

CI-Quality Green Belt Update

Nov 15, 2018

KNAPHEIDE
SINCE 1848

United Rentals

West Quincy

KNAPHEIDE
SINCE 1848

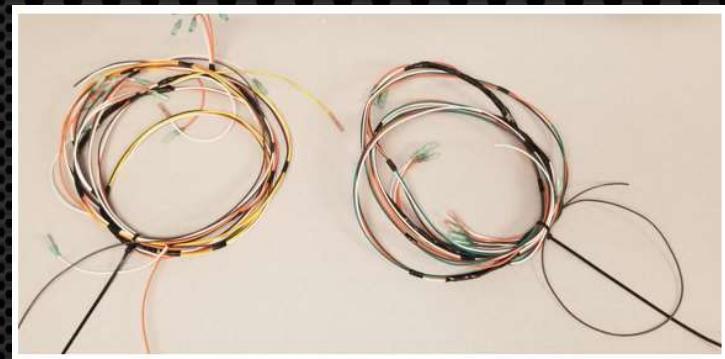
Parts

- 10 Kits were identified as incorrect for either the whole or part of the kit.
- 34 Parts of the kits above were identified as incorrect or not needed.
- There are various reasons for the part discrepancies.
 - BOM updates – Over time there are parts that get accidentally left in the builds.
 - Quote errors – Possible misquote using incorrect parts
 - Supplier errors – The supplier was not aware of changes that were made.



Wire harnesses from supplier which are not utilized because they are incorrect.

Wire harnesses provided by WQ because we do not supply the correct harnesses for this build.



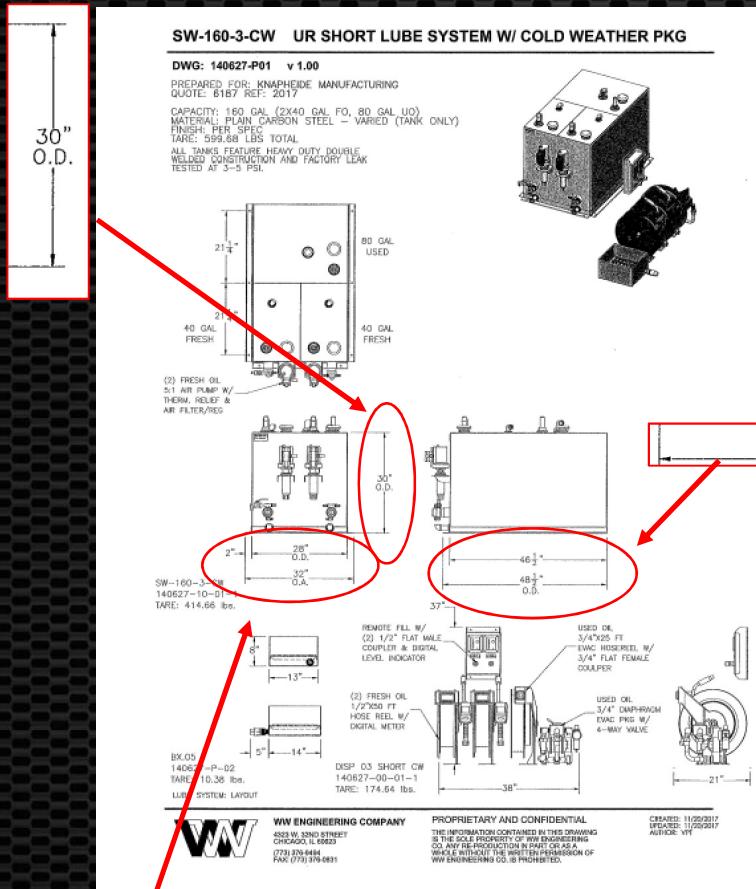
Parts

Kit number	Kit Description	Parts with discrepancies in kits	Description	Qty	Cost per	Cost total	Per Kit	Reason	Action Completed
12011840	KIT, HARDWARE FLUSH MNT LIGHTS FASTENAL#12927-02655	12030565	NUT HEX UNC #8-32 EXT TOOTH	4	\$0.01	\$0.04		Part not used	Engineering approved
		12180410	SCREW,PAN PHIL #8-32 X .75 SS	4	\$0.03	\$0.12		Part not used	This kit will be taken out of the BOM
		12030169	NUT HEX UNC #10 -24 EXT. TOOTH	2	\$0.01	\$0.02		Part not used	
		12180220	SCREW,PAN PHIL #10-24 X .75 SS	2	\$0.02	\$0.04		Part not used	
		12251625	TIE, BUNDLE 7.8" PUSH MOUNT	6	\$0.08	\$0.48		Part not used	
		12011730	GROMMET 1.25GR DIA .50ID.06MIT	4	\$0.18	\$0.72		Part not used	
						\$1.42			
33010640 - Parent	KIT, WRKG LGHTS, UN RENTAL								
20039480 - Child	KIT LED SURFACE MOUNT LTS UB6C NO LED LT PLUG ADAPTER REQD	12011460	HARNESS PROPRIETARY POWER INT	1	\$8.79	\$8.79		Part not used	This has been identified as an MPV part and will be taken out of the BOM
						\$8.79			
33010640	KIT, WRKG LGHTS, UN RENTAL	33015210	HARN, WRK/CLR, UN RENTAL SS	1	\$36.13	\$36.13		These parts are not used. WQ makes their own. Confirmed with Adam and install staff.	These harnesses are being updated but in the meantime WQ will continue to use theirs.
		12256319	HARNESS,UPFITTER POWER SWITCH LED COMPT LIGHT FLEX STRIP LTS	1	\$6.78	\$6.78			
		33015230	HARN, WRK/CLR, UN RENTAL CS	1	\$34.80	\$34.80			
						\$77.71			
33110110	KIT,LED COMPT UNITED RENTAL 18	12256251	LIGHT STRIP LED24".180D MLDBUL DIAMETER MOLDED BULLETS	4	\$12.22	\$48.88		Per J Holt these are not needed	A quantity of 8 lights are provided and only 4 are needed. The additional 4 will be taken out of the BOM.
						\$48.88			

