The Journey To Demand Driven

Presented by:

Debra A. Smith, Managing Partner Constraints Management Group
Agenda

1. CMG and Demand Driven;
2. Who is becoming Demand Driven?
3. Demand Driven Adaptive Enterprise Model
4. The biggest challenge is our thinking;
CMG - Thought Leadership

• Demand Driven Materials and Supply Chain Planning & Execution
• Demand Driven Resource Scheduling
• Demand Driven Finance & Smart Metrics
• Strategic Thinking Processes
Our Journey of Exploration

1995 - The Power of Decoupling:
- $35M inventory decrease
- Lead time 90 to 14 days
- Sales up +20%

1997 - The Power of Vertical Integration:
- $30M inventory decrease
- ROI from 4 to 18%
- Lead time 3 weeks to 3 days

1999 - The Power of the Right Rules/Tools DBR+™/DDMRP:
- Sales up 12%
- Inventory down 24%
- Income up 21%
- Cash flow doubled
- Foundry lead times 2 weeks to 2 days
Our Journey of Exploration

2010 - 2013
The Prioritized Share Equation & Hybrid Distribution:
- 45% decrease finished goods;
- 18% decrease raw and pack;
- 99.7% service levels;
- Distribution transport cost decreased $25K/day.

2004 - 2009
Analyze Deep and Broad Product/Project Structures:
- OTD 60% to +95%;
- ROI from 5 to 22%;
- Lead time 24 to 10 weeks Equipment;
- Lead time 27 mos. to 12 mos. Drilling Rigs;
- 6 X revenue with .8 inventory increase;
- Sold for 25X net investment in 2010.

2011 - 2014
The Prioritized Share Equation & Hybrid Distribution:
- 45% decrease finished goods;
- 18% decrease raw and pack;
- 99.7% service levels;
- Distribution transport cost decreased $25K/day.

2015 - 2017
Demand Driven Adaptive Enterprise
- Demand Driven Operating Model;
- Demand Driven S&OP;
- DDMRP Prioritized Share Equation integration with critical capacity scheduling & execution priorities;

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CMG Customers
Thoughtware BEFORE hardware and software! Invest in people’s ability to think and problem solve systemically:

• If you and your Leadership can’t think systemically then you can’t observe, identify and resolve distortions to relevant information and materials at the systemic level.

• That means your organization is INCAPABLE of thinking and adapting for FLOW at all levels.

• Ensuring and maintaining a framework for the four pre-requisites for relevant information should be the primary job of senior management.
Demand Driven Is About Visibility For Flow!

\[ \Delta \text{Flow} \rightarrow \Delta \text{Cash Velocity} \rightarrow \Delta \left( \frac{\text{Net Profit}}{\text{Investment}} \right) \rightarrow \Delta \text{ROI} \]

**Variability** is defined as the summation of the differences between our plan and what happens.

\[ \text{Variability} = \text{Flow} \]

**Visibility** is defined as relevant information for decision making.

\[ \text{Visibility} = \text{Variability} \]

Relevant Information = Flow Based Metrics = “Smart Metrics”
- Convention has some flow-based metrics in use.
- Their effectiveness is limited by conflicting cost-based metrics.
- These conflicting metrics obscure what is relevant and introduce self-imposed variability within organizations as personnel oscillate between protecting flow and protecting cost performance.
- When flow is promoted and protected, costs are under control. The inverse, however, is not true.

$$\Delta \text{Flow} \rightarrow \Delta \text{Cash Velocity} \rightarrow \Delta \left( \frac{\text{Net Profit}}{\text{Investment}} \right) \rightarrow \Delta \text{ROI}$$

- Due Date Performance
- Fill Rates
- Inventory Turns

$$\Delta \text{Cost} \rightarrow \Delta \text{Cash Velocity} \rightarrow \Delta \left( \frac{\text{Net Profit}}{\text{Investment}} \right) \rightarrow \Delta \text{ROI}$$

- OEE
- Fully Absorbed Unit Cost
These Three “Truths” are “Myths”

