Prep & Paint Standardization

Knapheide Stores and Installation Centers

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Problem

No Standard Work

Consequences of not having a standard to follow

- Process Variations
- Product Variations
- Different product outcomes
- Increase in warranty
- Results will vary
- Possibility of best practices not being utilized

Resolution

Implementing Standardization

- Aids in training
- Gain predictable results that are measurable
- Focus will be on the process and not the employee
- Ensures work is done to the current best practice
- Provides a baseline for improvement
- Eliminate Waste
- Streamlines problem solving

Form Improvement Team

Knapheide Manufacturing
- *Christy Frankel – Continuous Improvement*
- *Matt Hazelrigg – Quality Assurance*

Knapheide Truck Equipment Store
- *Michael Thomas – KTEC Red Oak*
- *James Sellers – KTEC Midland*
- *Anthony Yates – KTEC Quincy*
- *Lester Medero – KTEC Orlando/Miami*
- *Justin Ericson – KTEC St. Peters*

Knapheide Installation Centers
- *Don Riley – West Quincy, Missouri*
- *Brandon Campbell – Quincy, Illinois*
- *Dave Boytis - Louisville, Indiana*
- *Gerry Powers – Wentzville, Missouri*

Current Process Review

Review Current Practice

- Tools used
- Prep Product
- Paint

Locations

- Wentzville
- West Quincy
- 5th Street Install Center

Next Step

Collaborate with team on the following

Define prep process

- Steps in the process
- Product used
- Training tools

Define paint process

- Steps in the process
- Product used
- Required mils testing
- Training tools

Road to 36K and Beyond

Constraint : E-coat

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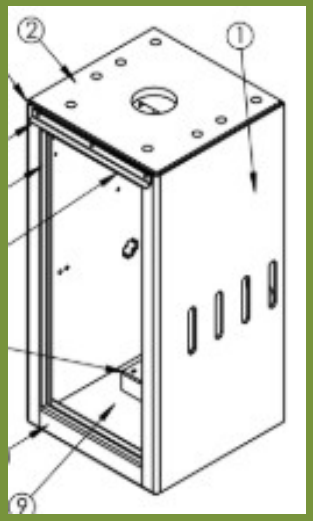
Pre E-coat Improvements

- Minimize use of side-tracker for misc. components
- Reduce load bars consumed by 607
- Load bar densification in 607
- Stake rack – with material change, e-coat is not required
- Outsource selective parts from 607 to be finished complete

Crane Pedestals & Floors

Pedestal



Option A

- Hang them at 607 instead of side-tracker - Currently in progress

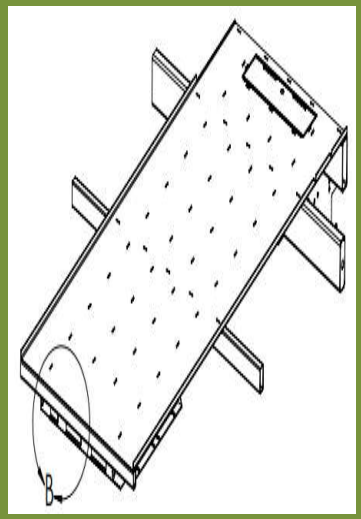
Option B

- Explore direct metal to powder coat – Quality testing with Supplier

Option C

- Outsource e-coat process – Supply Chain to get quotes

Floor



Option A

- Hang vertically at platform (611) - Not feasible at this time

Option B

- 48 hour window delivery to consumption - Supply chain currently testing

Option C

- Apply Rust inhibitor for prolonged storage outside - ME to investigate and price

Outsource parts

20 parts selected for outsourcing

	Description	Op#	Oper Desc	Stat	Tooling	Bas Cde	Nest Cd	Run Hours	Setup Hrs	Mach Hrs	#of Oper	Prev Yr Iss	YTD Issues	Top Coat	Assy	LB YTD
80009640	GSNK SHEAR PLATE, PGN	5	HANG	1			33	0.0055	0.1	0	1	3878	5521	Black		376
26125740	WASHER PLATE - TOP	30	HANG	1			36	0.0066	0.1	0	1	3238	2136	Black		56
26125757	WASHER PLATE - BOTTOM	30	HANG	1			36	0.0066	0.1	0	1	3234	2134	Black		70
26273235	BRACKET MTG FORD .96 EC	80	HANG	1			31	0.0055	0.05	0	1	2262	2078	E-coat		90
26273243	PLATE MTG FORD .38 EC	5	HANG	1			33	0.0055	0.2	0	0	2262	2070	E-coat		100
85413102	BRKT MUD FLAP 32" BLK	40	HANG	1			11	0.0049	0.1	0	1	1881	2102	E-coat		74
80009670	FRONT SHEAR PLATE, PGN	5	HANG	1			33	0.0055	0.1	0	1	1994	2980	Black		169
82013871	BRACKET,MTG.TB & MUDFLAP PG/A	35	HANG	1			12	0.002	0.1	0	1	1523	2185	Black		156
32494640	WELD BRKT ASY PLATFORM KIT SS	20	HANG	1			1	0.01	0	0	1	1761	1878	Black	Weld	86
32594610	WELD BRKT ASY PLATFORM KIT CS	20	HANG	1			1	0.01	0	0	1	1761	1581	Black	Weld	78
21786959	BRACKET WIND DEFLECTOR - RP/FT	80	HANG	1			2	0.0055	0.05	0	1	521	544	E-coat		121
20010460	MOUNTING RAIL KUV EC	40	HANG	1			31	0.008	0	0	1	2215	2412	E-coat		132
26102475	BRACKET MTG.AUX.LEFT 3.50	30	HANG	1			30	0.012	0	0	1	1466	1309	Black		127
26102483	BRACKET MTG.AUX.RIGHT 3.50	30	HANG	1			30	0.012	0	0	1	1466	1310	Black		120
26252999	RECEIVER RING ASSY 8 IN DIA.	20	HANG	1			1	0.01	0	0	1	1492	1989	Black		124
26253153	BRACKET MTG ELOCKCONTROLLR NXG	30	HANG	1			6	0.0066	0.1	0	0	4435	5480	E-coat		295
26808659	WINDOW GUARD OFFSET REAR DR H	30	HANG	1			91	0.005	0.1	0	1	8491	7929.01	E-coat		229
32831050	BUMPER AY, AT&T 78 W/OUT HITCH	20	HANG	1			1	0.1	0	0	1	125	614	E-coat		239
26194274	DRIP PAN ASSY, CRK BODY	20	HANG FROM QMF	1			1	0.0194	0.1	0	1	905	1020	E-coat		88
82055302	BULKHEAD ASSY BHR4096 BLK	12	HANG FROM CM&W	2			1	0.049	0	0	0	1245	1168	Black		582

