Practical aspects of Make-to-Availability (MTA) pilot

Oded Cohen, Ryoma Shiratsuchi

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Oded Cohen

Oded has over 30 years of experience in developing, teaching and implementing TOC methodology, solutions and implementation processes working directly with Dr. Goldratt all over the world. Among the countries to which Oded brings his expertise are the USA, Canada, Japan, India, China, the UK, Poland, Russia, Ukraine, Colombia, Chile, Peru and many others.

Oded is the author of Ever Improve – A Guide to Managing Production the TOC Way, published in June 2010. Oded co-authored the book Deming & Goldratt: The Theory of Constraints and the System of Profound Knowledge – The Decalogue.

Oded and Jelena Fedurko just recently wrote and published a new book TOC Basics.

Ryoma Shiratsuchi

Ryoma Shiratsuchi is a management consultant of Juntos Co. Ltd. and Medium Enterprise Management Consultant.
He teaches Operations Management and Project Management as a lecturer at Education & Research Center of Manufacturing, Kyushu University.
His involvement with TOC started in 2004 with implementing CCPM into Bridge Design Department in Juntos. And after its successful implementation, he was sent to the sister company (Construction) and led CCPM implementation project as an internal consultant.
He co-translated "TOC Insights" into Japanese.
Since 2007, he has received intensive instruction from Oded Cohen, the International Director for Goldratt Schools and since 2008 he has been a Goldratt Schools faculty member.
Now he is providing TOC trainings and implementation support, especially in the areas of production and project management.

Modes of supply – Make to Stock / Make to Availability

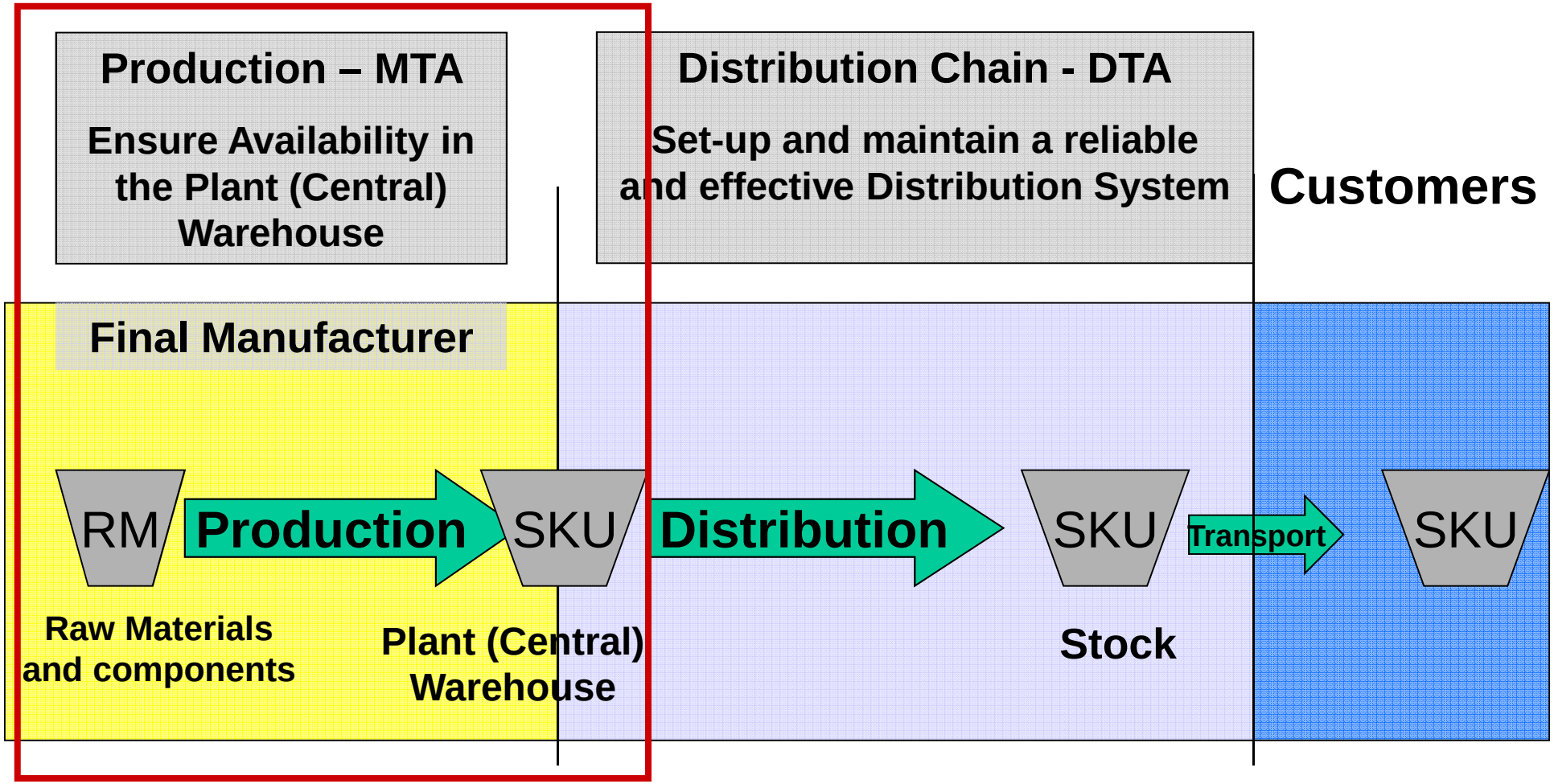
MTS/MTA - A system based on holding stocks ready for customers in order to provide instant availability.

This is due to the fact that the end consumer does not have the patience to wait for the entire response time from order to delivery. ("Zero tolerance time")

MTS – make-to-stock is to produce just in case, mostly based on forecast of selling most demanded products. It happens when the market is not willing to wait until the order is manufactured and expects to buy "from stock", hence the production starts without a firm order from a specific customer. There are also situations where there is not enough capacity – like in seasonality – and hence production has to start ahead of time.

MTA - make-to-availability is to produce to replenish previously calculated and monitored buffers. This is a TOC solution to handle certain types of MTS.

Modes of supply – Make to Stock / Make to Availability



TOC Solution for MTA

Strategy:

The company secures high level of availability of stocked items with no excess inventory

Tactics: Production and Material Management are on the TOC Replenishment system

Mindset

Produce to ensure availability

MTA - Injection 1

Immediate improvement in availability

MTA - Injections 2-5

Continuous improvement POOGI

Process of Ongoing Improvement

MTA - Injections 6-8

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MTA - Injection 1

Management is committed to availability with no excess inventory at the Plant (Central) Warehouse, with the P(C)W as the major regulator of the whole replenishment system

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MTA - Injection 2

Stock Buffers in the Plant (Central) Warehouse are maintained to ensure 100% availability, with Production Work Orders (WO) released according to the consumption from the P(C)W Buffers

MTA - Injection 3

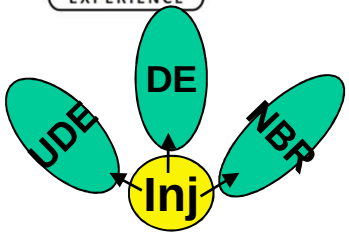
Open Work Orders (WO) are prioritized according to the status of their corresponding buffers in the Plant (Central) Warehouse

