



Focused Factory

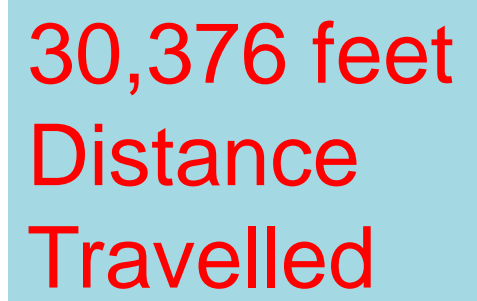
What is it, why pursue it, how do we implement it

Conventional Factory



■ Functional Organization Structure

- “Many organizations, even until the end of the 1970’s, operated under central control, through large functional departments.
- “Organizations need a new kind of management system—one explicitly designed to manage strategy, not tactics.”
 - Kaplan, 2001
- Departments based on function (winding, assembly, test)
- Shared support resources (planning, engineering, stockroom)
- Requires coordination, priority setting, and queue each time product moves between departments
- Emphasis on efficiency & utilization extends queue & lead times
- New product introductions cause delays on existing products which are in contention for the same resources



Our biggest opportunity

- *All we are doing is looking at the time line from the moment the customer gives us an order to the point where we collect the cash. And we are reducing that time by eliminating the non-value-added wastes”*
 - *Ohno, 1988 (credited with developing TPS now called Lean)*
- Queue time is the largest component—as much as 90%—of internal lead time. It is “the amount of time a job waits at a work center before setup or work is performed on it.” *TMEH Vol. 9*
- *“Taking time out of the system requires completely rethinking how you organize production, materials supply, and white collar work. The result is a cellular organization.” Suri 2002*
- “There is not a single factor which commends a lengthy lead time.”
 - *Lu, 1989*

Time Based Competition

- *Traditional manufacturing requires long lead times to resolve conflicts between various jobs or activities that require the same resources.*
- *In a traditional factory products usually receive value for only .05% to 2.5% of the time they are in the factory.*
- *Product oriented layout of the factory and local scheduling makes the total production process run more smoothly.*
 - Stalk 1988
- 303 firms were studied for the effects of Time-Based Manufacturing Practices (TBMP). TBMP reduce costs, improve quality, and shorten lead times resulting in improved customer value.
 - Tu 2001

Quick Response Manufacturing

- Break the “Planning Loop” with a single focus on Lead Time.
 - Focus on efficiency, utilization, cost, and on-time delivery results in longer lead times.
 - Focus on Lead Time results in improved cost, quality, and on-time delivery.
- Number one key principle for reducing lead times:
 - *“You must change the organization of tasks, procedures, equipment, and processes from a functional basis to a product-oriented basis. All the resources needed to complete a given product are located close to each other.”*
 - Suri 1998

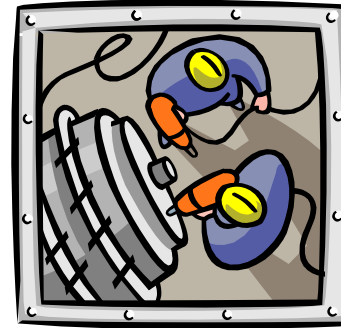
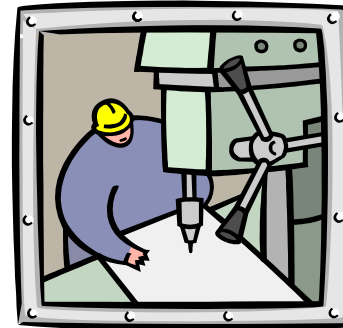
What is a “Focused Factory?”

- A factory that focuses on a narrow product mix for a specific market
- A competitive weapon to meet customer need in the shortest time.
- Costs are lower because fewer supporting resources are needed and overheads can be more appropriately allocated.
- A “plant within a plant” (PWP) is where the existing facility is divided both organizationally and physically into several PWPs.
- Each PWP has it’s own: product line, facilities, equipment, workers, materials, quality, engineering, customers, etc.