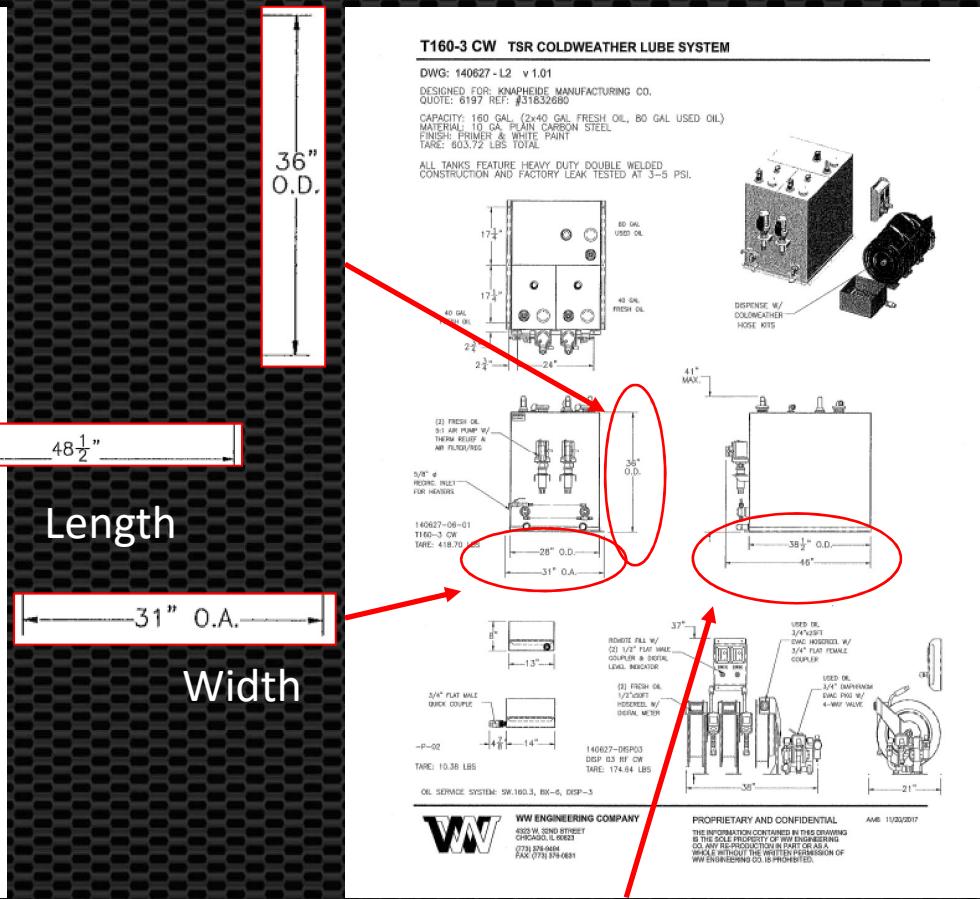
Warranty/Price Discrepancy

Lube Units installed on Dodge chassis require 2 additional hours of installation time.

Height *Part 33004030 specification*



Height Part 31832680 specification (preferred)



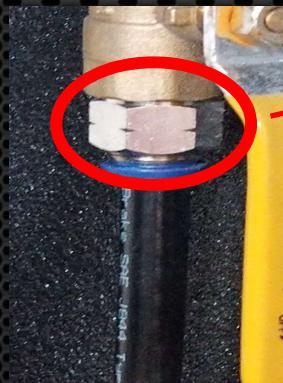
Warranty/Price Discrepancy

- Warranty
 - Warranty case is filed, reviewed and then paid.
 - If the claim is submitted via warranty the pay back from manufacturing is \$72 per hour.
- Price Discrepancy
 - If a price discrepancy is filed then the pay back is determined by Matthew Allen.
- Current orders in house at time of request.
 - 25
- Savings per unit as it relates to cost of part.
 - \$286
- Action completed – Approvals to make the change.
 - Terry Johnson, Adam Stark, Matthew Allen and Jeremy Holt all approved fit, function and change.
 - Email request was sent to Account Manager to have the United Rental orders updated.
 - Email request sent to Matthew Allen to have all quotes updated with the correct part number.

Improvement Opportunities

1. Strobe light mount on top of TSR
 - Incorrect hole pattern
 - Correction - Supplier updated the location of the mounting holes.

2. Tanks
 - All hoses have to be removed so we can re-tape each.
 - Some fittings are incorrect and have to be replaced.
 - Correction – Supplier updated the incorrect fittings.



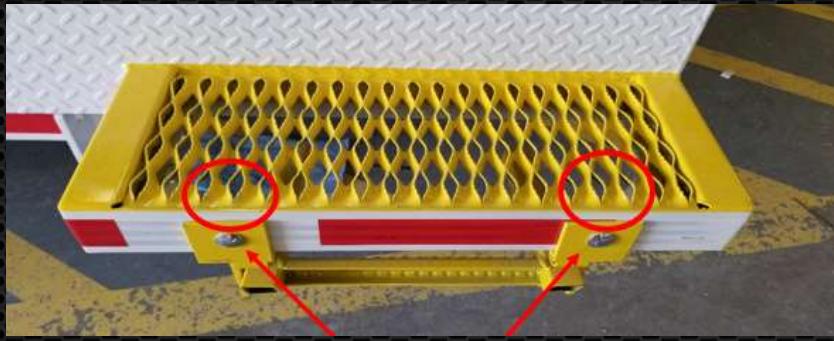
Improvement Opportunities

1. Harnesses

- The harnesses in the BOM are replaced with harnesses that are made in WQ
- Correction - Supplier corrected

2. Rear Steps

- Rear steps on the street and curbside are supposed to be cutout to allow for proper mounting of the drop down step.
- Steps are having to be cut at installation.
- Correction - Steps are now arriving at the installer already notched



Locations called out where steps are notched underneath to allow clearance for front bolts.



Cutout showing where the step is notched for the step attachment to be installed.

Improvement Opportunities

1. Re-Drilling

- Holes are off causing the installer to have to drill holes.
- Engineering is updating the drawings.



Holes punched at manufacturing

2. Rear strobe hole

- The installers are having to cut a hole for the rear strobe to be able to access the wires from the rear strobe light.
- Engineering is updating the drawing.



Exterior view of strobe light



Interior view showing where cutout is needed for wiring.



KUV Best Practices

KNAPHEIDE
SINCE 1848

KUV installation 5th Street

- Station 1 of 4 – Chassis prep



Installation Steps

- All parts laid out on the chassis frame before installation.
- Runs main wire from front of chassis to rear for the dome lights.
- Preps the cab
 - Unplug the airbags
 - Loosened the seats
- Tighten all of the mounting points.
- Removes extra bracing from the rear of the chassis.
- Installed fuel lines.
- Drilled holes in the frame.
- Moved the fuel guard towards the front of the body to make room for the bumper & hitch.
- Uses template to cut long sills

KUV installation 5th Street

- Station 3 of 4– Hitch, Bumper & Cab install



Installation Steps for Cab

- Preps area with work cart
- Removes door seal enough to remove header
- Drills 13 holes in the header
- Assist other installer with installing bolts in the L1V and R1V from cab
- Installs blue tape to contain caulk when tightening chassis cab to body
- Bulkhead installed
- Installs caulk on the floor between chassis and body & installs door striping.
- Installs caulk on the body side of the striping.
- Re-installs header, front seats, visors, etc.
- Places torque marks on the bolts under the front seats
- During this installation the cab is cleaned multiple times to make sure surfaces are clear of metal shavings.

KUV installation 5th Street

- Station 3 of 4 – Hitch, Bumper & Cab install



R1V and
L1V.
Securing
body to
chassis



Identifying
where the
installer
welds the
bumper
bracket



Install Steps for Hitch & Bumper

- Pulls vehicle into bay to start install. While pulling vehicle in the horn is honked to alert others.
- Preps battery for welding
- Removes seats from cab
- Moves wires in the cab before drilling holes
- Drills holes in each of the front compartments
- Installs bolts & mono bolts in R1V and L1V
- Tightens bumper bolts located in the rear compartments
- Bolts and welds bumper mounting brackets
- Welds on hitch
- Preps work area for next install

KUV installation Wentzville

- Station 2 of 4 – Cab/Chassis Prep & Set on



Install steps Cab/chassis prep

- Pulls plastics off cab opening
- Preps cab
- Removed bolts from seats
- Install curbside/street side mirrors
- Install curbside/street side mounting brackets on chassis frame
- Removes B-Pillars
- Rolls carpet back from opening
- Moves chassis back to set body on
- Tightens body to chassis
- Welds hitch brackets in place

KUV installation Wentzville

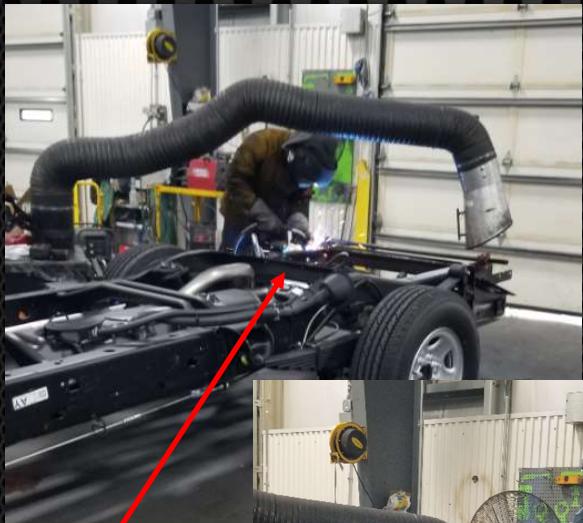
- Station 2 of 4 – Cab/Chassis Prep & Set on



- Steps for body prep & install
- Drives chassis into bay
 - Raises body
 - Pulls bulkhead for install
 - Drills holes in body for bulkhead install
 - Installs bulkhead
 - Secures into place
 - Tightened all bolts
 - Runs main wire from engine to rear of chassis
 - Sprayed the chassis with undercoating.
 - Install fuel fill lines
 - Raised body for install on chassis
 - Sets body on and aligns
 - Bolted body to chassis frame
 - Marked bolts with torque paint
 - Filled out paperwork

KUV Bolt on Hitch

- Bolt on hitch installed via welding.
- Installers have not received notification that they are able to utilize the bolt on application.
- Met with Jim Rainey to confirm and ticket 886584 submitted to Core Products Engineering.