MTA - Injection 4

Buffer Management for recovery actions is in place

MTA - Injection 5

Availability of Raw Materials and components is monitored and managed

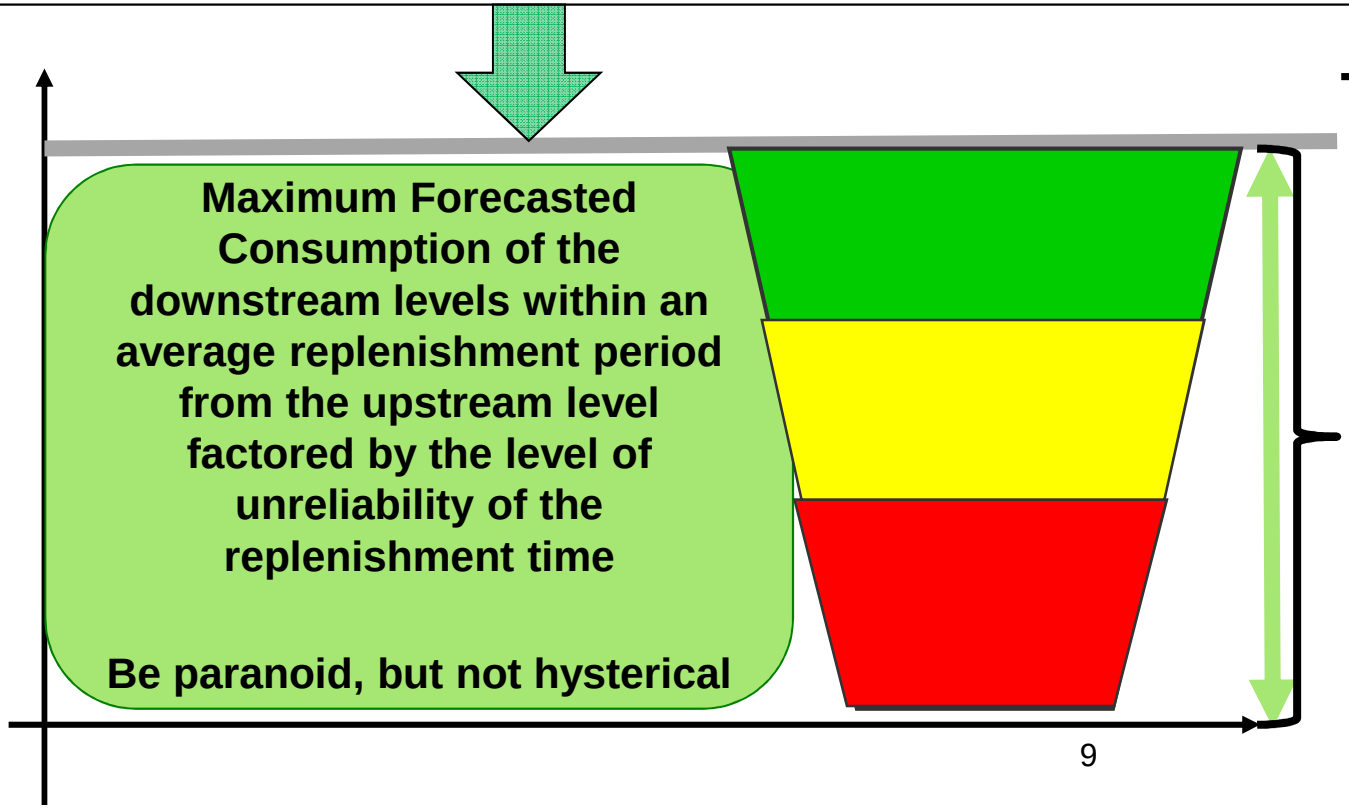


MTA - Injection 2

Stock Buffers in the Plant (Central) warehouse are maintained to ensure 100% availability, with production Work Orders (WO) released according to the consumption from the Plant (Central) Warehouse Buffer

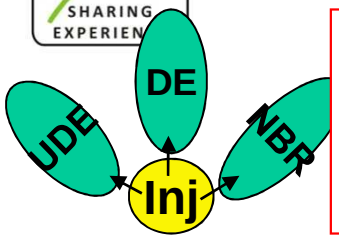
Determining inventory target levels

The target level for each SKU (for every stock position) is comprised of: the number of unit "on hand", in a way and in the orders for replenishment.



Target

The stock buffer for every SKU (for every stock location) is actually the total amount of units of this SKU that are circulating in the system (like water in the engine cooling system)



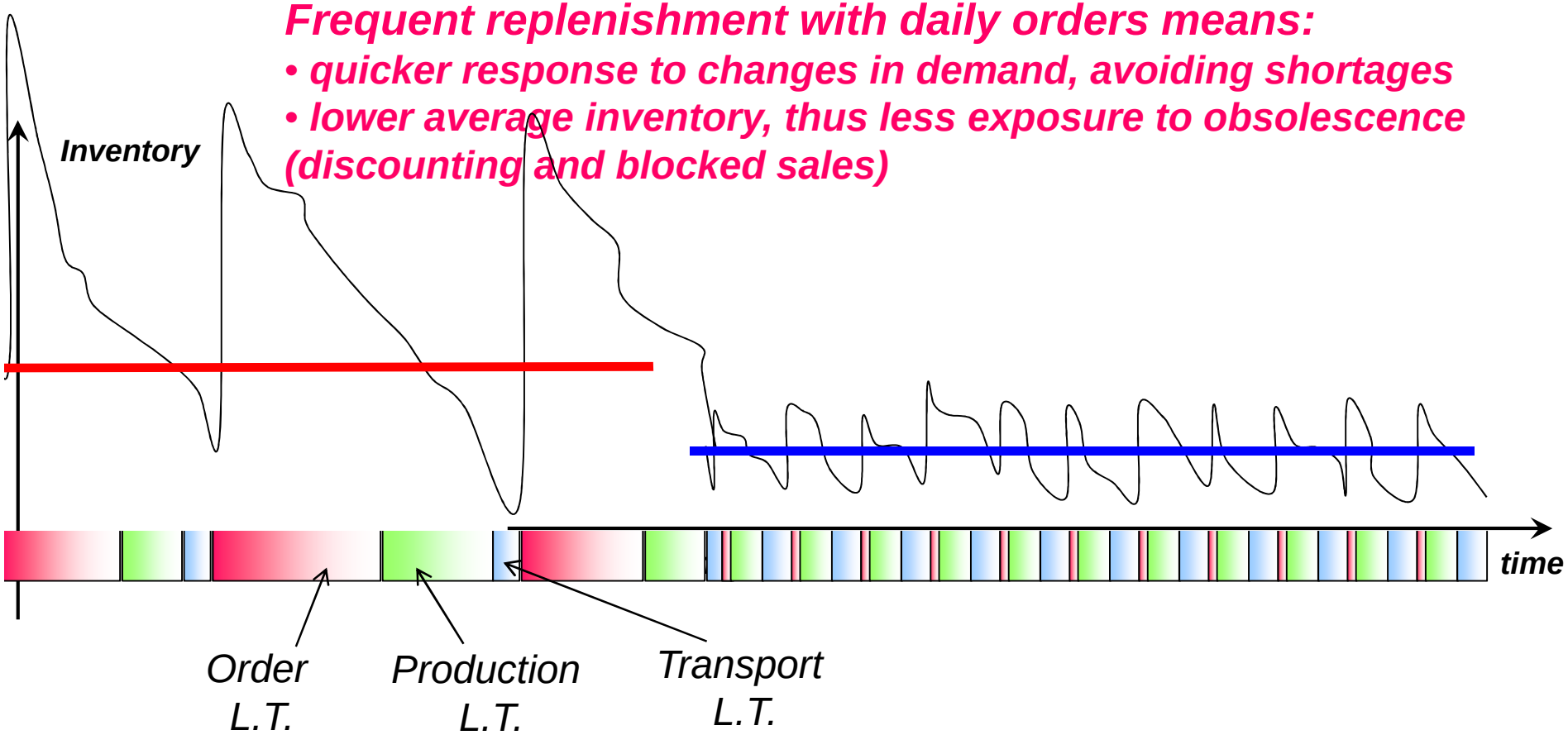
MTA - Injection 2

Stock Buffers in the Plant (Central) warehouse are maintained to ensure 100% availability, with production Work Orders (WO) released according to the consumption from the Plant (Central) Warehouse Buffer

