



**PDHonline Course G303 (1 PDH)**

---

## **Lean Series - Creating Flow**

*Instructor: John M. Gross, PE, CQE, CSSBB*

**2020**

**PDH Online | PDH Center**

5272 Meadow Estates Drive  
Fairfax, VA 22030-6658  
Phone: 703-988-0088  
[www.PDHonline.com](http://www.PDHonline.com)

An Approved Continuing Education Provider

# Lean Series – Creating Flow

*John M. Gross, P.E., CQE, CSSBB*

## Introduction

Creating continuous flow should be a fundamental objective of any lean program. Continuous flow is defined as producing and moving one item at a time (or a small and consistent batch of items) through a series of processing steps as continuously as possible, with each step making just what is requested by the next step.<sup>1</sup> The objective of flow is to drastically reduce throughput time (or lead-time) and human effort by eliminating waste in the process.<sup>2</sup>

In an ideal state of perfect one-piece flow, a product would flow continuously through its value stream from raw material to the customer with no delays. There would be no stops, delays or waiting—the product would proceed through the production process in steady rhythm with all processes balanced to meet the demand of the customer (or Takt—to be discussed later).<sup>3</sup>

However, in the real world, our production processes are full of delays, stops, unnecessary moves, rework, reprocessing, etc. Essentially, creating flow is really about identifying and removing obstacles (or waste). As we proceed through this process we are asking: Does the information, material and people flow? If not, where and why? An Australian colleague provided me with the best way to visually think about creating flow which I am sharing in figure 1.



Figure 1 – Visualizing the obstacles to Flow

## Creating Flow

While this all sounds wonderfully abstract, a straight forward process exists to facilitate the identification and elimination of waste to create real flow improvements.

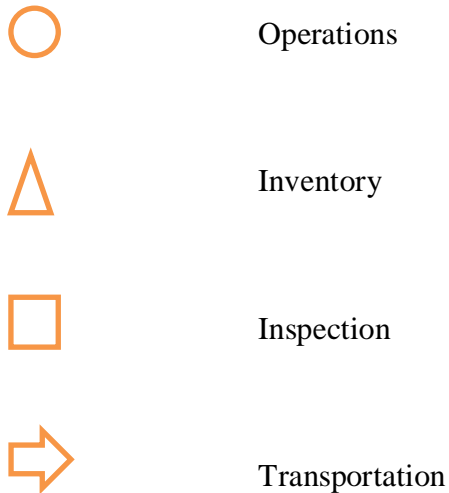
The steps of this process are:

1. Map the process
2. Identify/Eliminate the waste
3. Rebalance the process
4. Implement
5. Train the team
6. Audit and follow-up

These steps should be carried out with a cross-functional team. The cross-functional team will provide the input to develop the best solution and will be a key element of creating buy-in for the change.

### 1. Map the Process

Mapping the process helps visually identify the waste in the target process. Keep the map simple—use the following key to document the steps:



The process map should be created by walking the process. A ‘real’ map cannot be created in the office. By walking the process, the team sees the real process and the real waste. As a matter of practicality, use post-it notes to record the process. Once you have all the steps, arrange them sequentially to see the waste. Figure 2 shows a process map created by a team during a flow workshop.



Figure 2 – Process Map

## 2. Identify the Waste

Once the process map is completed, then it is time to identify the waste so a new better process can be created. Note that I said address the waste--because not all identified waste can be eliminated. The level of technology, customer requirements, regulatory compliance, design robustness, etc. may prevent elimination of the waste. The extent that identified waste can be eliminated will be a judgment by the team. (Note once again the need for the cross-functional team.)

With these words of caution, the goal of the team should be to eliminate as of much of the waste as possible. To help identify the waste, answer the following questions:

- Where is inventory accumulating?
- Where does the product stop—waiting for processing, people, parts or more information?
- Where does the product repeat steps or criss-cross (i.e. go back and forth in the factory)?
- Where does rework or reprocessing occur?
- Is there a single scheduling step or multiple?
- Are all the inspection steps required? (or can inspection steps be replaced by training, self-inspection tools or gages, etc.?)