1. Increasing our efficiency is the best way to increase ROI.

2. Our unit cost determines our pricing.

3. Cost savings “anywhere” will fall to the bottom line.
Demand Driven Adaptive Enterprise Levels

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Focused on cost-based operational efficiency (Cost reduction AND Responsiveness in conflict).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 2</td>
<td>Begin to emphasize flow-based operational efficiency with the preliminary implementation of DDMRP.</td>
</tr>
<tr>
<td>DDAE I</td>
<td>Synchronizing and leveraging operational capability for better flow performance. Expand the implementation of a Demand Driven Operating Model.</td>
</tr>
<tr>
<td>DDAE II</td>
<td>Leverage the Demand Driven Operating Model capability across the enterprise and into the market. DDS&amp;OP and Adaptive S&amp;OP in place.</td>
</tr>
<tr>
<td>DDAE III</td>
<td>Sensing, Adapting and Innovating across the supply chain (customers and suppliers) for continual ROI improvement. Mature DDAE Model.</td>
</tr>
</tbody>
</table>

Visibility and Thoughtware determine an Organization’s ability to adapt and improve flow!
Demand Driven Adaptive Enterprise Model

1. RELEVANT RANGES
   - Operational
   - Tactical
   - Strategic

2. Tactical Reconciliation

3. FLOW-BASED METRICS SUITE
   - Operational
   - Tactical
   - Strategic

4. Actual Demand

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1. Relevant Ranges in the DDAE Model

**RELEVANT RANGES**

- **Operational**
  - (hourly, daily, weekly time buckets)
  - Up to the longest Decoupled Lead Time

- **Tactical**
  - (blends the present, short-range past and future)
  - At Least the Cumulative Lead Time of the Product (Past and Future)

- **Strategic**
  - (annual, quarterly monthly time buckets)
  - Cumulative Lead Time of the Product and Beyond

**Actual Demand**

**Operating Model**

**Demand Driven S&OP**

**Adaptive S&OP**

**Market Driven Innovation**
Four Prerequisites for Relevant Information

1. Understanding Relevant Ranges
2. Implement a Flow-Based Operating Model
3. Implement Flow-Based Metrics
4. Tactical Reconciliation (bi-directional) between Relevant Ranges
1. Relevant Ranges

Forecasts are relevant in the long range, not the short range. Fixed costs are variable in the long range, not the short range. A work order delay is relevant in the short range, not the long range. A machine breakdown is relevant in the short range, not the long range.

- Relevant Range = The time frame in which assumptions are valid
- The assumptions and information that are valid and relevant will differ between these ranges.
- Force fitting irrelevant assumptions into the wrong range will lead directly to distortive information.
- Different relevant ranges are typically utilized by different personnel.
Demand Driven Operating Model (DDOM)

A Demand Driven Design begins with the stated business and market strategic objectives (strategic lead time and market emphasis). The Model’s key parameters/attributes are populated with the “current reality” of resource capacities and demand variation (time standards). Then buffers are dialed in to protect the control points and deliver the market strategy.

A Demand Driven Operating Model (DDOM) is a supply order generation, operational scheduling and execution model utilizing actual demand in combination with strategic decoupling and control points protected with stock, time and capacity buffers. It creates a predictable and agile system that promotes and protects the flow of relevant information and materials within the tactical relevant operational range (hourly, daily and weekly).

A DDOM follows the Right Rules – “Complex Adaptive System Rules”

Flow Based Metrics are an outcome of following the “Right Rules”
2. Right Rules For DDOM

Demand Driven Model

ΔVisibility → ΔVariability →

Core Conflict Area

Operating the Demand Driven Model (Tactical Time Frame)

ΔFlow → ΔCash Velocity → Δ \left( \frac{\text{Net Profit}}{\text{Investment}} \right) → ΔROI

Plossl’s First Law of Manufacturing

Smart Metrics are a DDOM outcome:
• They drive tactical planning and execution to flow;
• They connect flow to ROI operationally and tactically.
2. The Flow-Based DDOM Criteria

Combines elements of MRP, DRP, Lean, Theory of Constraints, Factory Physics and Six-Sigma.

