MRP & KANBAN:
Together Again For The First Time!

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About Us

- 25 years of pull experience
- Network of senior lean consultants
- Hundreds of Pull systems

Typical client results:
- Total inventories down 20-40%
- Fill rates up to 99%
- Scheduling effort required down 80%

Don Guild, Principal
- Over 45 years of manufacturing and consulting experience
- Expertise in requirements planning, TOC, and lean
- Authored NIST/MEP Pull/Kanban training module
- Faculty member at the Lean Enterprise Institute
- Authored initial LEI pull/kanban training
Never undertake vast changes with half-vast ideas.

Anonymous

Push vs. Pull Definitions

Push production . . . is a method for scheduling production and materials requirements to dates derived from lead time offsets from anticipated demand for finished product.

Pull production . . . is a method of production and materials control in which downstream activities signal their needs to upstream activities.

Kanban . . . is a signaling device that gives authorization and instructions for the procurement, production or conveyance of items in a pull system.
Why Not Use Kanban?

- Our customer demand is too repetitive for kanban.
- Our customer demand is not repetitive enough for kanban.
- We have to simplify our supply chain first.
- We have to clean up our past due first.
- We need to build up our supermarkets first.
- We’ve invested too much money in MRP to abandon it now.
- We’re not going to schedule our operation on Excel spreadsheets.

If We Do Implement Kanban . . .

- Which schedule to we follow – kanban or MRP?
- How do we set (and reset) the correct number of kanbans?
- How does kanban prioritize non-kanban demand?
- How does kanban handle spike customer demands?
- How do we track schedule adherence?
- How do we clean up our past due orders?
- Why do we still need production meetings and expediting?
A virtual pull system is a visual information system... for... based on... and for... without...

- Scheduling production and procurement,
- Actual consumption – not forecast,
- Controlling and improving the flow of materials,
- A physical component.

Virtual Pull is a global solution... not a kaizen event!

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**Advantages of Virtual vs. Manual Pull**

- Accounts for both supply and demand flow constraints.
- Calculates the maximum inventory required to maintain material flow.
- Eliminates non-value-adding kanban cards, containers, and boards.
- Provides transparent, visual schedules anywhere in your operation.
- Incorporates level-loading into your scheduling and purchasing processes.
- Includes non-kanban demand in level-loaded visual schedules.
- Reduces non-value-added scheduling and expediting effort by up to 90%.
- Builds on your investment in MRP.
Basic MRP Structure

MRP – Virtual Pull Linkage

Planning:
- Historical usage
- Historical shipments
- Forecast
- Master production schedule
- Forecasted gross requirements
- Bills of materials
- Item masters
- Routings
- Work center data
- Vendor data

Execution:
- On hand inventories
- Open work orders
- Open purchase orders
- Customer order backlog
- Backlog gross requirements
- Dispatch lists
- Min/max reports

Replaced by Virtual Pull
Defining Success with Virtual Pull

- Improved customer service • Higher fill rates and fewer shortages
- Reduced inventories • Shorter lead times and better cash flow
- Simplified scheduling • Less expediting, overtime, and scheduling overhead
- Identifying improvement opportunities • Financial impacts of flow and waste

Type “A” Pull Systems
Where to Locate Type “A” Supermarkets

**Strategically:**
- Where supply leadtime > market leadtime
- Where lumpy demand ==> long lead times
- Where demand is highly repetitive
- At divergence points and assembly points
- Where continuous flow is not established

**Physically:**
- Ideally, at the point of use
- At the supplier of large batches
- Satellite location
- Expensive items: Controlled location

Sizing Type “A” Supermarkets

Sized to forecast – replenished to consumption
Case Study

Seven items: 3 MTS, 4 MTO
95% fill rate required
All processed on one dedicated machine
One week further processing
One shift; 95% uptime

Demand Data
Processing Data

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\[
\text{WEEKLY HOURS AVAILABLE} = 40.0
\]

\[
\text{Times PERCENT UPTIME} = \ldots
\]

\[
\text{Equals NET HOURS AVAILABLE} = \ldots
\]

\[
\text{Minus WEEKLY RUN HOURS REQUIRED} = \ldots
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\[
\text{Equals WEEKLY CHANGEOVER HOURS AVAILABLE} = \ldots
\]

\[
\text{Divide by CHAGENOVER HOURS PER INTERVAL} = \ldots
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\[
\text{Equals INTERVAL [WEEKS]} = \ldots
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Supermarket Calculations

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### Fuel Gauge – Visual Supermarkets

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### Fuel Gauge – Current Inventory

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### Fuel Gauge – Process Improvement and Scheduling

**VIRTUAL PULL SIMULATOR**

This simulator is intended to be used in conjunction with our article on Virtual Pull. It strongly suggests the article before using the simulator.