The answers to these questions will tell you where the ‘fallen trees’ exist in your process.

(Note that these questions are based on the 7 waste identified by Taichii Ohno of Toyota.

A more comprehensive discussion of these waste is contained in PDH series G300—Basics of Lean.)

### **3. Rebalance the process**

In step 3, the cross functional team will create a new process in which the waste identified in step 2 are eliminated or reduced. The process will require the team to make time observations of the process and then create an operator balance chart. Once the team has timed and charted the current process, a new operator balance chart can be built which eliminates the waste and balances the flow. Figure 3 shows how the operator balance charts are used to create a new balanced flow.

The new balanced flow should be based on the customer demand. We refer to this balance as ‘Producing to Takt’ where takt time refers to precisely matching production output to the customers demand. Mathematically, takt time is calculated

by dividing *available production time* by *the customer demand*. When a process produces at takt it only produces what is needed to satisfy the customer(s)—no overproduction occurs, no shortages occurs!

Once the new, rebalanced flow has been created, then it is time to create an equipment layout that supports this new flow (i.e. move the furniture around). It is important that this step follows the creation on a new flow and not the reverse. Creating a new layout and then trying to balance the flow of work is a recipe for disaster—i.e. determine how to flow the work, then worry about the equipment layout!

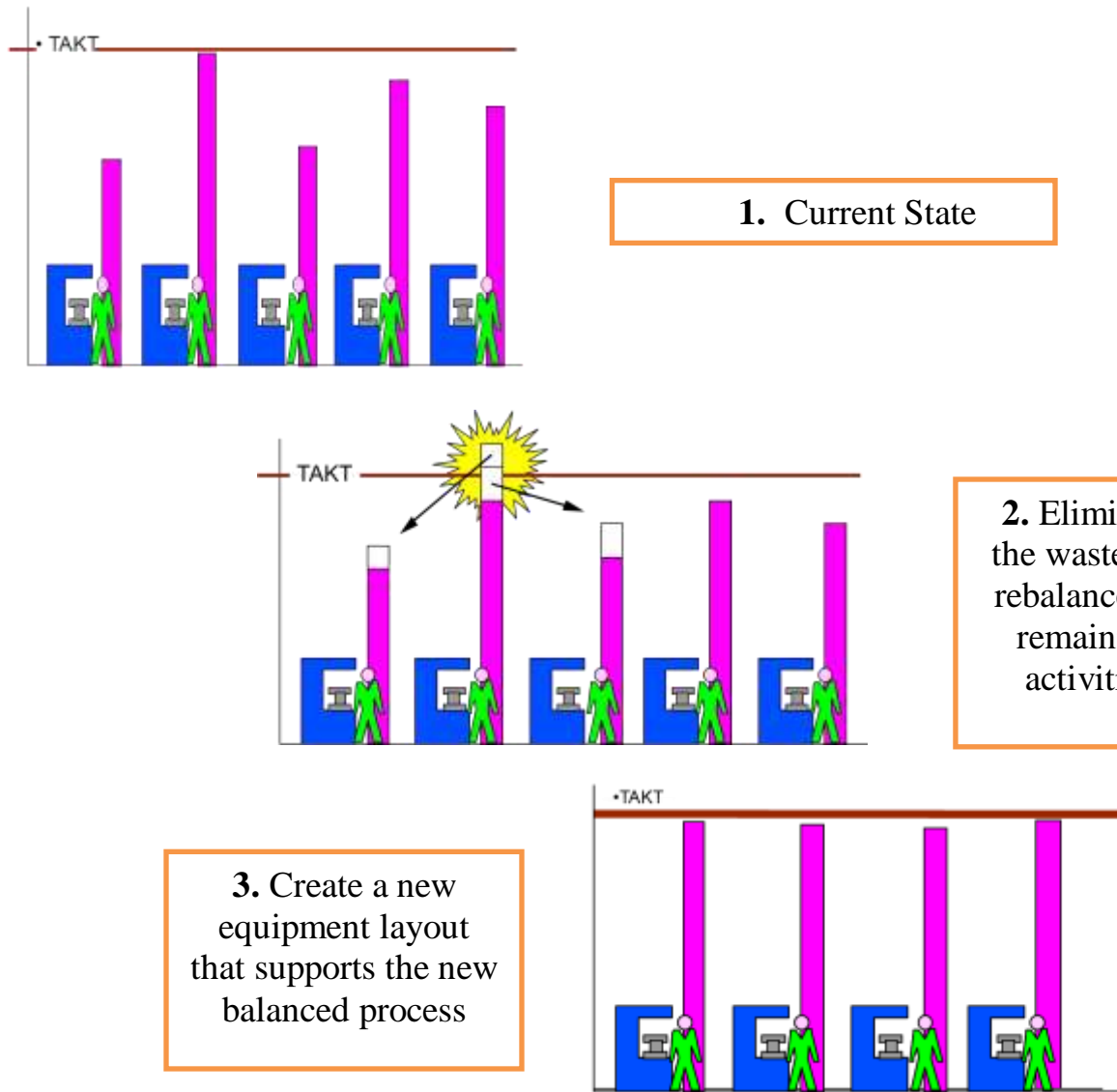


Figure 3 – Steps to Creating a Balance Flow

#### 4. Implement

In step 4, we translate the new flow into reality—we move the furniture! The first part of this step is self-explanatory—just move the equipment into the new layout designed in step 3. The second part of this step is not so obvious—create standard work to support the redesigned process. Standard work is the documentation of how the



product flows, what are the quality checks, and where is inventory allowed. Creating the standard work also validates that the new process will meet takt time and that it actually works as planned. Many different formats exist to document standard work, but the selected format should show the sequence of actions, the quality checks and inventory (or work in process). Figure 4 shows an example of standard work for a new process.

