



23 7 2002

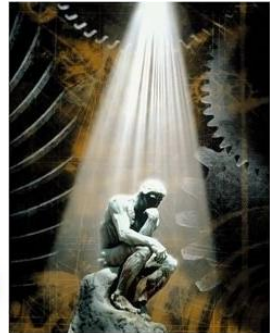
Common Sense Solutions

Clarehill Plastics



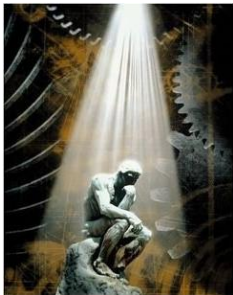
**Planning & Scheduling
Production**

Common Sense Solutions



June 17, 2008

Common Sense Solutions



Harlequin



1200ENV
Bundled Top Outlet
Plastic Oil Tank



1300ENV
Bundled Top Outlet
Plastic Oil Tank



PS1200ENV
Bundled Top Outlet
Plastic Oil Tank



PS1300ENV
Polyrock Bunded T/O
Tank - Sandstone



1450ENV
Bundled Top Outlet
Plastic Oil Tank



2000ENV
Bundled Top Outlet
Plastic Oil Tank



PS1400ENV
Polyrock Bunded T/O
Tank - Sandstone

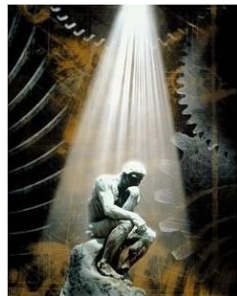


PG1400ENV
Polyrock Bunded T/O
Tank - Granite

<http://www.harlequinplastics.co.uk/site>

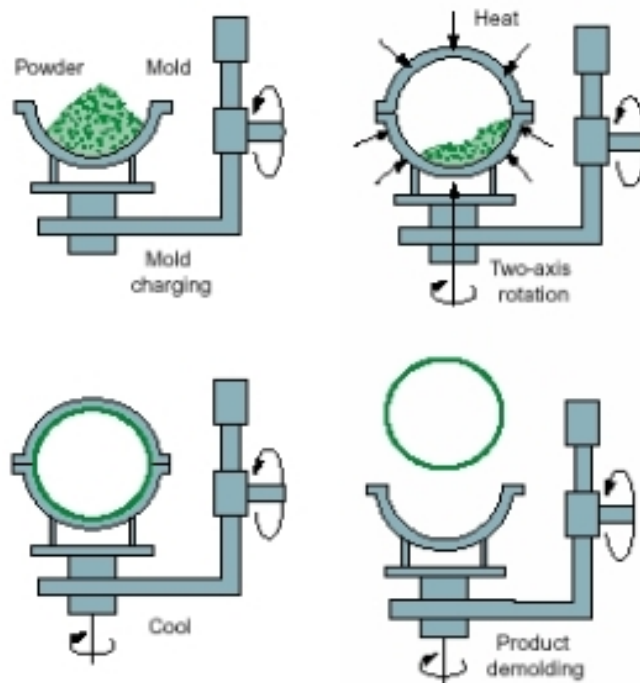
June 17, 2008

Common Sense Solutions

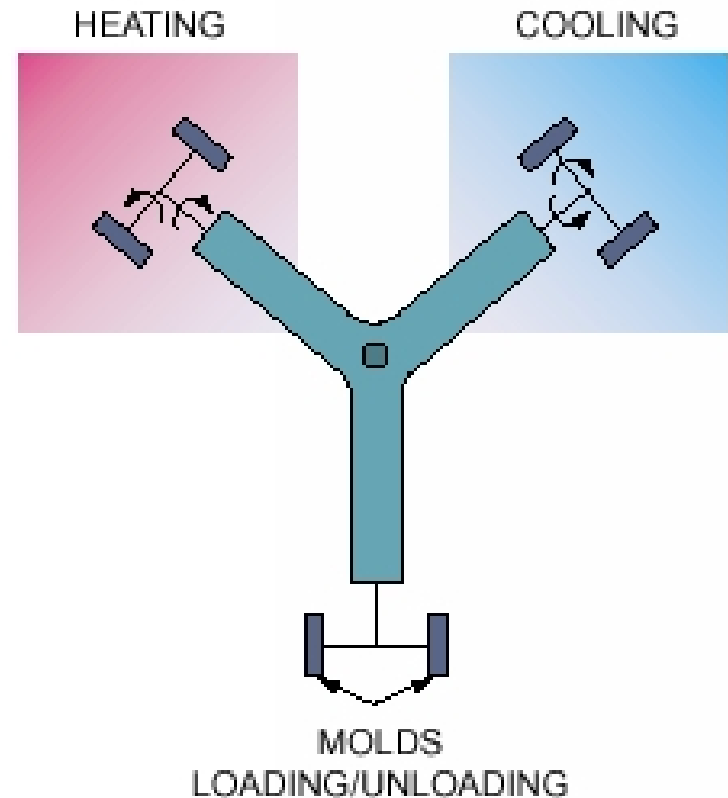


Rotational Molding

Rotational molding

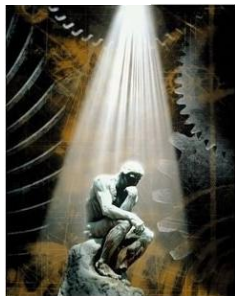


A premeasured amount of powdered or liquid plastic is placed in mold half. The mold is closed, transferred to the heating oven, and then on to the cooling station. During the entire heating and cooling process, the molds simultaneously rotate around two right-angle axes.