Shortening the replenishment period – increasing shipping (replenishment) frequency

Frequent replenishment with daily orders means:

- ***quicker response to changes in demand, avoiding shortages***
- ***lower average inventory, thus less exposure to obsolescence (discounting and blocked sales)***



TOC Solution for MTA

Tactics: Production and Material Management are on TOC Replenishment system

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MTA - Injection 6

Buffer Penetration reasons are reviewed periodically (weekly) for POOGI

MTA - Injection 7

Capacity is monitored to identify CCR – Capacity Constraint Resources and to manage accordingly

MTA - Injection 8

Transfer batches (TrB) are challenged and sized to support the flow

MTA Pilot

1. CRS – Current Reality Study
2. Defining the Pilot
3. Choosing SKU for the pilot
4. Data file for the pilot
5. Pilot activities
6. Learning experience
7. Results of the pilot
8. Roll out plan
9. Current Status (end April 2012)

1. CRS – Current Reality Study (key data)

- Products: Spring parts for automobile, agricultural machines and Original Equipment.
- Total sales of the company
  - 2009: $ 15m
  - 2010: $ 15.4m
  - 2011: $ 15.5m
- Sales of own Manufacturing: $10.85m (2011)
- RM: 25% (no data on other TVC items)
- Operating Expense: $7.8m /year
- Obsolescence: $ 100K /year
- 3,600 SKUs. Of them: 1,300 supplied by external venders
- Capacity: 1 shift (8 hours/day), 5 days per week (260 days per year)
- Average Daily sales of SKU produced in house - $10K
  - (10.85x0.25)/260 days = 10.4K

1. CRS – Current Reality Study
Sales and Modes of Supply

Supply mode

10%

MTO for firm orders – first time products

Does NOT exist MTS for SKUs that are stored in front of packing

90%

MTS for SKUs that are sold from FG warehouse – products for high-volume production

With unofficial announcement from customers

80%

Without unofficial announcement from customers

20%

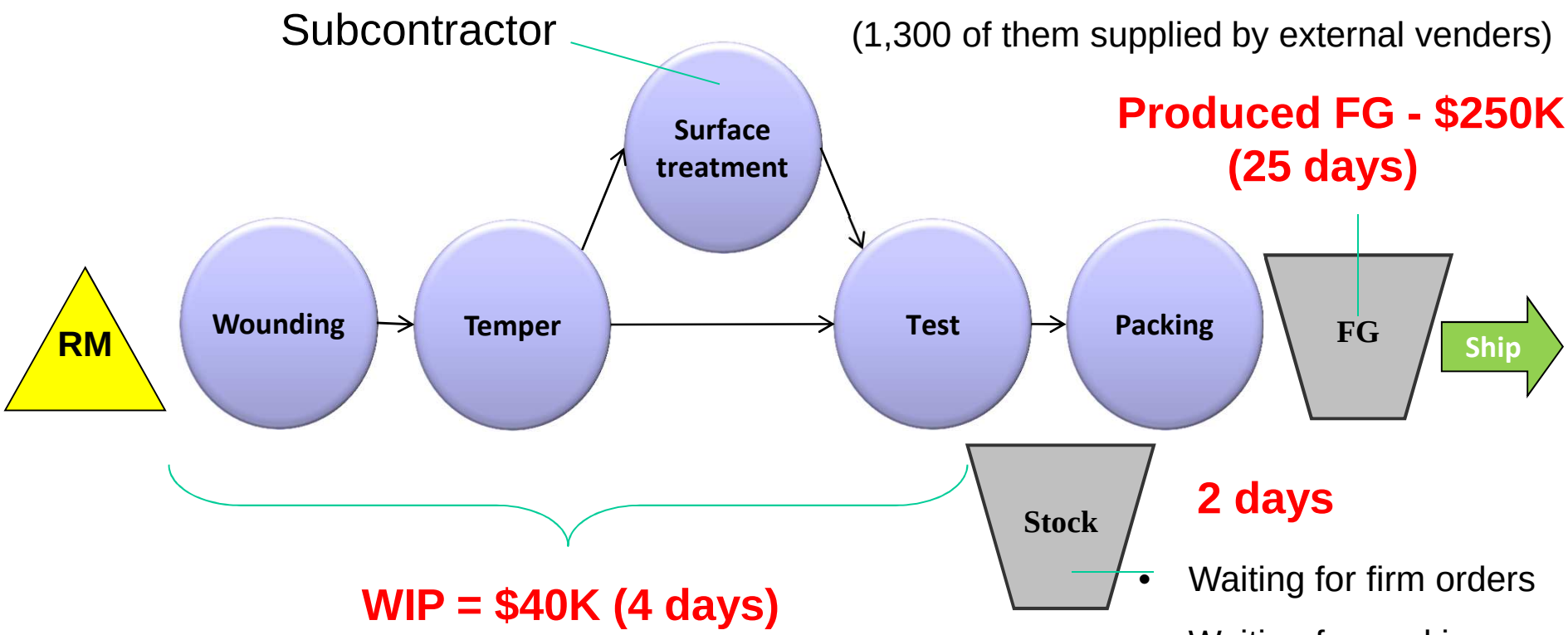
1. CRS – Current Reality Study

Flow & Inventories

The value of stock is measured in terms of RM

- Total live SKUs - 3,600

(1,300 of them supplied by external venders)



- Waiting for firm orders
- Waiting for packing resources

Daily sales of own produced products – $10K

1. CRS – Current Reality Study (key data)
Production planning and measurements

- Current PLT = 4-5 days
- Batching policy:
  - Create production plan on a monthly basis.
  - Minimum batch size per item set base on cost accounting
  - When a machine continuously doesn't meet production schedule AND the set-up time of the machine is bigger that its process time, then the production plan sets the WO to be for 2 months expected sales. Priority is given to high runners.
  - Touch time: less than 1 day (including subcontractor process)
- Measurement: Units manufactured per month, Net working ratio on machines, Set-up loss time

2. Defining the MTA Pilot

- **The MTA Pilot – has two purposes:**
  - **To verify the claim that with MTA solution it is possible to provide high level of availability with no excess stock. (for confidence).**
  - **To find how to accommodate the MTA in the existing system.**

Deliverables through MTA Pilot

1. **Identify what else is needed in order to smoothly integrate MTA into our reality**
2. **Demonstrate some benefits (to support the expected DEs).**
3. **Collect the questions and the issues that we need to deal with when the buffer is in red :**
   - **A list of situations that are accounted when in Red**
   - **A list of actions that can be taken**
   - **Potential NBRs or Obstacles to taking these actions**

3. Choosing SKUs the MTA Pilot

- **Choosing 20 SKUs that are produced internally**
  - Analyze the sales and the FG profile of every SKU (sorted in descending order)
  - Choose high runners – from a list of the top sellers.
  - Not to much inventory on hand. DIOH should be less than 40-60 days to allow the TOC replenishment to work
  - Add some purchased SKUs. Ensure no imposed minimum order quantity that is bigger than 60 days sales.

