FlexSim problem solved.

Value Stream Mapping + Simulation

Taking Your Map to the Next Level

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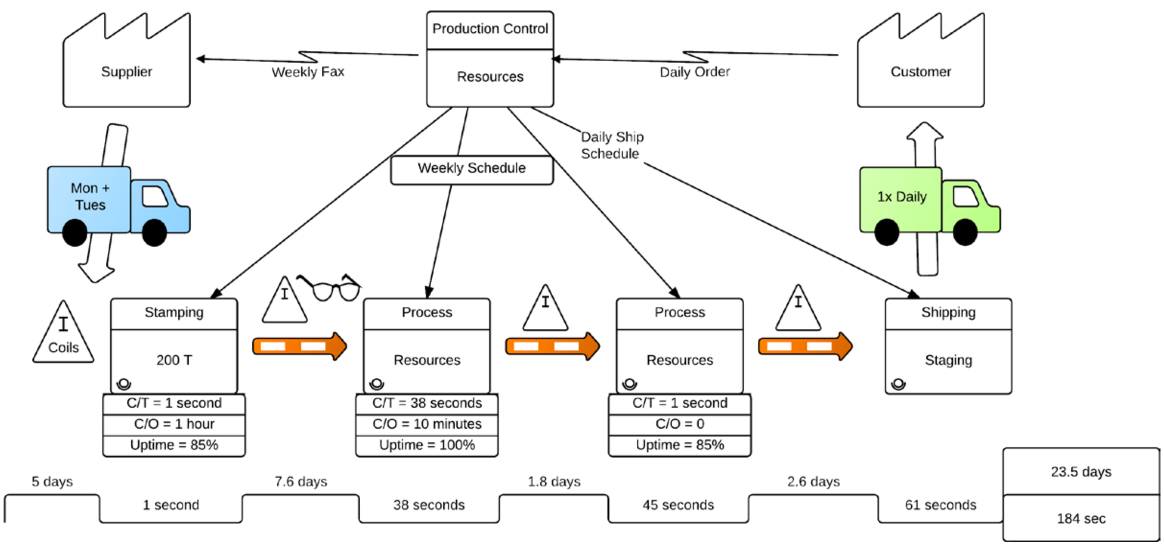
What Is **Value Stream Mapping?**

Value stream mapping is a visual flow charting tool used frequently in Lean manufacturing to diagram the information and material flow in a system. This tool makes it possible to identify constraints, value-added time, and non-value added time, all with the intention of recognizing possible system improvements. It's often done before an improvement project to determine the current state, followed by a future state proposal using an altered version of the map to determine the benefits of the proposed changes.



Value stream mapping uses standard symbols that represent different aspects of a system and help to visually describe the system to others. Standard calculations are available to assess the performance of various parts of the system. These standard symbols and calculations make it easy to determine which parts of the system should be the focus of improvement efforts.

Does It **Have Limitations?**

Value stream mapping is an effective tool when it comes to visually representing simple material flow systems. However, as the system exhibits more complex behavior the map becomes less capable of representing the reality that is occurring.

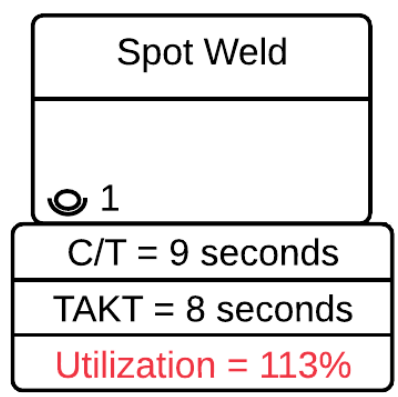
THE BOTTLENECK PROBLEM

Let's imagine a system is mapped out where the customer demand results in a **takt time** less than the **cycle time** of one or more of the processes. In this case, the utilization of that process step (cycle time divided by takt time) would be calculated as above 100 percent. In reality, that process can't have a utilization above 100 percent, so the system is unable to meet the customer demand. The result is a queue that continuously builds before the **bottlenecked** step. In a value stream map, the size of the inventory before the process is just a snapshot of an ever increasing queue; the total non-value added time is only accurate for that specific time frame. This becomes a problem when a future state map is drafted and changes are made based on irrelevant data – and the predicted results of the project are not met.

takt time: the average unit production time needed to meet customer demand.

cycle time: the total time from the beginning to the end of a process.

bottleneck: a congested process that causes the entire system to slow down or stop.



