Value Stream Mapping in the Converting Industry

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Topics to be Covered

1. Why VSM?
2. VSM Overview and Basics
3. VSM in Action
4. Conclusion
5. Questions?
Traditional Supply Chain Management

“Traditional” supply chain management...
1. Customer demand requirements not known
2. Large lot production
3. Pacing to maximize resources
4. Limited communication
5. Forecasting
6. Questionable quality
7. Large quality rejections

→ INVENTORY =
Process Improvement of Old

2. Don’t see the whole → Local Optimization
Why VSM?

- What do we see?
- VSM helps us see waste
- VSM helps us “see the whole” to focus improvement efforts where they can help most

The problem is not elimination of waste, but identification of waste. Any reasonable person will eliminate waste if he/she can only see it in the first place.”

Shigeo Shingo

Graphic from www.lean.org
What is VSM?

- VSM = Value Stream Map aka M & I Diagram
- Value Stream = Represents all steps (both value-added and non-value-added) required to bring a product through:
  - Concept to Launch
  - Raw Material to Finished Product
  - Pay to Get Paid
- VSM is a graphical technique developed at Toyota to aid understanding of the current system for the purpose of highlighting improvement opportunity.
VSM Calculations

• For inventory, days of inventory is calculated like this...

\[
\text{Days of Inventory} = \frac{\text{Amount of Average Inventory (SM or LM)}}{\text{Average Daily Demand (SM or LM)}}
\]

• Takt Time
  – Beat of Production as Required by Customer
  – Takt Time = Available time/Demand
How much value added time is there?

- Value Added = 960 minutes
- Non-Value Added = 18 days
- % Value Added = 10%

Total Lead Time = 20 days
VSM Symbols

1. **Shows material shipment by truck. Include the frequency or any other important info. inside**

2. **Use to show material pushed by a schedule.**

3. **Use to show finished goods material to a customer or supplied material from a supplier.**

4. **Shows material sequenced first-in-first-out where the sequence was initiated upstream based on pull.**

5. **Symbol illustrates a supermarket where material quantities are calculated based on demand and lead time. The material movement is controlled using signals or kanban.**

6. **Describes removal of material from an upstream process by a downstream process based on need.**

7. **Shows material shipment by forklift. Include the frequency or any other important info. inside.**

8. **Shows material shipment by boat. Include the frequency or any other important info. inside.**

9. **Used to depict a process, not for individual process steps but for a general process. Usually placed anywhere the flow stops.**

10. **Used for a process that is shared for many different products. An example would be Heat Treat.**

11. **Used to represent either a Customer or a Supplier.**

12. **The data box is used to put information about a process, customer etc. It should contain pertinent data. What goes in it is up to you, use it flexibly but get the core numbers.**

13. **This is used to symbolize stationary inventory in a typical batch operation. It could be Raw, Work in process or finished inventory.**
**VSM Symbols**

- **Manual Flow**
  - Shows information flow achieved through manual movement of paper schedules or orders.

- **Electronic Info Flow**
  - Shows electronic information flow by computers. EDI or E-Mail are examples.
  - The schedule box is used to show the use of schedules in the information flow.

- **Load/Leveling**
  - Represents a leveling tool that mixes models. (Heijunka box or similar tool)

- **Withdrawal Kanban**
  - A kanban card authorizing removal of parts or material from store.

- **Production Kanban**
  - A kanban card authorizing production based on use in a downstream process.

- **Signal Kanban**
  - Represents a kanban symbol used to authorize production. Multiple cards are not used and the signal can be made in many different ways.

- **Kanban Post**
  - Represents a leveling and sequencing tool to control the sequence of production.

- **Sequenced Pull Ball**

- **Go See Production Scheduling**

- **Buffer or Safety Stock**

- **Kaizen Lightning Burst**

**General Icons**

- **One Piece Flow**

- **Operator**

- **Quality**

A collection point for kanban cards to be placed.

Scheduling achieved by physically looking to see what a downstream process needs. Not controlled by kanban or calculation.

Used on Future State maps to show where Kaizen activity is needed to execute the future plan.

Symbol used to represent a person in the process (operator).