Create Flow in Engineered Products

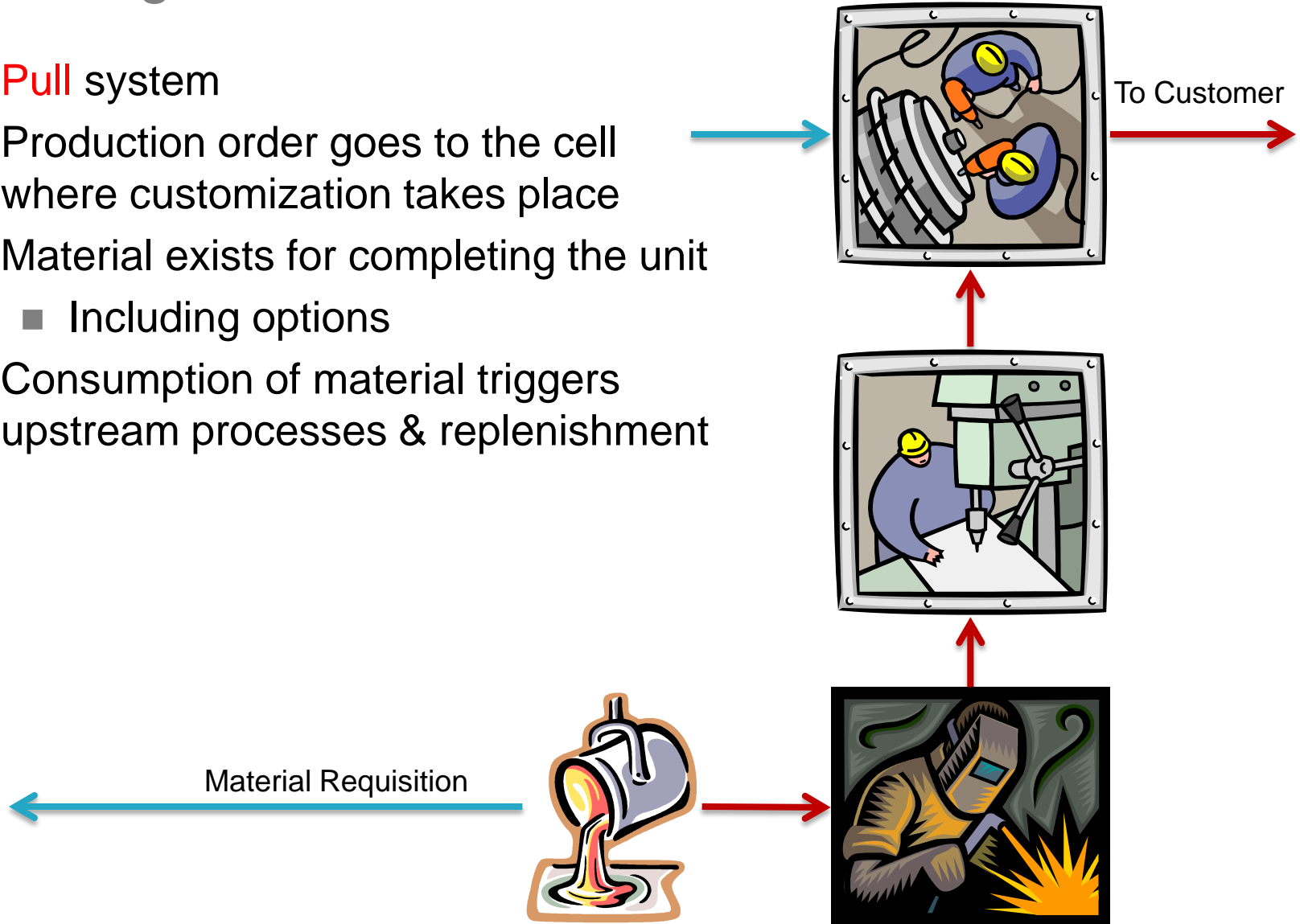
- **Push** system
- Design is completed.
- Material is ordered.
- Production order goes to FIRST process.
- Material and Production Order triggers downstream processes.
- Material **MUST** be delivered to the next step in order to proceed.



To Customer

Creating Flow in Customized Products

- **Pull** system
- Production order goes to the cell where customization takes place
- Material exists for completing the unit
 - Including options
- Consumption of material triggers upstream processes & replenishment



Cellular Manufacturing

- “A manufacturing cell consists of a set of machines, in proximity to each other, arranged according to product routing to minimize product movement. The cell is operated by a team of multiskilled workers... who take complete responsibility for quality and delivery performance. All the resources to complete the operations should be available within the cell.” *Suri 1998.*



What does Lean look like?