June 17, 2008

Common Sense Solutions

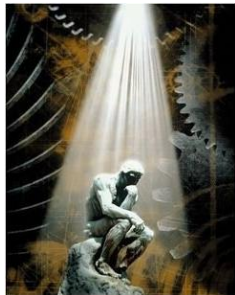


Assembly



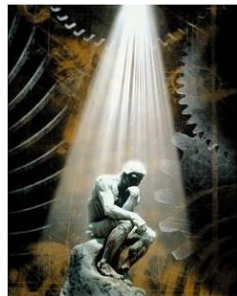
June 17, 2008

Common Sense Solutions

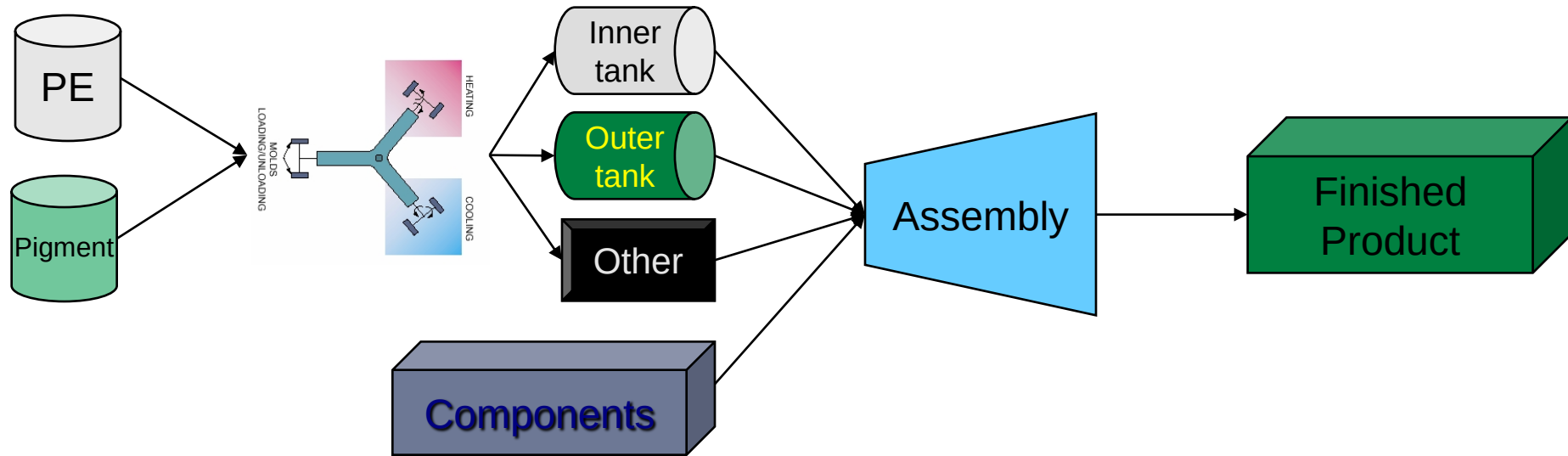
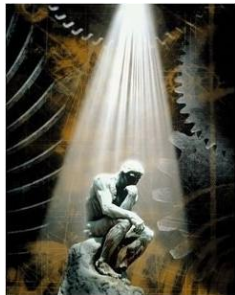


Value Chain

- Raw materials (Polyethylene, pigments ...)
- Components
- Production of inner and outer tanks
 - Many sizes 300l - 10000l
 - Different 'colours'
- Semi-finished stock
- Assembly (to stock and to order)
 - Create the 'bund'
 - Add the components - many variations
- Finished product stock

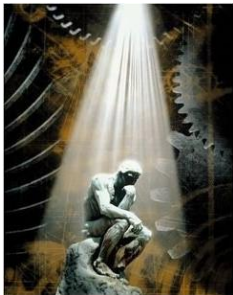


Value Chain Schematic



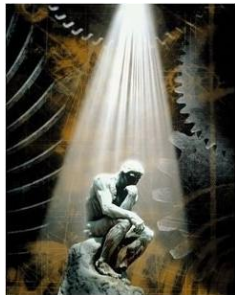
“Injections”

- Clarehill Priorities are:
 - **first** - to maximise “T” (Throughput)
 - **second** - to minimise “I” (Inventory)
 - **third** - to minimise “OE” (Operating Expense)
- We want a warning signal when our “T” is in danger
- Stock is limited by a fixed target to replenish to
- We have a mechanism to adjust inventory (target & safety) levels
 - To changes in demand levels
 - To changes in variability

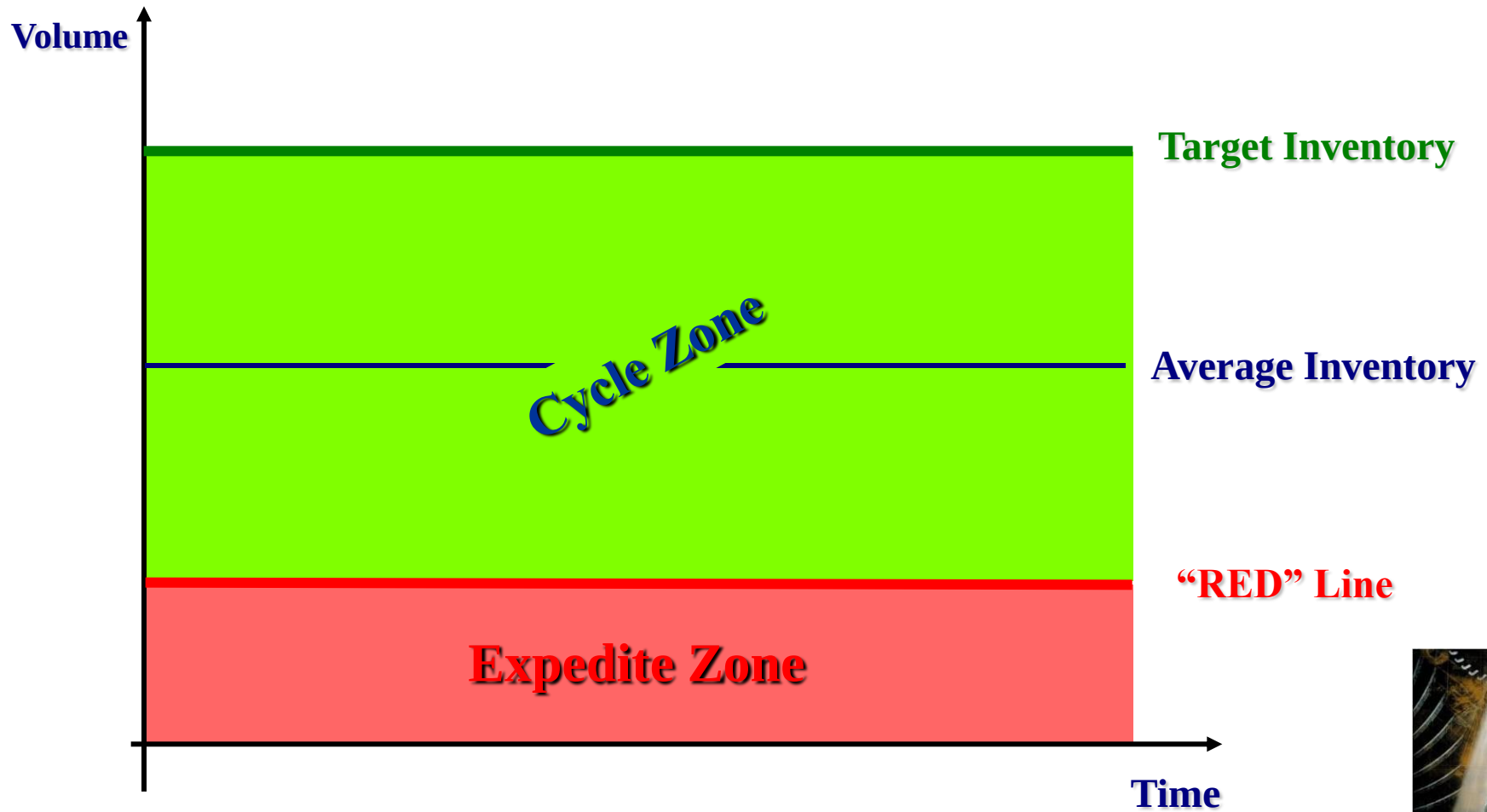


Cost of Implementation

- Initially we invest in some extra OE and I
- Normally we should expect equal or less inventory when stability is achieved
- Plan to never have zero inventory -
 - Otherwise, statistically we will lose “T” (Throughput)