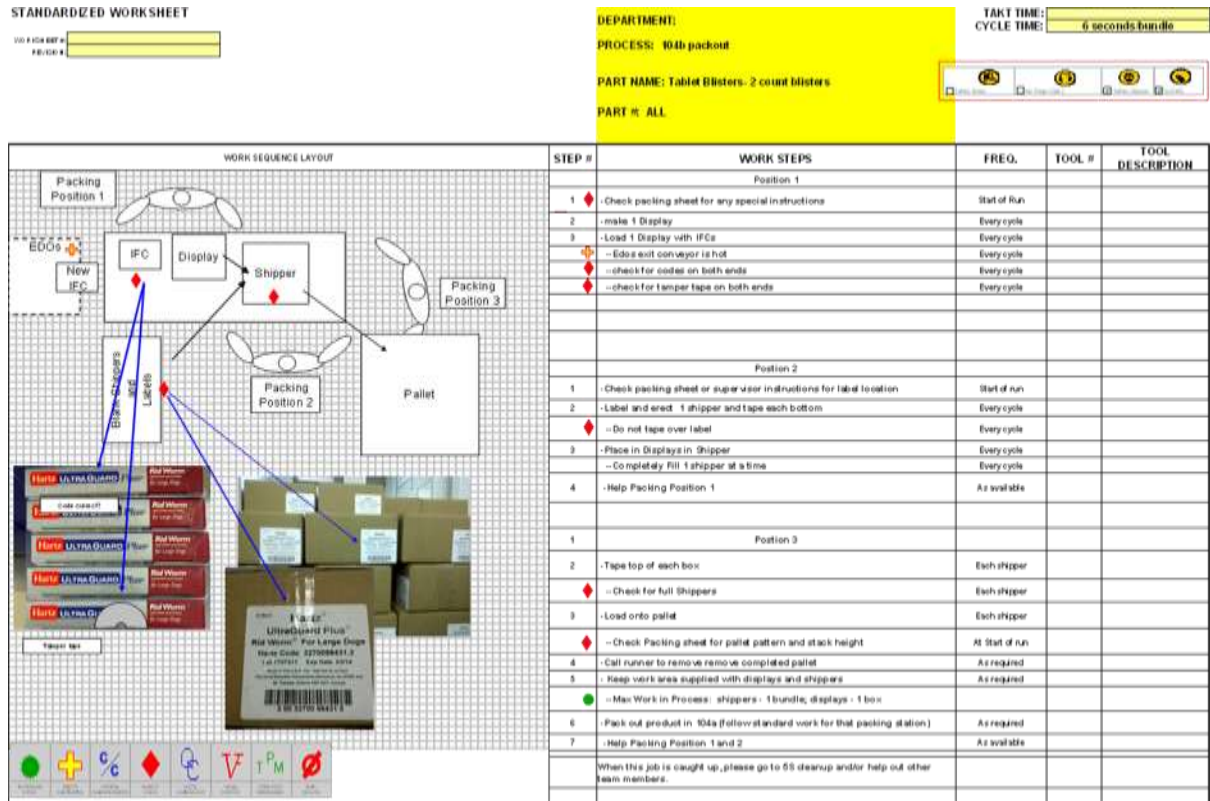


Figure 4 – Standard Work Example

### 5. Train the team

Training the team is a key element of a successful launch of a new process. The standard work created in step 4 will serve as a key document for this training. The

training should also be hands on—adult learners typically learn best by experiencing the new process.

This step is also a great way to create buy-in with the people who actually have to perform the work. Use this time to understand their issues and to make sure that new process addresses them. If the new design does not address the operator issues, then consider what changes need to be made.

## **6. Audit and follow-up**

Step 6 is often the step that everyone forgets. We typically implement the first 5 and then never come back to check on how the new process is working. In this check, the standard work document created in step 4 is used to check whether or not standard work is being followed. If the audit finds that standard work is not being followed, then the first question is: If not, then why not?

When you find out that standard work is not being followed, do not jump to conclusions assuming that the operators are ‘just not doing their job’. In fact, most times, the operators are not following the standard work because they can’t. Typical reasons standard work is not followed:

- a. The necessary support equipment was not provided.
- b. The necessary maintenance work orders were not completed.
- c. The agreed to product changes were not made.
- d. The sequence was just plain wrong.

Bottom line, when it is determined that standard work is not being followed, then the true root cause needs to be found.

Additionally, part of the audit agenda needs to include asking for feedback and improvement suggestions. While standard work is the one best way, it is not intended to be static and unchanging. The best source for changes and improvements are the supervisors and operators.