- **TD Power Systems Bangalore**
- **TDPS BUSINESS NEWS** First order for the US Market from Dresser Rand for a 3.75MVA steam turbine generator.
- <http://www.tdps.co.in>



Example of Lean at Competition

- “Production line based on: cellular concept, scalable, continuous improvement focus, mathematically-based, quicker and more efficient response.”
- TECO-Westinghouse Motor Company, Round Rock, TX
- <http://www.teco-wmc.com>



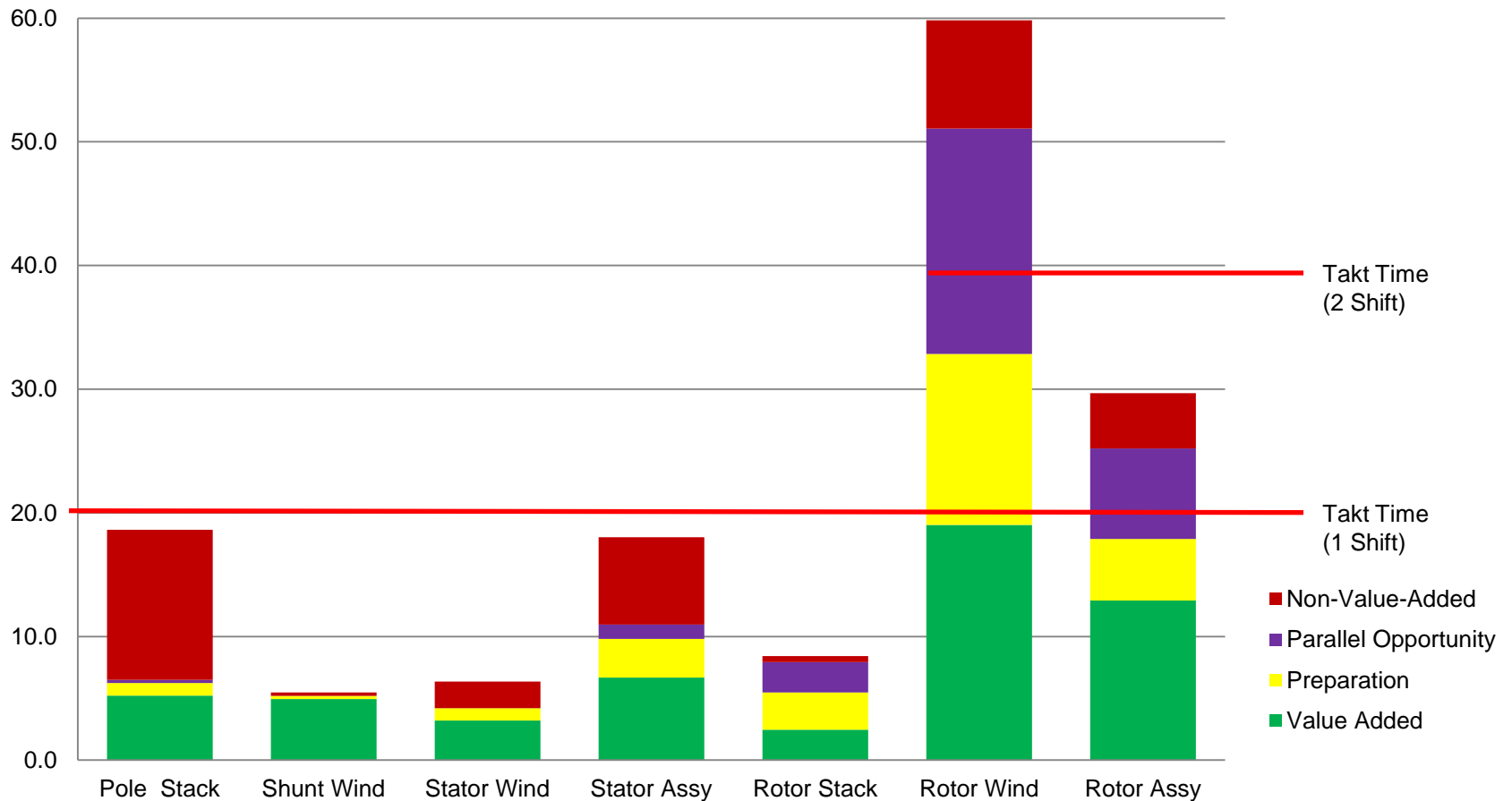
Standard Work Observation

- Discrete steps recorded for major processes in Exciters (example):