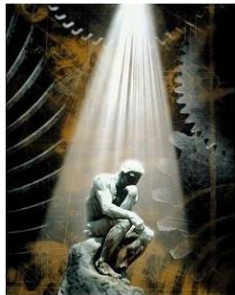


“Expedite” and “Cycle” Zones



June 17, 2008

Common Sense Solutions



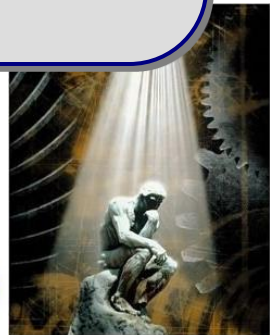
First our Expedite Zone must be **BIG** Enough



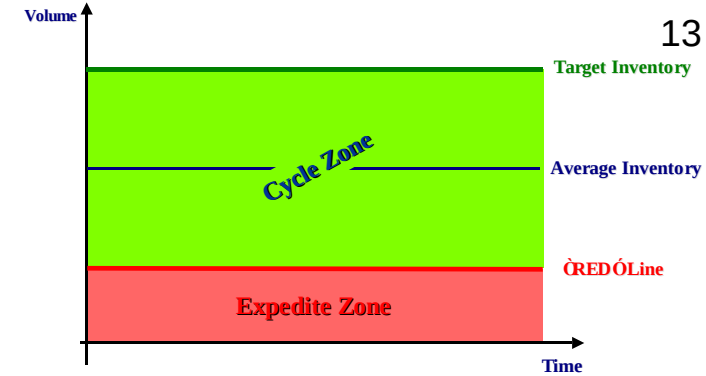
WHY?

We are protecting **Throughput**. If the expedite zone is too small we risk lost sales
(shortages at clients).

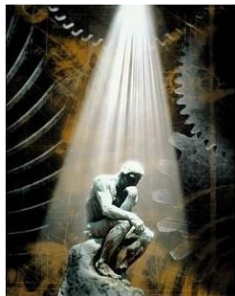
Common Sense Solutions



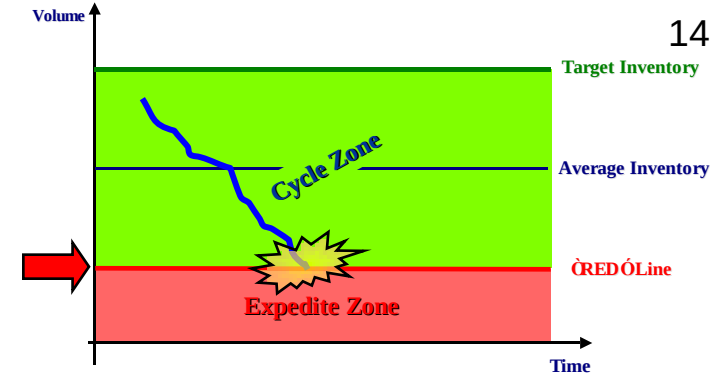
Expedite Zone Rules!



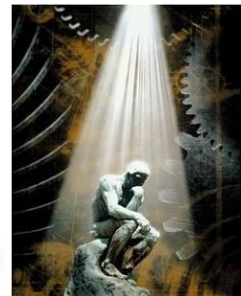
- If we cross the **red line**, spend money to recover
 - by expediting.
- Cost of expediting is money invested to achieve the solution.
- Since I cannot have unlimited inventory, I must trade off between inventory & expediting.
- Depending on how easily a business can expedite this Zone will vary in size.



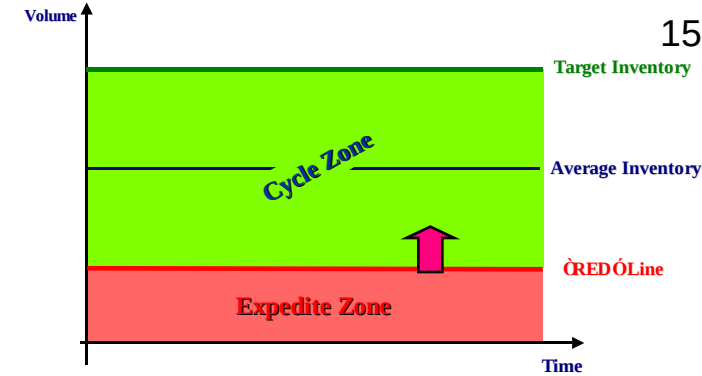
Size of the Expedite Zone



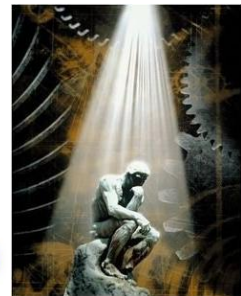
- Since we don't know, start with an educated guess.
 - Zone size corresponds to the time for replenishment - Expedite zone inventory equals about 1.5 times the demand during the time it takes for an expedited replenishment
 - A knowledgeable person defines this number for every SKU. He needs to be only approximately correct - our adjustment mechanism will correct the level later
 - Start running the system immediately



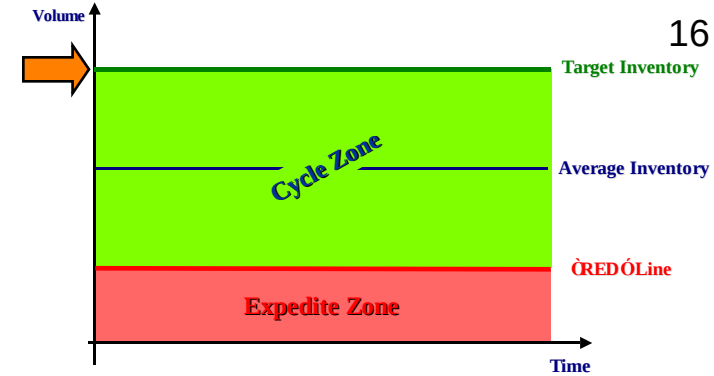
Sizing the Expedite Zone



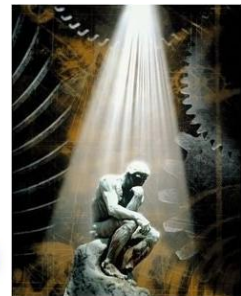
- In the beginning check only if the Zone is too small!
 - Each SKU has its own expedite zone. As we move forward in time each SKU gets an expedite zone in relation to its circumstances
 - Adjust the size until we get no more stock-outs
 - Whenever the red line is touched - **expedite**
- **Result:** Expedite zone is not too small - it might be too big.
- We are following our priority - protect Throughput.



