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Value Stream Mapping: The Map of your Journey to Becoming "Lean"

Introduction

It would be hard to find a medical device or pharmaceutical manufacturing site in Ireland which is not currently running some kind of "Lean" initiative. Terms like Value Stream Map, Takt time, Level Loading, 5S, Mistake Proofing, OEE and SMED are in common usage. Previous BSM newsletters have explored many of these terms/techniques. This edition focuses on the core Lean technique of Value Stream Mapping by addressing the following:

- What is a Value Stream?
- What is Lean Manufacturing?
- What is a Value Stream Map?
- How can Value Stream Maps be used – Case Study
- Benefits of Value Stream Mapping

What is a Value Stream?

A Value Stream is any set of operations which, in combination, deliver value for a customer. In a manufacturing business unit the most familiar value stream is the one which transforms raw materials into finished goods. Such a value stream often involves activities on two or three continents. The same could be said of the value stream which generates product concepts and brings them through a series of "gates" to product launch.

What is Lean Manufacturing?

In the early 1990's, a team in the Massachusetts Institute of Technology studied the global automotive manufacturing sector. They found that Japanese companies generally practised what had been preached 30 years before in the "Toyota Production System" and focused on optimising flow through the whole manufacturing value stream. However, U.S. and European companies generally focused on optimising the productivity of individual operations within the value stream. This is an example of the difference between "Systems" thinking and "Analytical" thinking. The latter breaks a process into "micro" processes, each of which can be understood on its own. The former sees a process as part of a bigger "system" which needs to be understood as a whole.
The MIT team correctly observed that the western approach had developed little beyond the "Mass Production" model used by Henry Ford. They wanted to underline the fact that the Japanese approach was fundamentally different and so they named it "Lean", and they underlined the many ways in which it is the antithesis of "Mass" production. The Lean philosophy is well summarised by the simple phrase "If you flow it faster, you will do it better and it will cost you less".

When the term "Lean" is used today in Irish manufacturing facilities, it generally refers to a set of techniques which, used in the appropriate manner, can work in unison to optimise flow in the manufacturing value stream. Unfortunately, many organisations approach Lean as though they were preparing for yet another regurgitation exam in which all questions must be answered to get maximum marks. As a result, they learn the wrong mix of techniques and implement them in an inappropriate localised manner, often delivering 5% improvements in plant performance where 50% was possible (but hey, don't the visitors just love those Powerpoint presentations!). Ironically, this reflects a natural tendency towards Analytical rather than Systems thinking. Used properly, Value Stream Mapping can help to avoid this pitfall.

What is a Value Stream Map?

When starting a journey you need to know where you're starting from, where you want to go to, and how you're going to get there. Process Mapping is a familiar technique which answers these questions. The steps in Process Mapping are as follows:

1. Map the current state
2. Identify improvement opportunities
3. Define the ideal future state
4. Plan implementation of the future state
5. Implement
6. Future state becomes current state – start again!

A Value Stream Map is a type of process map which focuses very much on the time factor and places as much emphasis on the flow of information as on that of material. It uses simple standard icons to show the following:

- At the top: The flow of information that supports and directs both the flow of materials and the transformation of raw materials into finished goods.
- In the middle: The flow of materials, from receipt from suppliers to delivery to customers.
- At the bottom: quantitative data on how material is transformed.

The following are simple guidelines for creating a Value Stream Map:

- Always begin at the Customer and work upstream.
- Walk the flow of the value stream, never assume anything.
- Map the flow as you see it, not the way it ought to be.
- Collect data as you walk along the flow.
- Don't get caught up in the details, keep the map simple.

How can Value Stream Maps be used – Case Study

These steps have been used in the Case Study Company, as shown in Figure 1 - Current State Value Stream Map. Standard Value Stream Mapping icons are shown above the Current State Map.