Date	Shift	Observer	Seq. No.	Work Cnt	Operation Element	Mach. No.	Time			Comments
							Start	Stop	Dur.	
6/19/2012	1	SH	1	P	Remove completed rotor from stand	Rotor	7:50		0:15	
				X	Hunt for skid	Wind	8:05		0:08	No skid on 2nd floor, find & send up on elevator
				P	Place spud on skid		8:13		0:01	
				P	Hook hoist to mandrel		8:14		0:01	
				X	Run Jib up & down to purge water, wipe up		8:15		0:06	Timer turned off by second shift
				P	Flip part up		8:21		0:01	
				P	Set on floor vertically & remove nut		8:22		0:01	Need a spud to set mandrel on
				P	Lift off mandrel & lower onto skid		8:23		0:02	
				P	Air hose & butterfly wrench to remove faceplate		8:25		0:02	Socket falls off wrench; needs repair
				P	Lift off faceplate		8:27		0:01	
				P	Paperwork, move ticket, elevator, signal trucker		8:28		0:07	
				P	Move 354-02-09 under hoist		8:35		0:05	
				X	Visual inspect & wipe off		8:40		0:05	Part comes from lathe without being cleaned. Covered with oil.
				P	Position hoist & attach ring		8:45		0:02	
				P	Flip, set on plywood, remove ring, pick up faceplate		8:47		0:03	
				P	Loctite & insert dowel, attach faceplate		8:50		0:10	
				P	Hoist rotor onto mandrel, attach nut		9:00		0:07	
				P	Position under jib crane, lay part on side		9:07		0:08	
				P	Hoist onto lathe		9:15		0:05	
				P	Power on lathe		9:20		0:02	
				X	Purge air line		9:22		0:01	
				X	Spin part & blow off		9:23		0:07	
				X	Break		9:30		0:23	
				X	Fetch alcohol		9:53		0:04	
				P	Put away skid of tooling from last job		9:57		0:05	
				P	Wipe part with alcohol & rags		10:02		0:10	Flameable rags placed in open trash container; need fireproof
				P	Measure spider & fetch supplies		10:12		0:04	
				W	Wrap glastic & tape around spider		10:16		0:11	lathe has 4 RPM max; could use more for some operations
				W	Insulate spider		10:27		1:10	
				W	Insulate slots		11:37		0:18	