Establishing “Cycle” Inventory

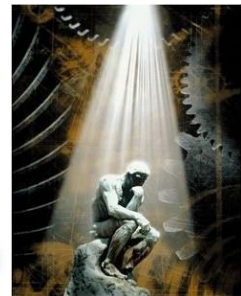


- **Target inventory = Buffer Level**
- Again we have to make an educated guess:
 - **“Paranoia demand”** = that possible demand we want to be able to cover between replenishments.
 - **“Paranoia demand”** = the peak demand we can expect between replenishments - without considering peaks caused by once in a lifetime occurrences
 - What happens if we guess wrong?

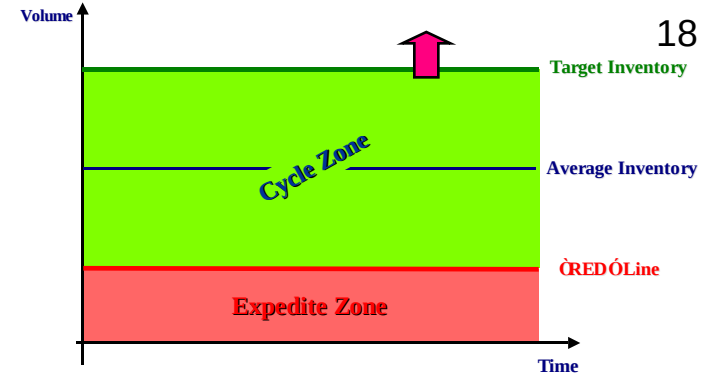


What if I Guess Wrong?

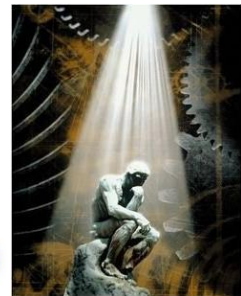
- Either
 - I will have too much inventory
 - or**
 - I will have extra expenses because of excess expediting.
- We will reduce expediting first - the need for expediting indicates that I am putting Throughput at risk. (Remember our priority!!!)



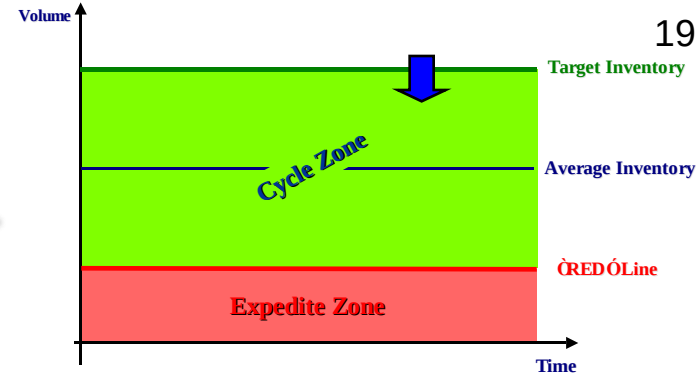
Reducing Expediting



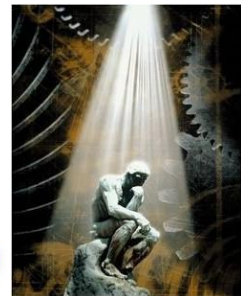
- Increase target inventory of SKUs until each one has a maximum of about 1 penetration per month. Worry if there are 2, increase target inventory if there are 3 or more.
- If we have a penetration into the expedite zone in a month - look back 1 month; if there is also a penetration in that month then increase target inventory by x% (by SKU).
- When inventories are stable e.g. when expediting is down to the level of OE I want; then we can attack those inventories that are too high!



Reducing Cycle Inventories

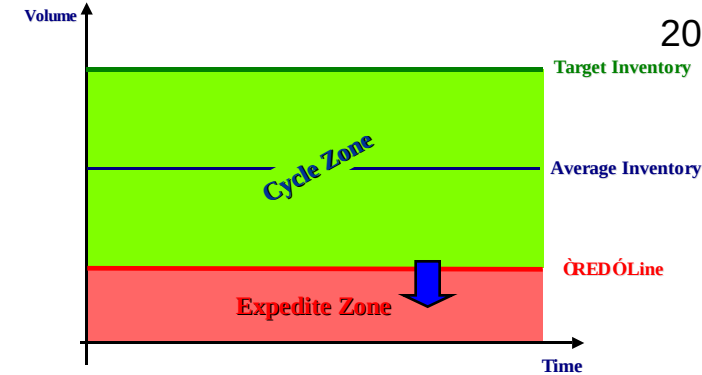


- **Candidates** are those SKUs that have not penetrated into the expedite zone.
- To decide which ones to reduce:
 - Take those SKUs with the highest ratio of average inventory to target inventory, or
 - Or look at the minimum inventory by SKU and take those which are furthest above the red line.
- Reduce inventory targets of the chosen SKUs in (not too) small increments until we start to get penetration into the expedite zone.

