John Hall, Plant Logistics Manager, CNH Wichita Skid Steer,
Compact Track Loader Operations

The development of World Class Manufacturing

WCM was developed by Fiat and partnering firms in 2005. Hajime Yamashina, Professor Emeritus at Kyoto Universality in Japan, played a key role. From the outset, all Fiat-group companies took part in the new journey towards operational excellence. Consequently, WCM was launched in Fiat's automobile and powertrain divisions, in Maserati, in Lancia, in Alfa Romeo, and so on. The Fiat-owned companies CNH (manufacturer of Case agricultural equipment and New Holland tractors) and the truck- and engine manufacturer Iveco also use WCM as their XPS. In fact, today, companies as varied as the Royal Mail Ariston (manufacturer of white goods), Unilever (consumer goods), Atlas Copco (industrial tools), Barilla (pasta) and 12 different transportation companies reportedly use the WCM concept.

The Chrysler Group joined the WCM when Fiat acquired majority shares in 2009 (as a consequence of the financial crisis driving Chrysler to bankruptcy). Today, Chrysler is known as *the Comeback Kid*. The incredible transformation is partly credited the WCM as a change program. A stronghold of choosing WCM as an "off-the-shelf XPS" is that companies that join, get the benefit of a world class benchmark from the other participating companies. Today, 166 manufacturing plants in 16 countries are active partners in the worldwide WCM Association. 30 of these are Chrysler plants, whereas 45 belong to Fiat.

WHAT IS WCM?

- WCM is a proven **continuous improvement** methodology
- Helps **prioritize resources** to attack problems and losses
- Aims to achieve safe, sustainable manufacturing processes with **ZERO loss** and **ZERO defects**

WCM PILLARS

TECHNICAL PILLARS

MANAGERIAL PILLARS

Williams	Powell	Vasankumar	Freud Horsch	Schulte	Davenport	Hall	Burkholder Hutchison	Strodtman	Callaway
Management Commitment	Clarity of Objectives - KPI	Route Map to WCM	Allocation of High Quality People	Commitment of the Organization	Competence of the Organization	Time & Budget	Level of Detail	Level of Expansion	Motivation of Operators

SAFETY

SAFETY IS PARAMOUNT

- **PREVENT** safety hazards
- **PROTECT** the workforce from risks and injuries
- **PRESERVE** safe working conditions always

WCM aims towards **ZERO** unsafe acts and **ZERO** unsafe conditions

COST DEPLOYMENT

This is WCM's Compass for all pillars

- Provides clear **Direction** towards top losses
- Helps **Prioritization** of resources for **maximum benefit**
- Tracks **Progress** of pillar projects and financials

FOCUSED IMPROVEMENT

Technical Pillar for **FOCUSED** Projects

- Work with a clear scope on a **Specific** problem
- Focused projects generally use **specialized** tools for specific problem solving

WORKPLACE ORGANIZATION

Pillar for workplace design to attack

- **MUDA** – Waste (Overproduction, Inventory, Wait time, Motion, Transport, Rework, Over-processing)
- **MURI** – unreasonable burden
- **MURA** - variation, inconsistency

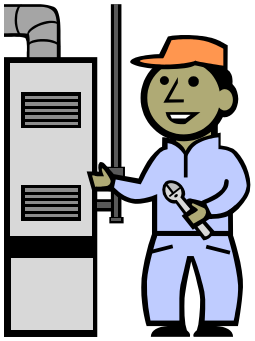
Utilizes most of the IE tools to identify, measure and provide solutions to problems

AUTONOMOUS MAINTENANCE

Pillar that ensures daily basic conditions

- Cleaning and inspection **Calendars**
- Daily **workstation level** checks
- Works towards high **Equipment Efficiency** and **Effective Performance**
- Emphasizes on **operator-ownership**

PROFESSIONAL MAINTENANCE



- **Periodic maintenance** of machine and equipment by skilled professionals
- Aims to increase the time between failures of equipment (**MTBF**) and reduce repair time (**MTTR**)
- **Prevent** losses due to machine **breakdowns**

QUALITY CONTROL

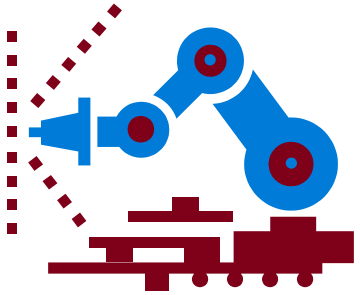
- Gate keeper for **Standards**
- From start to finish, ensures products meet **customer requirements**
- Works towards **ZERO Defects**
- Ensures customer quality **satisfaction**
- Utilizes highly specialized tools for **analysis** and quality **assurance**

LOGISTICS

Pillar responsible for making parts available

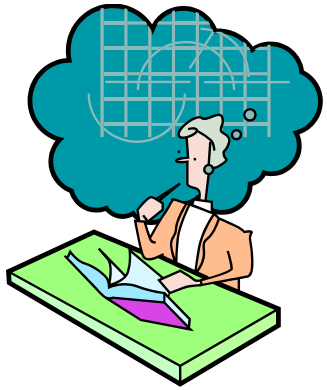
- at the right **location**
- at the right **time**
- in the right **manner** that meets **customer requirements**
- Safe, efficient and cost effective methods of logistics are vital to any mfg. environment

EARLY EQUIPMENT MANAGEMENT



- Based on **experience with existing equipment**, ensure procurement of **new equipment** that are engineered to **meet requirements** for safety, reliability and easy maintenance
- Generate **checklist** items that would be useful for new equipment procurement

EARLY PRODUCT MANAGEMENT



- Driving design for manufacturability, to make advancements in safety, quality and customer care
- Based on **experience with existing product**, ensure **future designs** address concerns and accommodate changes based on customer **feedback**
- Continuously improving product design for **market competence** and customer satisfaction

PEOPLE DEVELOPMENT

- Creating **Exceptional** people
- Impart state of the art **training** and **development** to create a strong workforce
- Facilitate **knowledge sharing** and creating **best practices** throughout the journey of continuous improvement