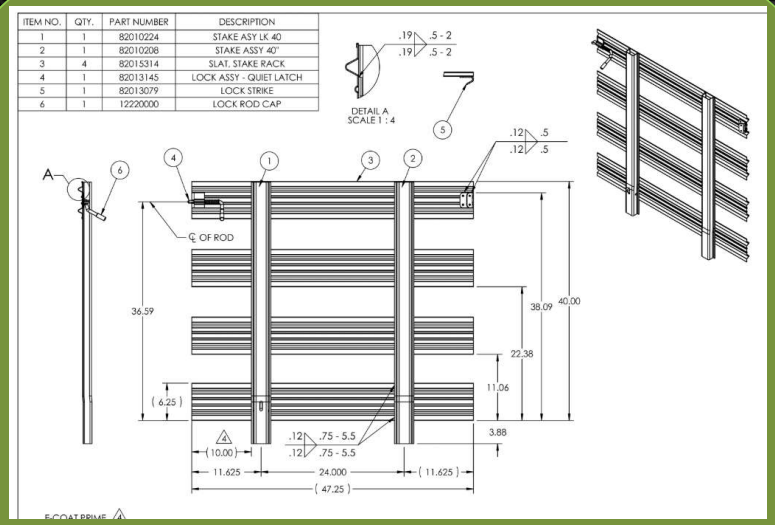
Highlighted parts outsourced but brought back to be hung

Load bar densification in 607

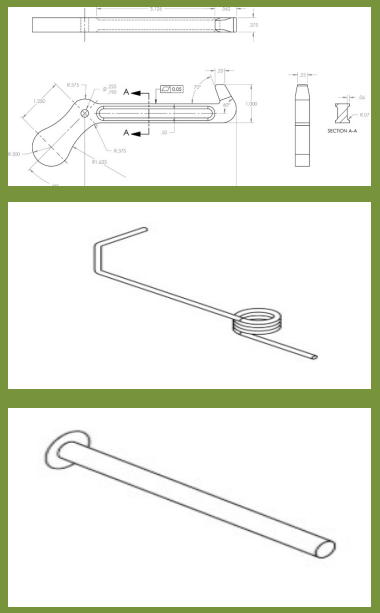
Changes in effect from first week of Feb

- Two hang operators per shift - One hanger east side and one hanger west side
- Hang operators responsible for wanding all product to load bars
- Log info. on hang sheets similar to UB - Log sheets create a record for point of reference
- Hang operators control release of all product into e-coat

Stake Rack – Material Change



- ECO for material change in process
- Galvanneal Material estimated delivery March 1



- Stake lock hardware to be plated

Part #	Desc.	
82010562	Corner rack Connector R	
82010554	Corner rack Connector L	
82010547	Stationary Rack Connector R	
82010513	Rack Connector L	
82010539	Stationary Rack Connector L	
82010521	Rack Connector R	
82013053	Lock Strike L	

- ECO released for hardware change

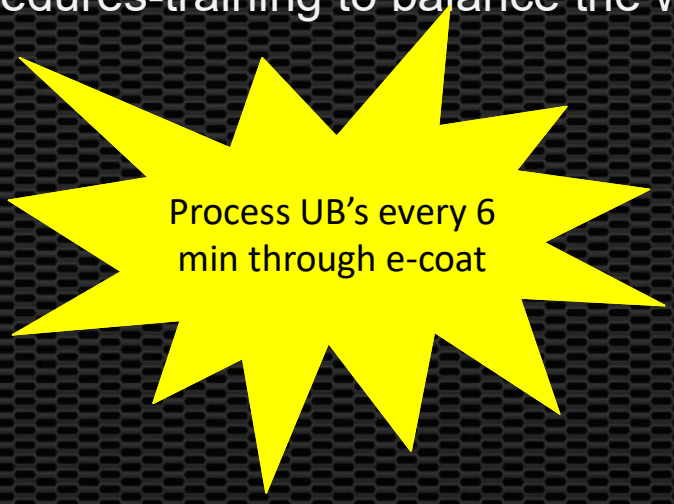
Stake Rack activities

Stake Rack activities tracked through weekly meeting

TASK	Support Team	Owner	PROGRESS	START	END
Stake Rack Project - Use Galvanneal					
Equipment-Location					
Equipment Location (Manual and Robot)	Operations	Dale Gill	Complete		
Equipment move schedule	Manufacturing Eng./ Operations				
Inventory buffer during move	Planning		Complete		
New Equipment location Space	Operations	Dale Gill	Complete		
Incoming and outgoing material storage	Operations	Rob Witler	Complete		
Re-establish HOME position for Robot after move	Automation	Chris Ford	Complete		
Additional resource for programming robot	Automation	Chris Ford			
Fill the manual location at 607	Operations		Complete		
Spot welder - where to locate?	Operations	Rob Witler	Complete		
Handling					
Method of Shipping to PCP	Supply Chain/ PCP	Dave Tanner			
# of Racks needed	Manufacturing Eng.				
Storage of parts at PCP(must be covered)	Supply Chain/ PCP				
Galvanneal parts estimated delivery from PCP	Supply Chain/ PCP	Dave Tanner		3/1/19	
Routing					
ECO process to update material from hot roll to galv.	Engineering	Deepak		1/14/19	
Update routing to reflect the new process	Manufacturing Eng.	Bill Greving			
Part number move from manual to robot	Manufacturing Eng.	Bill Greving	Complete	10/22/18	10/22/18
Inventory					
Current inventory of Stakes, Stake plates and slats and its usage	Supply Chain	Adam H./ James R.			

Post E-coat Improvements

- Eliminate priming of KUV cargo in PB1(undercoat booth)
- Eliminate painting inside of compartments on DL-132 and DL-169
- Hang two 9’ bodies on a single load bar
- Add two operators per shift in unhang/trim
- Balance the line to create smooth flow - plug & caulk, unhang and trim
- Create policies-procedures-training to balance the work load into e-coat system



Post E-coat Improvements

- Eliminate priming of KUV cargo in PB1(undercoat booth) - Complete
- Eliminate painting inside of compartments on DL-132 and DL-169

  Move paint operation, CTECH drawers and shelves installation to West Quincy

  Collaborate

  - with WQ to identify storage space for CTECH drawers and shelves
  - with Supply Chain to explore options like drop ship CTECH drawers to WQ
  - with Engineering to make necessary changes to drawings, kits etc...