Welding
hitch
onto
frame



Hitch installed



Hitch showing bolt
on hole pattern



KUV Best Practices

5 th street Installation Facility	Wentzville Installation Facility
Using templates where applicable	Using templates where applicable
Stations utilize 6S	Uses welding vacuum when installing hitch and overhead door cannot be opened
Horn verification when moving chassis	Verbal communication when raising/lowering lift
Verbal communication when raising/lowering lift	Utilizing work carts for certain areas
Utilizes automotive tape when installing bolts for the header to contain caulk	
Utilizing work carts for certain station jobs	
Everyone using proper PPE gear	
Installs a reusable mat in cargo area to protect the floor during install	

609 Line Improvement

KNAPHEIDE
SINCE 1848

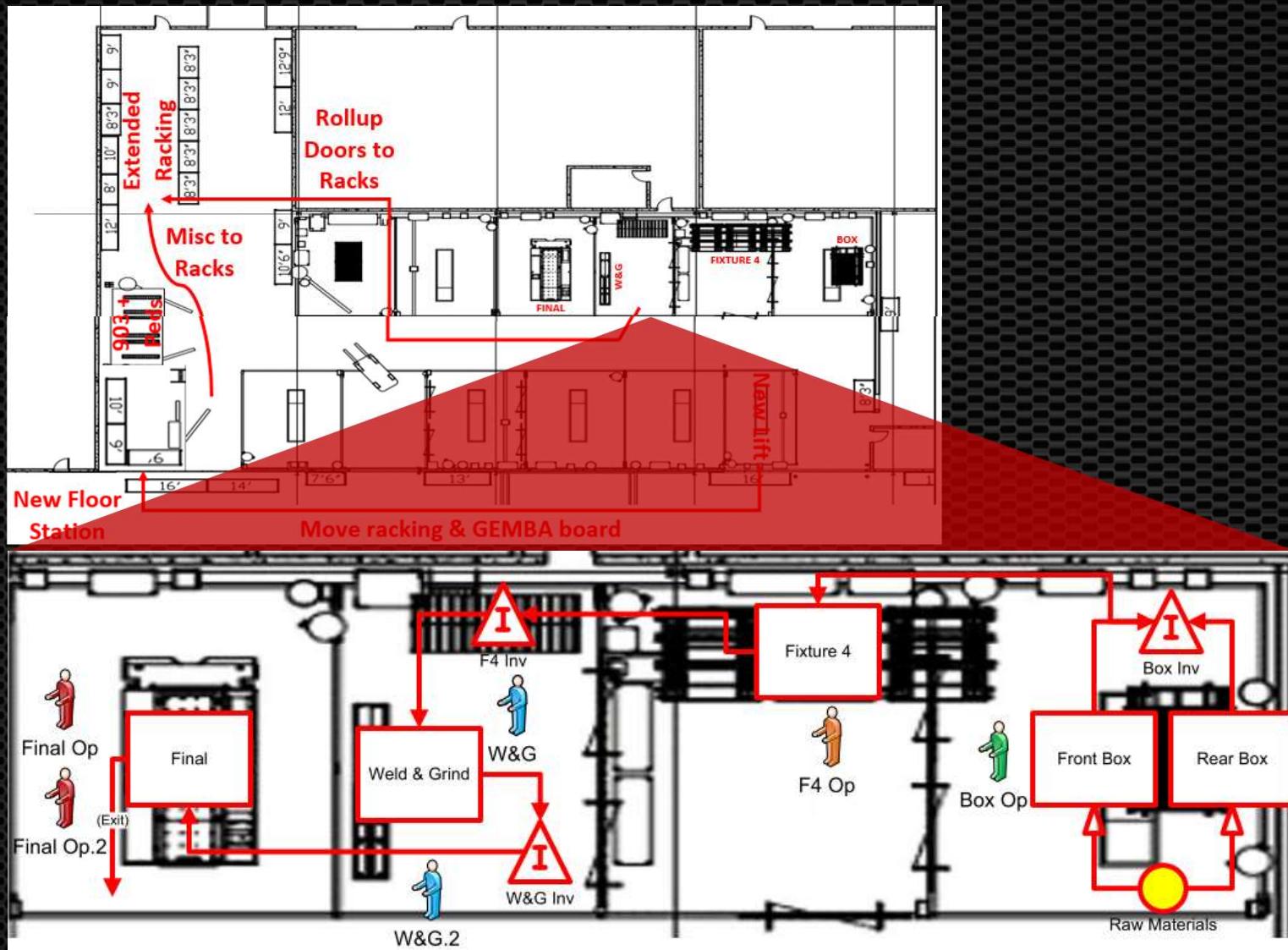
Status Update – 609 Line

Situation	With the increase in custom orders, 618 high hour assembly line leadtimes have extended outside acceptable levels. Additional “surge protection” is needed to help alleviate the lead time for high hour units.
Objective	Develop additional high hour assembly capacity within current plant footprint.
Lean/Six Sigma Tools used	Project Charter, Simulation, Data Analysis, Process Mapping, 6S (needed), Cost-Benefit Analysis (needed)
Key Wastes or Problems found	Lack of high hour capacity has led to long lead times Significant hour variation on 618 high hour assembly line creates bottlenecking and “bull whip” affect
Accomplished Actions during event (Results)	Layout options identified for additional high hour assembly capacity in form of “mini line” in 609 area
Follow Thru Actions	Product mix – what goes on “mini line” to alleviate 618 high hour demand stress? Flexibility – Can we develop equipment to allow current 609 product to run on progressive line (railroad bodies, gorilla KUVs, oversize cranes, etc)? Material flow and manpower – how do we staff a mini line to avoid bottlenecking and starving stations without over-staffing?