ENVIRONMENT

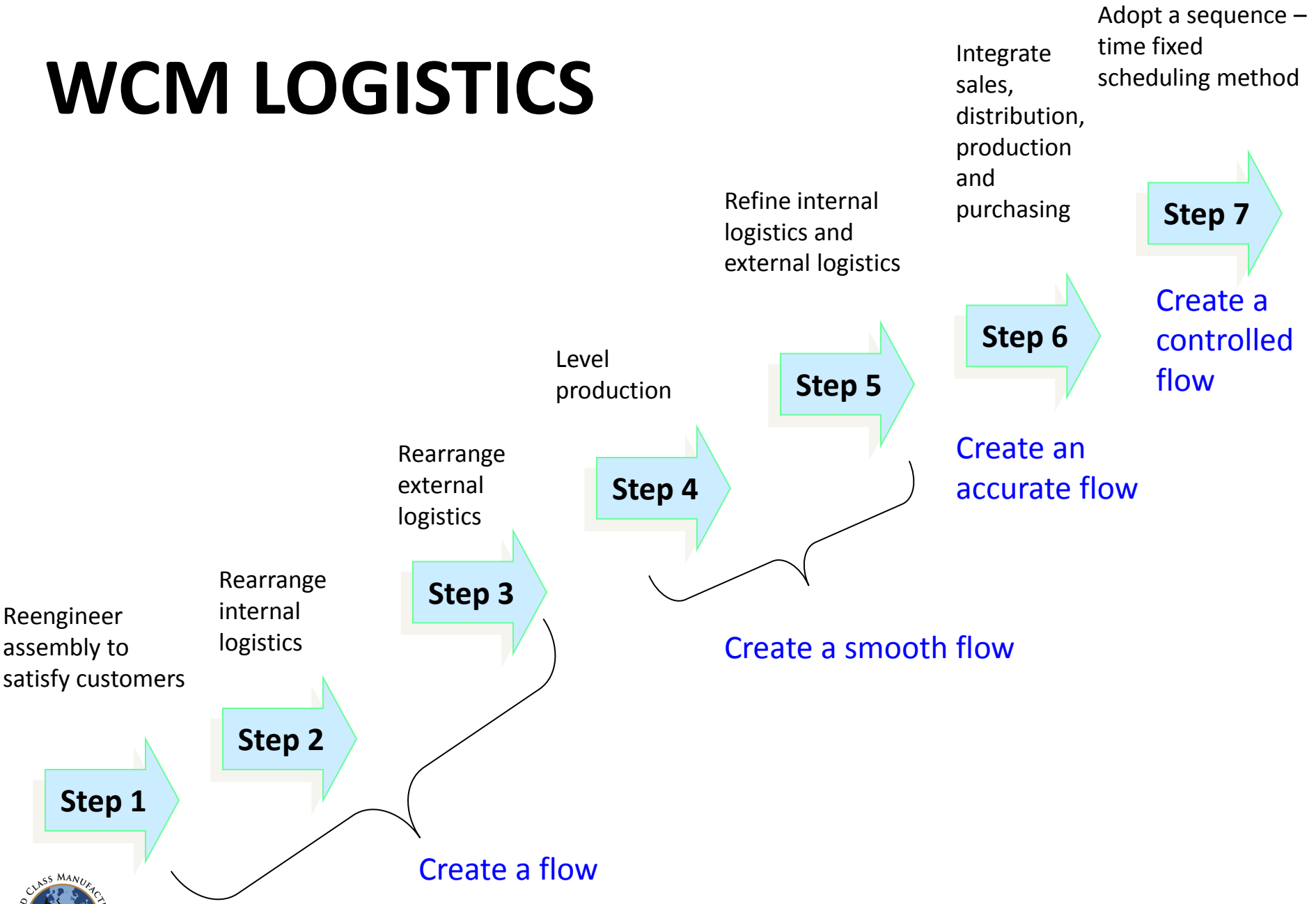
- Ensuring our responsibility towards the environment and its **preservation** for future generations
- Continuously pursuing **ZERO WASTE** philosophy through reuse and recycle mechanisms
- Prevent all **Environmentally unsafe acts** and **conditions** throughout the facility
- Create a sense of **awareness** among other partners

FOUR PHASES OF LOGISTICS

The flow must be short and simple !

Improvement from big movements to small movements gradually.

WCM LOGISTICS



PHASE 1 : CREATE A FLOW

[Broad standardization and synchronization]

a) Establishment of the concept of overall logistics and design of logistic network. (Customers and suppliers inclusive)

b) Design of external logistics and establishment of routes for scheduled transportation (min. : 1/day).
(Fixed time, variable quantity → fixed time, fixed quantity)

c) Layout change for internal logistics.

d) Arrangement of the places of products and parts and stores, the ways items are packed. (Container, packaging shape, size, the number of items stored in a container, easiness to identify items)

e) Use of kanbans.

f) Use of the water strider method.

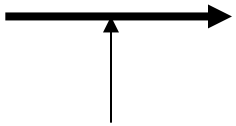
WORK PLACE ORGANIZATION

a) Improvement of assembly line layout (Simplify)

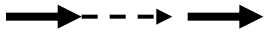
b) Making the assembly line short

c) Leveling daily production

d) Connection of the sublines to the assembly lines.



Putting sub assembly lines into lines as much as possible.



e) Following the pull principle.

TO START:

3S

1. Seiri (Abandon the unnecessary)
2. Seiton (Putting things in order)
3. Seiso (Keep tidy and clean)

5T

1. Tei-ji
2. Tei-ichi
3. Tei-hyouji
4. Tei-ryou
5. Tei-shoku

SEITON: 5T (TEI-JI, TEI-ICHI, TEI-HYOUJI, TEI-RYOU, TEI-SHOKU)

- Tei-ji : Fixed route (where to pass?)
  In order to create a flow of products, information, equipment and/or people
- Tei-ichi : Fixed place (where to put?)
  In order to determine the place to put and take things easily, quickly and surely
- Tei-hyouji : Standardized display (where is it, what is it, what/how to do?)
  In order to let everybody understand easily places, articles, what/how to do
- Tei-ryou : Fixed quality (How much?)
  In order to control quantity of articles
- Tei-shoku : Standardized colors (How to distinguish?)
  In order to prevent errors by using colors

PHASE 2: CREATE A SMOOTH FLOW

Making a flow capable to cope with change

Logistics

a) Reorganization of logistics points to shorten the line of logistic flows.

b) Re assessment of “purchase” or “make in-house”.
Try to produce products of small quantity in-house.

c) Reorganization of stores and level production.

Work place organization

A. Improvement of setup operation.
B. Connection of lines. Absorption of smaller lines into the main line.
Gathering lines. Promotion of mixed production.
C. Creating multi-skilled labor.
D. Integration of lines.