SKU no.	Purchase cost	Raw Material cost	Quantity on hand	Item cost	Yearly sales in quantity	On hand value	DIOH
1	2.64	0	2219	2.64	5157	5858.16	112
2	2.1	0	228	2.1	5146	478.80	12
3	3.2	0	1316	3.2	10400	4211.20	33
4		2.96	348	2.96	420	1030.08	215
5		0.56	182	0.56	6770	101.92	7

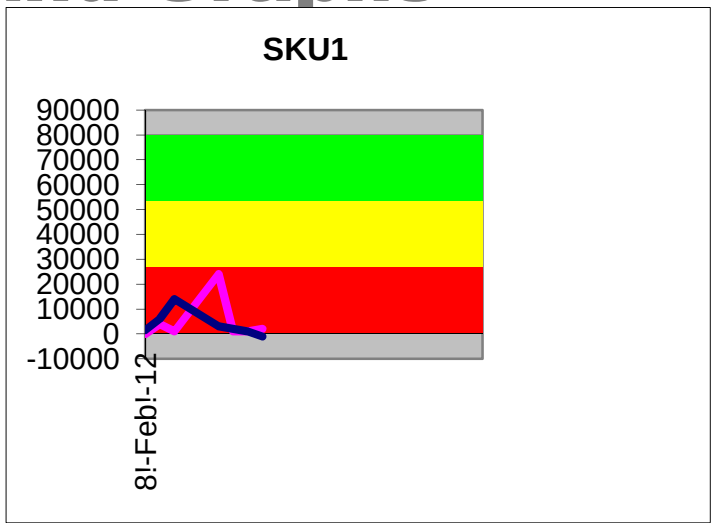
4. Data files for the pilot – Daily Data

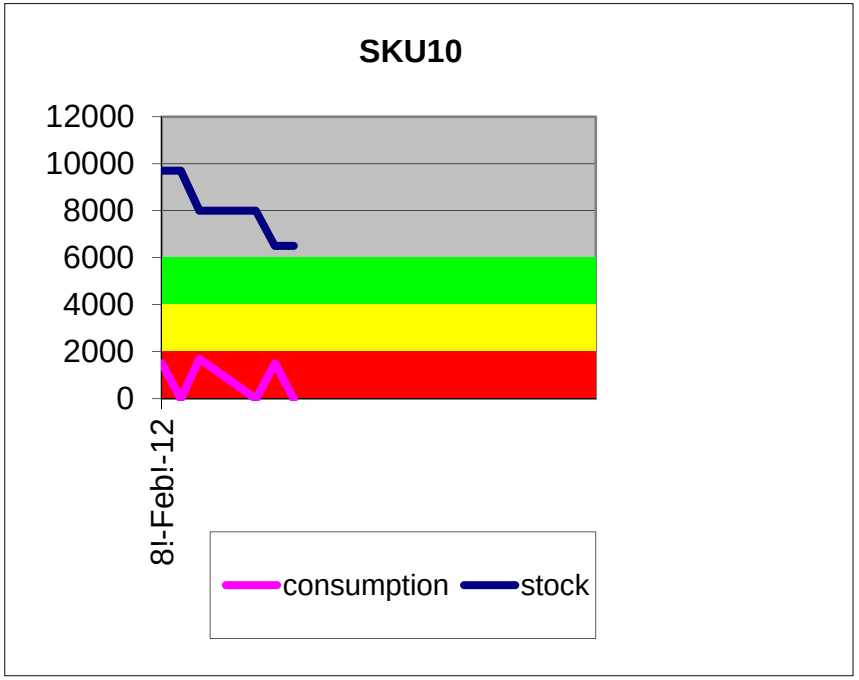
Value of Inventory	1285681					Value of Inventory	
Avg Value of Daily Sales	454966					Avg Vaule of Dailiy Sales	
MTA DIOH	2.8					Non MTA DIOH	

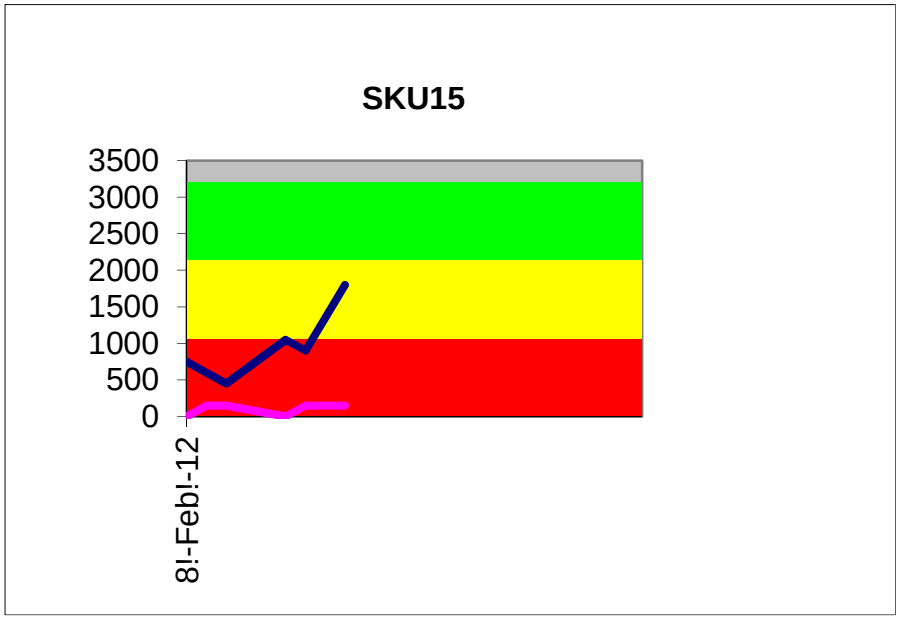
ｺｰﾄﾞ code	目標在庫 Target Level	生産ﾛｯﾄ Mini Batch	手持在庫 Stock on-hand	手持在庫色状態 On-hand Status	製造中WO Stock in Production	WOが待っているもの What the WO is waiting for	取り得る対応策 Possible recovery actions	製造からの予想到着日 Expected delivery date	要求補充量 Requested Replenishment	入庫数 Daily Receipts	出庫数 Daily Dispatches	平均日次消費（先週） Avg daily consumption (Last week)	平均日次消費（先月） Avg daily consumption (Last month)	DIOH (Last week)	DIOH (Last month)
545	80,000	40,000	10,000	88%	84,500				-14,500		8,000	7,571		1	
279	15,000	16,000	5,500	63%	9,980			2月28日	-480		1,500	1,429		4	
511	1,000	1,000	660	34%	1,750				-1,410	0	120	90		7	
505	400,000	100,000	106,000	74%	10,000				284,000	102,000		43,143		2	
494	10,000	10,000	-200	102%	1,600				8,600	0	600	586		-0	
494	4,500	4,500	1,900	58%	1,100			2/24に緊急セット	1,500	2,200	800	300		6	
494	10,000	5,000	600	94%	4,900				4,500	1,800	1,300	1,157		1	
29	5,400	3,600	300	94%	2,250				2,850		150	214		1	
29	4,500	3,000	2,100	53%	4,950				-2,550		150	193		11	
22	10,000	5,000	3,000	70%					7,000		1,000	488		6	
22	8,400	5,000	700	92%	5,000				2,700	1,500	1,000	700		1	
22	80,000	60,000	16,500	79%				3月1日	63,500		4,000	5,400		3	
29	900	600	1,000	-11%	450				-550		50	43		23	
29	1,800	1,200	1,000	44%	1,000				-200			36		28	
29	3,200	2,100	1,950	39%	3,100				-1,850			129		15	
29	2,300	1,500	1,350	41%	200			淀川	750			43		31	
29	6,000	3,900	650	89%	7,550			堺・淀川	-2,200	450	150	371		2	
192	100,000	50,000	40,250	60%					59,750			10,571		4	
88	1,800	1,800	0	100%	1,500				300			357		0	

4. Data files – periodic Reports
SKU – BM Report and Graphs

日付 – Date	消費数量 – Consumption	入庫数量 Entries	手持ち在庫 – On Hand Stock	Suggested Q for replenish	Red	Yellow	Green
2012/2/8	0	0	1500	78500	26667	53333	80000
2012/2/9	4000	0	6000	74000	26667	53333	80000
2012/2/10	1000	21000	14000	66000	26667	53333	80000
2012/2/13	24000	21000	3000	77000	26667	53333	80000
2012/2/14	1000	0	2000	78000	26667	53333	80000
2012/2/15	1000	0	1000	79000	26667	53333	80000
2012/2/16	2000	0	-1100	81100	26667	53333	80000