- Paces operations to **actual demand**
- Strategically places **decoupling points** for lead time compression and variability (bullwhip) mitigation.
- Strategically places **control points** for schedule synchronization.
- Protects decoupling and control points through **stock, time and capacity buffers**

**A Demand Driven Operating Model is About “Position, Protect and Pull” – The 3 P’s**
3 Types of Buffers Dampen/Protect Against Variation

- Stock
- Time
- Capacity

Decoupling Points
Control Points
The Right Design Rules Create Visibility

Demand Driven Model

ΔVisibility → ΔVariability →

Core Conflict Area

Operating the Demand Driven Model

Paretian statistical models – The tails of the distribution identify the few critical points that define the relevant information to *design, manage, predict and adapt* nonlinear complex systems.
Assign Lead Time Buffer Profiles

Buffer zones & sizes are a function of the part lead time profile

+ Individual Part Attributes

### Lead Time Categories for Parts

<table>
<thead>
<tr>
<th>LT Profile</th>
<th>Lead Time Range</th>
<th>Red Base %</th>
<th>Safety Protection %</th>
<th>Yellow Base %</th>
</tr>
</thead>
<tbody>
<tr>
<td>From</td>
<td>To</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>5</td>
<td>90</td>
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<td>8</td>
<td>31</td>
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<td>25</td>
</tr>
<tr>
<td>9</td>
<td>37</td>
<td>45</td>
<td>30</td>
<td>25</td>
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</table>

### Part Attributes

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Buffer LT Profile</th>
<th>LT Days</th>
<th>ADU</th>
<th>Variability</th>
<th>MOQ</th>
<th>Order Cycle</th>
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<tbody>
<tr>
<td>r457</td>
<td>1</td>
<td>2</td>
<td>18</td>
<td>Low</td>
<td>30</td>
<td></td>
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<tr>
<td>r672</td>
<td>4</td>
<td>14</td>
<td>120</td>
<td>Med</td>
<td>3</td>
<td>3 days</td>
</tr>
<tr>
<td>h654</td>
<td>8</td>
<td>31</td>
<td>3</td>
<td>High</td>
<td>10</td>
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Greater of MOQ or MOC

Usage over 1 LT

Variability

Risk Mitigation
Buffer Zone Sizing Calculations

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<tbody>
<tr>
<td>1</td>
<td>Cat 1</td>
<td>1-5</td>
<td>90</td>
<td>Low</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>Cat 2</td>
<td>6-10</td>
<td>60</td>
<td>Medium</td>
<td>25</td>
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<tr>
<td>3</td>
<td>Cat 3</td>
<td>11-15</td>
<td>35</td>
<td>High</td>
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### Calculations

- **Minimum Order Quantity or Minimum Order Cycle**: Average Daily Usage (ADU) x Lead Time (usage over full lead time)
- **Safety % x Red Base**: Safety % x Red Base
- **Red Safety**: Average Daily Usage x Lead time x base red %

---

**Part r457**
- 18(ADU) X 2 DAYS
- 36

**Part r672**
- 120 ADU X 14 DAYS
- 1680

**Part r654**
- 3 ADU X 31 DAYS
- 93
Components Buffer profile B43C:
B = Buy;
LT Cat = 4;
Safety Protection = 3 (high);
Green Zone = Order Cycle 7 days (no MOQ)

Green Zone: Order Cycle 7 days x 56 (adu) = 392

Yellow Zone: LT 35 days x 56 (adu) x 100% = 1,960

Target Inventory: TOR (1,225) + 50% Green Zone (196) = 1,421

TOR: Base (16) + Safety (34) = 1,225
Red Zone Safety: Red Zone Base of 490 x 150% = 735 (high variability)
Red Zone Base: LT 35 days x 56 (adu) x 25% = 490
ATO to forecast 13 days

Remember target inventory is a function of ADU over lead time

Drum/ Pacesetter

Press 220 Ton All VS Samples

Press 220 Ton x 2

Press 88 Ton x 4

Press 44 Ton x 1

Outside Plating and Decorating

Outside Plating and Decorating

Charge Stand Cell

RVS Pack

Pro Lines x 9

1st OP 2nd OP Pack

Shaver Lines x 5

Motor 1st OP 2nd OP Pack

Shaver Sub Assembly Pack

Detach Blade Assembly M243

CVS Comp Blade Supermarket

Supplier

Warehouse

customers
Targeted tolerance times of 2 days and markets service levels of 98%. Given the current state of operations with a 13 day ATO would require $2M+ increase in finished goods inventory and we don’t have the molding capacity to build the buffers.
All of this Demand variation cascades from the first operation through to the finished goods!
LINE MATERIAL FLOW MAP – **CASE** Mold and Assembly

