A blue ribbon graphic with a central rectangular box containing text.

ASQ Section 1302
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The Tools of Lean - Value Stream Mapping

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Outline

- Two Stories
 - 1 English, 1 Japanese
- Definition of VSM
- The limits of VSM
- Present State Value Stream
- Future State Value Stream
- Conclusions
- Reference Material

Definition

Value stream mapping:

A pencil and paper tool used in two stages:

1. Follow a particular product's production path from beginning to end and draw a visual representation of every process in the material and information flows.
2. Then draw a future state map of how value should flow. The most important map is the future state map.

The Limits of Value Stream Mapping

Beware the people preaching the panacea.

VSM becomes extremely challenging -

- In disjointed product development processes
- Where there is no “product” to follow
- Where there is high variety/low volume

Fortunately there are other, more appropriate tools for these situations

Mapping the Present State

- Shows work processes as they currently exist
- Provides understanding of the need for change
- Allows understanding of where opportunities lie
- Should be developed by a broad based team using the following structure

Mapping the Present State

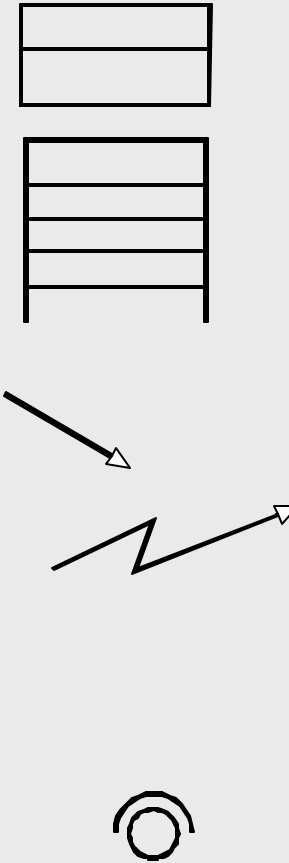
Example: a shop with a 5-step manufacturing operation, provided by Strategos, Inc

1. Draw Customer, Supplier and Production Control icons
2. Enter customer requirements per month and per day
3. Calculate daily production and container requirements
4. Draw outbound shipping icon and truck with delivery frequency
5. Draw inbound shipping icon, truck and frequency



Mapping the Present State

6. Add process boxes in sequence, left to right
7. Add data boxes below process boxes
8. Add communication arrows and note methods and frequencies
9. Obtain process attributes and add to data boxes. Observe all times directly!
10. Add operator symbols and numbers