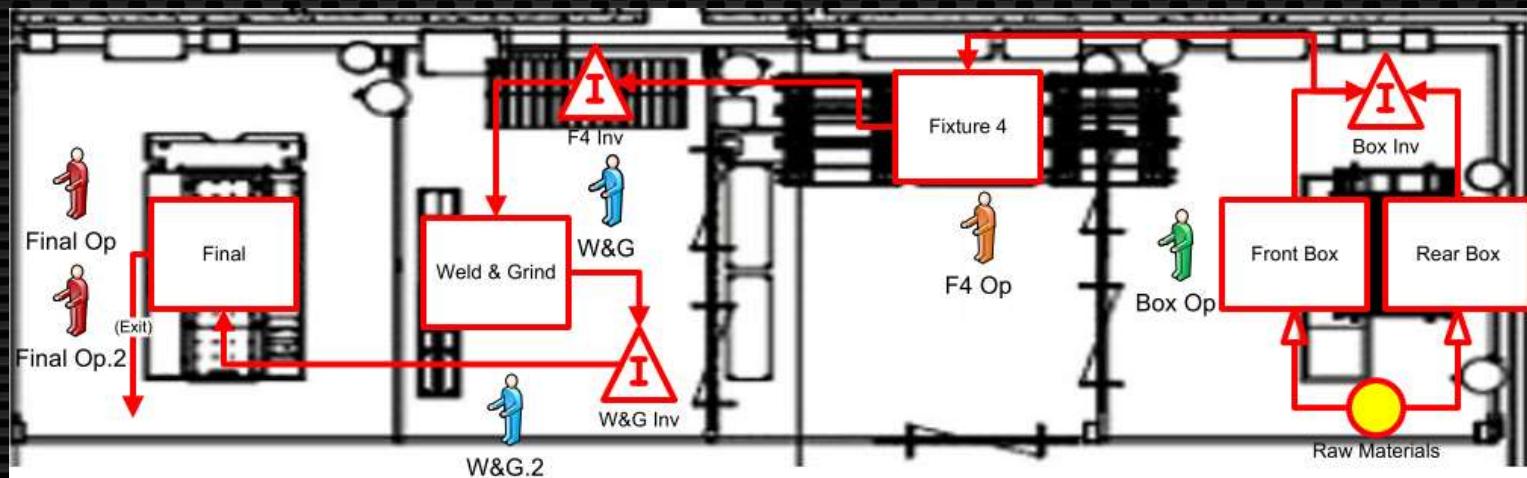
Measure	Goal	Before Event	After Event
Capacity	16,000 – 17,000 additional hours*	0 additional hours	TBD

*Assuming 75% capacity of “mini line” – may change based on product mix

Proposed Layout



Staffing Estimates by Mix



Staffing Options:

High Hour (28+ Mix):

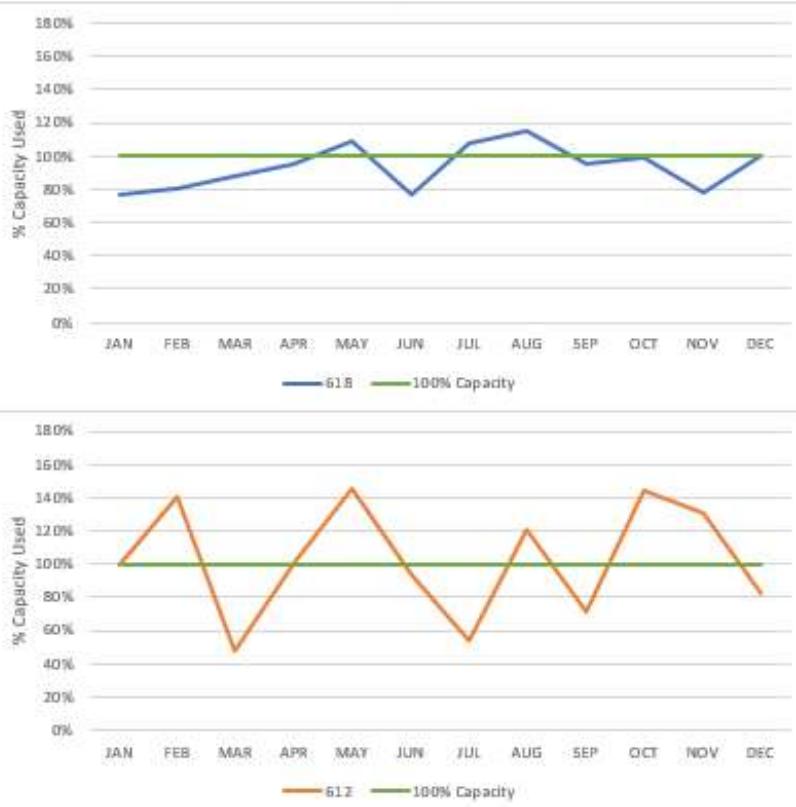
- 2 @ Final – 3 shifts
- 2 @ W&G – 1 shifts
- 1 @ Fixture 4 – 1 shifts
- 1 @ Box – 1 shifts
- 10 total assemblers**

Low Volume SMO's:

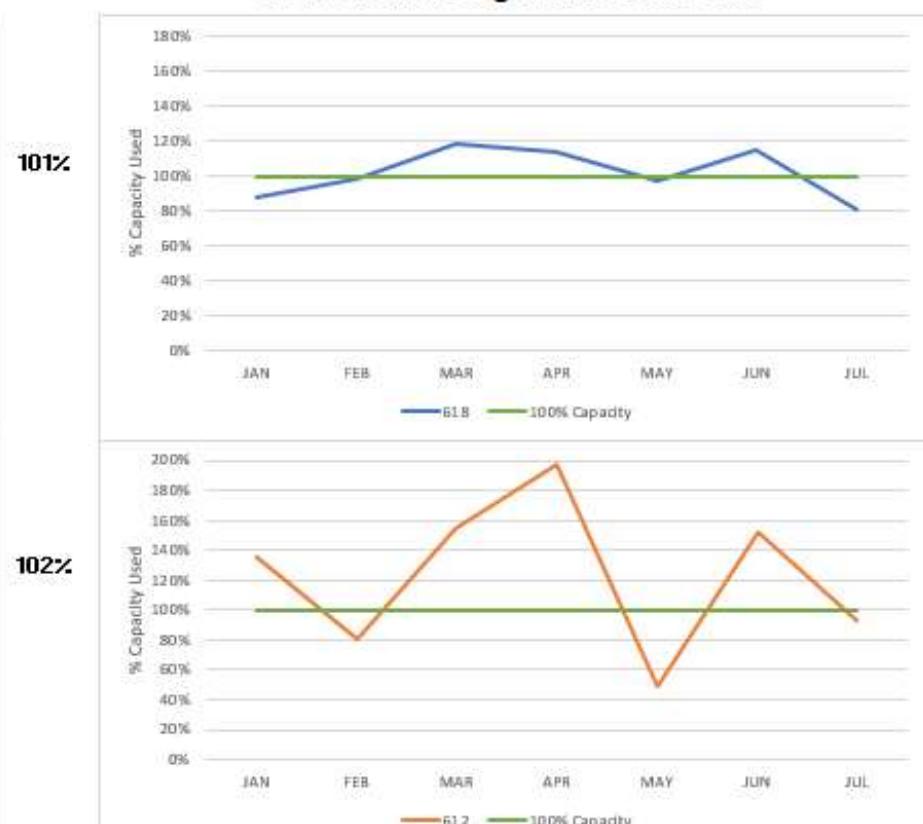
- 2 @ Final – 3 shifts
- 2 @ W&G – 2 shifts
- 1 @ Fixture 4 – 2 shifts
- 1 @ Box – 2 shifts
- 14 total assemblers**