PHASE 3: CREATE AN ACCURATE FLOW

Logistics

a) Improvement of the ways items are packed in such a way that parts and products can be put and can be easily picked up and taken out. Making the quantity smaller.

b) Reduction of the size of stores and increase of the number of transportation.

c) Improvement of the accuracy of utilized kanban.

d) More leveling.

Work place organization

a) Improvement of the accuracy of SOP. Small, smooth and rhythmical movement

b) Arrangement of the workshop in such a way that any anomaly can be detected immediately.

PHASE 4: CREATE A CONTROL FLOW

Logistics

a) Making a manual for using kanban.

b) Preparation of management data on Q, C and D, especially about root causes.

   Establishment of routine control, anomaly control and control for changes.

c) Management of PM

d) Making texts for education and training and management of personal career history.

STEP 1 INITIAL CLEANING

Sort

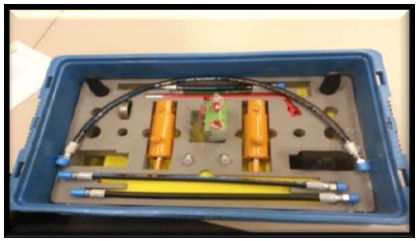
Set in Order

Shine

WO

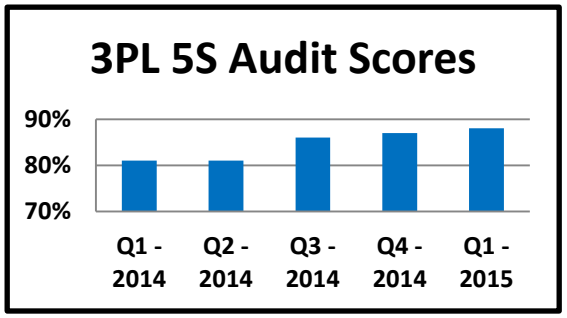
LOG

Standardize



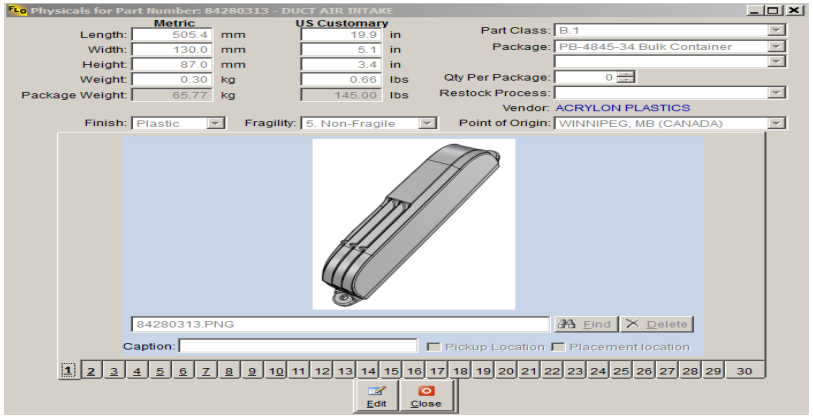
5S

Sustain

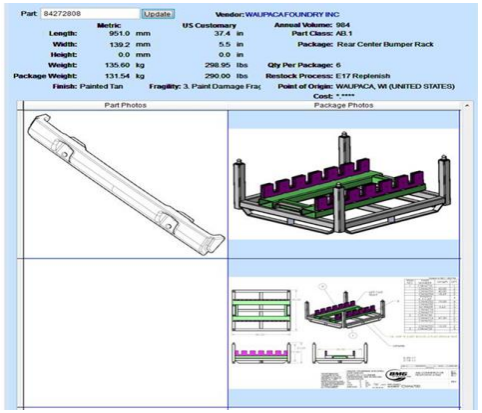


STEP 1 PLAN FOR EVERY PART

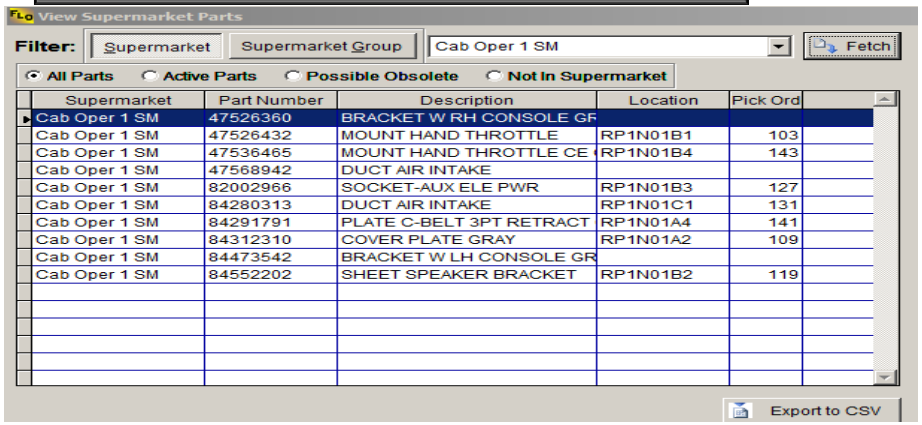
Physicals for Each Part Number



Packaging for Each Part Number

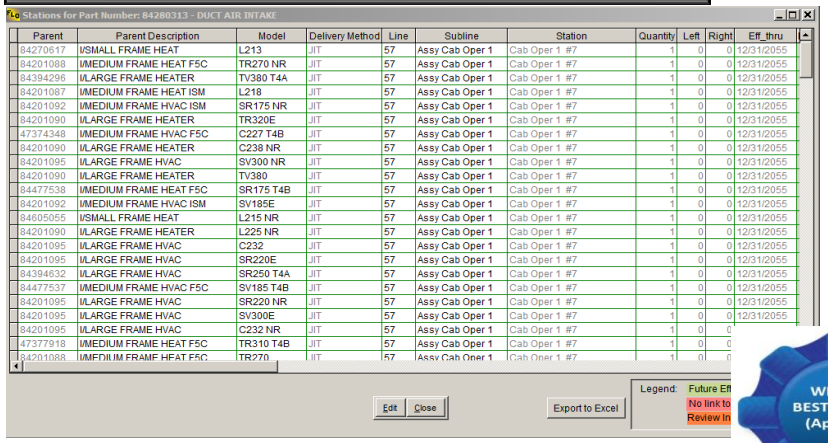


Supermarket Information for Each Part Number



Supermarket	Part Number	Description	Location	Pick Ord
Cab Oper 1 SM	47526360	BRACKET W RH CONSOLE GF		
Cab Oper 1 SM	47526432	MOUNT HAND THROTTLE	RP1N01B1	103
Cab Oper 1 SM	47536465	MOUNT HAND THROTTLE CE	RP1N01B4	143
Cab Oper 1 SM	47568942	DUCT AIR INTAKE		
Cab Oper 1 SM	82002966	SOCKET-AUX ELE PWR	RP1N01B3	127
Cab Oper 1 SM	84280313	DUCT AIR INTAKE	RP1N01C1	131
Cab Oper 1 SM	84291791	PLATE C-BELT 3PT RETRACT	RP1N01A4	141
Cab Oper 1 SM	84312310	COVER PLATE GRAY	RP1N01A2	109
Cab Oper 1 SM	84473542	BRACKET W LH CONSOLE GR		
Cab Oper 1 SM	84552202	SHEET SPEAKER BRACKET	RP1N01B2	119