<table>
<thead>
<tr>
<th>Models</th>
<th>Cases</th>
<th>Case Ass</th>
<th>Bulk</th>
<th>Finished Good</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12</td>
<td>11</td>
<td>0</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>52</td>
</tr>
</tbody>
</table>

Press 88 Ton x 4
Press 220 Ton x 2
Press 220 Ton x 2
Press 44 Ton x 1

1 Case sku

17 items 4 (MTO)
8 items 6 (MTO)
10 items 0 (MTO)
17 items 0 (MTO)

Pro Series Lines x 4
1st OP
2nd OP
Pack

Warehouse

Supplier

Blade

Supermarket

MC/ST/8481/CP2

Case Assembly

1 Case sku

MC/ST/8481/CP2

1 Case sku
Consolidated Variation is limited to laser and Pack

Unskilled sprint labor can deal with the demand variation at pack.

Total inventory target is $600,000 rather than the current inventory plus an additional $2 million for 98% service level
Future State Gains From Holistic DDOM Strategic Design

• Break variation with intermediate stock buffers of blades, cases and bulk clippers:
  • Cases from 12 to 2 variations;
  • Case assemblies from 11 to 3 variations;
  • Bulk increased from 0 to 3 variations.

• Gain Capacity:
  • Increase assembly line capacity moving skilled labor out of packing to assembly lines;
  • Create a Laser print packing line to feed finished goods and shipping.

• Reduced the number of skus carried in Finished Goods;

• Differentiating the product at T-2 days rather than T-13 days:
  • Reduced Finished Goods inventory stocking levels by 11 days X ADU (R+ lead time of 2 not 13);
  • More flexibility for scarce molding resources to respond to market demand variation.

This same thinking and design was then expanded to the other two Lean Lines!
2. Implement The Flow-Based Operating Model
Scheduling MTS Replenishment Buffers

**Schedule Finished Items**

Measure: Monitor capacity buffers in non-control point resources looking for potential overloads

Work order to assemble MTO & and all MTS for all Blended Products

<table>
<thead>
<tr>
<th>Part</th>
<th>Open Supply</th>
<th>On-Hand</th>
<th>Demand</th>
<th>Available Stock</th>
<th>Recommended StockQty</th>
<th>Action</th>
</tr>
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<tbody>
<tr>
<td>PPE</td>
<td>5453</td>
<td>4012</td>
<td>3200</td>
<td>6000 (30%)</td>
<td>6500</td>
<td>Create Work Order</td>
</tr>
<tr>
<td>SAP</td>
<td>3358</td>
<td>4054</td>
<td>540</td>
<td>6877 (40%)</td>
<td>3128</td>
<td>Create Work Order</td>
</tr>
<tr>
<td>FPA</td>
<td>530</td>
<td>3830</td>
<td>213</td>
<td>4038 (44%)</td>
<td>2102</td>
<td>Create Work Order</td>
</tr>
</tbody>
</table>

Order Entry MTO Planners MTS

Intermediates

Raw materials

Purchase Parts

Vendors

Finished goods shipments to customers and DC’s cascade down to trigger orders scheduled on the packing line and intermediate pulls and raw material and a signal to buy

Drum schedule priority by buffer penetration status
Scaling nondrum Resource Schedules Float

Measure: Monitor capacity buffers in non-control point resources looking for potential overloads

Order Entry MTO Planners MTS

Work order to assemble MTO & and all MTS for all Blended Products

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<td>213</td>
<td>4038 (44%)</td>
<td>2162</td>
<td>Create Work Order</td>
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Intermediate pulls trigger work orders and raw material pulls trigger purchase part buys.

Super Stack

Drum schedule priority by buffer penetration status
3. Flow-Based Metrics End Cost Conflict

• Any suite of flow-based metrics must take into account the other three prerequisites:
  ✓ The metrics must fit the range
  ✓ The metrics must fit the flow-based operating model
  ✓ The metrics must be reconcilable between ranges.