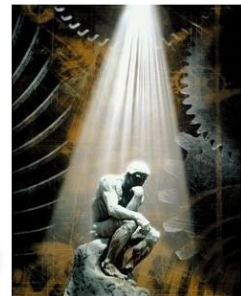


Reducing Inventories

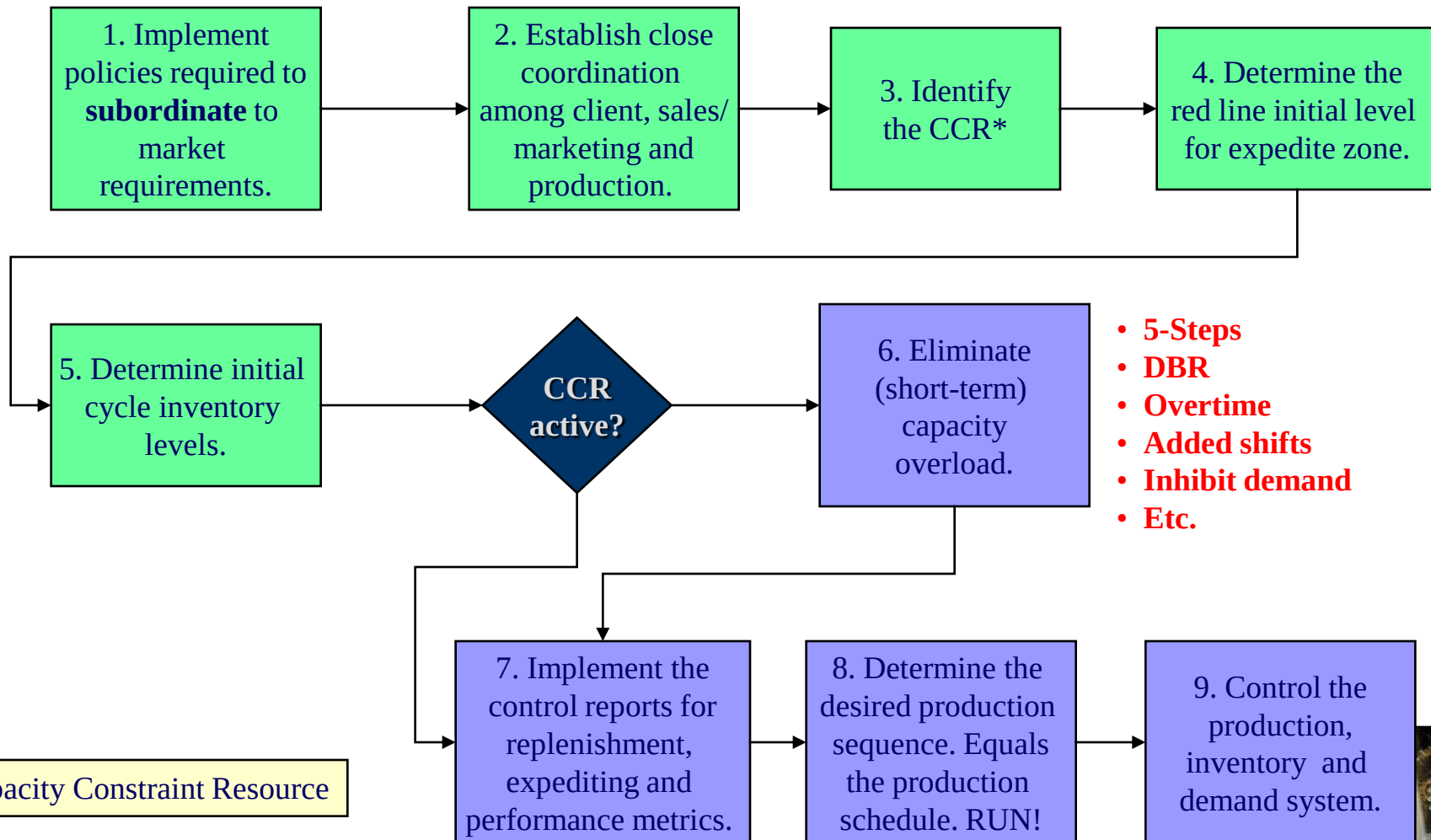
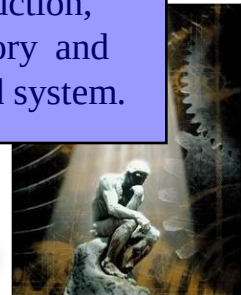
(expedite zone)



- **Candidate** SKUs are only those that already have crossed the red expedite line!
 - If expedite zone penetration at the time of replenishment is far from a stock-out - reduce the expedite zone.
 - Reduce in small increments - but don't be hysterical
 - If we start with a hysterical number (for the expedite zone) then it will take a very long time to get its to the right level.
- Other SKUs will eventually start to penetrate the Expedite zone due to the mechanism of reducing the Cycle zone.
- Make 1 person manage expedite zone and another for the the Cycle zone.

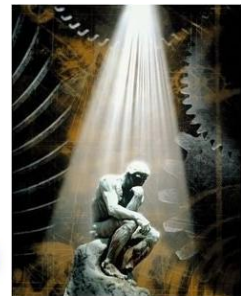


The Replenishment Solution Implementation

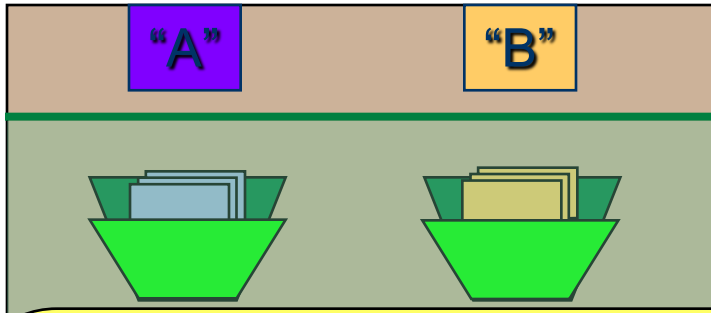


A Manual System

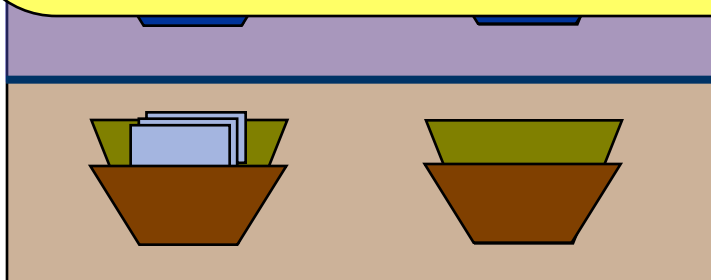
- For each article stocked in the Clarehill yard create
 - The initial target to replenish to
 - The initial expedite line
 - A 'Board' for the warehouse people to control inventory levels:
 - Reduce stock levels as a product is shipped
 - Inform manufacturing how much they need to produce to get back to Target
 - Inform manufacturing when an expedite is necessary
 - Provide information to management to adjust Target and Expedite (RED) levels



The Warehouse Board

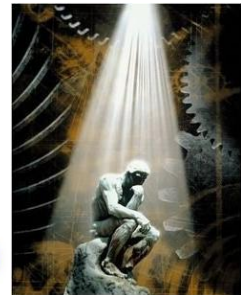


**65 Products (there were about 50)
represent a wall of about 8 meters using
12cm per product.**



In Production

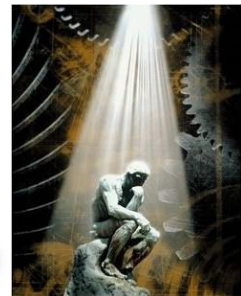
Common Sense Solutions



QuickTime™ and a
decompressor
are needed to see this picture.