Simulate by shutting down washer at certain hours in a day to allow only utility bodies flow through e-coat – First week of Feb

Road to 36K and Beyond

Constraint : Capacity

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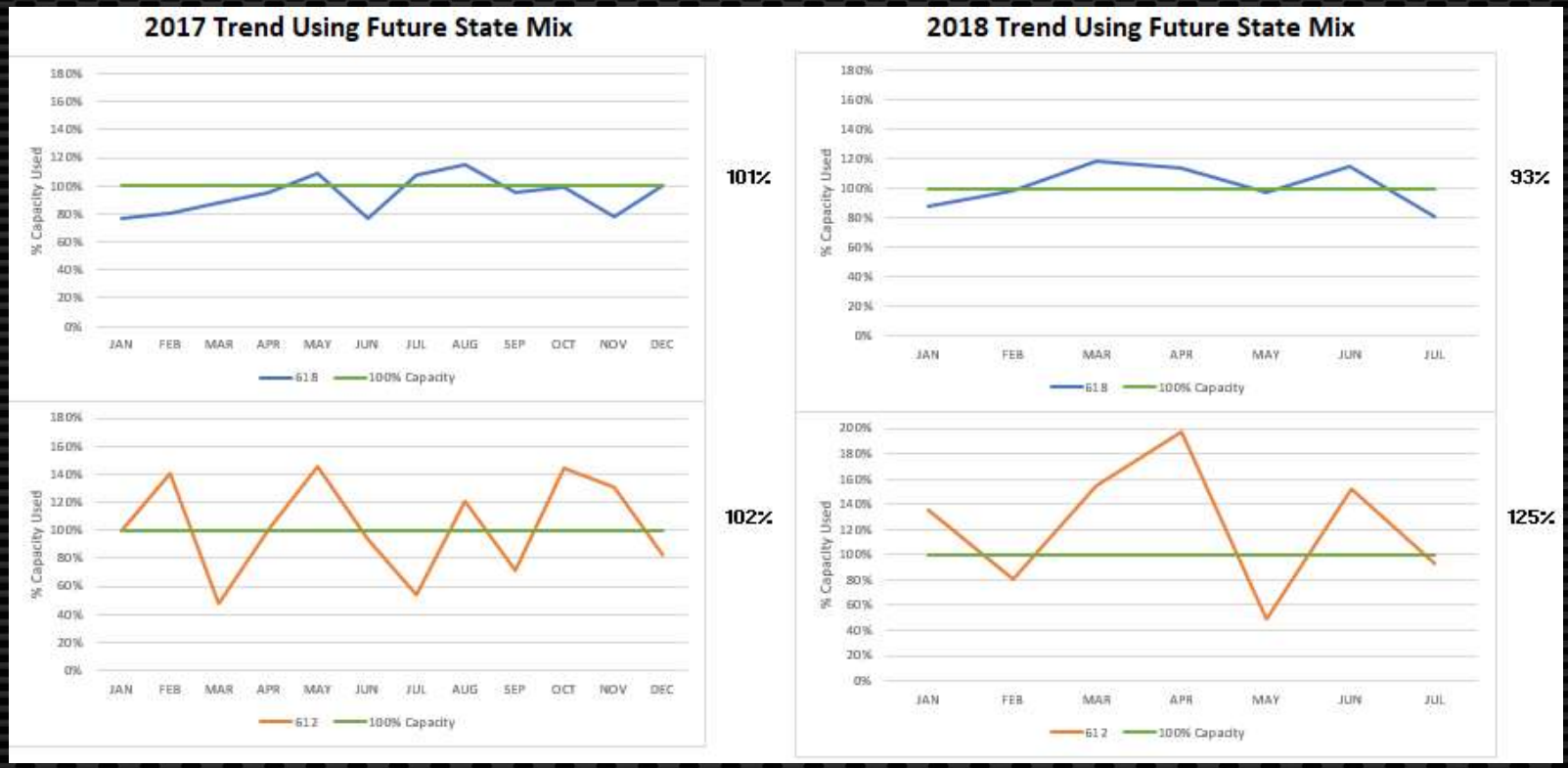
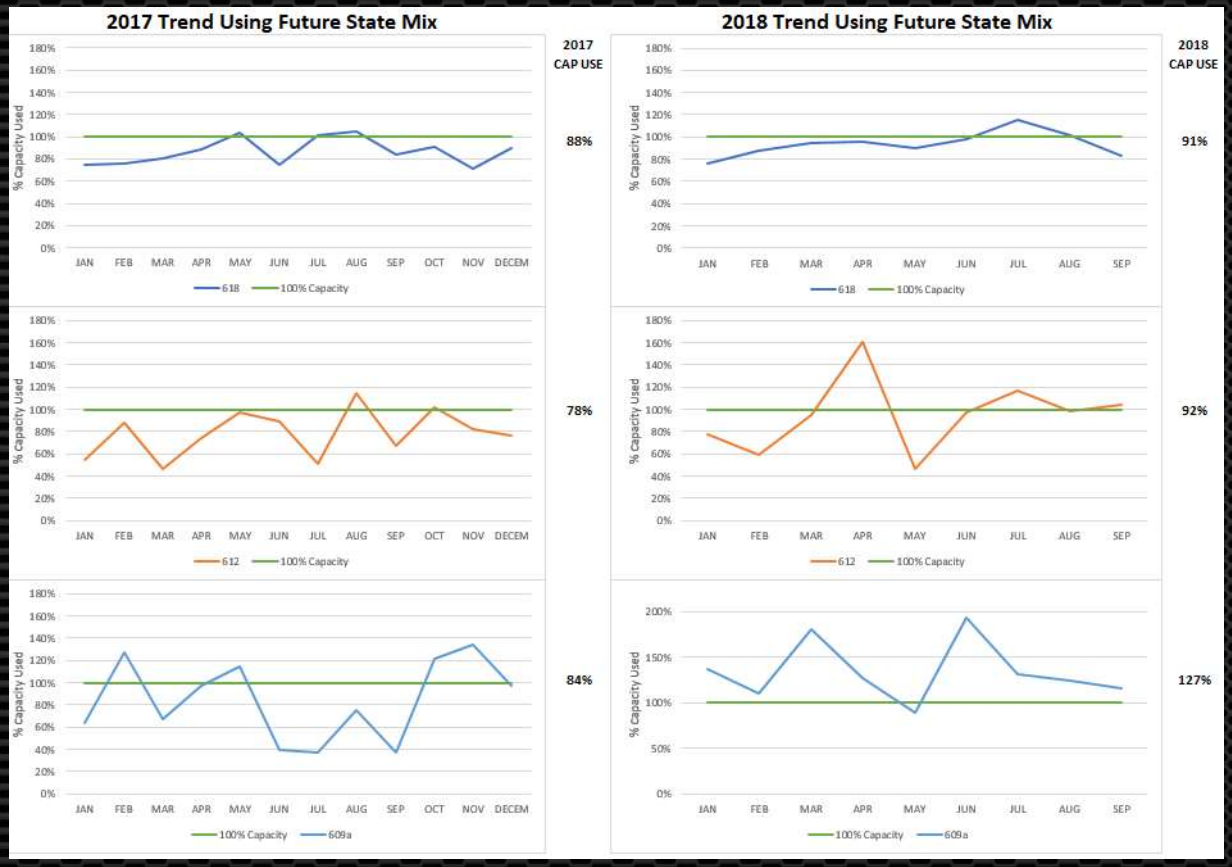
Mini line to handle high hour bodies