• Force fitting non flow-based metrics will directly lead to conflicts and distortions throughout the organization – it will obscure what is relevant!
Flow-Based Metrics in the DDAE Model

<table>
<thead>
<tr>
<th>Metric Objectives</th>
<th>The Message Behind the Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Reliability</td>
<td>Execute to the model, plan, schedule and market expectation;</td>
</tr>
<tr>
<td>System Stability</td>
<td>Pass on as little variation as possible;</td>
</tr>
<tr>
<td>System Speed/Velocity</td>
<td>Pass the right work on as fast as possible;</td>
</tr>
<tr>
<td>System Improvement &amp; Waste Reduction (Opportunity $)</td>
<td>Identify and prioritize obstacles/conflicts to flow</td>
</tr>
<tr>
<td>Local Operating Expense Control</td>
<td>Spend minimization to capture the market opportunity</td>
</tr>
<tr>
<td>Strategic Contribution</td>
<td>Maximize system return according to relevant model factors (volume and rate)</td>
</tr>
<tr>
<td>Contribution Margin (cash generation rate)</td>
<td>Drive innovation (internal and external) and growth to increase cash generation capability (RATE)</td>
</tr>
<tr>
<td>Working Capital (inventory &amp; cash &amp; credit)</td>
<td>Ensure proper levels of working capital to protect and promote flow in the short and long term</td>
</tr>
<tr>
<td>Customer Base (market share, sales &amp; service &amp; quality)</td>
<td>Ensure and grow a solid base of business for the enterprise (VOLUME)</td>
</tr>
</tbody>
</table>

NO DDOM = NO Flow based operations and tactical metrics!
Reliability
Planner, Buyer, Scheduler
- Net Flow & On Hand Stock Status
- Order Acceptance & Launch Timeliness
- Control Point Schedule Maintenance

Stability
Buffer Manager, Resource Manager
- Stock Buffer Status
- Time Buffer Status
- Capacity Buffer Status
- Reason Code Capture

Velocity
Buffer Manager, Resource Manager, Scheduler
- Flow Exception Reporting:
  - Release Schedules
  - Progress to Next Critical Scheduled Activity
  - Critical Scheduled Activity (Control Points)

Work order progression
- Yet to Be Received
- Received
- Control Points:
  - Late to release
  - Late to start
  - Late to complete
  - Late to ship
  - Protection status
3. Operate The Demand Driven Model

Paretian statistical models – The tails of the distribution at the few critical points, capture and define the relevant information to predict, manage and adapt nonlinear complex systems. They contain the “lever point phenomena” and the relevant information for decision making.

Plan

Schedule

Execute

All buffers, stock, time and capacity, use Paretian models to identify lever point phenomena events to signal action, priority and opportunity.
System Speed Velocity

Measure status and speed of the planned work to the execution

Monitor Over the Top of Green (OTOG)

Monitor stock priority status and time buffer status determine exedite

Monitor early buffer entry
## 4. Tactical Reconciliation Demand Driven Dashboard

<table>
<thead>
<tr>
<th>System Improvement</th>
<th>Local OE Control Operations/Finance</th>
<th>Strategic Contribution DDS&amp;OP/Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDS&amp;OP Team</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Strategic Stock Buffer Range and Disruption Analysis</td>
<td>Review department spend monthly to track additional spend at local areas required to maintain flow and deal with overages: Expedite Related Expenses, OT, and flex budgeting for volume related expenses.</td>
<td>Opportunities to redefine or leverage the operating model for better ROI:</td>
</tr>
<tr>
<td>• Time Buffer Reason Code Analysis</td>
<td></td>
<td>• Flex budgeting and relevant step costs</td>
</tr>
<tr>
<td>• Capacity Buffer Analysis</td>
<td></td>
<td>• Volume maximization (Free product)</td>
</tr>
<tr>
<td>• Part Flow Variances</td>
<td></td>
<td>• Rate based and mix exploitation</td>
</tr>
<tr>
<td>• Variability, lead time &amp; MOQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Stock Buffer targets &amp; Flow index</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Capacity Buffer and Rate/standard issues will most often be visible through time buffer reason code analysis

### Variability Reduction Improvement

**BEFORE**
- Variability Reduction
  - Green zone: 60
  - Yellow zone: 180
  - Red zone: 30
- Red safety stock: 25%

**AFTER**
- Variability Reduction
  - Green zone: 60
  - Yellow zone: 180
  - Red zone: 30
- Red safety stock: 25%

### Lead Time Reduction Improvement

**BEFORE**
- Lead Time: 18 days

**AFTER**
- Lead Time: 4 days

### Minimum Order Quantity Reduction

**BEFORE**
- New: Green zone set to MOQ
- MOQ Reduction

**AFTER**
- MOQ

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DDOM System Improvement

Point out and prioritize lost ROI opportunities

Real time view

Stock buffer limit

Target on-hand

Quantity

Trend reporting focuses on parts with the greatest opportunity for a working capital reduction.