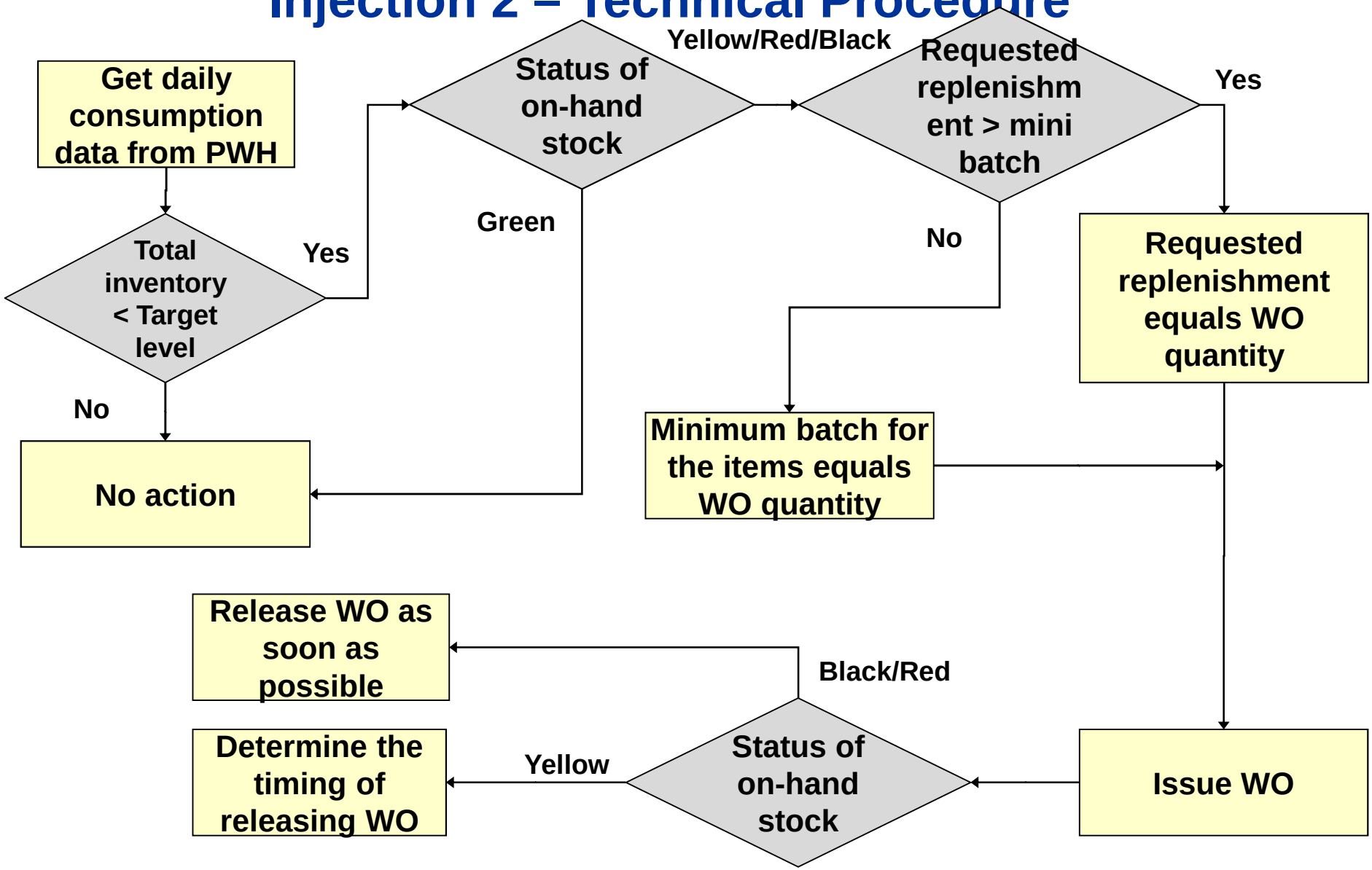






5. Pilot Activities - Procedures

Injection 2 – Technical Procedure



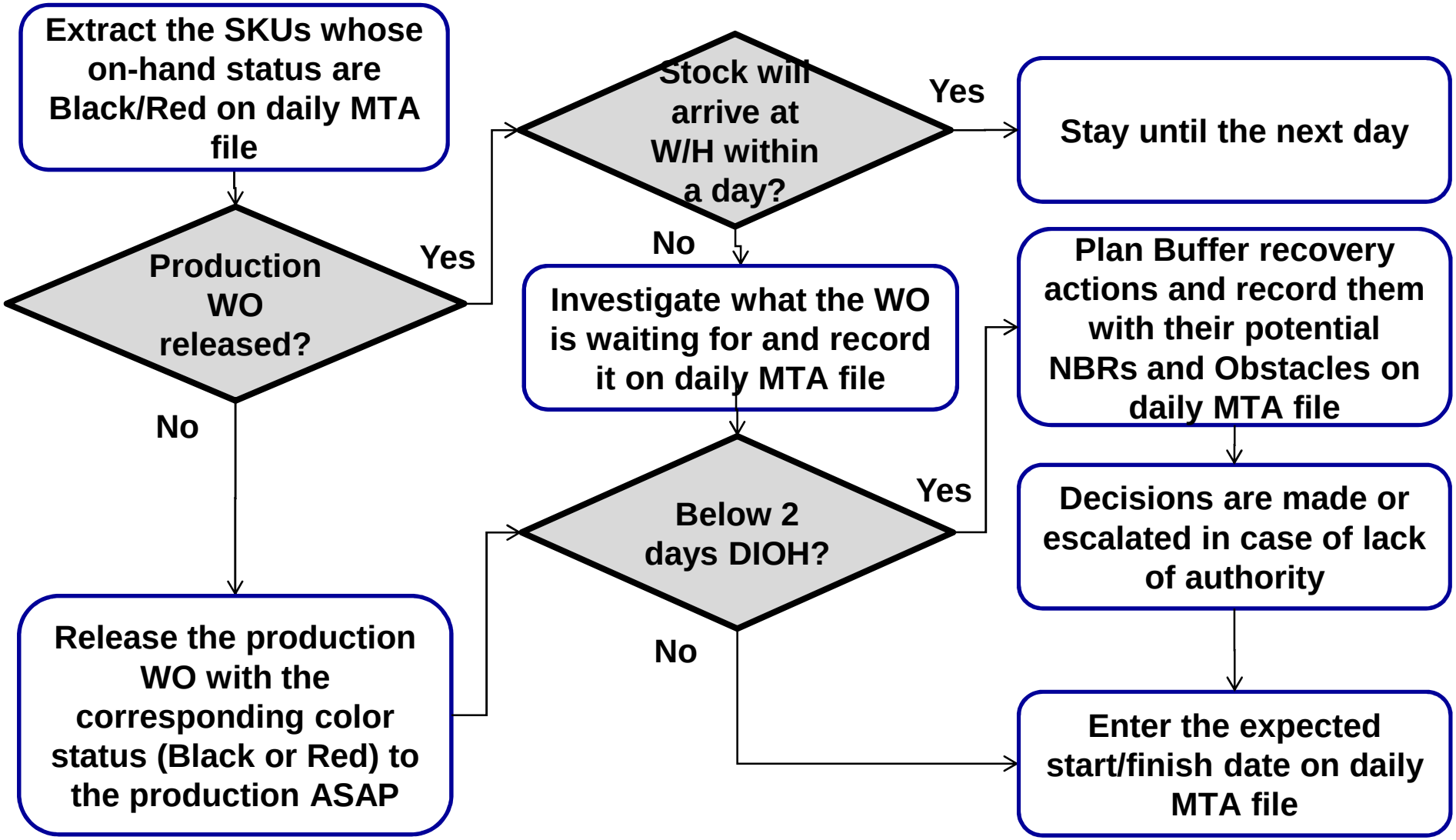
5. Pilot Activities - Procedures

Injection 3 – Priority Between Pilot and Non-pilot

- For the pilot – red orders must get priority over the non-pilot SKUs.
- However, if a non-pilot SKU is in shortage – it should get a priority as a black order.