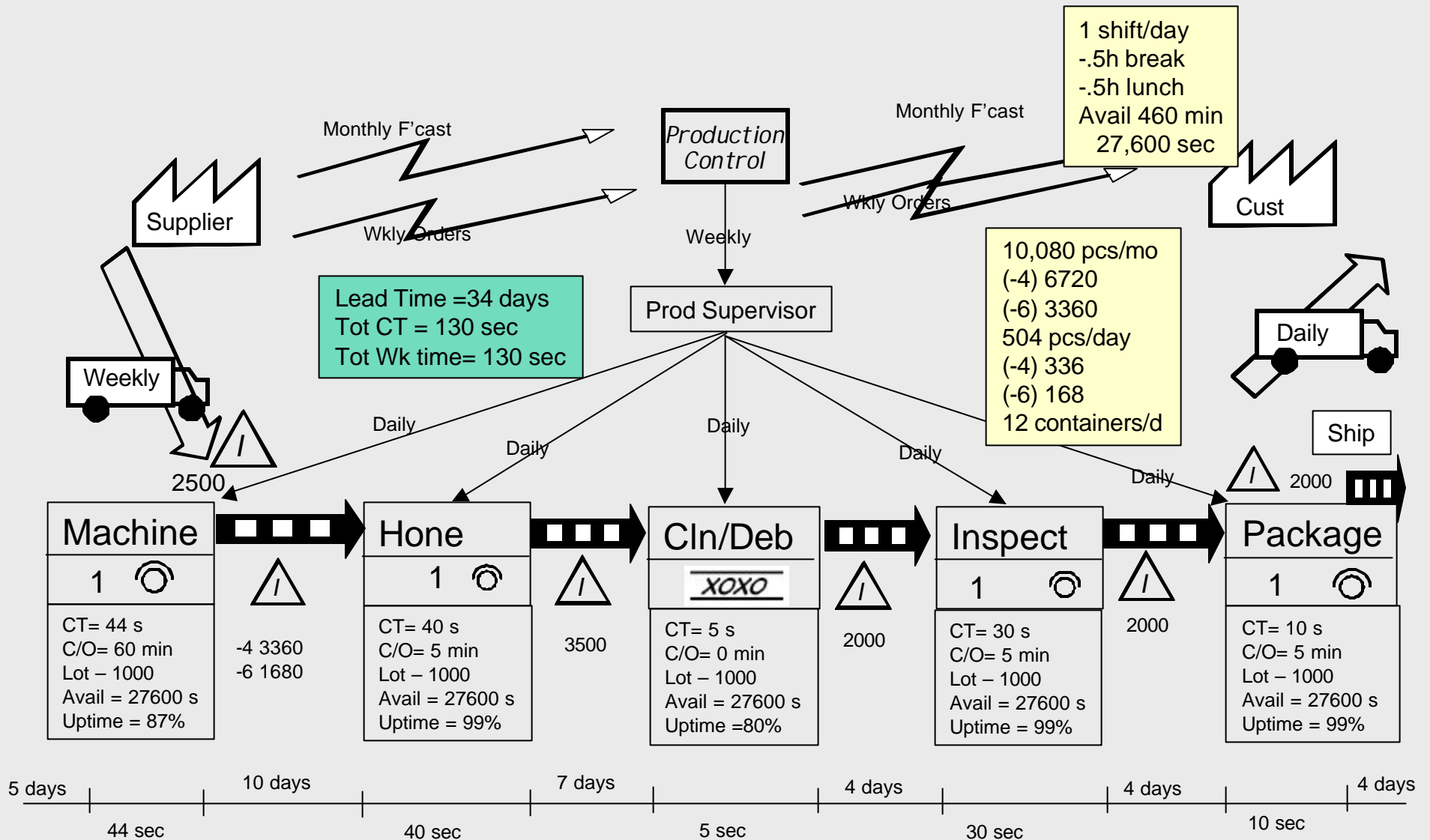


Mapping the Present State

11. Add inventory locations and levels in days of demand and graph at bottom
12. Add push, pull and FIFO icons
13. Add other information that may prove useful
14. Add working hours
15. Cycle and Lead times
16. Calculate Total Cycle Time and Lead Time



Present State Example



Mapping the Future State

- Requires more art, engineering and strategy than present state
- Need background knowledge in:
 - Cellular manufacturing
 - Takt time
 - Kanban
 - Setup reduction
 - Implementing change
 - Kaizen
 - Grouping technology
 - Lot sizing

Mapping the Future State

1. Takt time

- Average time between production units necessary to meet customer demand
- Divide available time by required number of units
- Get to the “beat” of the factory

Takt time

= 460 min/504 pcs

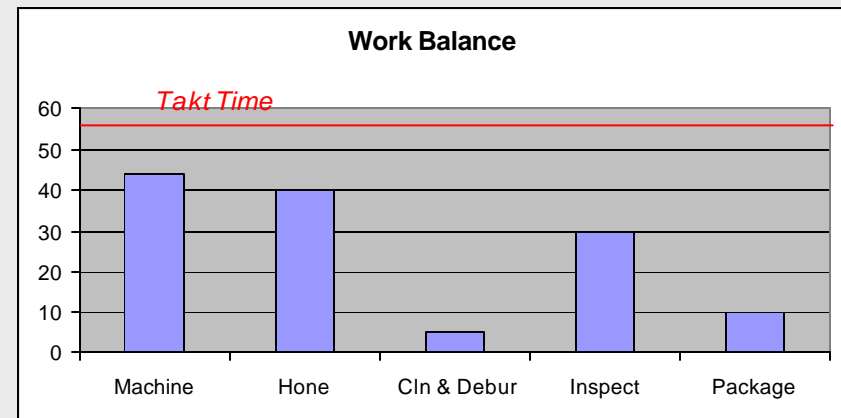
= 0.91 min/pc

= 55 sec/pc

Mapping the Future State

2. Identify bottleneck processes

- The operation with the longest cycle time
- Determines total system output
- Becomes the primary scheduling point
- A work balance chart is helpful



Mapping the Future State

3. Identify lot sizing / Setup opportunities
 - Present lot size = 1000 (2 days production)
 - Requires 3-6 days finished goods
 - Prevents daily adjustments to mix or demand
 - If lot size simply cut, additional set up time would preclude 'Machining' meeting average customer requirements
 - Focused setup reduction to 20-30 minutes would allow batch size of 500 or maybe 250
 - Future state map could have a Kaizen burst to achieve this

Mapping the Future State

4. Identify potential workcells

- The balance chart gives the indications
- Machine and hone are similar
- Very short times for cln/debur and package would normally preclude them from a cell since utilization would be low. Inspect and package are manual ops requiring little more than a workbench and hand tools. High utilization not critical.
- Note cln/debur is on special equipment in central area. If scaled down to a manual op, it could go in the cell
- Appears that 3 operators could run the cell