Station Information for Each Part Number

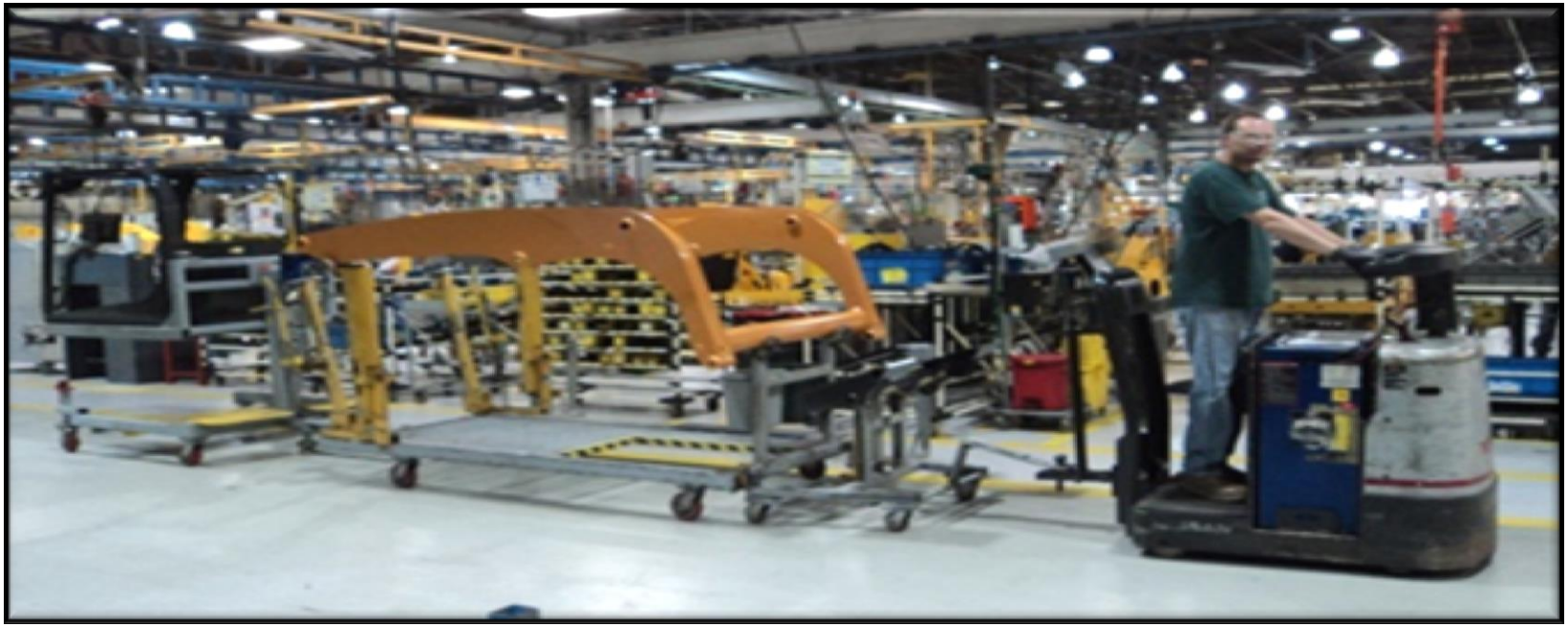


Parent	Parent Description	Model	Delivery Method	Line	Subline	Station	Quantity	Left	Right	Eff_thru
84270617	I/SMALL FRAME HEAT	L213	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201088	I/MEDIUM FRAME HEAT F5C	TR270 NR	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84394296	I/LARGE FRAME HEATER	TV380 T4A	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201087	I/MEDIUM FRAME HEAT ISM	L218	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201092	I/MEDIUM FRAME HVAC ISM	SR175 NR	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201090	I/LARGE FRAME HEATER	TR320E	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
47374348	I/MEDIUM FRAME HVAC F5C	C227 T4B	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201090	I/LARGE FRAME HEATER	C238 NR	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201095	I/LARGE FRAME HVAC	SV300 NR	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201090	I/LARGE FRAME HEATER	TV380	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84477538	I/MEDIUM FRAME HEAT F5C	SR175 T4B	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201092	I/MEDIUM FRAME HVAC ISM	SV185E	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84605055	I/SMALL FRAME HEAT	L215 NR	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201090	I/LARGE FRAME HEATER	L225 NR	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201095	I/LARGE FRAME HVAC	C232	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201095	I/LARGE FRAME HVAC	SR220E	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84394632	I/LARGE FRAME HVAC	SR250 T4A	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84477537	I/MEDIUM FRAME HVAC F5C	SV185 T4B	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201095	I/LARGE FRAME HVAC	SR220 NR	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201095	I/LARGE FRAME HVAC	SV300E	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201095	I/LARGE FRAME HVAC	C232 NR	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
47377918	I/MEDIUM FRAME HEAT F5C	TR310 T4B	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055
84201088	I/MEDIUM FRAME HEAT F5C	TR270	JIT	57	Assy Cab Oper 1	Cab Oper 1 #7	1	0	0	12/31/2055

WICHITA's BEST PRACTICE (Approved)

STEP 2 JUST-IN-TIME METHOD

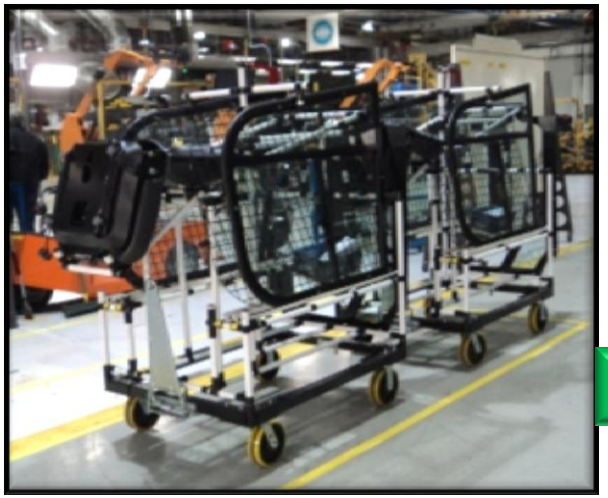
The Production Line Pulls the Material JIT or JIS.