5. Pilot Activities - Procedures

Injection 4 – Buffer Recovery Decision Flow



6. Learning Experience

- **The objective is that the on-hand inventory will be around the Yellow.**
  - **Green means excess, while Red means shortage.**
- **We have to replenish Black and Red SKUs immediately.**
  - **If the consumption is higher than average and we fear the risk of shortage – PPC may elect to release another WO during the week.**
  - **We need to leave enough protective capacity to handle such orders.**
- **We set the minimum batch quantity. Therefore, a production WO with larger quantity than the figure of "Requested Replenishment" may be issued.**
  - **In this case, the total amount of inventory in the system can be larger than the target level. It is OK.**
  - **We need to ensure that we do not have extra setups due to smaller and more frequent replenishment batches.**

6. Learning Experience

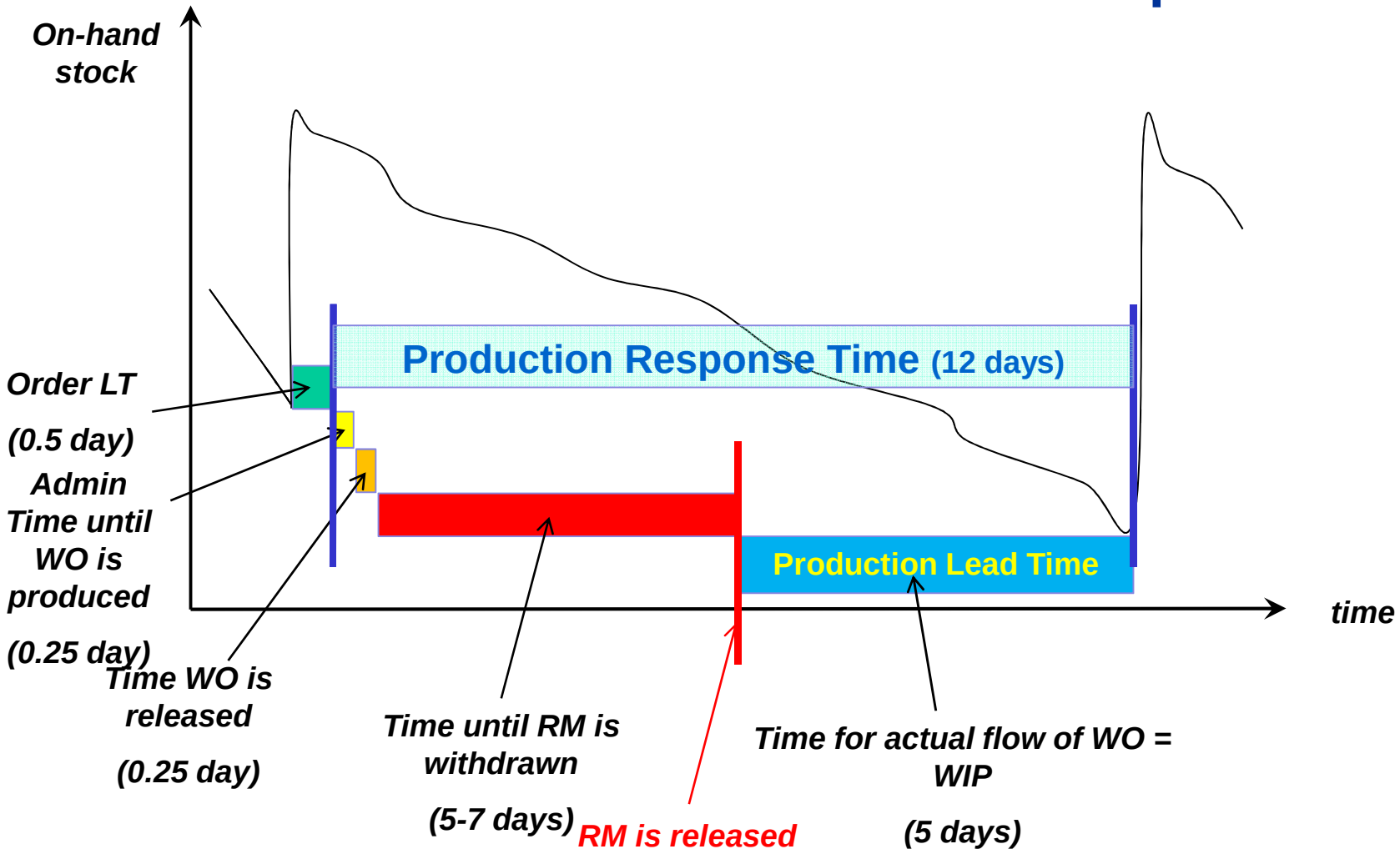
Composition of Replenishment Time

- **The replenishment time is defined as the elapse time from the moment an item has been dispatched from the warehouse until it has been replaced by a new item. This time comprises:**
  - **Time from the moment an item has been dispatched until the request is sent to the production control – it is called 'Order lead time'**
  - **Administrative time from the moment the request is reported until the production order is produced**
  - **Time until the production order is released – allowed to be produced**
  - **Time until RM is withdrawn from the store (beginning of WIP)**
  - **Time for the actual flow of the production order (WIP) – it is called 'Production lead time'**
  - **Transportation lead time when relevant**
  - **Time from the moment the order arrives until it is accepted, recorded and available for selling.**
- **When MTA solution is in place, we can take 'Order lead time = 0.5 day' as the production control gets daily consumption from the warehouse.**