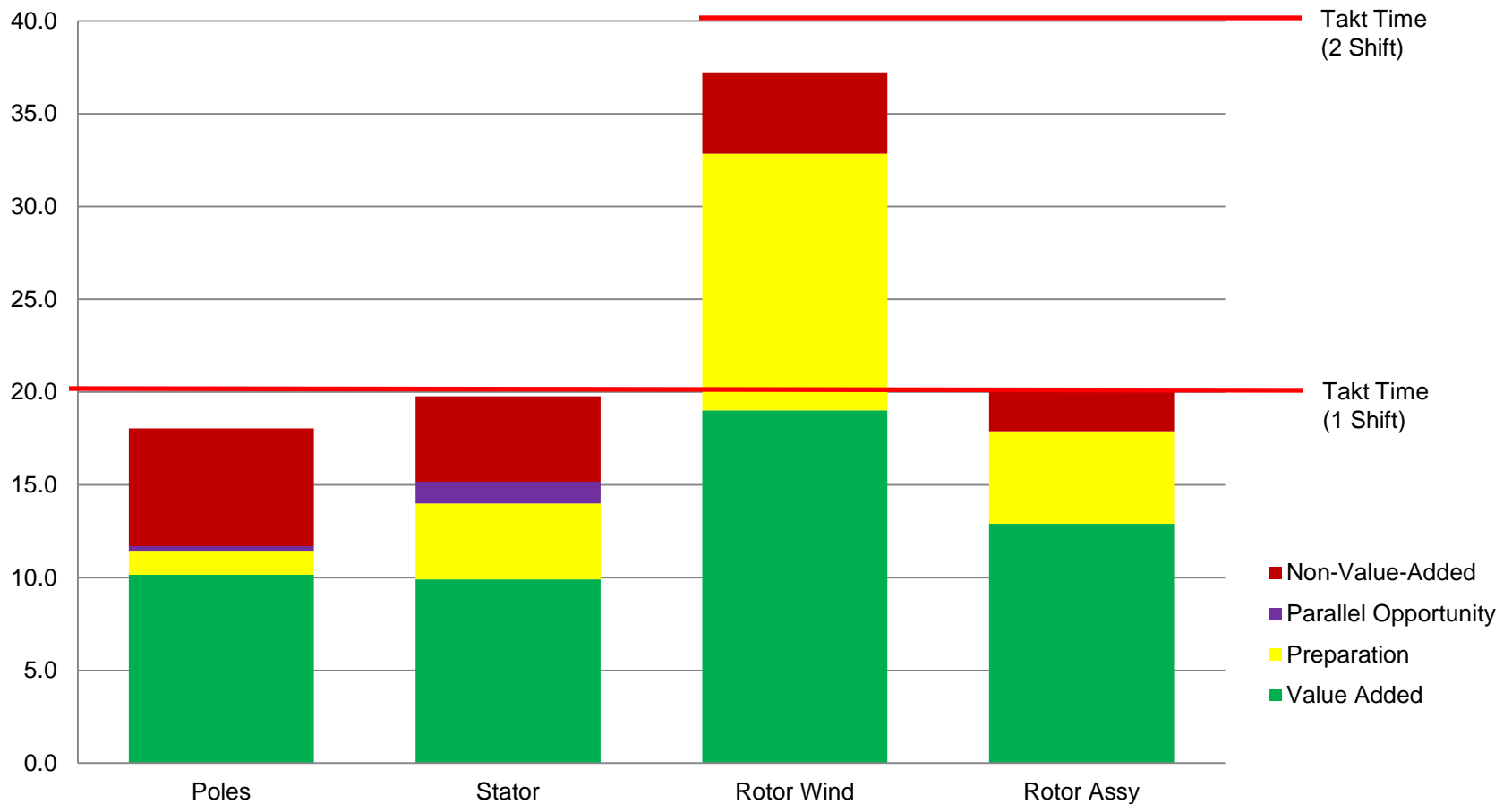
Operation Loading

Exciter Operation Loading Current State



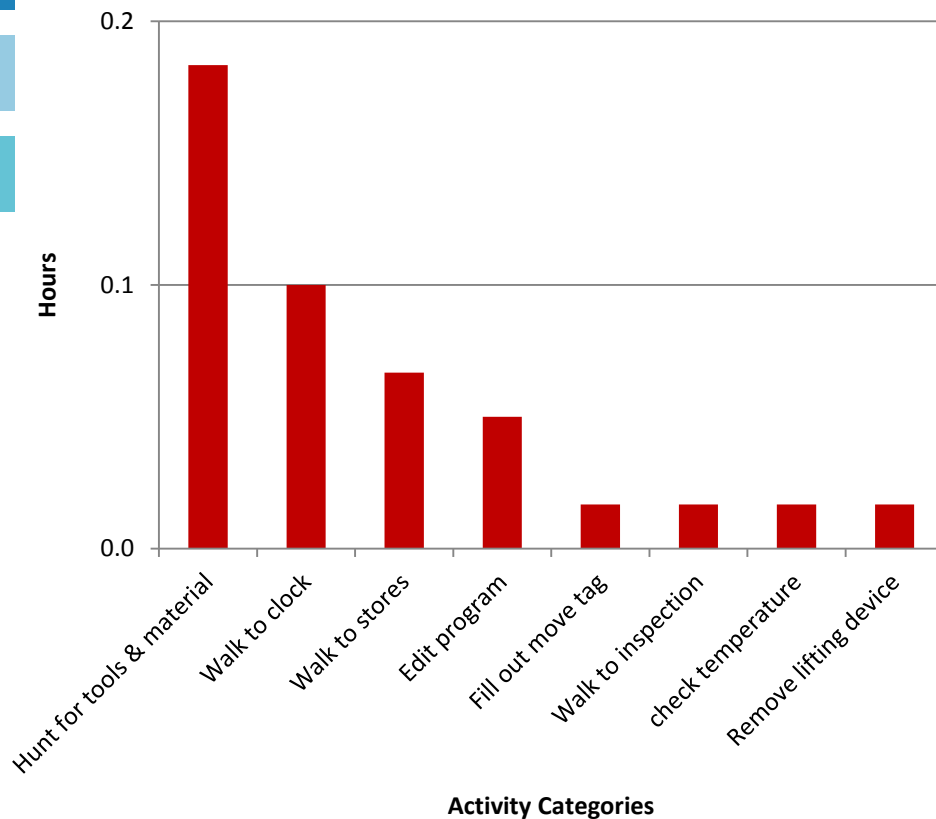
Operation Loading

Exciter Operation Loading Future State