Use to highlight Quality issues and problems.
Current State VSM Example

Takt Time = 2 min

Lead Time = 57.6 days
Value Added Time = 3 min
VA % of Total Lead Time = 0.0036%

Orders

RM Requests
RM Receipts
Shop Orders and Daily Priorities
Production Control/Purchasing

Process #1

Process #2

Process #3

Orders

Customers

Suppliers

Deliver to WO Warehouse

Shop Orders and Daily Priorities

Pick List

Shipping

C/T = 17 min
C/0 = 10 min
Uptime = 99%
Avail. = 2 Shifts
EPE = 2 Weeks

39 d

0 m

10 m

5 m

5 m

2.9 d

C/T = 1 min
C/0 = 4 hrs
Uptime = 95%
Avail. = 3 Shifts
EPE = 2 Weeks

5.4 d

3.8 d

6.5 d

LT = 57.6 Days
VA = 3 min

C/T = 2 min
C/0 = 4 hrs
Uptime = 95%
Avail. = 3 Shifts
EPE = 2 Weeks

C/T = 1 min
C/0 = 2 hrs
Uptime = 99%
Avail. = 3 Shifts
EPE = 2 Weeks

VA % of Total Lead Time = 0.0036%
1. What is the Takt Time? Can all processes meet it?
2. Where can we flow?
3. Where should we use supermarket based pull?
4. What is the pace setting process?
5. What will lot sizes be and how much standard WIP do we need?
6. How can we level load production?
7. Do our machine reliability and changeover times meet our needs?
Reducing Inventory is Easy?

Lowering inventory without calculating standard inventory needed for the current levels of variability and capability = CHAOS

Better would be to calculate the standard amounts of inventories needed and eliminate inventory above this level

Inventory = Lead Time x Demand + Safety Stock

Note: Safety Stock accounts for variation in yield, delivery, etc.
Synchronize the supply chain by implementing...

- Flow
- Pull

Key → Systemic thinking, not local optimization.
Ideas for Improvement

• Flow = Moving from one value added step to the next without any delay
  - Flow is an ideal we strive for
• Pull = Doing something when and only when the customer needs it in the amount needed.
• Continual waste reduction gets us closer...
  - Defects
  - Overproduction
  - Transportation
  - Waiting  - Motion
  - Inventory  - Processing
Demand Amplification \rightarrow Bullwhip Effect

![Diagram showing the bullwhip effect in supply chain management]

- **End Customer**
- **OEM**
- **1st Tier Mfg**
- **2nd Tier Mfg**

Order Quantity Stock

Time

Order Quantity Stock

Time

Order Quantity Stock

Time

Order Quantity Stock

Time

Transfer of Orders

Upstream

Downstream
VSM as Part of a System

1. Map Current State
2. Map Ideal Future State
3. Map 6 Month Future State Condition
4. Develop Improvement Plan
5. Implement and repeat 1 - 5

Note: This tool becomes part of a system when this cycle is repeated in some time frame (ie. every 6 months)
Where are we going with this?

PERFECTION

- Lead Time = Value Added Time
- Customers pull through entire system – “Just in Time”
  - Value Stream becomes self scheduling
- Material and Information flow between processes without delay
Ideal State Example

- Suppliers
- Production Control/Purchasing MRP
- Customers

Flow:
- Suppliers to Production Control/Purchasing MRP
- Production Control/Purchasing MRP to Shop Orders
- Shop Orders to LC Pass #1 (-2) via FIFO Lane
- LC Pass #1 (-2) to LC Pass #2 (-1) and Sheet
- LC Pass #2 (-1) and Sheet to Shipping

Timelines:
- Full C/O = 2 hrs
- 4 Shifts - 4 days

Waste:
- 3 Shifts - 5 days
- Waste = 1%

Cycle Times:
- 2 d
- 0.75 d
- 1.8 s
- 0.75 d

Quality:
- NVA = 4.0 days
- VA = 5.9 sec
Future State Example

\[ L/T = 9 \frac{1}{4} \text{ days} \]
Measures & Real Results

Overall VSM Lead Time (days)

Goal = 13.1 days

75% Overall Lead Time Reduction

90% Inventory Reduction

90% Customer Response Reduction

Raw Material Inventory (Sq Ft)
Customer Facing Administrative VSM

Outcome after Round #2 → 2 week response to customer with lead time reduced to same day/next day
Purpose

Customer Goals
- Profit
- Long term success
- Contribute to economy
- Contribute to society
- Good Quality

Madico Goals
- Profit
- Long term success
- Contribute to economy
- Contribute to society
- Good Quality

Long Term Mutual Prosperity

Employee Goals
- A Safe Workplace
- Meaningful Work
- Pay
- Growth
- Good Benefits
Summary

- VSM is a tool that helps a team see where waste exists.
- VSM integrated into a system can help reduce waste significantly.
- An ideal state should be created so that creative ideas can be captured and possibly used.
- Understanding why and reaching a principle level is critical to the sustained use of any Continuous Improvement tool.
- The speed at which information flows has a direct effect on overproduction → Demand Amplification/Bullwhip Effect
- Pull and Flow combat push and offer an alternative to traditional manufacturing.
- We need to think of the entire value stream as one synchronized process.

VSM → Competitive Advantage
Recommended Reading

“Learning to See” by Mike Rother and John Shook

“Seeing the Whole Value Stream” by Dan Jones and Jim Womack

The Shingo Model and Guidelines on the internet...

http://www.shingoprize.org/model-guidelines.html
Thank you for the opportunity.

Are there any questions?