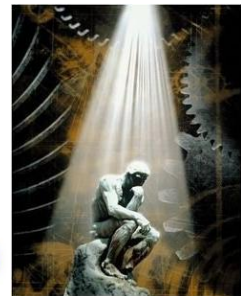
June 17, 2008

Common Sense Solutions



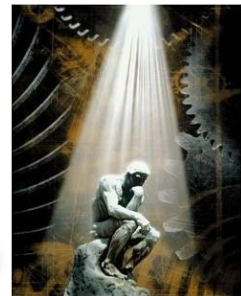
Warehouse Board Rules

1. The total of cards in a product column must equal the **Target**
2. As product is shipped shipping personnel moves cards from the Green and Red zones to the blue 'shipped quantity' pigeonhole.
 - Always empty the top pigeonhole 1st
 - Work towards the bottom
3. If you must ship from the **Red Zone**, production must be immediately notified to produce that product
4. As production decides to produce a product, they produce as many as there are cards in the 'shipped quantity' pigeonhole(s), & move cards to 'In Production'
5. The amount in the shipped quantity pigeonhole is used to determine whether or not the Target can be reduced (= penetration into cycle stock)
6. As produced units are delivered to the warehouse (yard), the number produced is placed in the red & green pigeonholes (filling the lower pigeonholes first)



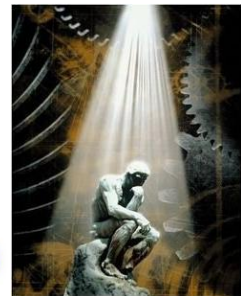
Control

- Production management and inventory control:
 - Plots the inventory levels of all products relative to their Targets, Red line and stock out lines.
 - If a product has stock-outs consider raising the Red Line (and the Target by the same amount)
 - If a product has frequent Red Zone incursions - increase the target.
 - Stock levels can be determined daily from the cards in the Blue pigeonhole. (not essential)
 - Whenever production produces a product the amount produced indicates the stock level just before production start.
 - If this stock level is always significantly above the RED line, decrease the Target.
 - After several incursions into the Red Zone with no stock-outs it may be clear that the Red Line is too high - lower both it and the Target by the same (small) amount.



Performance Measurements

- **Reliability**: We do what we are supposed to do.
 - **Never, ever** delay a shipment! Always ship by the due date!
 - $(\text{Sales Value}) \otimes (\text{Number of Days Late})$
- **Effectiveness**: We do **not** do what we are **not** supposed to do!
 - **Never** have excess inventory!
 - $(\text{Excess Inventory Value}) \otimes (\text{Number of Days in Stock})$
 - $\text{Excess Inventory} = \Sigma (\text{of inventories above target})$
 - Target is managed by: _____

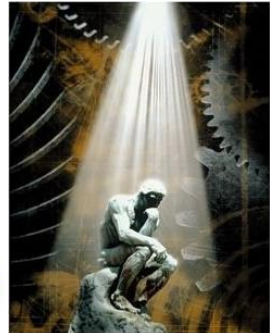


Visual Production & Inventory Control



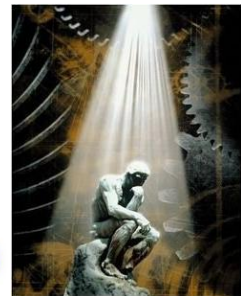
Implementation
Actions

Common Sense Solutions



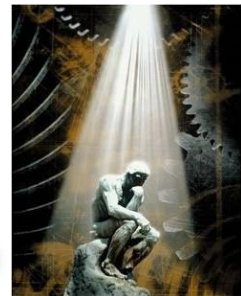
The Clarehill Constraint

- **Identify the Constraint:**
 - The market place - demand is not filling our capacity.
- **Decide how to exploit the Constraint:**
 - We will operate in a way that no customer must be turned away because a product is not immediately available.
 - MTS products are always in stock
 - MTO products have a short lead time; have priority in production
- **Subordinate everything else to the above decision.**
 - Production
 - Supply Chain
 - Measure operations on how well the exploit decision is achieved
 - ...



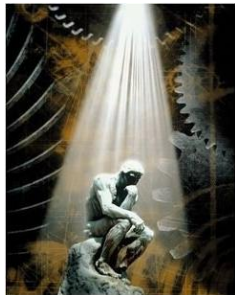
Decide the Target Levels

- Reliable time between production runs (re-stocks)
- Average and **peak demand** for each product
 - For the time period between production runs
 - Peak is the demand you want to be able to meet
 - NOT once in a lifetime occurrences
 - For that we have the **Red** line AND customers often don't want everything at once.
 - Don't be too scientific - the process will adjust to reality



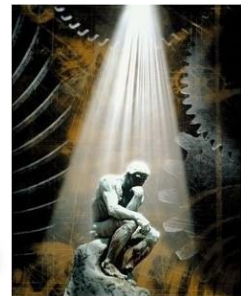
Decide the Inventory Strategy

- Decide:
 - Make-to-Stock product list (high volume, growth, strategic products).
 - Make-to-order product list (low volume ...)
 - Stocking policy of non-standard colour products
 - Coal bins
 - Orange tanks etc.
 - Decide stocking rules for products with multiple versions from the same base tank.
 - Service level by product category - lead-time, availability.
- Deliverable:
 - Everyone knows what must be in stock and what is MTO - and therefore never in stock without a customer order against it.



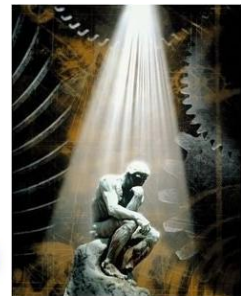
Decide the Target & Red-Line Policies

- Decide:
 - Targets will **NEVER** be exceeded
 - When a product is produced it is produced always to target
 - The **RED** line means production **MUST** expedite the product to stock. (We are in danger of missing a sale or being late to a customer).
 - Targets will be adjusted according to how close inventories come to the **RED** line just before replenishment.
 - RED line will be adjusted similarly - when we gain experience with expediting a product.



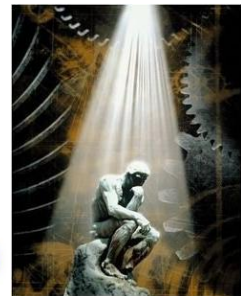
Build the 'Wall' (1 per machine)

- Enough 'pigeon holes' for all MTS products
 - Reserve?
- Decide the colours - green zone, (yellow zone?), red zone, blue zone to collect 'shipped' cards, brown zone for cards 'in production'?.
- Make sure cards are visible in each pigeon hole
 - So we can see when a zone is empty (Especially red, or yellow)
- Decide where to locate the 'Walls'
 - Near the supply chain people?
 - Near production?



Training

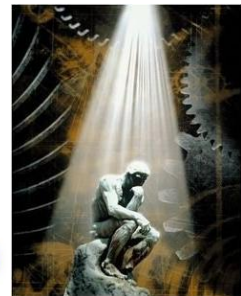
- Train (What and Why!!)
 - Everyone to subordinate to the constraint
 - Supply chain people to use the wall
 - Production to get production orders from blue pigeon holes
 - Production control to update Navision according to 'the Wall'
 - Inventory control to update control charts (Navision?, Excel)
 - Inventory control to adjust targets and RED lines.