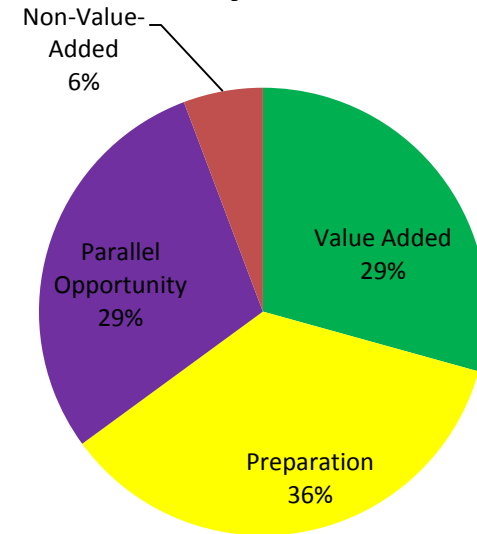


Work Observation Output

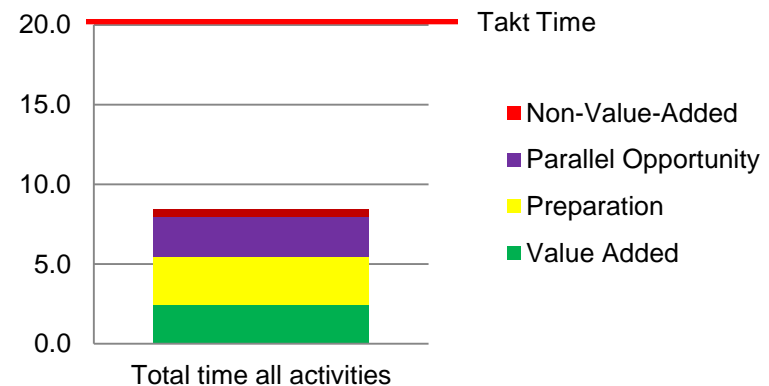
Stacked Rotor Non-Value Activity



Stacked Rotor Activity Breakdown

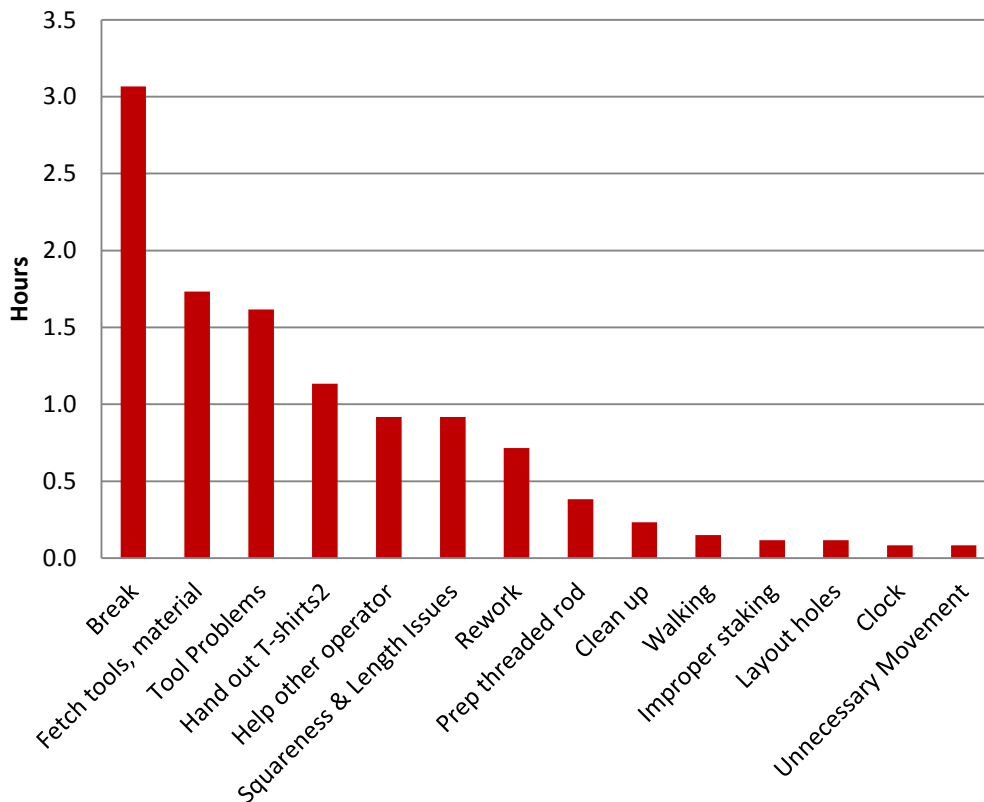