## Summary

In summary, creating flow is about removing obstacles that keep the product from flowing continuous from one operation to the next at the pace of customer demand. When done correctly, the 6 step process outlined above will reduce throughput time (or lead-time) and human effort by eliminating waste in the process.

One last note: the elimination of waste is a never ending activity. Do not expect to conduct a flow event once and then never come back to this process again. Pursuit of perfection necessitates the need to continuously look for obstacles (waste) and eliminate them!

## Suggested Reading

- *Lean Thinking—Banish Waste and Create Wealth in Your Corporation*, James Womack and Daniel Jones, Free Press
- *Learning to See*, Mike Rother and John Shook, The Lean Enterprise Institute
- *Creating Continuous Flow—an action guide for managers, engineers, and production associates*, Mike Rother and Rick Harris, The Lean Enterprise Institute.
- *The Toyota Way Fieldbook*, Jeffrey Liker and David Meier, McGraw-Hill.
- *Lean Manufacturing for the Small Shop*, Gary Connor, Society of Manufacturing Engineers.

- *Kanban Made Simple: Demystifying Toyota's Legendary Manufacturing Process*,  
John Gross and Kenneth McInnis, AMACON Books

### Recommended Websites:

- [www.ArtofLean.com](http://www.ArtofLean.com)
- [www.Lean.org](http://www.Lean.org)
- [www.ShingoPrize.org](http://www.ShingoPrize.org)

### Footnotes:

1. Chet Marchwinski, John Shook and Alexis Schroeder, Editors, *Lean Lexicon: A graphical glossary for Lean Thinkers*, (Brookline, MA; The Lean Enterprise Institute, 2003), p. 9
2. Ibid, p. 22.
3. Mike Rother and Rick Harris, *Creating Continuous Flow—an action guide for managers, engineers, and production associates*, (Cambridge MA; The Lean Enterprise Institute, 2001), Introduction page.