1. Lead times excessively long on high hour line
2. Cannot handle future crane demand (based on projected order rates)

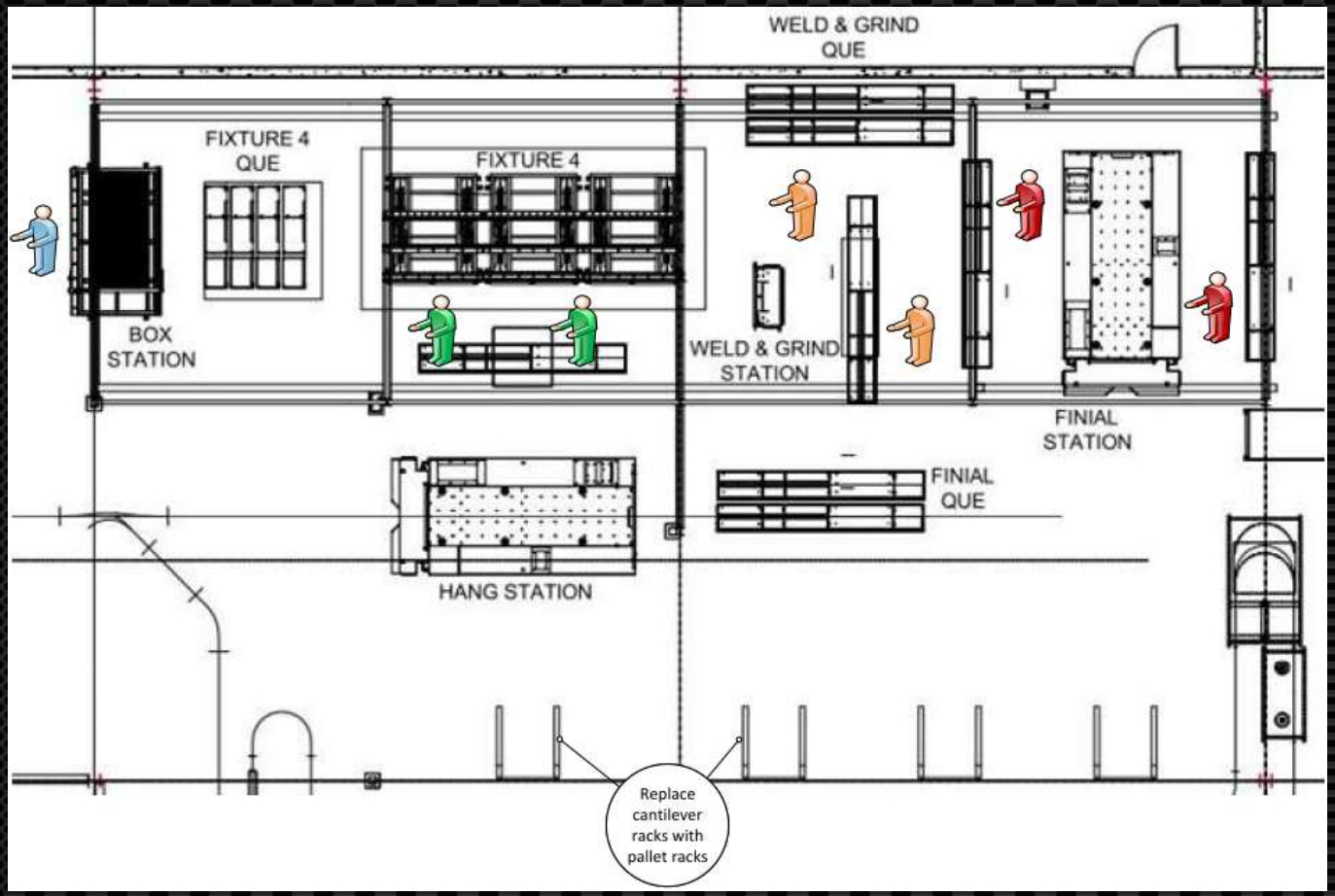


Mini line to handle high hour bodies

Create additional high hour capacity via mini assembly line along East wall



Mini line - Tasks Completed



- Layout aligned
- CAR approved
- Product mix identified
- Manpower defined
- Capacity
- New workcenters
- Planned by 609 Planner