Product Mix – Current State

2017 Trend Using Future State Mix



2018 Trend Using Future State Mix



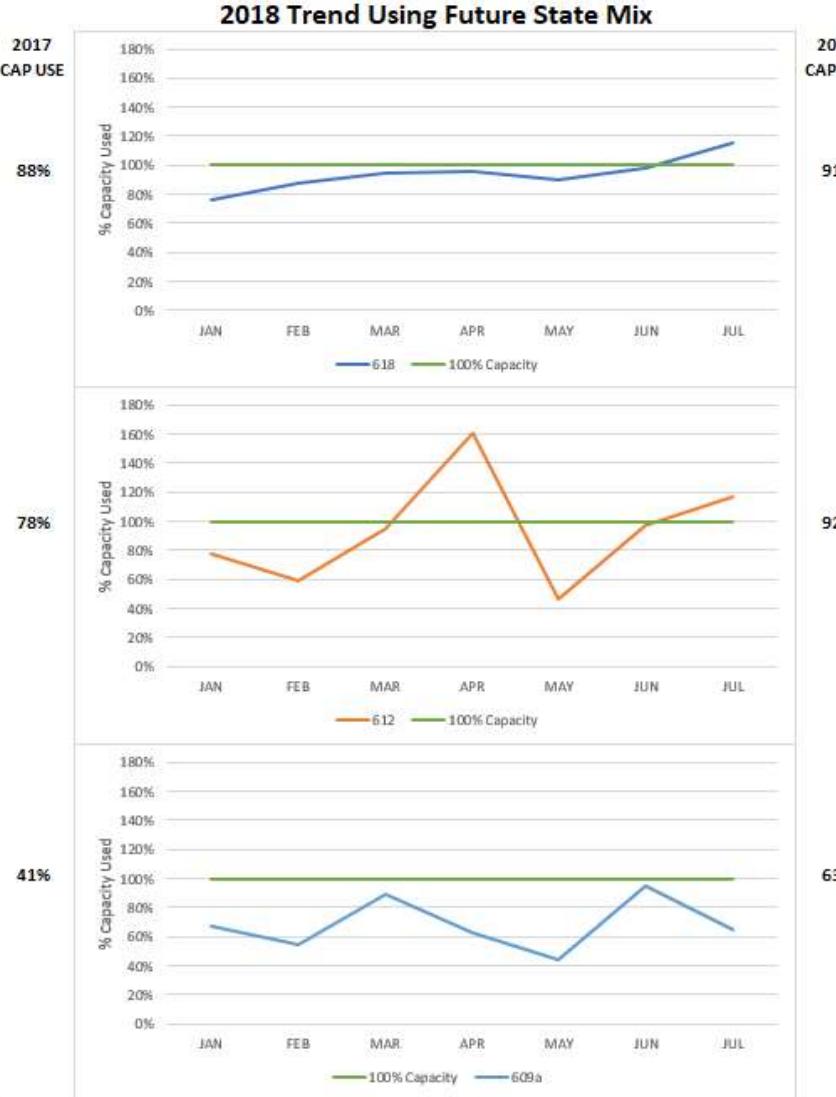
101%

93%

102%

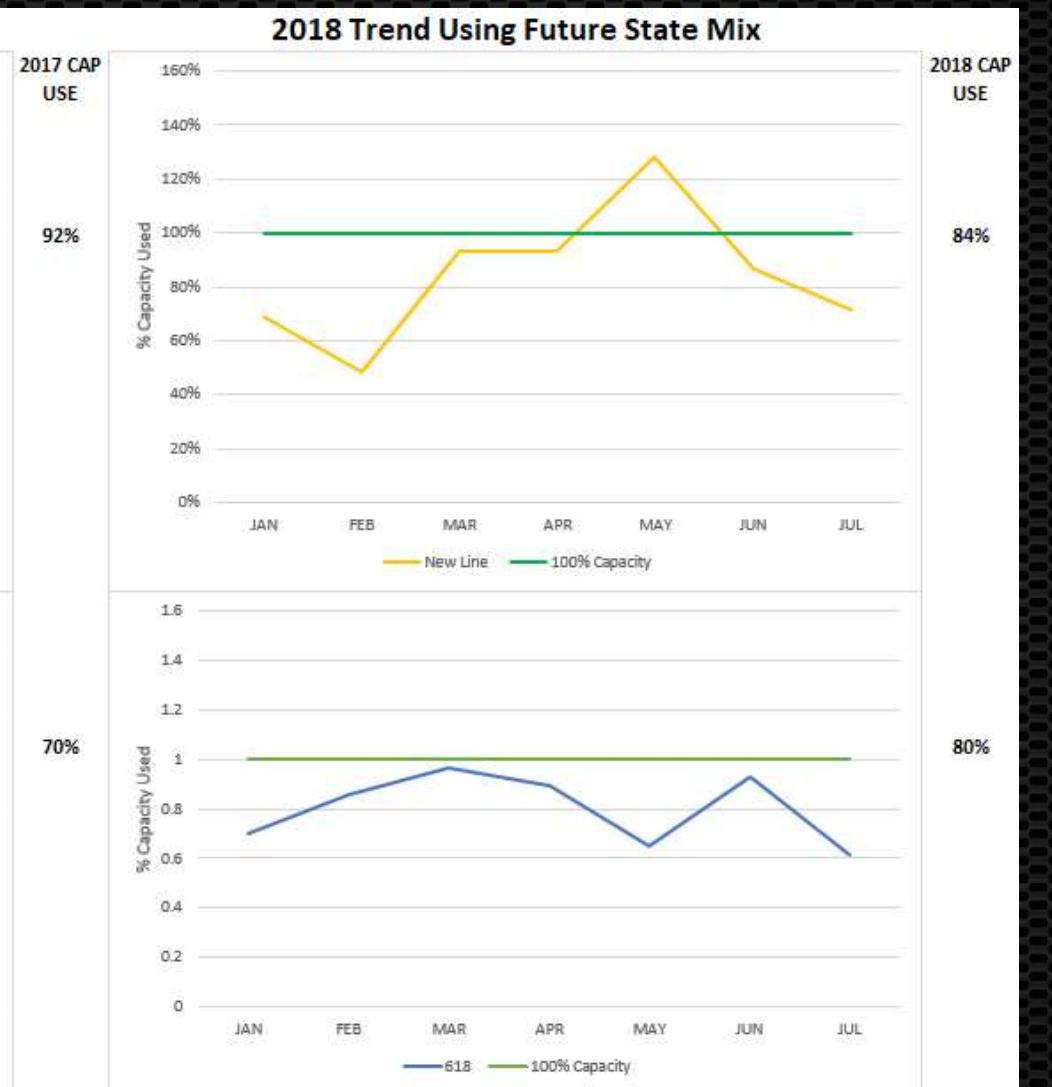
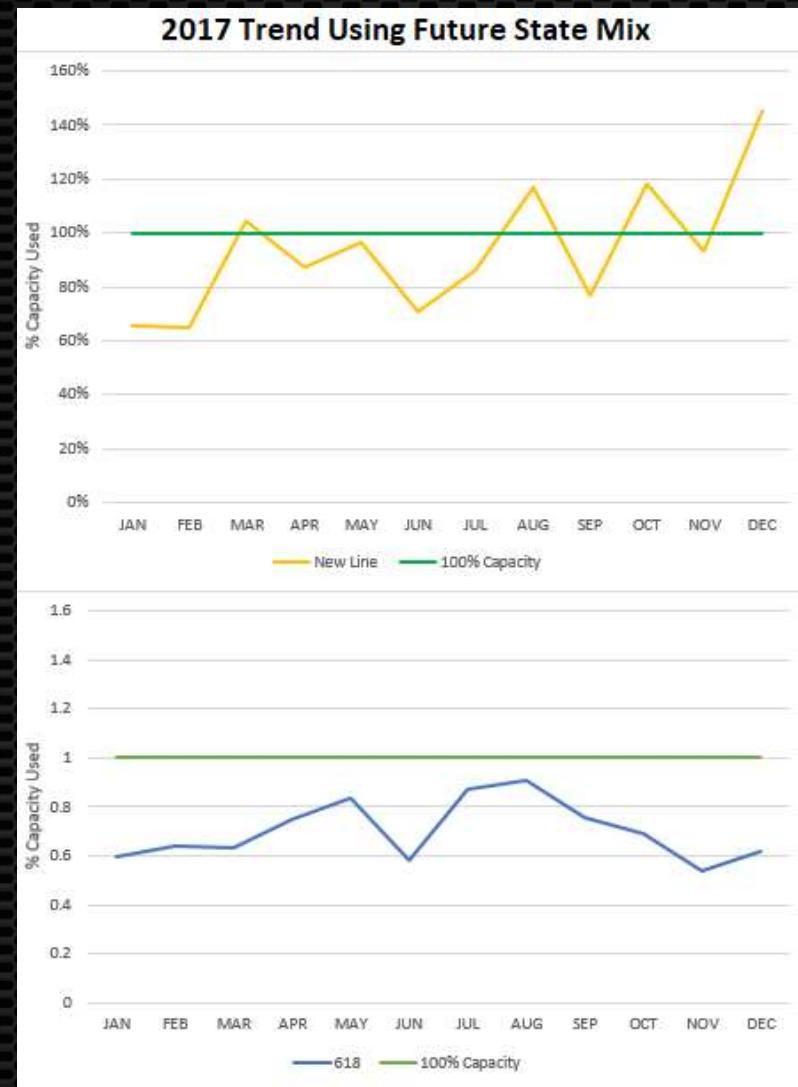
125%