6. Learning Experience

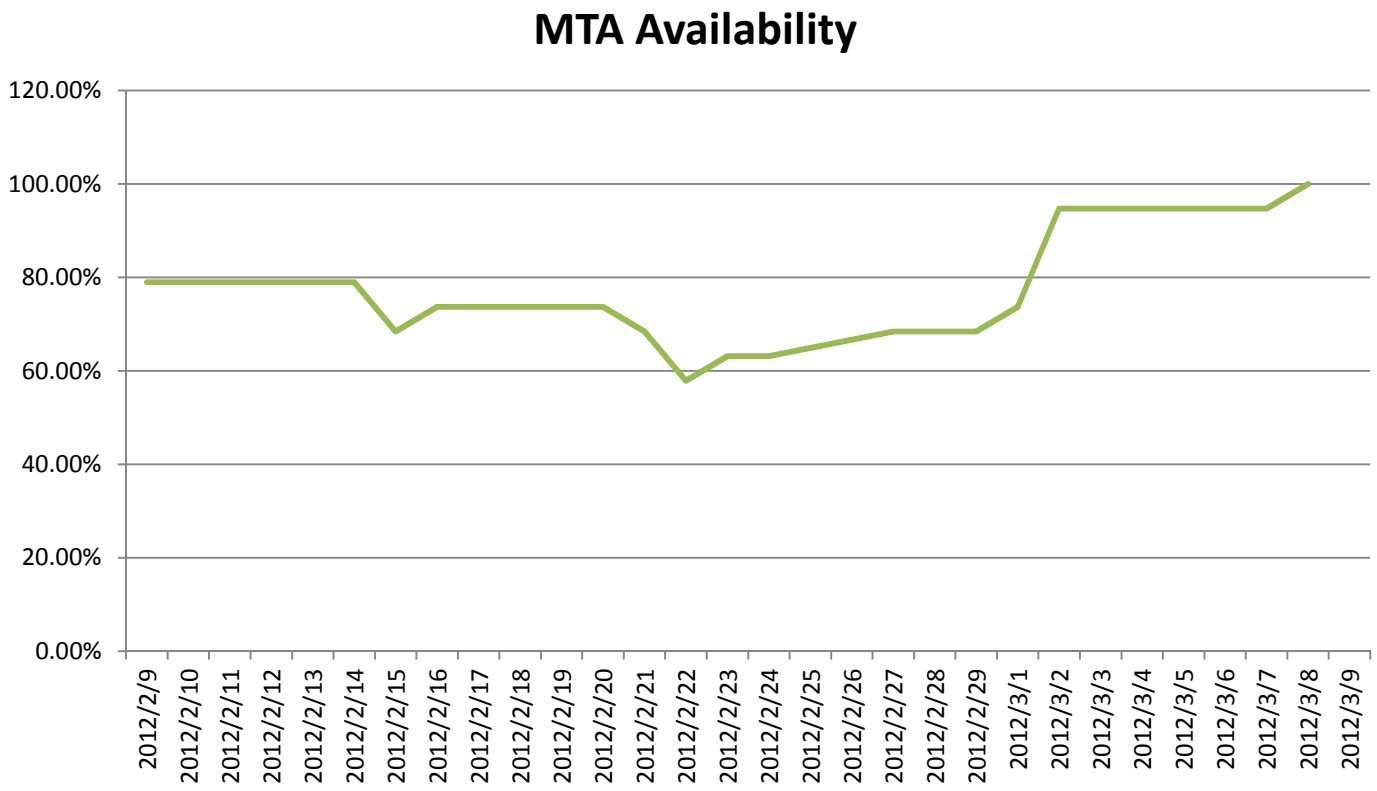
Composition of Replenishment Time

Production Lead Time vs. Production Response Time



7. Pilot Results

Trend Chart of MTA Pilot Availability



- SKUs with zero and 1day DIOH are dealt with as stock-outs
  - MTA Availability = 100% - % of SKUs in stock-out

7. Pilot Results

- Reduced time and effort for ordering
- Systemic ordering system can reduce human error.
- Responsive production
- Workload can be increased on a temporary basis, after that, capacity will be stabilized.
- Easy to understand priority on the MTA daily file
- The information on "what the WO is waiting for" should be updated properly – not only first operation but also other operations.
- Reduced expediting for SKUs under the pilot
- No need to do re-planning

7. Pilot Results (cont.)

- At first, still hectic operation remained, but gradually the flow (especially for the processes after first operation) became smooth
- We can expect that WIP inventory will be reduced.
- It seems like the total amount of production WO will be reduced to half.
- My real job as a manager became clear – up until now, I have been under fire-fighting.
- Visualized company as a whole

8. Roll-out Plan

- Address the learning from the pilot - What is Needed for Full MTA?
- Introducing groups of SKUs into the MTA mode of operation by product family
  - Each "Chunk" of SKUs can be considered as a "wave"
  - 3 waves are planned
- Checking the impact of every wave on the MTA performance
  - First Availability and then inventory level (through DIOH)
  - Make amendments and improvements as per BM analysis

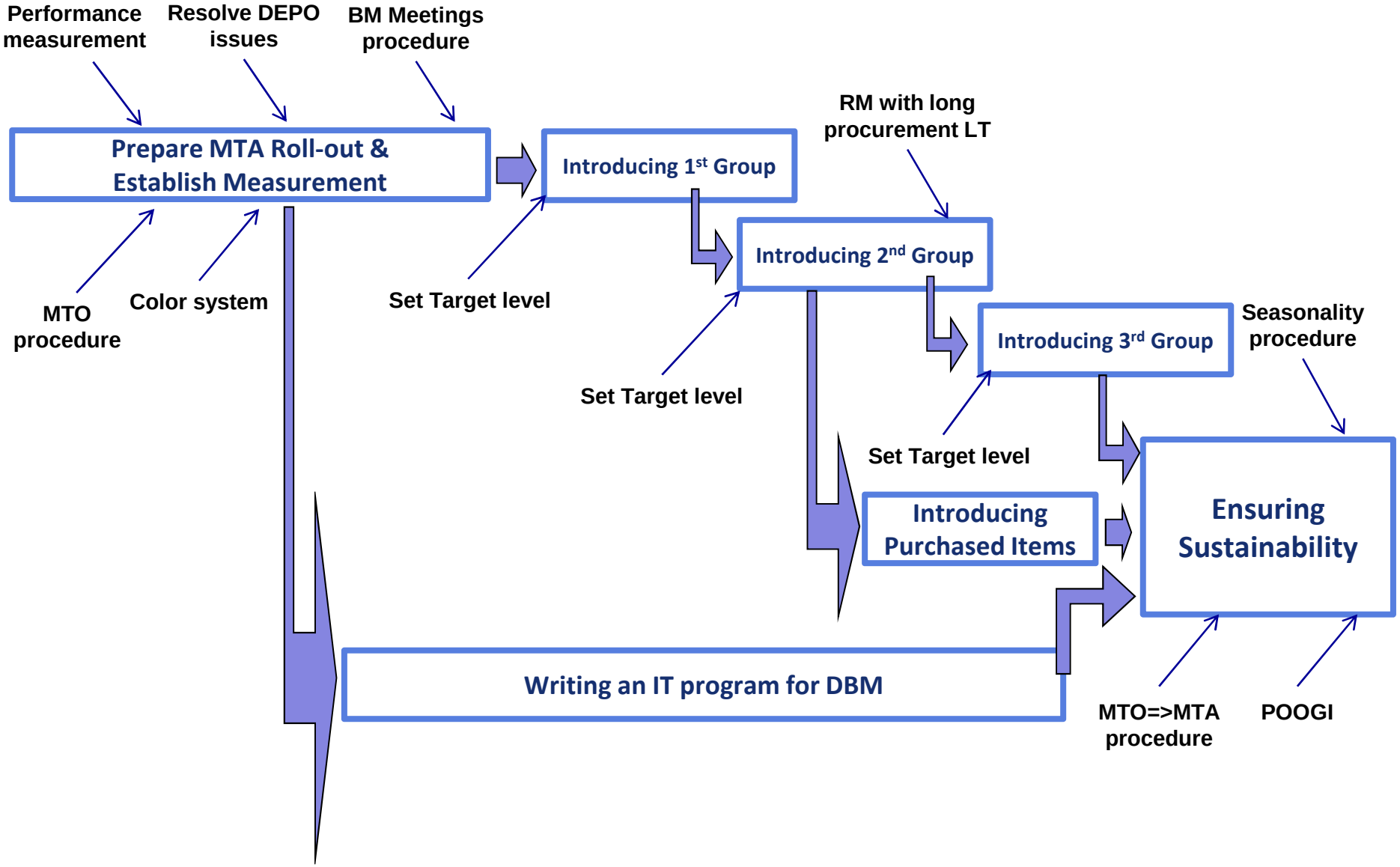
8. Roll-out Plan – What Else for MTA?