Trend reporting focuses on parts with the greatest opportunity for a reduction in expedite related waste.

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Point out and prioritize lost ROI opportunities

Reporting:
Trend the reason codes of work order penetrations into the red and late zones

Trend the reason codes for work orders for early buffer entry.
DDOM System Improvement

Point out and prioritize lost ROI opportunities

**Zone Receipt**

<table>
<thead>
<tr>
<th>Zone Receipt</th>
<th># of Occurrences</th>
<th>Reason</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>LATE</td>
<td>23</td>
<td>Set-up delay at CNC-Lathe 7</td>
<td>Set-up Reduction at CNC-Lathe 7</td>
</tr>
<tr>
<td>RED</td>
<td>27</td>
<td>CNC-Mill 18 down</td>
<td>Preventative Maintenance at Mill 18</td>
</tr>
<tr>
<td>EARLY</td>
<td>52</td>
<td>Released on time – beat standard</td>
<td>Clean up standards on named routings – evaluate changes on ropes and buffers</td>
</tr>
</tbody>
</table>

**Pareto/Control Chart of Reason Codes**

Buffer Receipts by Zone

- Green, 156, 28%
- Yellow, 245, 42%
- Red, 54, 10%
- Late, 39, 7%
- Early, 73, 13%

Tactical reconciliation and focused action drive variation out of operations
Zones are sized as a function:
- MOQ = 60
- ADU = 10
- lead time = 18
- Red base factor %= 37%
- Red safety factor %= 50%

Green Zone = 60
Yellow zone = 180
Red base = 67
Red safety = 33
Average on-hand inventory target = 130

Zones are sized as a function:
- MOQ = 60
- ADU = 10
- lead time = 18
- Red base factor %= 37%
- Red safety factor %= 25%

Green Zone = 60
Yellow zone = 180
Red base = 67
Red safety = 33
Average on-hand inventory target = 130
Stock Buffer Remodel - Lead Time Reduction

**BEFORE**

- Lead Time 18 days

Zones are sized as a function:
- MOQ = 60
- ADU = 10
- lead time = 18
- Red base factor %= 37%
- Red safety factor %= 50%

Green Zone = 60
Yellow zone = 180
Red base = 67
Red safety = 33
Average on-hand inventory target = 130

**Improvement**

- lead time ↓ 4 days

**AFTER**

- 4 = new lead time 14 days

Zones are sized as a function:
- MOQ = 60
- ADU = 10
- lead time = 14
- Red base factor %= 37%
- Red safety factor %= 50%

Green Zone = 60
Yellow zone = 140
Red base = 52
Red safety = 26
Average on-hand inventory target = 108
**Stock Buffer Remodel - Minimum Order Quantity Reduction**

<table>
<thead>
<tr>
<th>BEFORE</th>
<th>Improvement</th>
<th>AFTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note: Green Zone set to MOQ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOQ reduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOQ</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Zones are sized as a function:
- MOQ = 60
- ADU = 10
- Lead time = 18
- Red base factor % = 37%
- Red safety factor % = 50%

Green Zone = 60
Yellow zone = 180
Red base = 67
Red safety = 33
Average on-hand inventory target = 130

**Zones are sized as a function:**
- MOQ = 40
- ADU = 10
- Lead time = 18
- Red base factor % = 37%
- Red safety factor % = 50%

Green zone = 40
Yellow zone = 180
Red base = 67
Red safety = 33
Average on-hand inventory target = 120
Stock Buffer Remodel - Total of Improvements

**BEFORE**
- Green Zone = 60
- Yellow zone = 180
- Red base = 67
- Red safety = 33
- Average on-hand inventory target = 130

**AFTER**
- Green Zone = 40
- Yellow zone = 140
- Red base = 52
- Red safety = 13
- Average on-hand inventory target = 85

Variability ↓ 25%
Lead Time ↓ 4 days
MOQ ↓ 20 units
Total average inventory ↓ 45 units

32% reduction in inventory and better market lead time

DDAE’s can do it over and over again.....
Client Results 5 months After Go Live

- OTD 70% to 97%;
- Cycle time cut in half;
- Initial inventory reduction 35%;
- July – OTD is holding but Inventory bumped up and two of the most challenging areas backlog has increased;
- 1st audit Scheduled for the last week in September.
9/30 Audit - What Happened on May 18th?