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<tr>
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<th>FG POLICY</th>
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### Weekly Production Fuel Gauge

![Image of two people working on a computer with a fuel gauge display]
Distribution Fuel Gauge

Sam's Production Trigger Board

Type “B” Pull Systems

Type “A”
Type “B” Pull Is Based On:

- Value Stream Capacity
- Work in Process Levels
- On Hand Inventory
  
Implementing Type “B” Pull

- Identify value streams and define “work”
- Establish rates of output
- Set target value stream work in process levels
- Reduce the WIP to minimum required to maintain flow
- Define tools to control order release
- Set up flow maintenance tools
Type “B” Value Streams

What are our value streams?
- Which products use the same work centers?
- Which products use the same materials or tooling?
- Where is most of the material movement?
- Is there a “hierarchy” of bottlenecks?
- Other definitions?

Type “B” Work and Output Rates

Rate of value stream output could be:
- Hours
- Pieces
- Jobs
- Pounds
- Gallons
- Other?

Required per given time period.
Type “B” Pull Work in Process Levels

Units Required Per Day TIMES Work in Process Lead Time EQUALS Target WIP Level

Type “B” WIP Reduction

CANCEL ORDERS NO LONGER REQUIRED
DE-RELEASE LOW PRIORITY ORDERS
TEMPORARILY INCREASE CAPACITY
RESTRICT ORDER RELEASE
Sample Type “B” WIP Profile

Sample Type “B” WIP Profile
### Sample Type “B” WIP Profile

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Type “B” Release Mechanism

Sample Type “B” WIP Profile
Recent Virtual Pull Applications

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<th>PRODUCT CATEGORIES</th>
<th>NUMBER OF ITEMS ON VIRTUAL PULL</th>
<th>NUMBER OF RESOURCES SCHEDULED WITH VIRTUAL PULL</th>
<th>SERVICE LEVEL BEFORE VIRTUAL PULL</th>
<th>SERVICE LEVEL AFTER VIRTUAL PULL</th>
<th>INVENTORY REDUCTION AFTER VIRTUAL PULL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injection Molding</td>
<td>83</td>
<td>9 Molding Machines</td>
<td>95.0%</td>
<td>98.0%</td>
<td>51%</td>
</tr>
<tr>
<td>Brass &amp; Copper Casting</td>
<td>82</td>
<td>12 Furnaces &amp; Rolling Mills</td>
<td>95.0%</td>
<td>95.0%</td>
<td>62%</td>
</tr>
<tr>
<td>Brass Cupping</td>
<td>96</td>
<td>6 Press Lines</td>
<td>68.0%</td>
<td>95.0%</td>
<td>26%</td>
</tr>
<tr>
<td>Pallet Stoves</td>
<td>143</td>
<td>1 Assembly Line</td>
<td>81.0%</td>
<td>95.0%</td>
<td>66%</td>
</tr>
<tr>
<td>Consumer Electronics</td>
<td>170</td>
<td>14 Assembly Cells</td>
<td>89.0%</td>
<td>99.0%</td>
<td>46%</td>
</tr>
<tr>
<td>Plastic Trash Bags</td>
<td>670</td>
<td>40 Press Lines</td>
<td>72.0%</td>
<td>99.5%</td>
<td>28%</td>
</tr>
<tr>
<td>Aluminum Foil Cookware</td>
<td>1300</td>
<td>28 Press Lines</td>
<td>87.0%</td>
<td>99.5%</td>
<td>24%</td>
</tr>
<tr>
<td>Consumer Packaging Labels</td>
<td>69</td>
<td>14 Printing &amp; Cutting Presses</td>
<td>73.0%</td>
<td>95.0%</td>
<td>63%</td>
</tr>
<tr>
<td>Plastic Food Containers</td>
<td>290</td>
<td>10 Press Lines</td>
<td>90.0%</td>
<td>95.0%</td>
<td>51%</td>
</tr>
<tr>
<td>Stone Cutting Chisels</td>
<td>480</td>
<td>13 Machining Centers</td>
<td>76.0%</td>
<td>98.0%</td>
<td>46%</td>
</tr>
<tr>
<td>Fortune Cookies</td>
<td>110</td>
<td>13 Production Lines</td>
<td>90.0%</td>
<td>95.0%</td>
<td>67%</td>
</tr>
</tbody>
</table>

Implementation Phases

Planning:
- Lean and pull education
- Gather modeling data
- Set management policies
- Model demand on the supply chain
- Model supply constraints
- Calculate supermarkets & project benefits

Execution:
- Virtual pull training
- Interface with other systems
- Set key metrics
- Virtual pull startup
- Monitor and adjust system
- Document system
Questions?

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E = guild@att.net