STEP 2 JUST-IN-SEQUENCE METHOD

Tanks

ROPS JIS From Warehouse

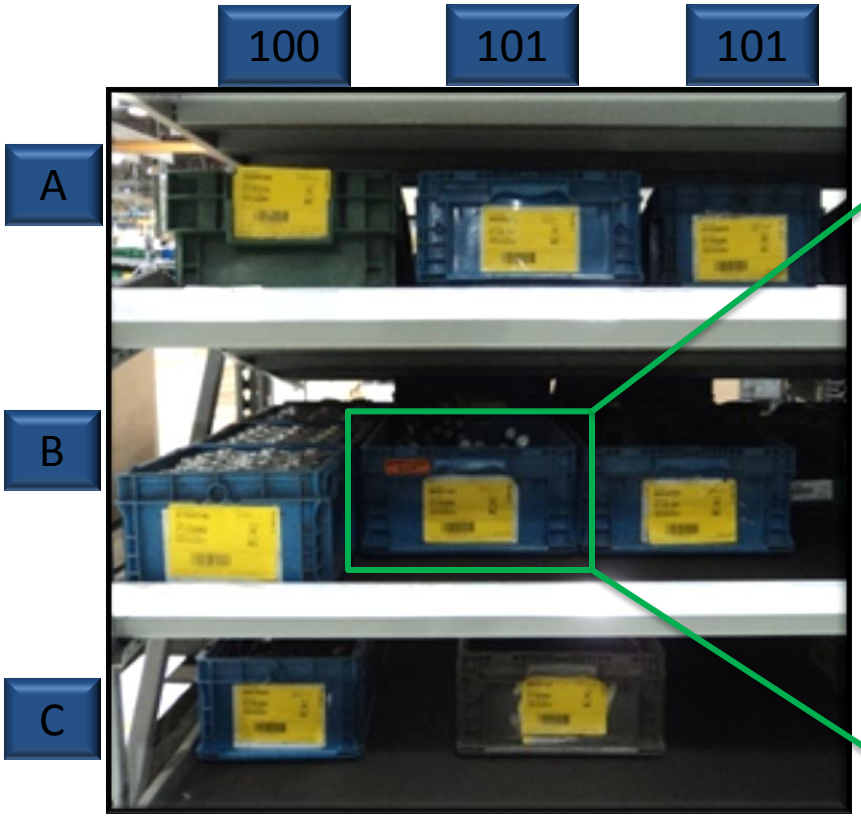


Supports FIFO!

Axles

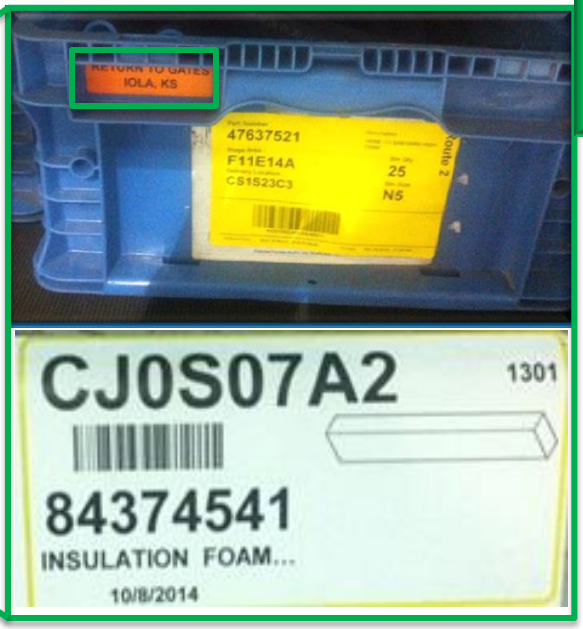
Tires JIS From Supplier

STEP 2 EKANBAN METHOD



Supports FIFO!

Returnable Tote Filled by Supplier and Stocked to the Supermarket in the Same Container



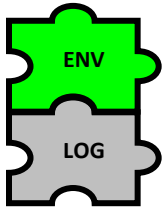
STEP 2 EXTERNAL TWO BIN METHOD

792 Class C Part Numbers
Delivered by 2
Bin Method

Supports FIFO!

STEP 3 REARRANGE EXTERNAL LOGISTICS

Developed Returnables with Vendors



5R'S

Dunnage Reduction					
Product	Each Corrugated Box weighs 3.5 lbs.	Total Boxes	Total Corrugated Weight lbs.	Total Pallets Eliminated	Total Urethane Foam
ECI Wiring Harness	3.5	1497	5239.5	94	0
ECI Wiring Harness	3.5	1357	4749.5	85	0
Airway Fittings	0.45	12861	5787.45	536	0
Gates Fittings	0.45	1450	652.5	60	0
GSK TECH Lap Bars	10	1479	14790	739.5	1479

Recycled Packaging Material 2014:

- **241 Tons of Corrugate**
- **590 Tons of Wood**

STEP 3 MANY GATES CONCEPT

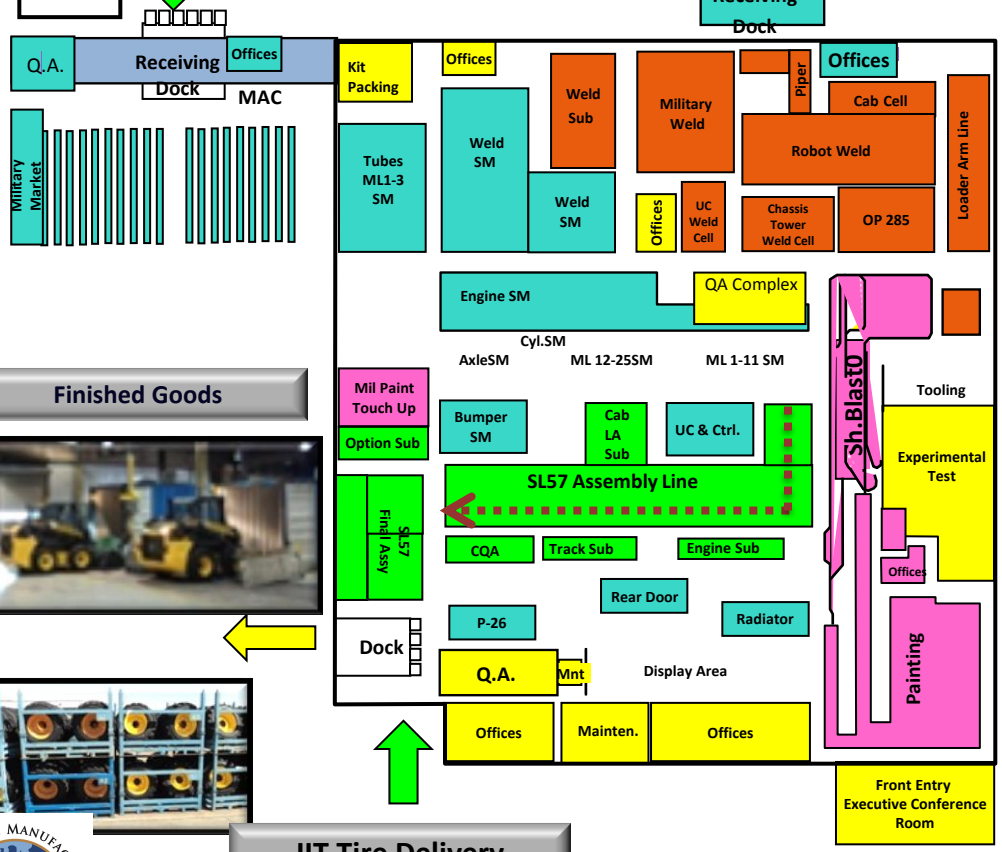
Milk Run/Cross Dock

JIT Steel Deliveries

FedEx & UPS

Ret.

Receiving Docks Distributed Around Plant to Allow Material to be Delivered Close to the Point of Use.



Buckets and Unpainted Parts

Finished Goods

JIT Tire Delivery

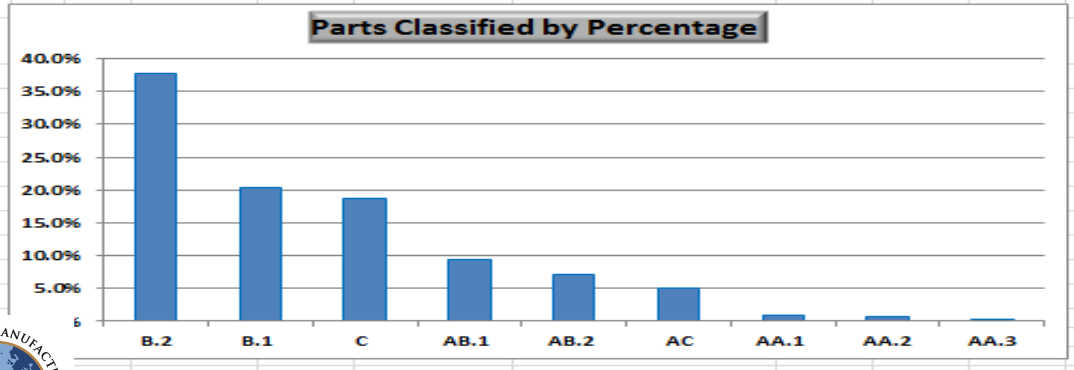
STEP 5 MATERIAL CLASSIFICATION – PLANT WIDE

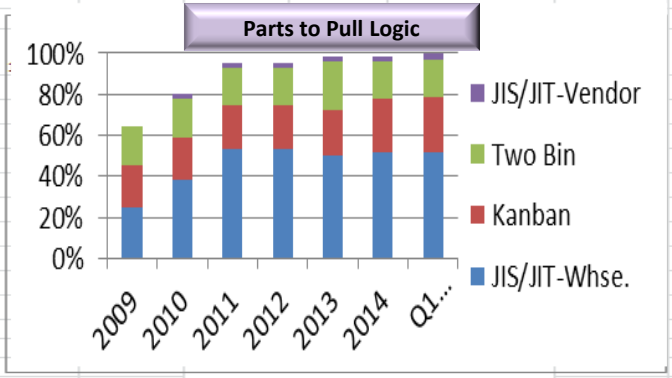
CNH – Wichita Buy Parts

Class		Type	Sub-class	Sub-group	Examples	Recommended stock level			Recommended flow type					Patrolling
						Level 3	Level 4	Level 5	JIT/JIS from Supplier	JIT/JIS from WH/DA	KANBAN	TWO-BIN SYSTEM	KIT[3]	
A	A	Expensive items (Upper 50% of BOM ~ >$350)	AA.1	Many variations	Includes all the expensive parts with many variations, bulky or not.	< 2 hrs	< 1 hr	<30 min	41				☑	
			AA.2	Bulky	Includes all the expensive and bulky parts. Without many variations.	< 2 hrs	< 1 hr	<30 min		31				
			AA.3	Other expensive	Includes the rest of expensive parts, not assigned to the previous sub-groups	< 2 hrs	< 1 hr	<30 min		3				
	B	Bulky items	AB.1	Many variations	Includes all the bulky parts, with many variations.	< 2 hrs	< 1 hr	<30 min		396				
			AB.2	Other bulky	Includes the rest of bulky parts, not assigned to the previous sub-groups.	< 2 hrs	< 1 hr	<30 min	68	237			☑	
	C	Many variations[1]	AC			< 2 days	< 1 day	<0,5 days		213			☑	
B		Normal items[2]	B.1	High consumption		< 2 days	< 1 day	<0,5 days		870			☑	
			B.2	Low consumption		< 2 hrs	< 1 hr	<30 min		502			☑	
C		Small & cheap items	C			< 7 days	< 5 days	<2 or 3 days			1101	792		