Schedule of activities

Mini Line

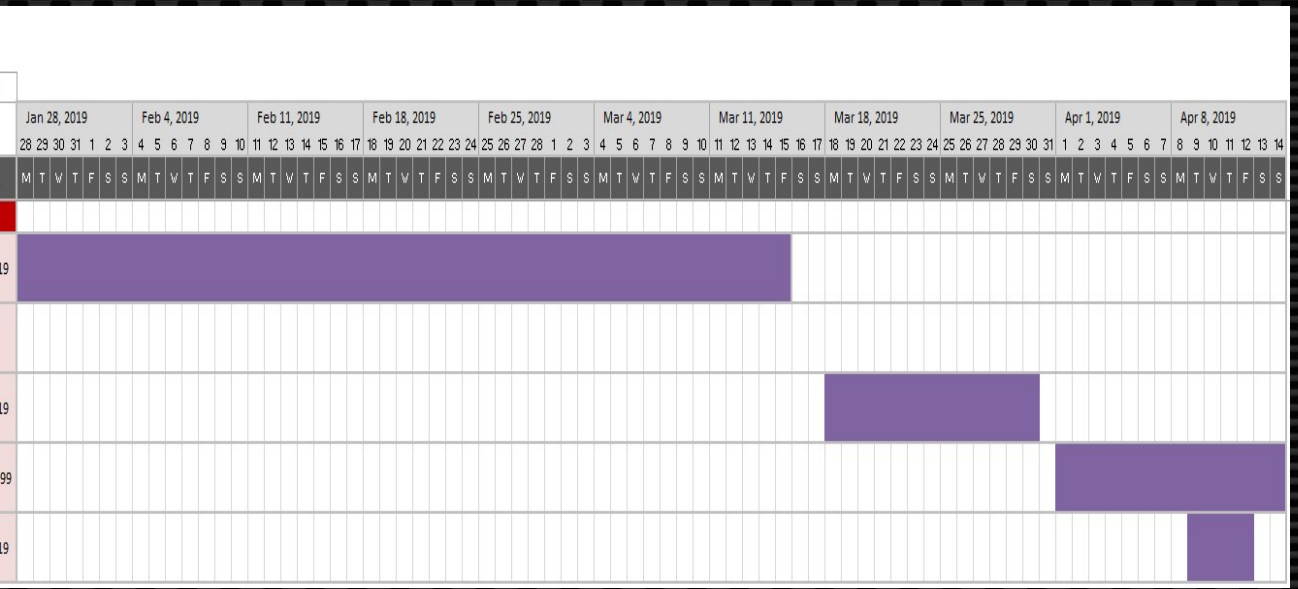
Knapheide Manufacturing

Dave Babcock

Project Start: Tue, 1/1/2019

Display Week: 8

TASK	ASSIGNED TO	START	END
Next Steps			
Equipment Procurement/Installation	ME	1/1/19	3/15/19
Plan Capacity Need UR weldments	PIC	TBD	TBD
Soft start-up - validate flow	Ops ME CI	3/18/19	3/30/19
Production ramp	Ops ME CI	4/1/19	12/31/99
Validate headcount	Ops CI	4/9/19	4/12/19



Road to 36K and Beyond

Constraint : Kitting

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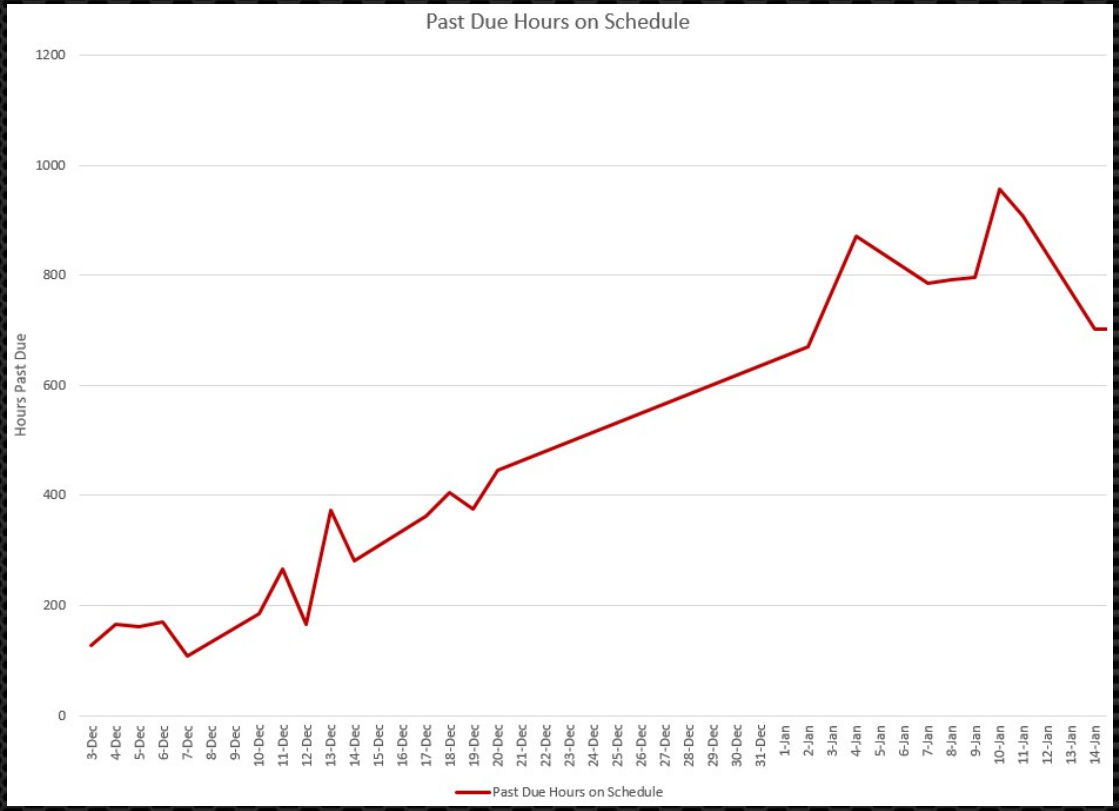
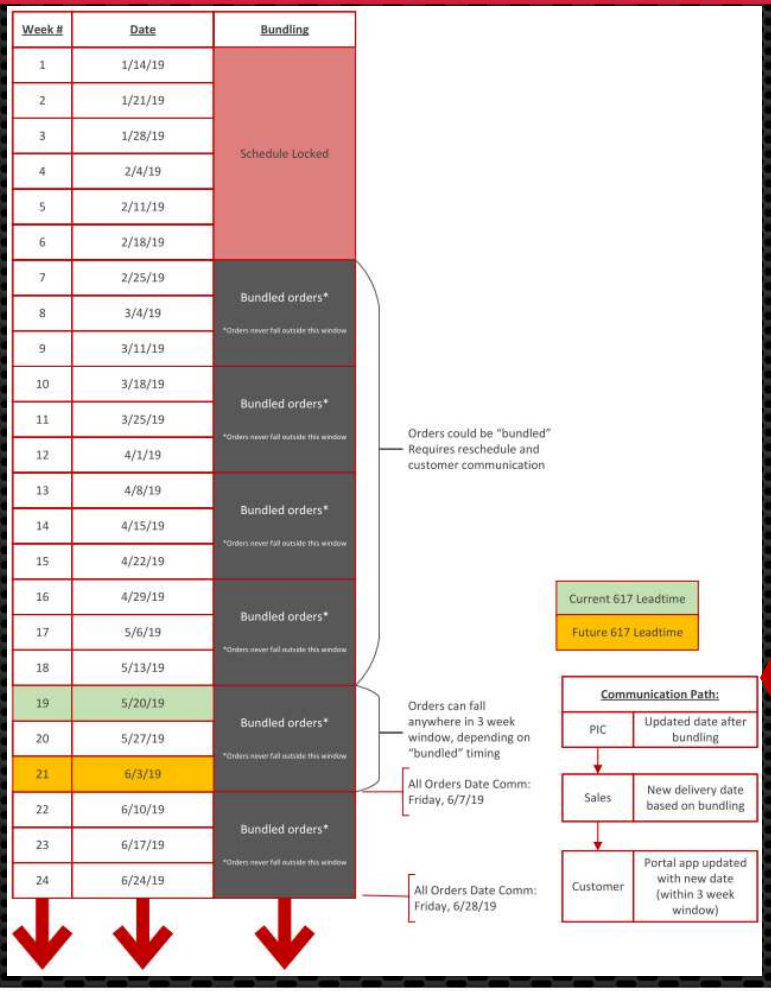
617 bundling and sequencing