Stacked Rotor

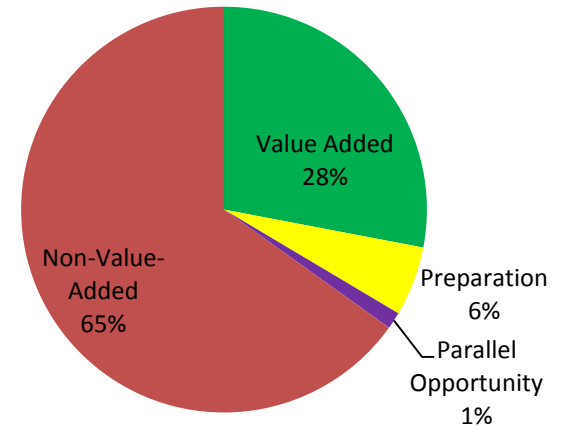


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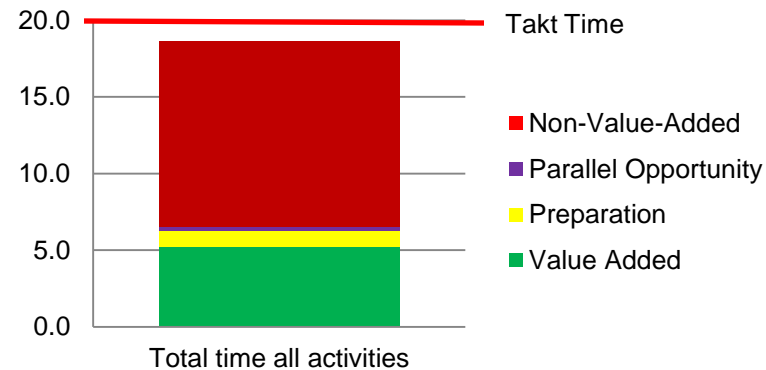
Stacked Pole Non-Value Activity