Product Mix – High Hour Units*



*Using 100% Productivity on New Line (2018 Avg)

Product Mix – Low Volume SMO's*



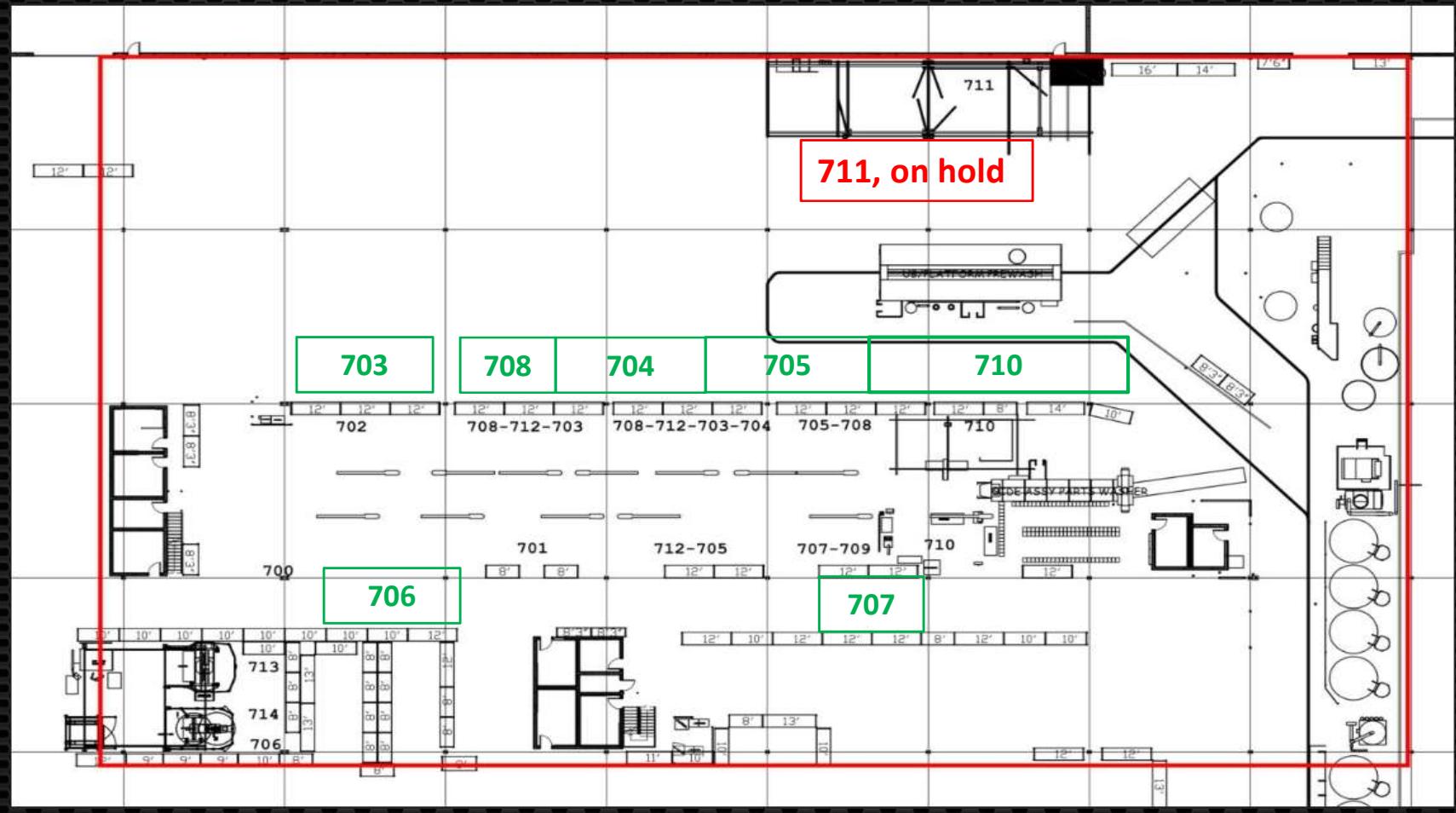
*Using 75% Productivity on New Line (2018 Avg)

607 Material Flow & Availability

KNAPHEIDE
SINCE 1848

607 Racking Layout

Reduced the time to build kits by assigning rack space for specific stations consumption



607 Improvements- Phase 1

Problem	Solution	Progress	Responsibility
Excessive material kitted in stations	Utilize top 2 bays in extended racks for kit overflow	Complete	632
Partially kitted orders cluttering stations	Close open bays on east side stations 6 and 8 to prevent overflow from aisles; all shortages are to be stored in "incomplete kits" rack until backfilled	Complete	Maintenance
No process for orders containing scrap or shortages	Utilize the "incomplete kits" rack in front of the 607 office for shortages, shop delays (shop delays to be tagged with green tag to distinguish)-IT tkt for 632 notification	Complete	607
Parts placed on floor in front of racks prevents access to racks by drivers	Consolidate 702 hang station to load from west aisle; all expedite material to be placed on the east side; operator is to pull from the west hang station for next set of hang components	Complete	607 daily

607 Improvements- Phase 2

Additional Issues	Resolution	Progress	Responsibility
Length of time it takes to build a kit	Divide racks by work centers to segregate and move parts as close to the point of consumption as possible; 712 work center too extensive, motor drivers will have to use their judgement	Complete	CI/ ME
Low earned hours though there are kitted hours available.			607 coaches
Hours earned are greater than hours kitted.			607 coaches
Routed labor is not enough compared to hours worked in 705, pull previous year labor similar to 706 situation.	Pull labor and evaluate same as 706 work center.	Complete	CI/ ME routing
Shared parts between Hoff and Fluid Power are not discovered until the kitting process begins in 632, lack of visibility (mainly 707) leads to wasted time on kit that can not be assembled.		Investigating/ Tkt 869835/ Meeting 10/24 Jennifer B, Mark R; list of shared parts obtained, going through line by line	CI/ Supply Chain
709 hours kitted are greater than hours earned and never seem to meet or find common ground.			607 coaches
700 work center needs to be ran on all shifts to support 701 & 713.	Issue needs expressed from Mgt. down in MFG		607 coaches
702 hang station needs managed by all 3-607 coaches, evaluate at beginning of shift if extra man power is needed.	Issue needs expressed from Mgt. down in MFG	Complete	607 coaches
711 material flow from fab to work station, ticket is in for more material racks and they will be color coated based on CCU usage. Racks currently in 711 need identified with location ID's so parts can be wanded and put away by operators. (Tkt is already in to ME's)	Have additional racks made and color coded to avoid confusion and provide fab the racking needed to support 711.	In process	ME
Orders are being partially ran and not completed resulting in shortages, lost, and damaged parts.	Evaluate and discuss with Ron H. and coaches to possibly come up with a process to avoid lost and or damaged parts.		607 coaches
Priority list for 714/ 706 work centers based on line production/ 636 consumption.	Kent Kite provides for 607 what is needed	Complete	Kent K./ 607 Coaches
Wanding done by shop employees is still an issue, continuing to find credit on hand orders. This results in more indirect labor either from 607 leadman and or coach searching and verifying inventory.	Evaluate and discuss with Ron H. and coaches to possibly come up with a process to avoid credit on hand, etc.		Shop Employee/ 607 Coaches
Orders logged as kitted and ready to go but are never ran and are not listed on the shortage tab.	Discuss with Ron H. and Matt S.	James R is investigating	607
Return of transfer racks form PCP is slowing throughput of painted/powder coated stake racks, also taking up space as they are stored since they cannot be hung.	Stake Rack Project IP	Hold for now, falls in line with stake rack project	Supply Chain
Pull responsibility from operator in 714 to program robot, each hour spent programming is an hour not earned out of the past due and/or schedule for that day.	Waiting on robot tech to be hired so hourly employee does not have to hold responsibility.	IP	Chris Ford