Kitting cannot keep up with 617 production following current kitting practices

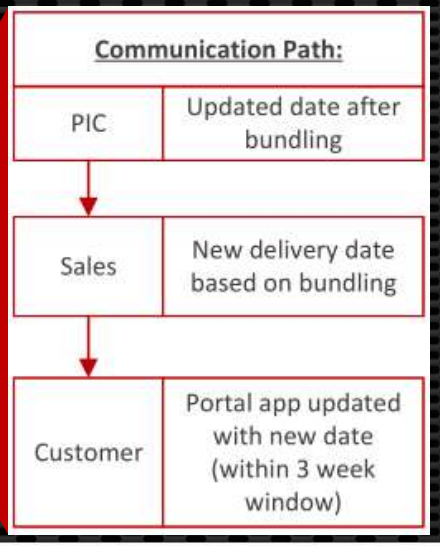


Bundling process

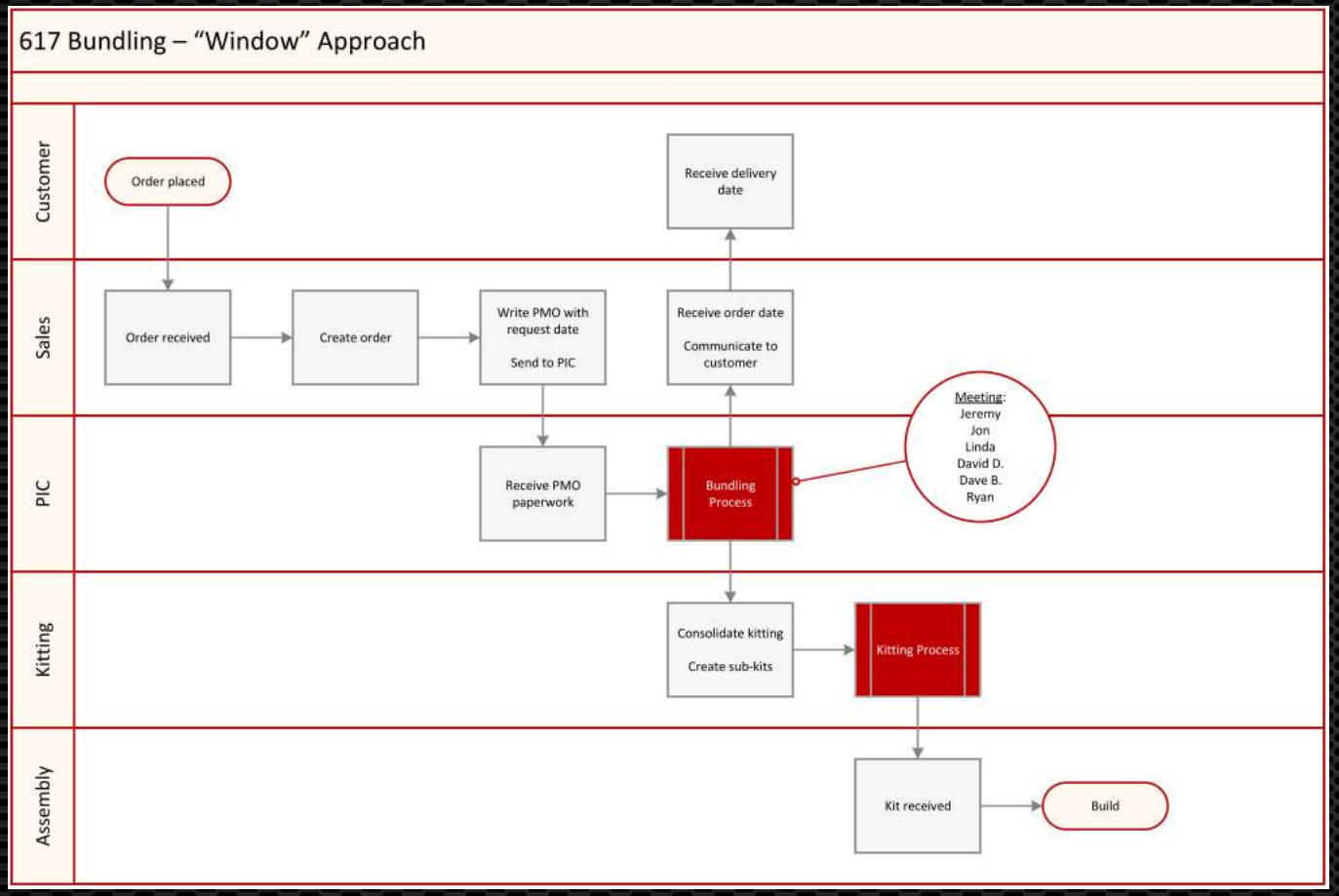


Conceptual view of how scheduling would work under “3 week window” approach.

Note: Lead time extension required due to communication process changes between Sales & PIC (protects planning window)