THE DEPENDENCY PROBLEM

Value stream mapping has a tendency to treat each individual process as an independent step in the system, but systems have complex interdependencies that are often glossed over while creating a map. An example involves the previously mentioned utilization calculation of cycle time divided by takt time. If an upstream process is highly utilized, it would affect the availability of work that can be done on downstream products – decreasing the utilization of all downstream processes.

THE VARIABILITY PROBLEM

One of the most dangerous assumptions of value stream mapping is the use of a static cycle time. In most systems these processing times are not exact, and mapping them using exact numbers ignores the difficulties created by variability. Lean manufacturing is focused on reducing the waste in a system; much of that waste is from queueing steps before process steps. These queueing steps are usually added to the system to separate the variability that is exposed between processes. By failing to model the variance in processing times, value stream mapping ignores this important intricacy of the system.

Overcoming The Limitations

The limitations of value stream mapping are rooted in the fact that a value stream map is just a snapshot of the current system. Evaluating processes as they are currently observed fails to predict how things will change in the immediate future. This is a problem, since all changes will be executed in a future state of the system.

Thankfully, all is not lost. If value stream mapping is combined with ***simulation***, then one can predict not only how changes will affect the current system, but also how those changes will affect the system as it exists in the future. Simulation is also effective at modeling the interdependencies that are present in almost every system, because it reproduces how objects would actually have to flow through the system. And simulation is useful for solving the variability problem, because it can model the variance in process times as it imitates product movement through the system.

WHAT IS SIMULATION?

Simulation modeling is the process of creating and evaluating a virtual prototype of a real-world system. The virtual environment provides a safe place where data is easy to come by and where mistakes result in improvement instead of ending careers. When it's presented in an intuitive and easy-to-use software package, simulation is a powerful problem solving tool that allows decision makers to answer important "what if" questions about their business.

1. SOLVING THE BOTTLENECK PROBLEM

By modeling the movement of products through a system, it's possible to identify the bottlenecks quickly. Bottlenecks are obvious during simulation because of the ability to actually watch inventories build up queues before the congested processes. This continual growth, shown only in a simulation, is evidence that the proceeding step is not capable of meeting customer demand. The utilization of this step is also correctly calculated at somewhat less than 100 percent, which would be closer to the real utilization one would see if they observed the actual process.

2. SOLVING THE DEPENDENCY PROBLEM

As the simulation moves products through the system, the actions of one part of the system are dependent on the other parts. Simulation does not allow a product to be processed unless there are actually products available to be processed. This makes it possible to accurately depict the value-added vs. non-value added time of the system, and also more adequately represents the utilization rate of each of the processes.

3. SOLVING THE VARIABILITY PROBLEM

Simulation is probably most suited to solving the variability problems associated with static value stream mapping analysis. The use of randomly determined representations of process times makes it possible to accurately reflect the variance that is represented in the system. Any proposed changes to reduce waste can be made with more confidence. And since many inventory buffers are in the system to separate the variability between process steps, modeling that variance can show how implementing supermarkets or pull strategies will actually affect the dynamic system – and not just the static system represented in a traditional value stream map.

The Power **Of FlexSim VSM**

Maybe the biggest benefit of simulation is that it can solve these problems in far less time and with much less effort than static value stream mapping. In a simple and focused product like* FlexSim VSM*, the time to complete a value stream map is reduced significantly by using drag-and-drop templates and allowing the simulation to calculate and present the all-important data individuals rely on for effective decision making.

FlexSim VSM is a **free, simple, and powerful** software tool to create dynamic value stream maps. By adding the capabilities of simulation to value stream mapping, it's possible to overcome the limitations and potential mistakes caused by the static analysis of a dynamic system. FlexSim VSM was created to quickly turn limited data into powerful decision making tools. Test multiple what-if scenarios to evaluate each improvement idea quickly and without capital investment.

FlexSim VSM does most of the work for you by dynamically calculating the queue sizes, waiting times, cycle times, utilization rates, takt time, value-added time, and non-value added time. Each of these are shown as the simulation is working for immediate validation of proposed changes, and built-in dashboards show even more information in engaging charts and graphs. For more information on FlexSim VSM, visit www.flexsim.com/vsm.

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