Details of In-process Action items

- Investigating parts consumed at vendor as well as MFG. (HOFF)
 - Parts located at vendor are not discovered until the kitting process begins
 - Current constraint on loads, schedule attainment, productivity
 - Currently identified 92 child part numbers that are consumed in 665 parent assemblies produced at MFG as well as HOFF
- 711 material flow from fab to work station
 - Ticket to ME entered for additional storage carts to be made
 - Racks to be color coated based on CCU usage

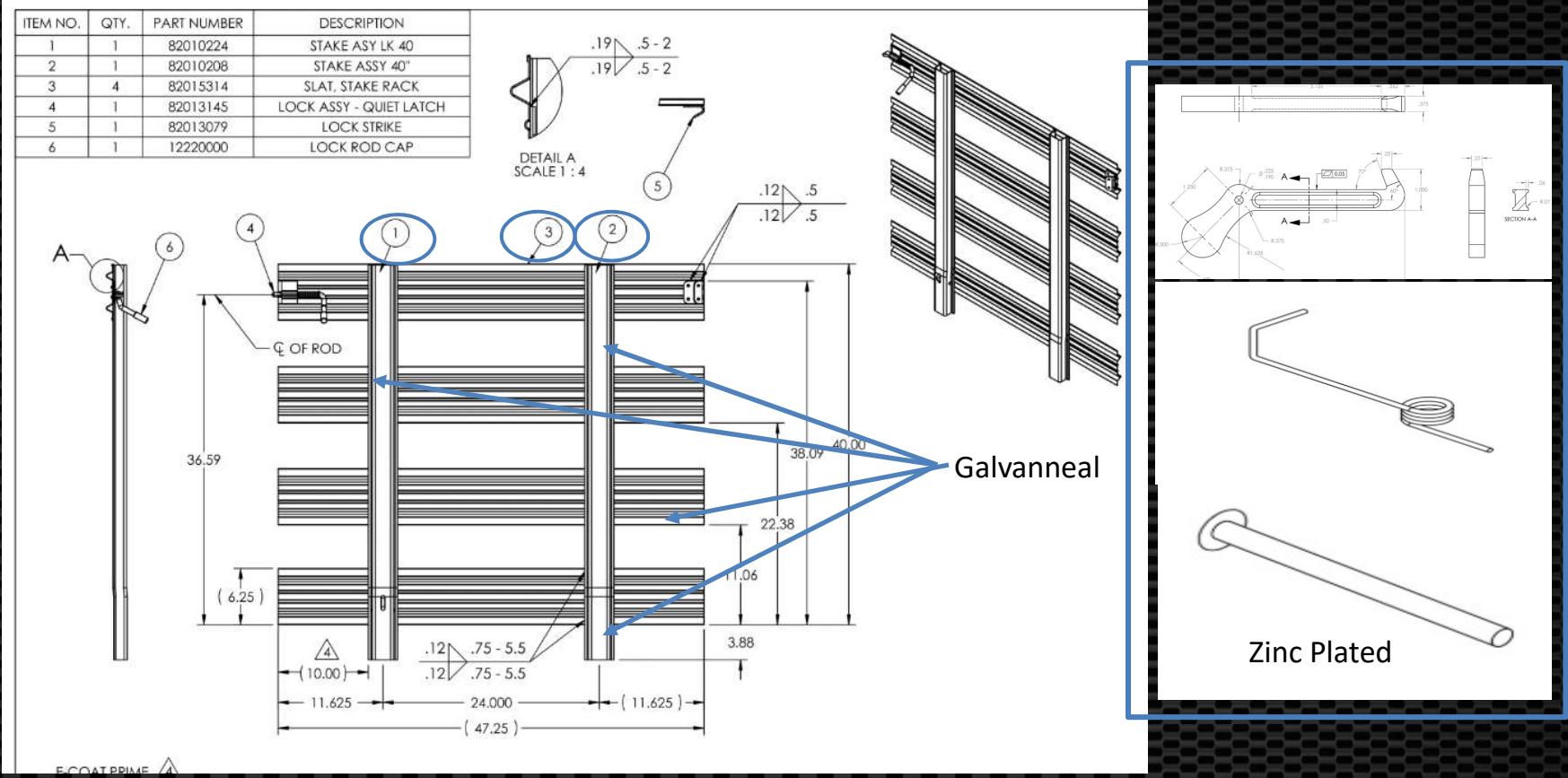
Stake Rack Project

KNAPHEIDE
SINCE 1848

Objectives

- Eliminates need for e-coat
 - Reduces amount of load bars required for 607
 - Increases capacity for UB e-coat cycles
- Reduces amount of floor space taken up by WIP material
 - Opens floor space for additional work station(s)