Mapping the Future State

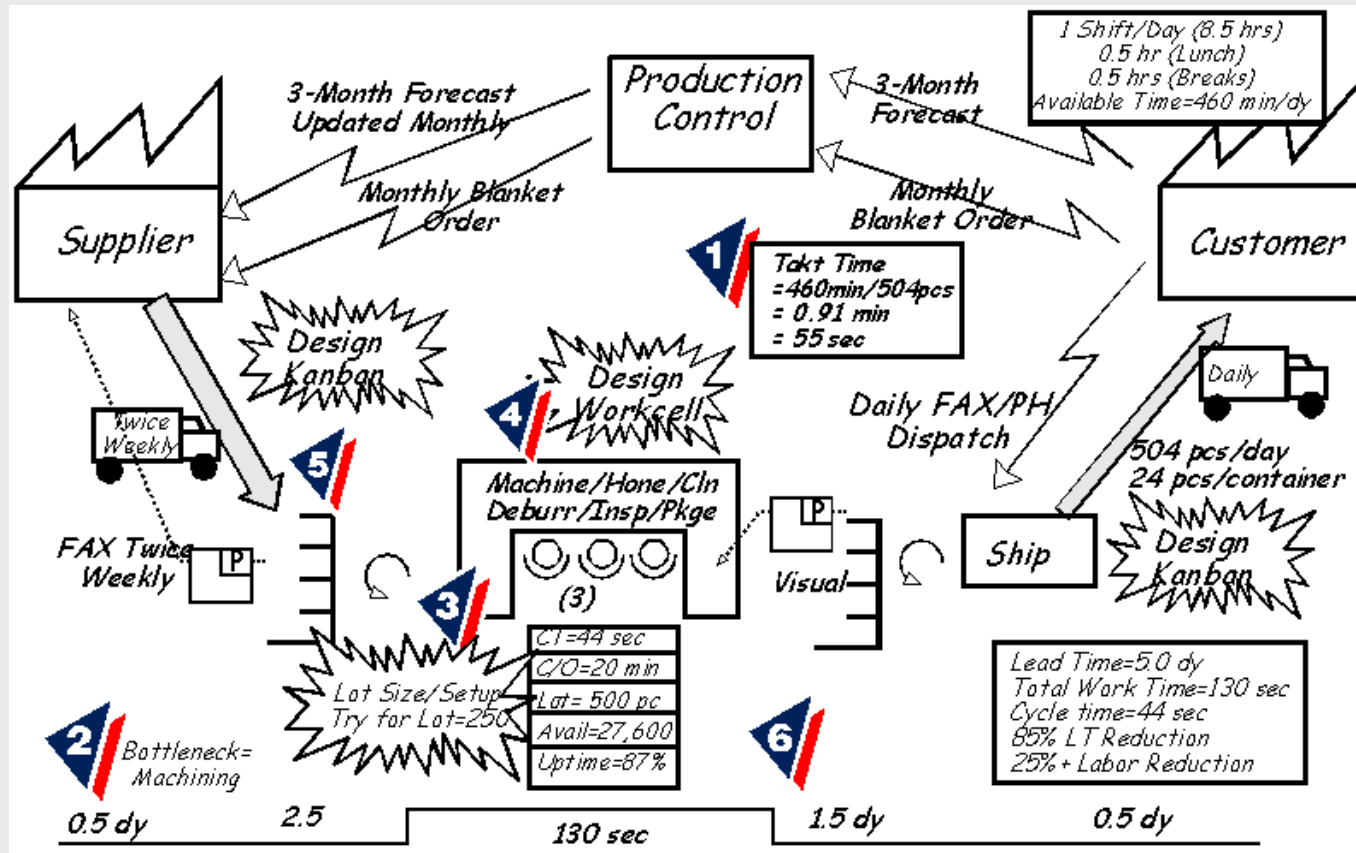
5. Determine Kanban locations

- With a cell of five processes scheduling between them becomes trivial. They will become directly linked with continuous or small batch flow
- Kanban does apply:
 - Between cell and supplier
 - Between cell and customer
- Illustrate detailed design of Kanban as a Kaizen burst on Future map

Mapping the Future State

6. Establish scheduling methods
 - Kanban and direct link now schedule all ops
 - Both Workcell and Supplier need forecast data to plan staffing and inventory levels
7. Calculate performance data

The "Completed" Future State



Mapping the Future State

Results

	Present	Future	% Change
Lead Time	34 days	5 days	-85
Cycle Time	130 sec	44 sec	-66
Working Time	130 sec	130 sec	0
Operators	4	3	-25

- In our example, the mapping team estimates a **Lead Time reduction of 85%** and a **productivity increase of 25%**. **Inventory will decrease about 85%**. Many additional, but unpredictable benefits are also likely.

Conclusions

Value Stream Mapping helps to:

- Visualize the product flow
- Show links between information and material and process
- Identify sources of waste
- Establish a clear future vision for the Value Stream
- Prioritize improvement activities
- Focus attention on key activities that will improve the Lead Time and reduce the Total Cost of Product