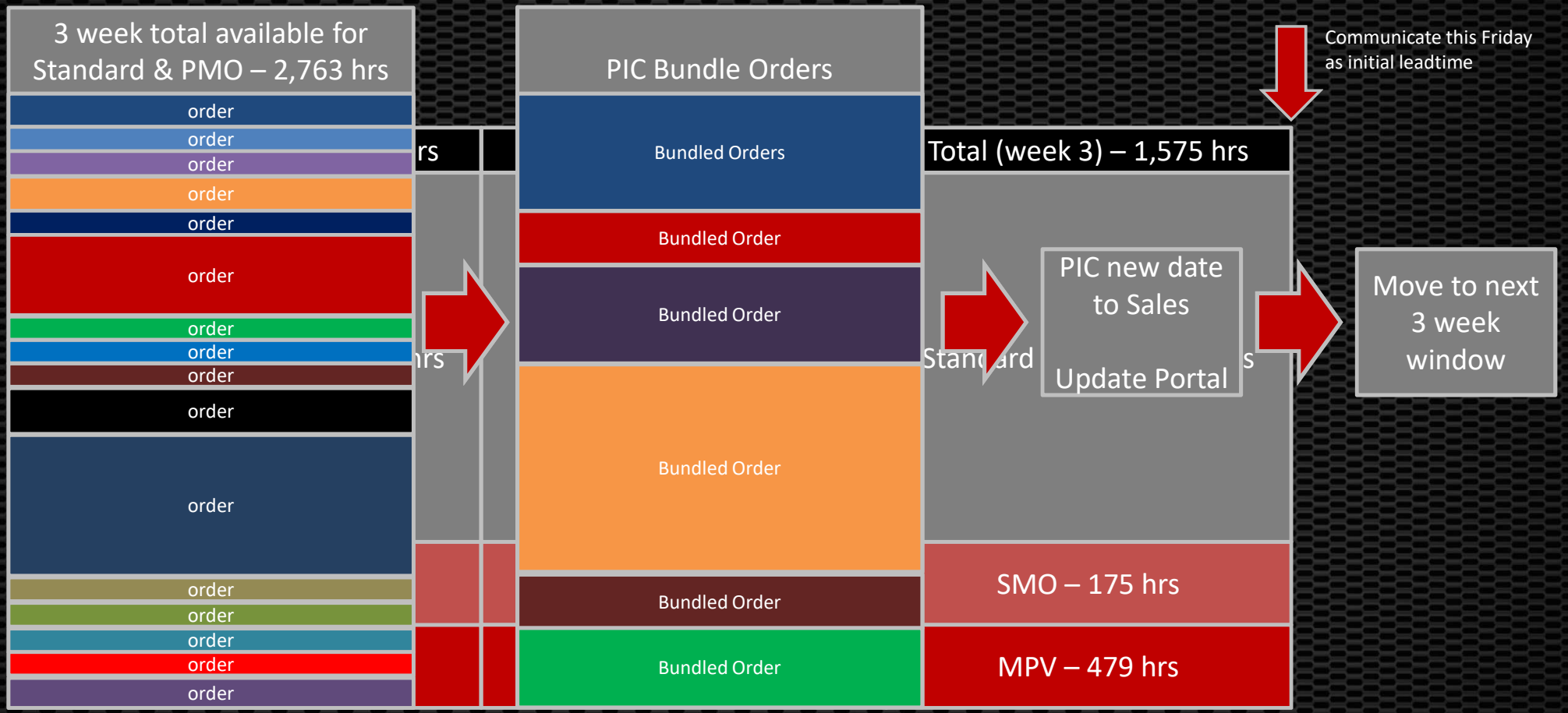


617 bundling - Tasks Completed



- Communication process
- PIC bundling process
- Kit reduction process
- Swimlane flow

617 bundling - Tasks Completed



Schedule of activities

Tentative schedule

617 Bundling

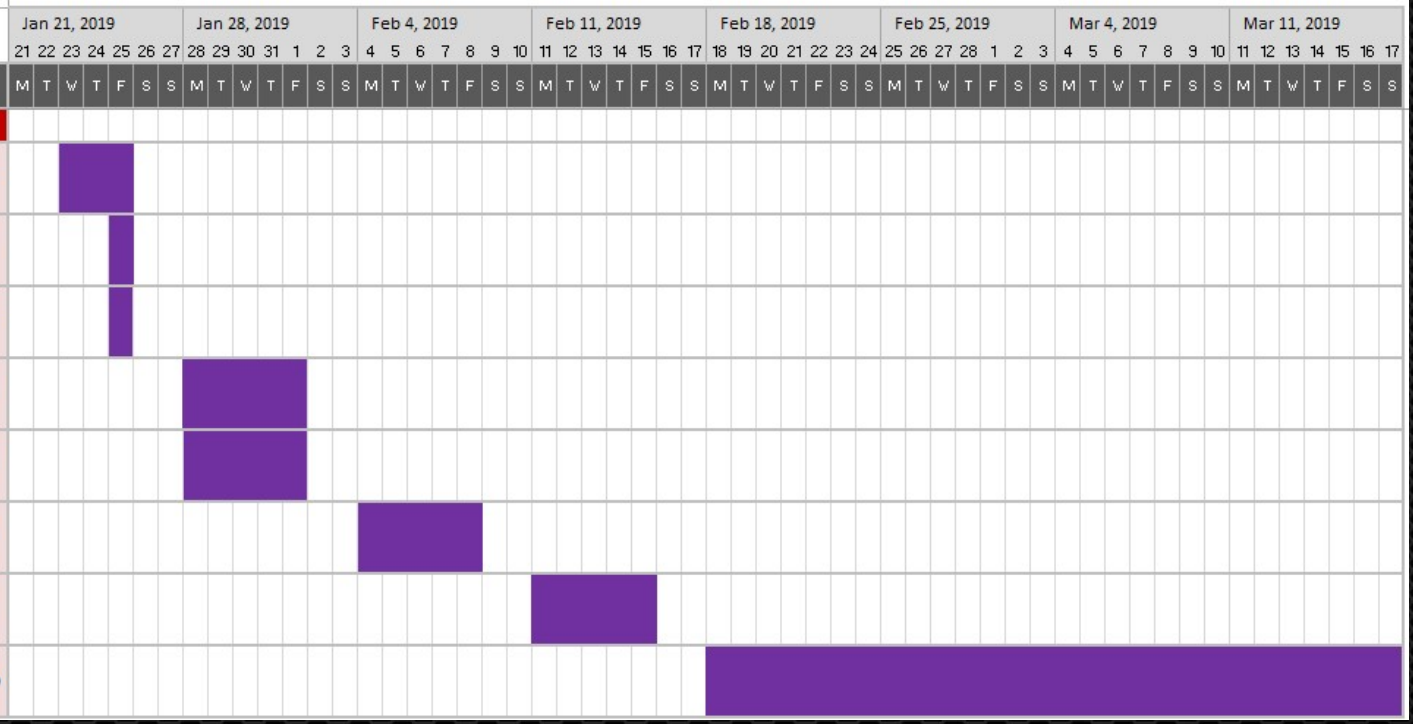
Knapheide Manufacturing

Dave Babcock

Project Start: Tue, 1/1/2019

Display Week: 4

TASK	ASSIGNED TO	START	END
Next Steps			
PIC bundling process	Team	1/23/19	1/25/19
PIC order intake flowchart	Team	1/25/19	1/25/19
Bundling simulation Order intake simulation	CI	1/25/19	1/25/19
Options creation 1) Reschedule 2) Existing Schedule	Team	1/28/19	2/1/19
Options review VP level	PIC/Sales/CI	1/28/19	2/1/19
Approval	VPs	2/4/19	2/8/19
Training	Team	2/8/19	2/15/19
Rollout	Team	2/18/19	12/31/99



Road to 36K and Beyond

Constraint : 607

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607: Side Assembly Schedule and Standardization

- Map and identify the standard schedule and procedures that influence the daily schedule for 607 (Side Assembly) to develop opportunities that:
  - Increase productivity
  - Decrease rework/confusion/losses
  - Increase communication across CCUs and PIC
  - Identify failures and high recurrences of issues
    - Develop procedures to limit/eliminate reoccurrences
  - Develop cross functional reporting procedures.
    - Data analysis
    - Grading

Roadmap to Productivity: Physical

- Map the physical flow of orders to completion
- Record transaction between 607 and CCUs
- Analyze PIC orders and what work is scheduled
  - What impacts schedule
  - How does availability of kits influence what is worked on
  - How does the coaches priorities requirements of each work center
  - How does Infinite Capacity influence workflow
- Map the ordering process from inception to completion

Order Generation Processing

How does the Ordering process influence Productivity.