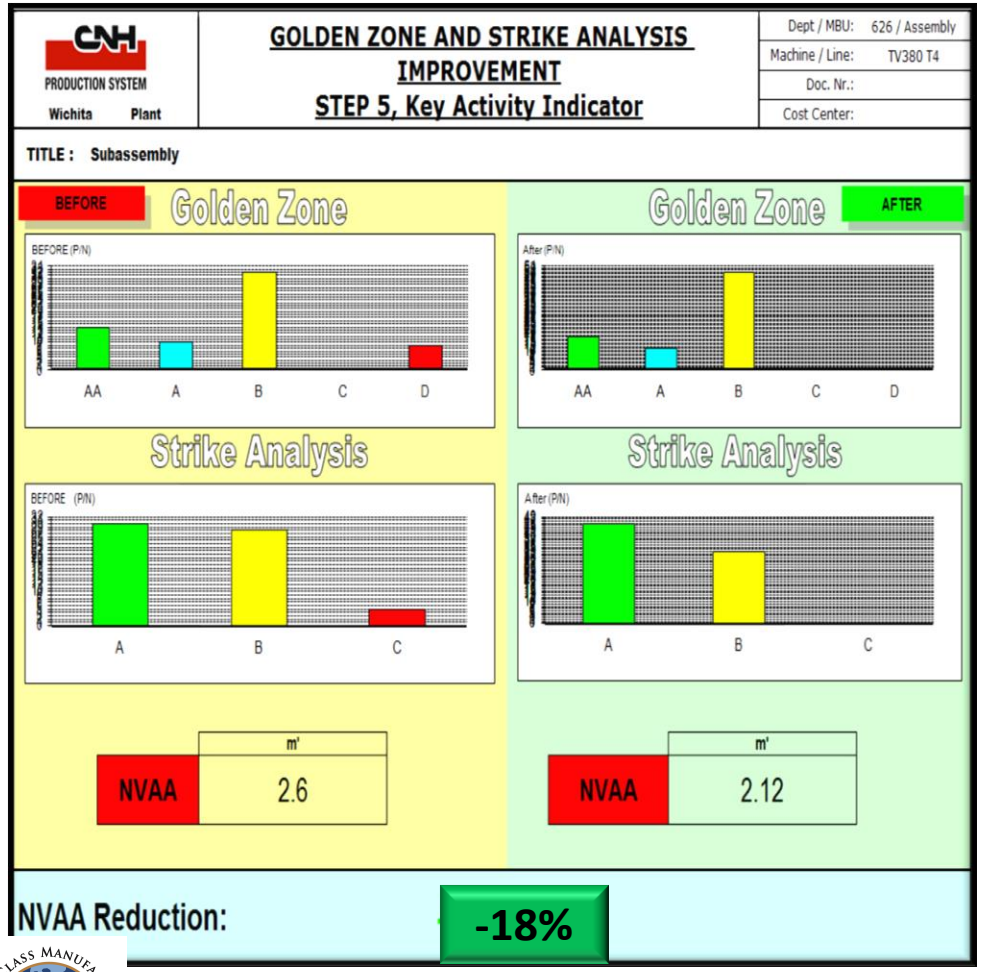
JIS from Supplier

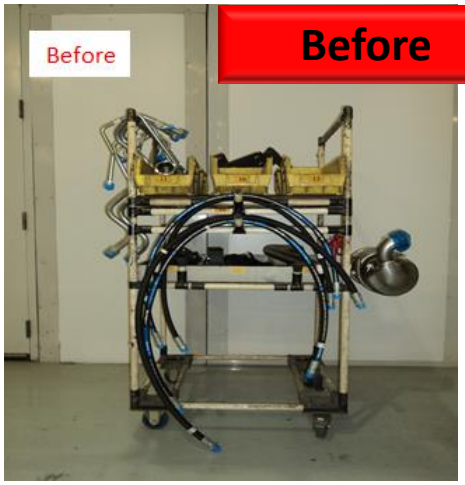
JIS from Warehouse

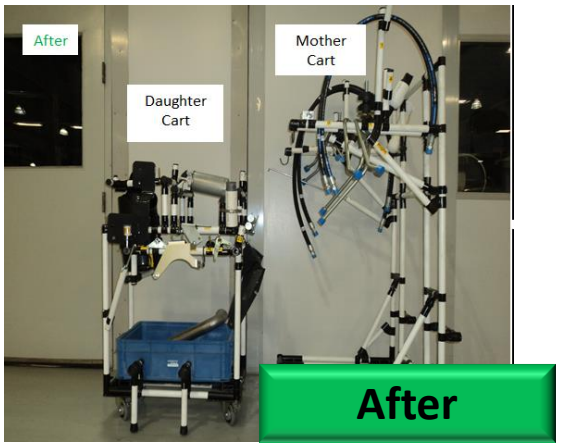




STEP 5 JUST-IN-SEQUENCE UPPER CHASSIS CART REFINEMENT

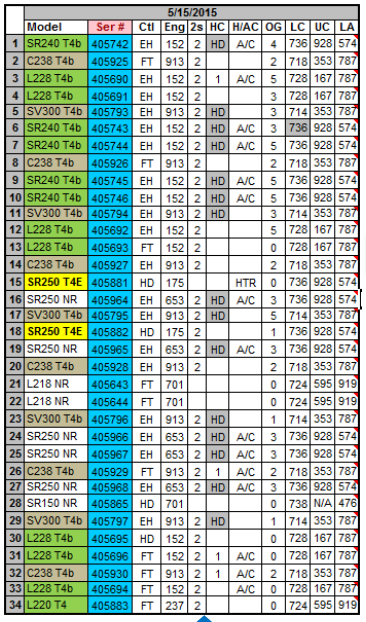






STEP 6 ACCURATE FLOW IN THE MODEL PROCESS

Line Load

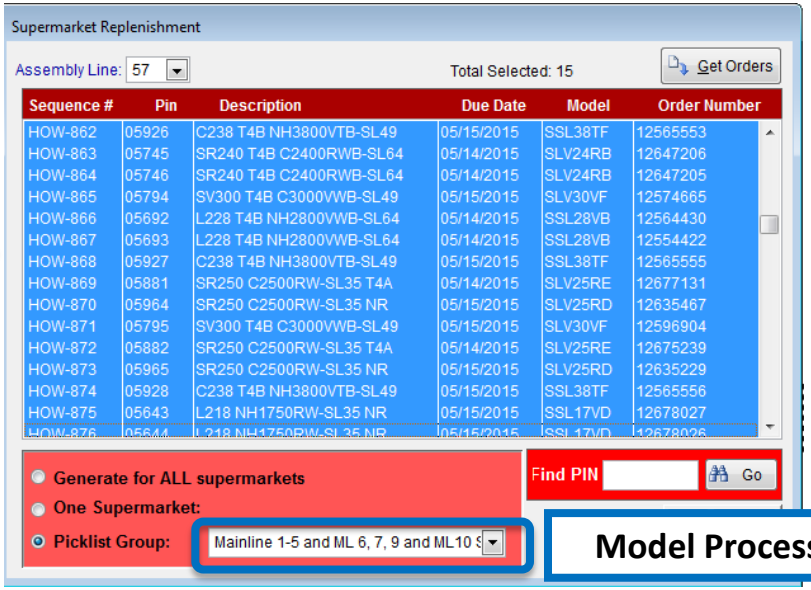


5/15/2015

	Model	Ser #	Ctl	Eng	2s	HC	H/AC	OG	LC	UC	LA
1	SR240 T4b	405742	EH	152	2	HD	A/C	4	736	928	574
2	C238 T4b	405925	FT	913	2			2	718	353	787
3	L228 T4b	405690	EH	152	2	1	A/C	5	728	167	787
4	L228 T4b	405691	EH	152	2			3	728	167	787
5	SV300 T4b	405793	EH	913	2	HD		3	714	353	787
6	SR240 T4b	405743	EH	152	2	HD	A/C	3	736	928	574
7	SR240 T4b	405744	EH	152	2	HD	A/C	5	736	928	574
8	C238 T4b	405926	FT	913	2			2	718	353	787
9	SR240 T4b	405745	EH	152	2	HD	A/C	5	736	928	574
10	SR240 T4b	405746	EH	152	2	HD	A/C	5	736	928	574
11	SV300 T4b	405794	EH	913	2	HD		3	714	353	787
12	L228 T4b	405692	EH	152	2			5	728	167	787
13	L228 T4b	405693	FT	152	2			0	728	167	787
14	C238 T4b	405927	EH	913	2			2	718	353	787
15	SR250 T4E	405881	HD	175			HTR	0	736	928	574
16	SR250 NR	405964	EH	653	2	HD	A/C	3	736	928	574
17	SV300 T4b	405795	EH	913	2	HD		5	714	353	787
18	SR250 T4E	405882	HD	175	2			1	736	928	574
19	SR250 NR	405965	EH	653	2	HD	A/C	3	736	928	574
20	C238 T4b	405928	EH	913	2			2	718	353	787
21	L218 NR	405643	FT	701				0	724	595	919
22	L218 NR	405644	FT	701				0	724	595	919
23	SV300 T4b	405796	EH	913	2	HD		1	714	353	787
24	SR250 NR	405966	EH	653	2	HD	A/C	3	736	928	574
25	SR250 NR	405967	EH	653	2	HD	A/C	3	736	928	574
26	C238 T4b	405929	FT	913	2	1	A/C	2	718	353	787
27	SR250 NR	405968	EH	653	2	HD	A/C	3	736	928	574
28	SR150 NR	405865	HD	701				0	738	N/A	476
29	SV300 T4b	405797	EH	913	2	HD		1	714	353	787
30	L228 T4b	405695	HD	152	2			0	728	167	787
31	L228 T4b	405696	FT	152	2	1	A/C	0	728	167	787
32	C238 T4b	405930	FT	913	2	1	A/C	2	718	353	787
33	L228 T4b	405694	FT	152	2		A/C	0	728	167	787
34	L220 T4	405883	FT	237	2			0	724	595	919

Select Units For Next Two Shifts

Replenishment Tool



Model Process

Load into WMS

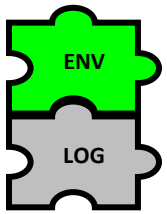
Replenish Only Parts Required

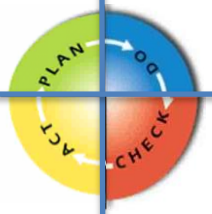
Pick Only Parts Required

STEP 6 - INTEGRATION OF DISTRIBUTION

- Project worked with vendor, purchasing, corporate logistics and plant logistics. Lap bars coming from Taiwan