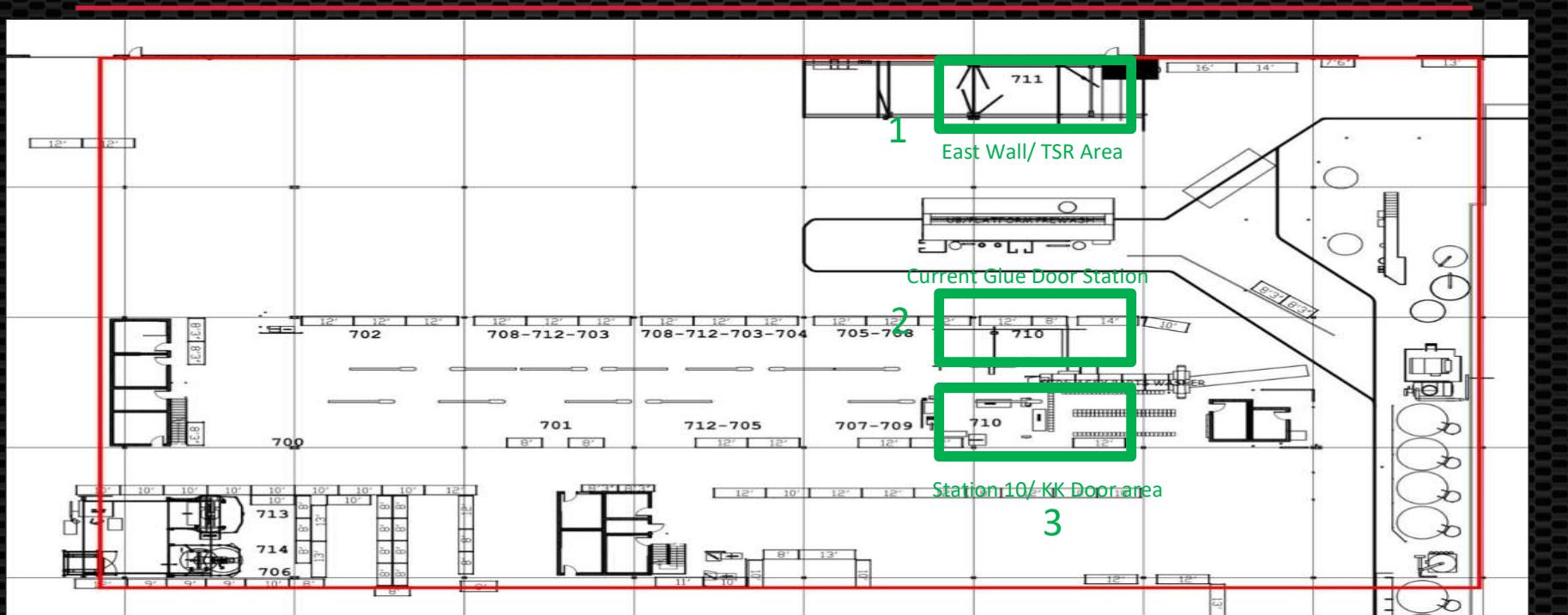
Stake Rack - Material Change



Project Schedule

TASK	SUPPORT TEAM	PROGRESS	START	END	NOTES
Stake Rack Project – Kick Off Meeting		Complete	11/13/2018	11/13/2018	
Equipment-Location					
Equipment Location (Manual and Robot)	Operations				East Wall, Glue doors
Equipment move schedule	Manufacturing Eng./ Operations				
Inventory buffer during move	Planning				
New Equipment location Space	Operations				
Incoming and outgoing material storage	Operations				
Re-establish HOME position for Robot after move	No action needed				Stay in current area
Additional resource for programming robot	No action needed				Stay in current area
Fill the manual location at 607	Operations				
Spot welder - where to locate?	Operations				East Wall, Glue doors
Handling					
Method of Shipping to PCP	Supply Chain/PCP				Palletized on Van Trailer
# of Racks needed	Manufacturing Eng.				
Storage of parts at PCP(must be covered)	Supply Chain/PCP				Van Trailer
Galvanneal parts estimated delivery from PCP	Supply Chain/PCP				
Routing					
Update routing to reflect the new process	Manufacturing Eng.				
Part number move from manual to robot	Manufacturing Eng.	Complete	10/22/18	10/22/18	Complete
Handle PRIME ONLY stake racks	Marketing				Keep prime racks or inactivate?
Inventory					
Current inventory of Stakes, Stake plates and slats and its usage	Supply Chain				3 months of inventory on hand
Engineering					
Testing 13GA and 14GA Galvanneal Stakes	Quality/ Eng.	Complete	10/24/18	10/29/18	13GA galv material
ECO to change material on all drawings and BOM	Eng.				
Quote					
Lever, spring and rivet for locking mechanism - Does this have to be zinc plated?	Supply Chain	IP			Waiting on supplier for rivet & lever quote
FAB					
Any changes to dies and oil coating on Galvanneal	FAB				

701 & 700 Possible Layout



537 Manning & Product Mix

KNAPHEIDE
SINCE 1848

Define

With the Assembly reshuffle, there is a need for additional capacity. In attempt to create more capacity, we explore the option of adding more product to 537 assembly line in the South Plant and by staffing the lines to an Optimal Level.

Current State

- 537 current Staffing:
 - Personnel from CCUs 525 and 550 on first shift.
 - 14 assigned Assemblers and 1 Material Handler.
 - 537 product mix after the reshuffle is:
 - KUV-SU/SL
 - 6132D54
-
- 617 current Staffing:
 - 17 assigned Assemblers, 1 Spot Welder and 1 designated hanger on first shift
 - 17 Assemblers on second shift
 - 15 Assemblers on third shift
 - 617 product mix after the reshuffle is:
 - KUV and KC
 - 596/796 under 8 hours

Optimal Manning

537

- With an increase of Assemblers:
 - With a staffing of 16:
 - Yield of 14 after absenteeism
 - With 2 shifts, additional hours will be 6,553
 - With a Staffing of 17:
 - Yield of 15 after absenteeism
 - With 2 shifts, additional hours will be 9,830

617

- With an increase of Assemblers:
 - With a staffing of 17:
 - Yield of 15 after absenteeism
 - With 3 shifts, additional hours will be 4,915
 - With a staffing at 18
 - Yield of 16 after absenteeism
 - With 3 shifts, additional hours will be 9,830

Capacity Manning

537

Assemblers per shift	# of units per shift	Productivity(%)
12	9	120.97
13	10	124.07
14	11	126.73
15	11	118.28
15	12	129.03

617

High hour units

Assemblers per shift	# of units per shift	Productivity(%)
12	7	133.98
13	8	141.34
14	9	147.65
15	10	153.12
16	11	157.9
17	12	162.13

Low hour units

Assemblers per shift	# of units per shift	Productivity(%)
13	21	122.98
14	23	125.07
15	25	126.88
16	27	128.47

537 Additional Product Obstacles

- Concerns of bringing product to 537:
 - Space and racking for Steel material
 - Physical constraints of the line (Weld & Grind)
 - Delivery of parts to the South Plant (racking, pallets)
 - Need for additional Material Handlers/Kitters
- SLs
 - Will fit in current racking (ME)
 - Will not have constraint on line (ME)
- SHs
 - Have ticket to request cost and timeframe of transport and delivery racks (883062)

Material Flow

- 6132s
 - Material racks have been assessed
 - ME set to have CAR ready on 11/16
 - Spot Welder CAR has been approved 10/19
 - 12-13 week timeframe for arrival
 - ECR for marker lights in work (ECOs out of ENG by end of month)
- KUVs
 - SU models currently being routed (no change)
 - SL models, current SU racks could be utilized (ME)
 - SH models, currently being assessed (883062)

CI Activity Plan 2018(Q4)-2019

KNAPHEIDE
SINCE 1848

CI Activity Plan 2018(Q4)-2019

Focus area	Improvements	2018	2019	Facilitator
609	Box station layout, Equipment/fixturing requirement and material flow to and from the line. Plan for fast deployment(including usage of weekends and shutdown)	Q4		David Babcock
608	Eliminate kitting for the line and move towards kanban system	Q4		David Babcock
607	Stake rack upgrade by changing material-layout-equipment. Fill the space in 607 with new station	Q4		Sean Fischer
	Material flow & 6s by station, Track the number of load bars eliminated	Q4		Sean Fischer
537	Optimal manning, best location for spot welder and material flow,	Q4		Brad Denton
	Explore options to build KUV-SH including racking. 6132's standardization and racking	Q4		Brad Denton
Gemba	Review and update Metrics. Standard process for Gemba walk including attendance and schedule	Q4		Sunil Rajagopal
KTEC	KUV best practices(Wentzville and 5th street)	Q4		Christy Frankel
	United Rental installation improvement and part requirement verification	Q4		Christy Frankel
	MPV - build review to observe and explore opportunities	Q4		Christy Frankel
608	Heijunka (Bundling & Sequencing)		Q1	
617	Optimal manning, Heijunka (Bundling & Sequencing), best location for spot welder and material flow		Q1	
612	explore and improve flow including racking for common DL-44KJ and HH60		Q1	
Fab	Balance of high volume parts selection to outsource vs in-house		Q1	
	Kits standardization to eliminate excess parts		Q1	
618	Line layout changes, Optimal manning, Heijunka (Bundling & Sequencing), best location for spot welder and material flow		Q2	
614	Cap line utilization - purpose and flow (currently first shift)		Q2	
	Explore effective scheduling process		Q2	
611	explore product mix and improve flow		Q3	
624	explore product mix and improve flow		Q3	
Ecoat	New loadbar configuration to accommodate additional UB based on reshuffle plan		Q3	

K share KNOWLEDGE
N NEWFANGLED culture
A positive ATTITUDE
P PRIDE in work
H create Harmony
E committed to EXCELLENCE
I continuously IMPROVE
D instill Determination
E create Enthusiasm