#	Issues/ Things that needed to be done	Action Items
1	Managerial procedures for performing DBM should be developed	Consider a purchase of Software and then make a technical decision on IT system
2	How to manage MTO orders?	Transfer the knowledge for MTO solution to core team. Then construct the PB file and develop a procedure for releasing MTO WOs
3	We should capture the quantity of production WO systematically	Provide the ability to retrieve the data from database
4	The supporting IT programs for coloring system on the WO file is needed	Production Director will construct the supporting IT programs
5	Mechanics/procedure for judge the priority between Red SKUs is needed	Use DIOH on the daily file, and then check and develop a procedure
6	Need to determine the way of handling the SKUs for DEPO users – dispatching process is batched	Ask the DEPO users the possibility to provide daily consumption data, then develop a mechanics accordingly

8. Roll-out Plan – What Else for MTA?

#	Issues/ Things that needed to be done	Action Items
7	There are a lot of released WOs issued based on the previous planning mode at the start of moving to MTA	All the released WOs for MTA SKUs should be cancelled and then PPC issues new WOs accordingly
8	Check and upgrade the procedure tested under the Pilot	PPC manager will make a documentation and get an approval from the president
9	How to handle the SKUs that need the RM with long procurement lead time?	Add the procurement time to the production time when determining the replenishment time for the SKU
10	Entering and dispatching from WH are not done by the day of the working day	Production provides one part-time staff to dispatch area in order to ensure entering daily dispatched and receipts
11		

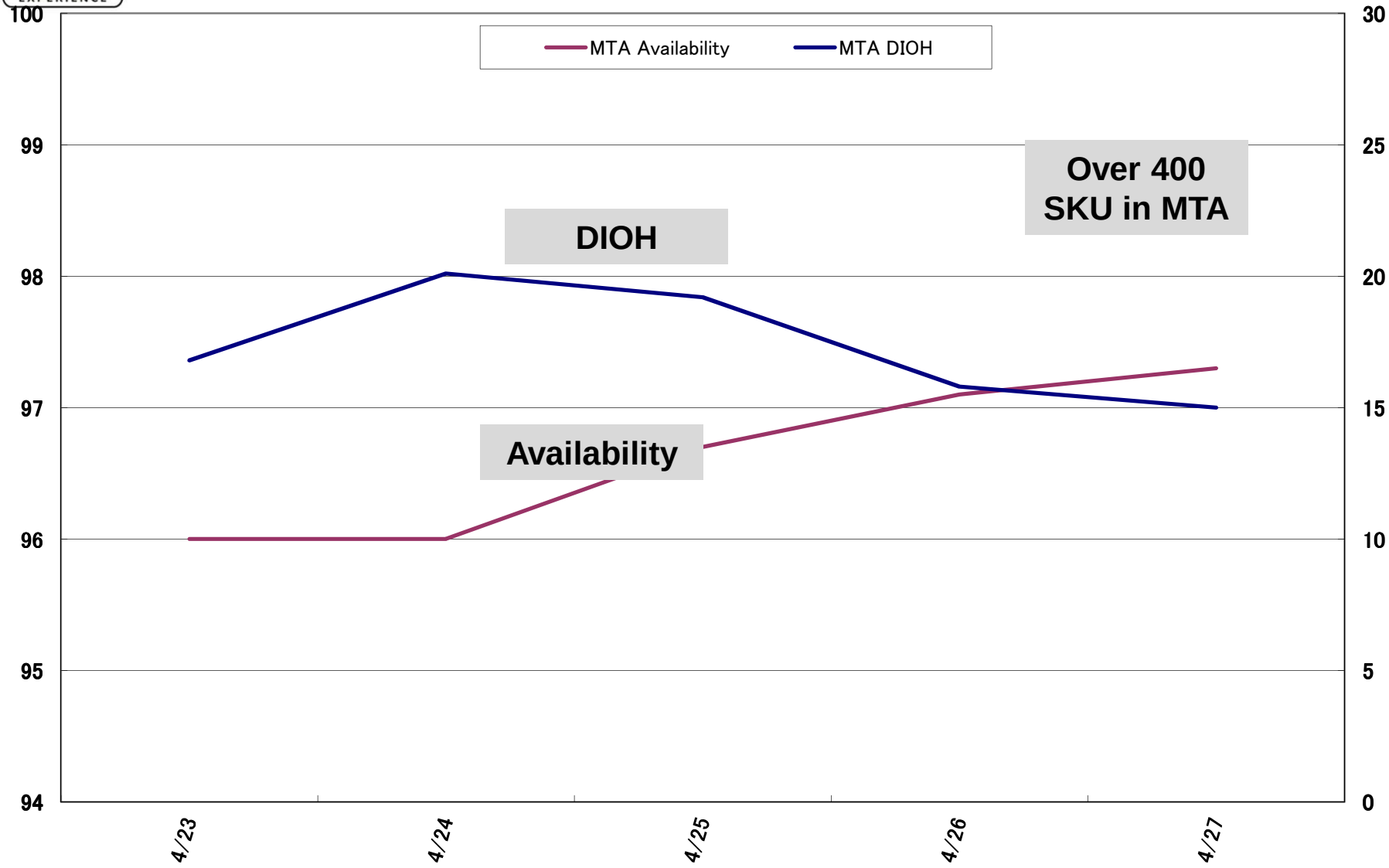
8. Roll-out Plan – Map



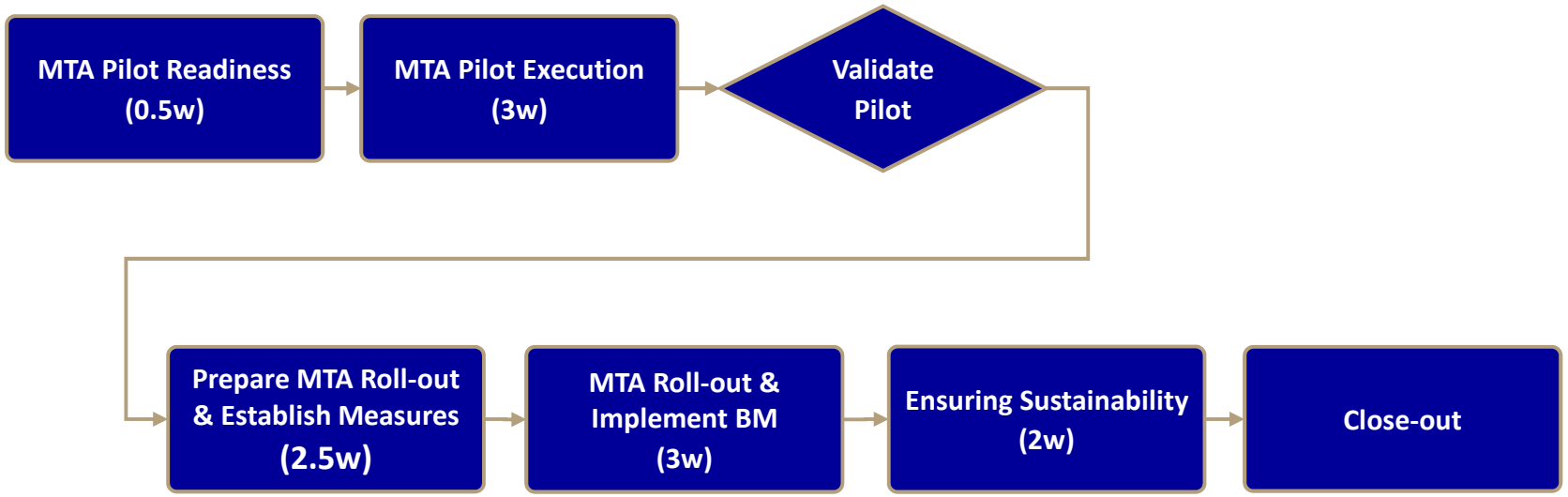
8. Roll-out Plan – Actions

- Upgraded the procedures – MTA Injection 2&4
- Developed the procedure for performing DBM
- Built the mechanics of linking MTA File with existing production control system – MTA Injection 3
- Developed the procedure – MTO Injection 2
- Resolved the issue on entering and dispatching from WH
- Selected new MTA items and set the target levels
- Explained the new rules to production people
- Wrote an IT program for DBM

9. Current Status – End April 2012



9. MTA Implementation Plan



Implementation Status – 2012/5/2