What Happened?

- Inventories down significantly.
- Service up (T&E Days very low)
- To exploit the market Clarehill introduced many new products and variations
- Wall became unwieldy
- Wall also cannot do 'everything'

⇒⇒⇒ Build an electronic version of the Wall.



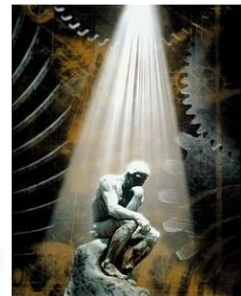
The “Electronic Wall”

Date 2-Jul-07

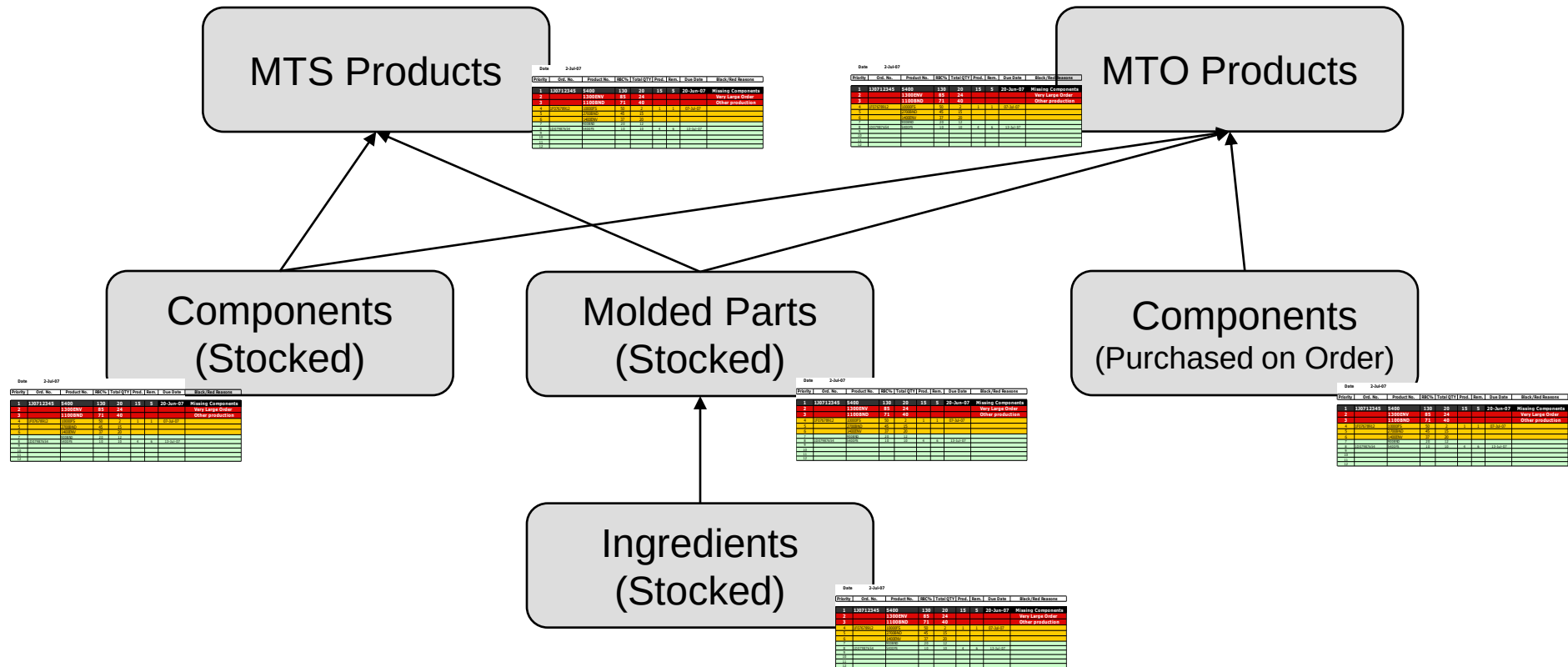
Priority	Ord. No.	Product No.	RBC%	Target	Total QTY to Produce	Prod. / Inv	Rem.	Due Date	Black / Red Reasons
1	1J0712345	5400	130	0	20	15	5	20-Jun-07	Missing Components
2		1300ENV	85	28	24	4			Very Large Order
3		1100BND	71	56	40	16			Other production
4	1F07678912	10000FS	50	0	2	1	1	07-Jul-07	
5		2700BND	45	33	15	18			
6		1400ENV	37	54	20	34			
7		900BND	20	60	12	48			
8	1D07987654	5400FS	10	0	10	4	6	13-Jul-07	
9									
10									
11									
12									