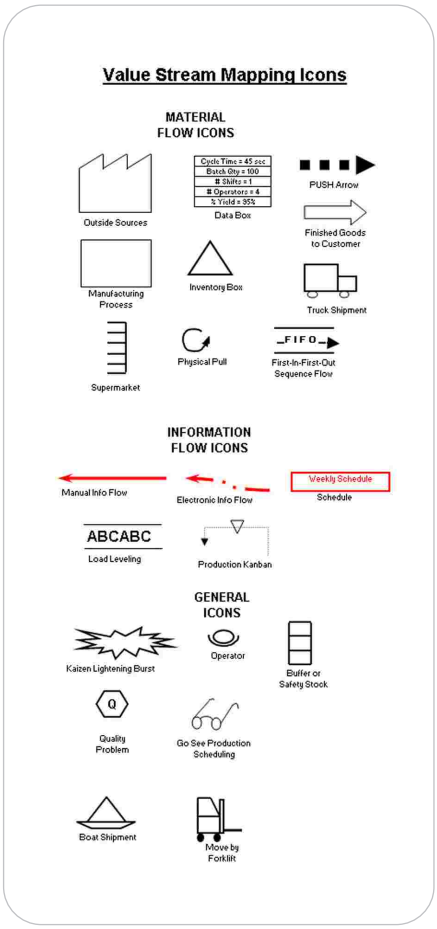
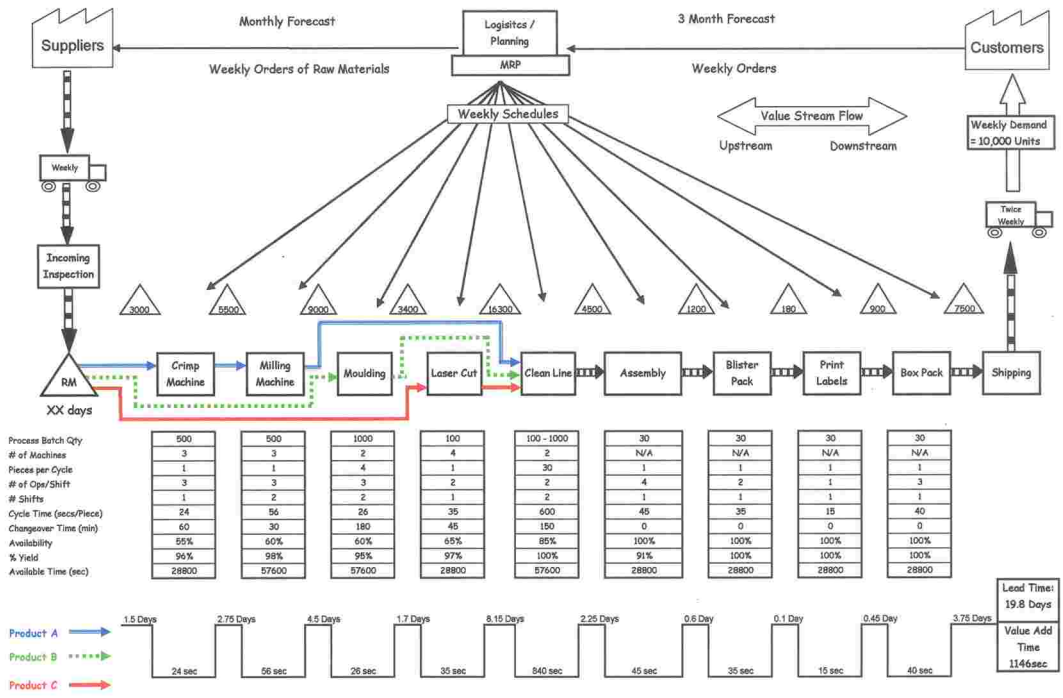


Figure 1 – Current State Value Stream Map



Once the Current State Map has been completed, the next step is to identify opportunities and create the Future State Map of a "Lean" Value Stream. This is done by answering the following eight specific questions, which are based on the principles of Lean thinking:

- What is the bottleneck or constraining process, based on Takt Time?
- Given the Customer Lead Time requirement is it possible to ship direct with minimum queues or is a supermarket of finished goods needed?
- Where can one piece flow be introduced?
- Given product variety, where can we introduce supermarkets and where must we control queue sizes?
- At what single point in the production chain (the "Pacemaker process") will you schedule production? This process should be as near the customer as possible.
- How will you level the production mix at the pacemaker process?
- What increment of work will you consistently release to the pacemaker process?
- What process improvements will be necessary for the value stream to flow as the future state map shows?