Investment in an Automated packaging line: to save labor cost.
• All green zones had been increased to as the MOQ for packaging had been increased to allow for better utilization of the new automated packaging line.

• We learned that the investment decision was made using 9-point question/criteria centered around increasing efficiency/speed and reducing the unit cost of packaging. After the investment was made the decision to increase all MOQs of packaged finished goods was necessary to capture the unit cost savings.

• The decision ignored the fact that packaging already has sprint capacity and investment will not gain system velocity.

• Only investment in the scarce resource areas/drums will increase velocity and translates to increased system flow.
A Hard Lesson, Well Learned, Easily Corrected

• Additionally, the potential gain in sprint capacity was misused. Instead of using it to decrease the effects of demand variation on the scarce resources and decrease the green zone the green zone was increased to decrease set ups at packaging.
• Holding inventory further back in the system reduces the effects of variation on the scarce resources producing common products;
• The already stressed scarce intermediates buffers were assembled into the finished goods (mugs and cups and all earthenware) in larger batches;
• **Target inventory is a function of the red zone plus ½ the green zone.** Increasing the green zone unnecessarily drives up the total target inventory, increases carrying costs, and further depletes intermediate and biscuit buffers of scarce items;
• The depletion of the intermediate and biscuit buffers put more stress on the already backlogged earthenware, cups and mugs, decorating and screen print drums and decreased velocity, increased total system inventory;
Still Stuck in Conflicting Metrics!

- Convention has some flow-based metrics in use.
- Their effectiveness is limited by conflicting cost-based metrics.
- These conflicting metrics obscure what is relevant and introduce self-imposed variability within organizations as personnel oscillate between protecting flow and protecting cost performance.
- When flow is promoted and protected, costs are under control. The inverse, however, is not true.

\[
\Delta \text{Flow} \rightarrow \Delta \text{Cash Velocity} \rightarrow \Delta \left( \frac{\text{Net Profit}}{\text{Investment}} \right) \rightarrow \Delta \text{ROI}
\]

- Due Date Performance
- Fill Rates
- Inventory Turns

\[
\Delta \text{Cost} \rightarrow \Delta \text{Cash Velocity} \rightarrow \Delta \left( \frac{\text{Net Profit}}{\text{Investment}} \right) \rightarrow \Delta \text{ROI}
\]

- OEE
- Fully Absorbed Unit Cost
The Three “Truths” Are “Myths”

Protecting With Capacity Buffers

- Capacity buffers protect control and decoupling points
- Sprint and recover ability determine the sizing of both time and stock buffers and the variation factor in the red safety zone

The “Unit Cost Myth” *misuses* spare capacity=

- Responsiveness
- Lead times
- Inventory levels
- ROI

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Demand Driven Adaptive Enterprise Levels

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1</strong></td>
<td>Focused on cost-based operational efficiency (Cost reduction AND Responsiveness in conflict).</td>
</tr>
<tr>
<td><strong>Stage 2</strong></td>
<td>Begin to emphasize flow-based operational efficiency with the preliminary implementation of DDMRP.</td>
</tr>
<tr>
<td><strong>Stage 3</strong></td>
<td>Sensing, Adapting and Innovating across the supply chain (customers and suppliers) for continual ROI improvement. Mature DDAE Model.</td>
</tr>
<tr>
<td><strong>Stage 4</strong></td>
<td>Leverage the Demand Driven Operating Model capability across the enterprise and into the market. DDS&amp;OP and Adaptive S&amp;OP in place.</td>
</tr>
<tr>
<td><strong>Stage 5</strong></td>
<td>Synchronizing and leveraging operational capability for better flow performance. Expand the implementation of a Demand Driven Operating Model.</td>
</tr>
</tbody>
</table>

Visibility and Thoughtware determine an Organization’s ability to adapt and improve flow!
Questions?