- Lap bars from Taiwan were shipped 2 to a box, reconfigured the layout of the lap bars in the box and increased to 4 pieces per box





- We are reviewing all international suppliers for opportunities to leverage packaging.

- Reduction of 18 ocean containers o average per year for lap bars

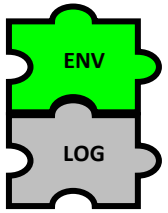
Reduction of 43,128 lbs. CO_2

5R'S

STEP 6 - INTEGRATION OF DISTRIBUTION

Full container engine deliveries from overseas. Container is live unloaded and the empty container returns to Kansas City, round trip is a cost of $900

Previously 8 containers a month were filled with returnable racks and returned to engine supplier with an additional $900 round trip charge, working with corporate logistics and steamship lines racks are returned on containers that delivered engines



5R'S

Next phase will involve pulling whole-goods units into the outbound mix.

Projected Savings: Transportation $86,000 annually

CO2 Reduction: 349,000 lbs. CO2

LOGISTICS TOOLS

Reactive	1	Parts classification
	2	Logistics cost deployment
	3	phase 1: Creation of a flow, 5T
	4	Logistics step 1
	5	Logistics step 2
	6	Separation operation/transport
	7	Line side stock management
	8	Logistics step 3
	9	QC stage 1 & 2
	10	QC stage 3 & 4

Preventive	11	FIFO
	12	Phase 2: smooth flow, SMED
	13	Andon
	14	QC of incoming materials: phase 5
	15	QC of incoming materials: phase 6 & 7
	16	Logistics step 4
	17	JIT and MRP
	18	Logistics Step 5
	19	WPO/LOG cross training
	20	The way items are packed

Proactive	21	QC of incoming materials: phase 8
	22	Phase 3, step 6
	23	No breakdowns, no defects
	24	Phase 4, step 7: controlled flow
	25	Minimum inventory
	26	Purchasing policy @ design stage
	27	Suppliers' involvement
	28	VSM
	29	SCM
	30	IPS

HOW CAN THIS FIT THE ENERGY SEGMENT?

- Engage a Process Expert (3PL or Industrial Engineering support)
- Establish a model area
- Perform a Cost Deployment to understand losses
- Pareto losses and drive project activity by highest losses
- Standardize packaging wherever possible, this includes size and quantity
- Incorporate and Standardize visual management
- Implement minimum material handling concepts
- Standardize put away and picking processes
- Continually drive to 0 human errors

Thank You.