The process improvements selected for the Value Stream in our Case Study Company, are shown in Figure 2.

The improvements are as follows:

- Continuous one piece flow:
  Combine 1) the Crimp and Milling Machine processes and 2) the Assembly, Blister Pack, Print Labels and Box Pack processes together.
- Layout redesign – Cellular layouts.
- Reduction in changeover times and batch sizes – SMED.
- Elimination of downtime causes to improve availability – OEE.
- Queue control of inventory levels between processes – Supermarkets.
- Elimination of Push flow – introduction of Pull system with Kanban signaling.
- Select the Clean Line as the Pacemaker.
- Load leveling – Heijunka Box.
- Release production instructions every hour at the Clean Line to create level production pace.
- Reduction in Raw Material levels - daily deliveries from suppliers.

Implementation of these changes will deliver a lead time reduction of 75%, from 19.8 days to 5 days. The Value Stream Map will change to that shown in Figure 3.

Figure 2 – Current Map with Selected Improvements

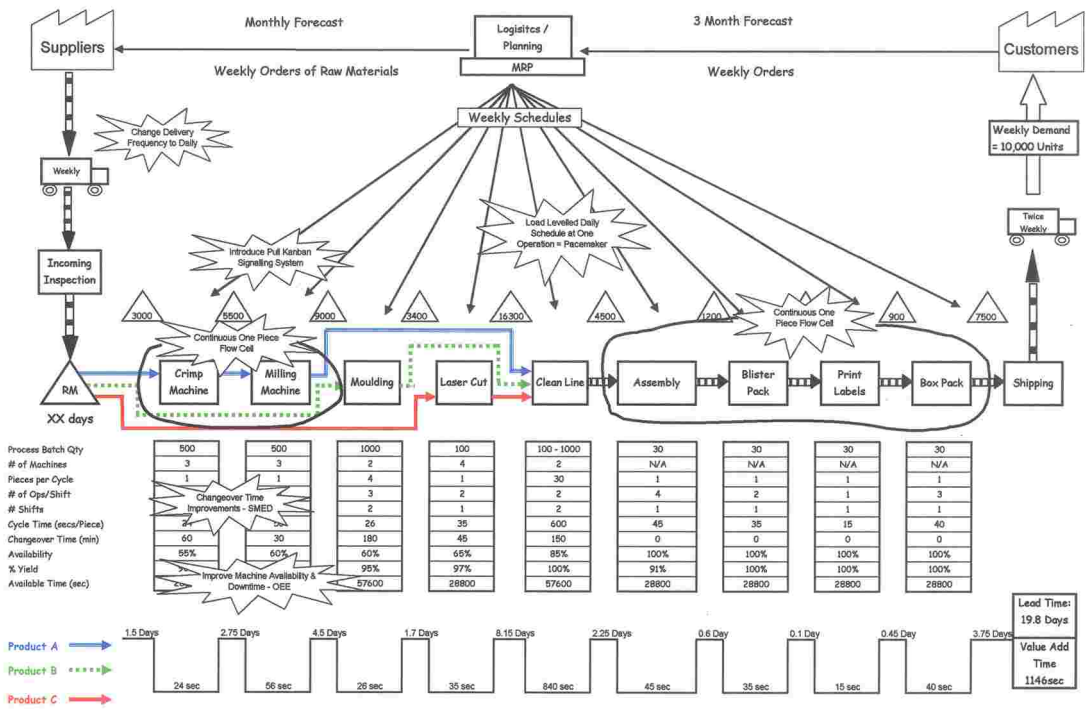
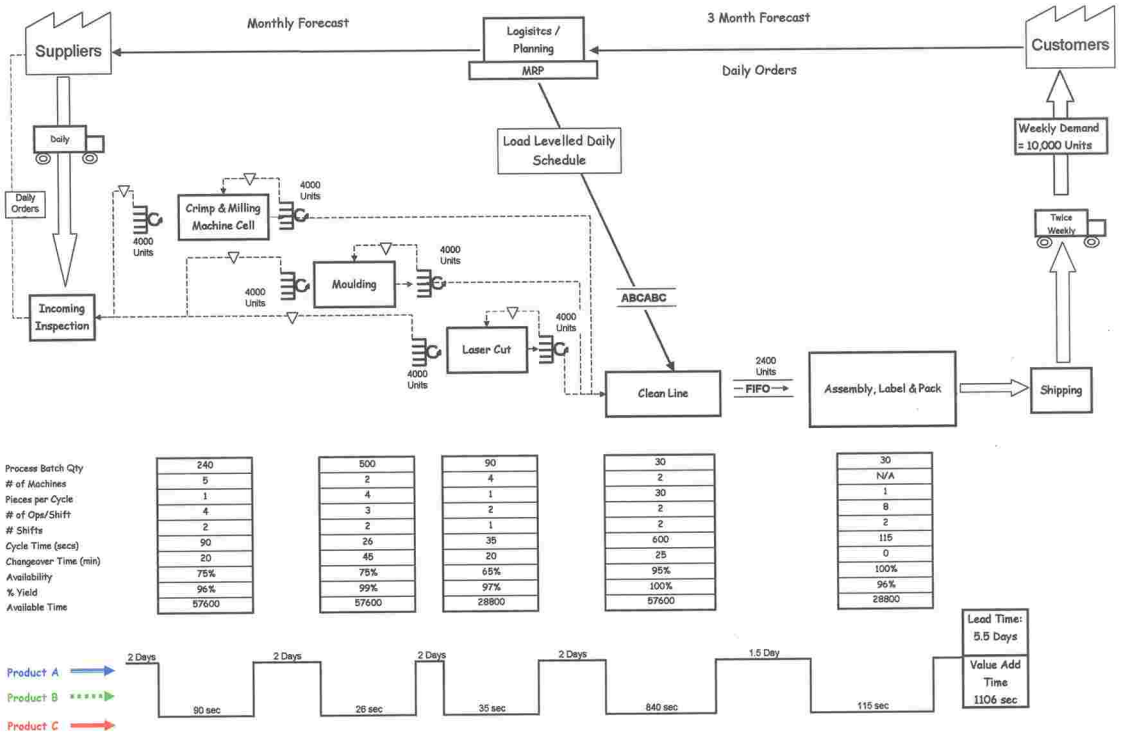


Figure 3 – Future State Value Stream Map



Benefits of Value Stream Mapping

The benefits of creating a Value Stream Map include:

- It helps you visualise more than just the single-process level in production – you can see the flow.
- It creates a clear picture of the components of manufacturing lead-time.
- Mapping helps you see the *source* of waste in your value stream.
- It facilitates the description and discussion of alternative approaches to material flow.
- It improves your chances of choosing the right initiatives to optimize flow through your value stream.
- It forms the basis of an implementation plan. By helping you design how the whole door-to-door flow should operate, value stream maps become a blueprint for lean implementation.
- It shows the linkage between the information and material flow.
- It is an excellent tool for communicating future plans.
- It creates a common language and understanding among employees through the use of standard value stream mapping icons.

BSM is a leading management and technology consulting company working in the Medical Device and Pharmaceutical sectors. We help clients achieve significant improvement by implementing sustainable process, people and information systems solutions.

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