan each improvement during the year.
- Person in Charge a person with the responsibility to oversee the improvement through to its completion.
- Related Individuals & Departments any people or departments lending support to the person responsible for implementing the improvement.
- Review Schedule to document any management review meetings about the improvements.



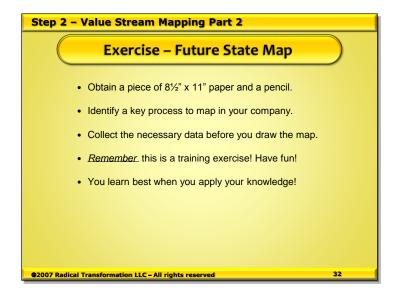
When is it finished?

Spray Pump Repair Company's value stream mapping exercise is finished when their future state map becomes their current state. The leadership team will need to focus on supporting the execution of the value stream implementation plan. Until this takes place, this whole process is nothing more than a value stream team going through a paper exercise.

When the plan is executed, Spray Pump Repair Company is still at the beginning of their continuous process improvement journey. It will be a continuous cycle that repeats itself as more waste is discovered. It will require everyone in the organization to become a problem solver. Spray Pump will need to improve their problem solving capabilities to develop the necessary skills to discover solutions to identify and eliminate the root causes of waste.

Spray Pump Repair Company must continue to strive for perfection! They must stretch themselves everyday and push themselves to discover new ways of delivering value for their customers. This is the only way to stay ahead of the competition and strive towards becoming a Lean Enterprise.

Remember: The entire value stream mapping process is nothing more than a paper exercise; it only becomes a reality when the plan is executed!



Exercise

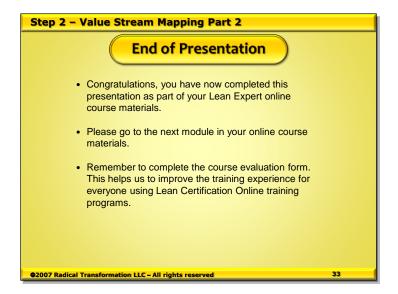
We would like you to get involved in a practical exercise. We want you to draw your own future state value stream map.

Obtain a piece of 8½" x 11" paper and a pencil.

Use your current state map from Step 2 - Value Stream Mapping Part 1

Create a future state map for the process identified in your current state map.

It's important to remember this is a training exercise designed to help you, so try to have fun with it. You learn best when you apply your knowledge.



End of Presentation

Congratulations, you have now completed this presentation.

Please go to the next training module in your Lean Expert online course materials.

Reference Materials

1. Learning to See: Value Stream Mapping to create value and eliminate muda.

By: Mike Rother and John Shook. Published by Lean Enterprise Institute (LEI) 1998.

2. Value Stream Management: Eight Steps to Planning, Mapping and Sustaining Lean Improvements.

By Don Tapping, Tom Luyster and Tom Shuker. Published by Productivity Press 2002.

3. Value Stream Management: Eight Steps to Planning, Mapping and Sustaining Lean Improvements.

By Don Tapping, Tom Luyster and Tom Shuker. Published by Productivity Press 2002.

Documents List

1. Value Stream Implementation Sheet

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V.S. Manager.													\dashv				
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