June 17, 2008

Common Sense Solutions

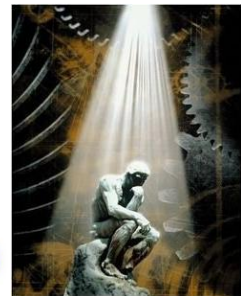


Bill of Materials



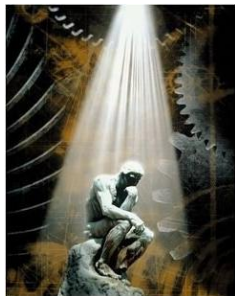
June 17, 2008

Common Sense Solutions

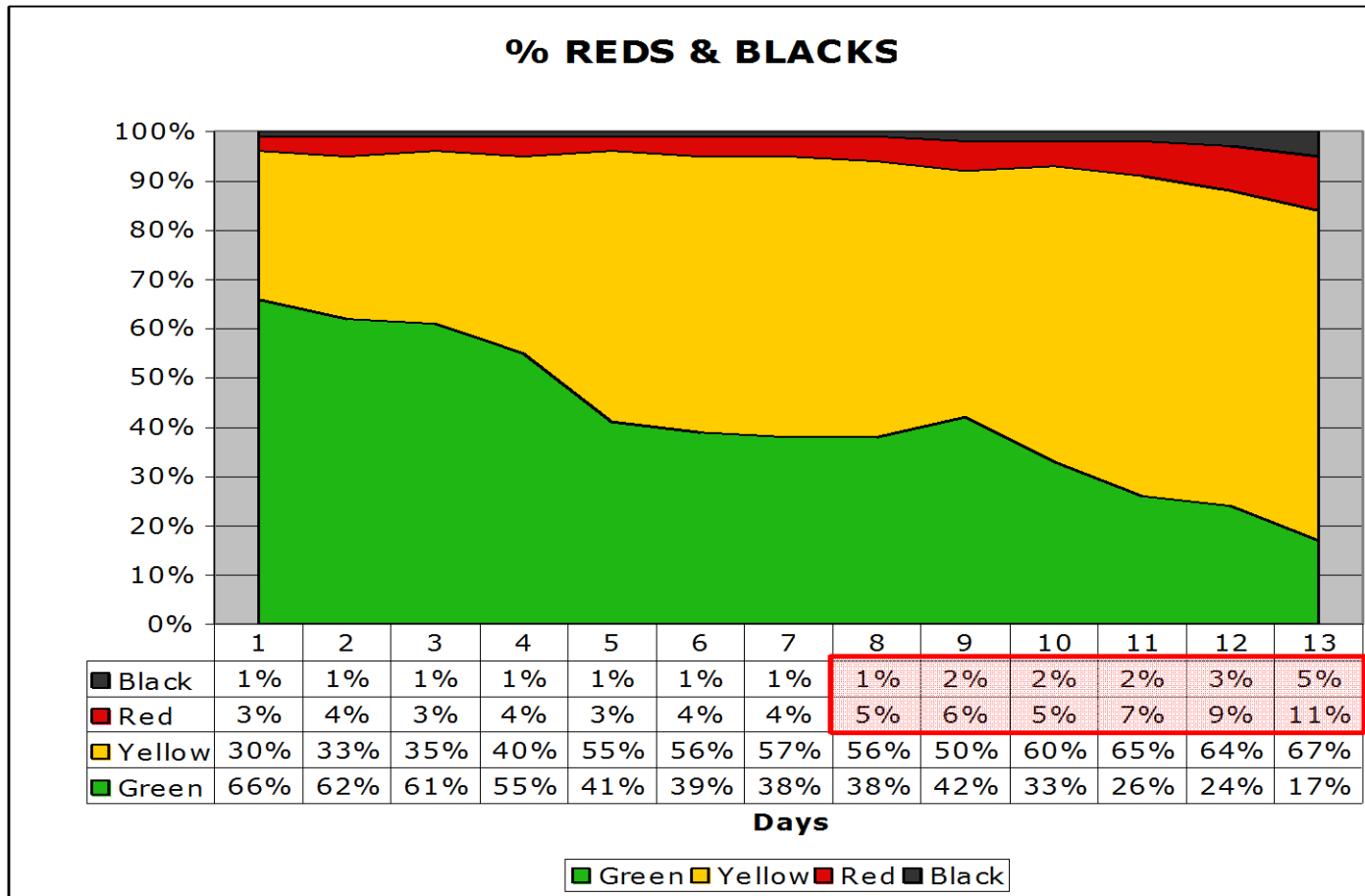


Other Components to be Implemented

- T£Days and I£Days - Daily
 - Reliability and Effectiveness
- Managing the Target Level
- Planned Load / Capacity Management
- POOGI
- Possibly Distribution ...
 - Clients
 - Suppliers

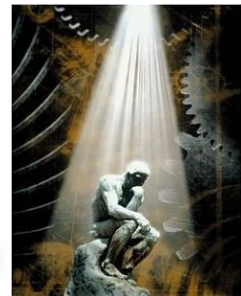


Capacity Management



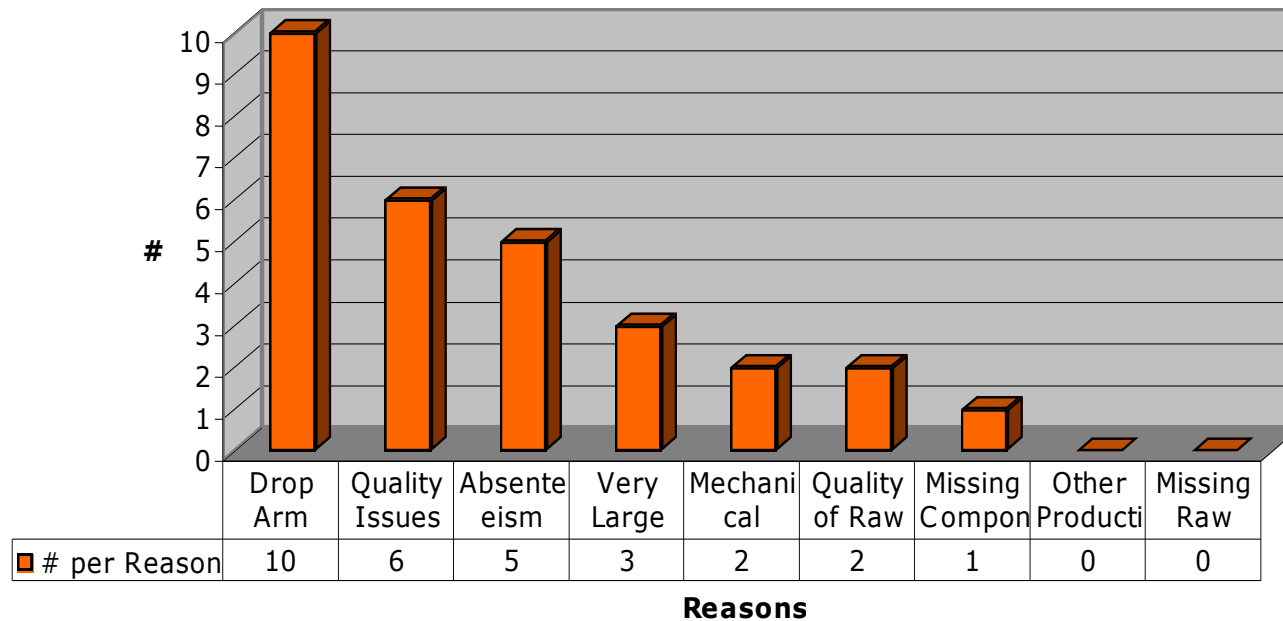
June 17, 2008

Common Sense Solutions



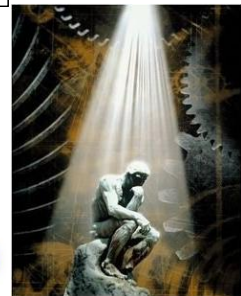
POOGI

Reasons for Black & Red (1 month)



June 17, 2008

Common Sense Solutions

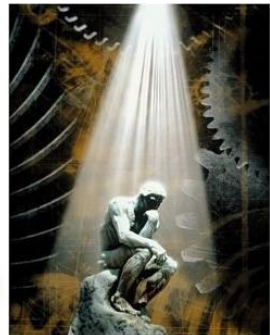


Questions???



?

Common Sense Solutions



Common Sense Solutions



Common Sense Solutions

Rudolf G. Burkhard

Essex House

CH-1187 St. Oyens

Switzerland

Tel: +41 21 828 4051

Mobile: +41 29 413 5709

Email: csstw@bluewin.ch

Common Sense Solutions