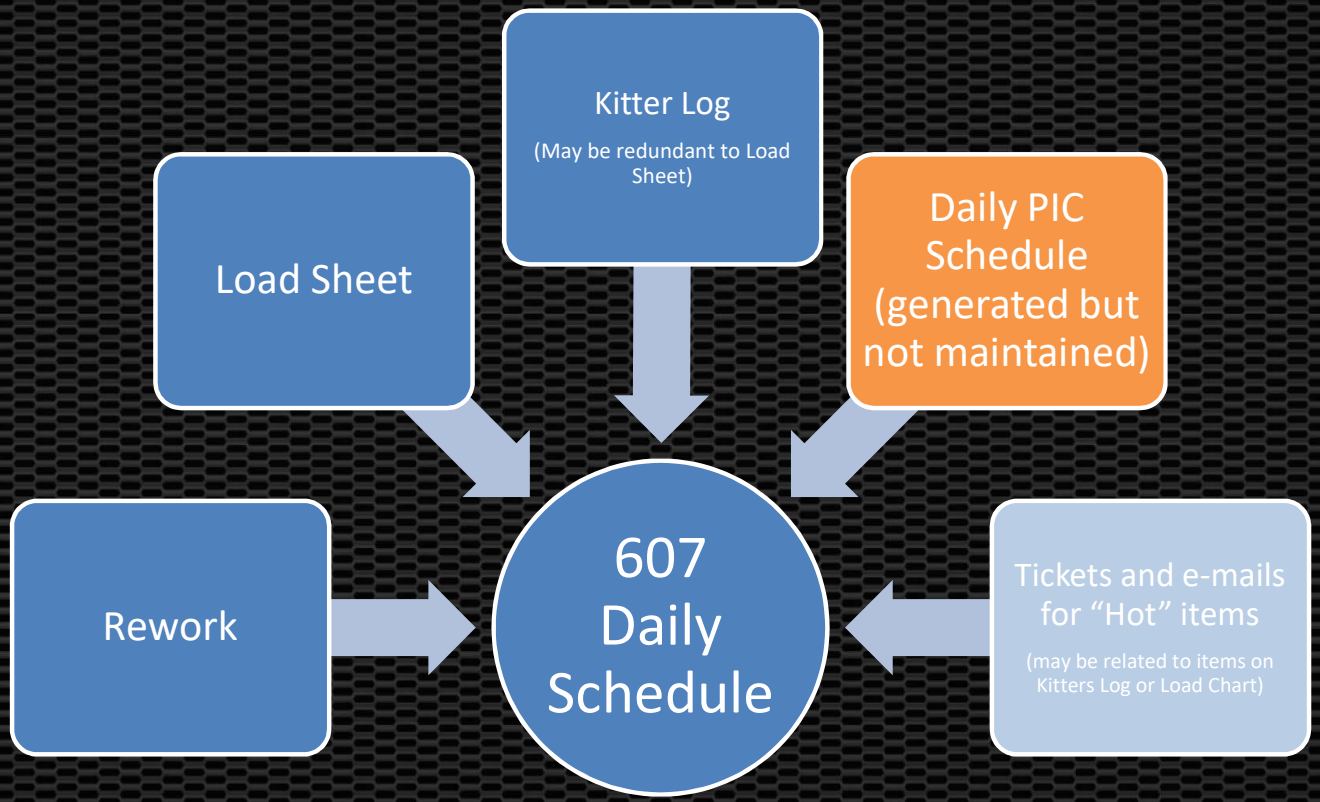
Is the Work orders predictive

What can PIC do to be productive so 607 does not have to be reactive.

Incoming Ordering and scheduling processes for 607

- PMO/Standard: Standard products PO received by Distributor Services or Standard Parts w/Options. Processed in by DS and Scanned into file.
- SMO (C-Quote): Custom Order requiring Engineering (Seven Types of SMOs reviewed by Custom Order Confirmation)
- Fleet Order (L-Quote): PO submitted and processed by Fleet
- Replenishment/Stocking Program: Stocking orders directed by Marketing or the Production Floor w/o PO.
- Subassembly: Orders to 607 (Side assembly to be used by another CCU to complete an order.

Schedule Flow (Spaghetti Highway)



Schedule Flow (Priority)

Damage/issue found with 607 part/order after it leaves 607.

Hot item identified by PIC (Source Load Sheet)

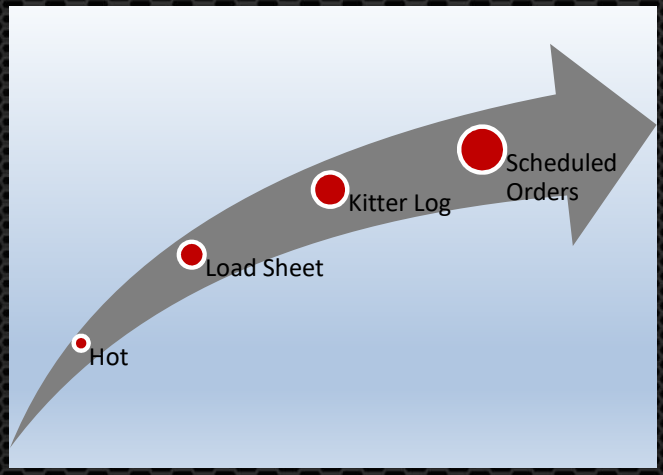
Shortage Identified/ issue with completion of order. (Source Kitter Log)

Scheduled Work Center Orders

Tickets sent Directly to Coaches for “Hot” items.

Overview Priority Mapping

The priorities set by 607 are driven by severity of need. The daily schedule for each work center derives from the load sheet and kitter log. Issues identified as “HOT” by PIC will take precedent over WS orders.



Roadmap to Productivity: Data

- Analyze reporting data
  - Who collects the data and how/where
  - Measure the importance of data
  - How does the data/reports impact productivity
- Review Communication reports
  - Load Sheet
  - Kitters Log
  - Standard Schedule
- Review operations that are not communicated via Reports or retrievable data systems (AS400/Shop Controls)

Next Step

- Physical and procedural changes
  - Identify low level, medium level, and high level opportunities that would influence Productivity.
    - Collaborate with supply chain and Fab
    - Conduct Kaizens
    - Initiate Micro projects
  - Resolution methods including the metrics to measure and sustain