Stacked Pole Activity Breakdown

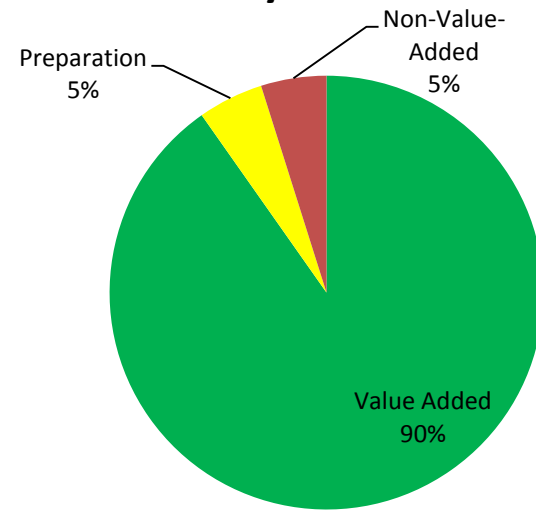


Stacked Pole

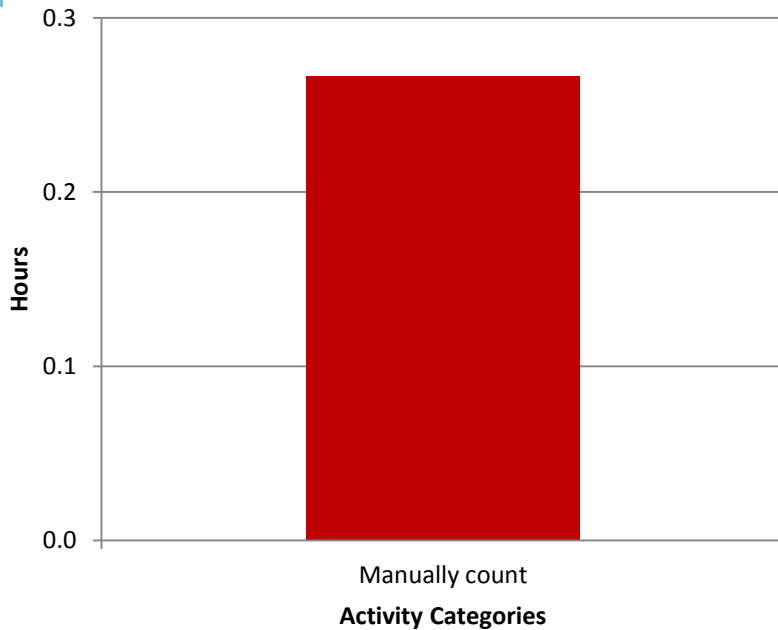


Work Observation Output

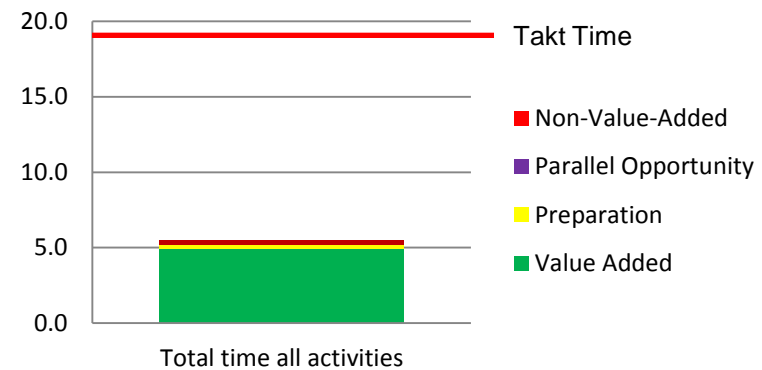
Shunt Winding Activity Breakdown



Shunt Winding Non-Value Activity

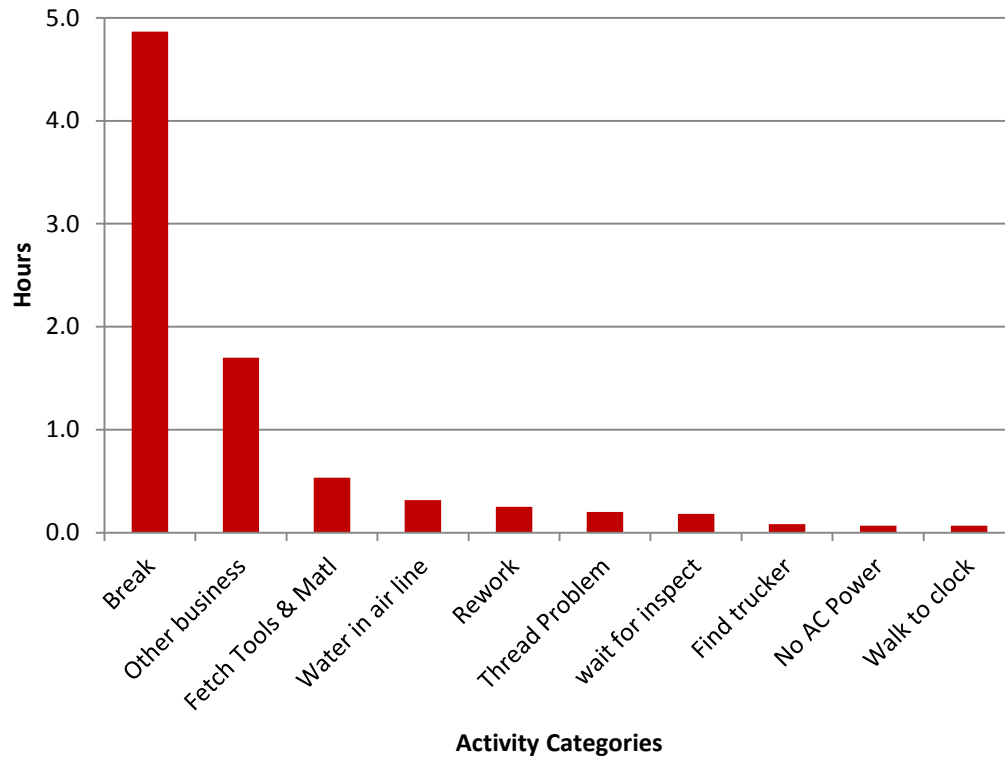


Shunt Winding

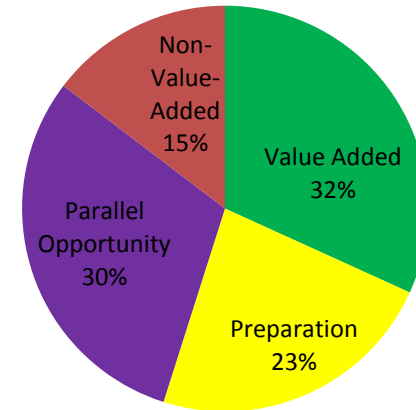


Work Observation Output

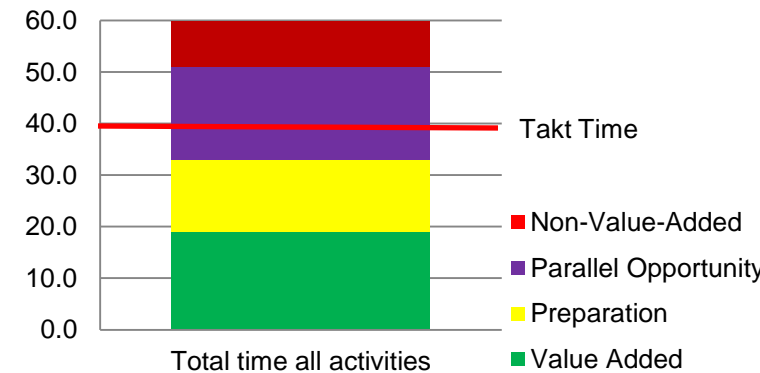
Rotor Winding Non-Value Activity



Rotor Winding Activity Breakdown

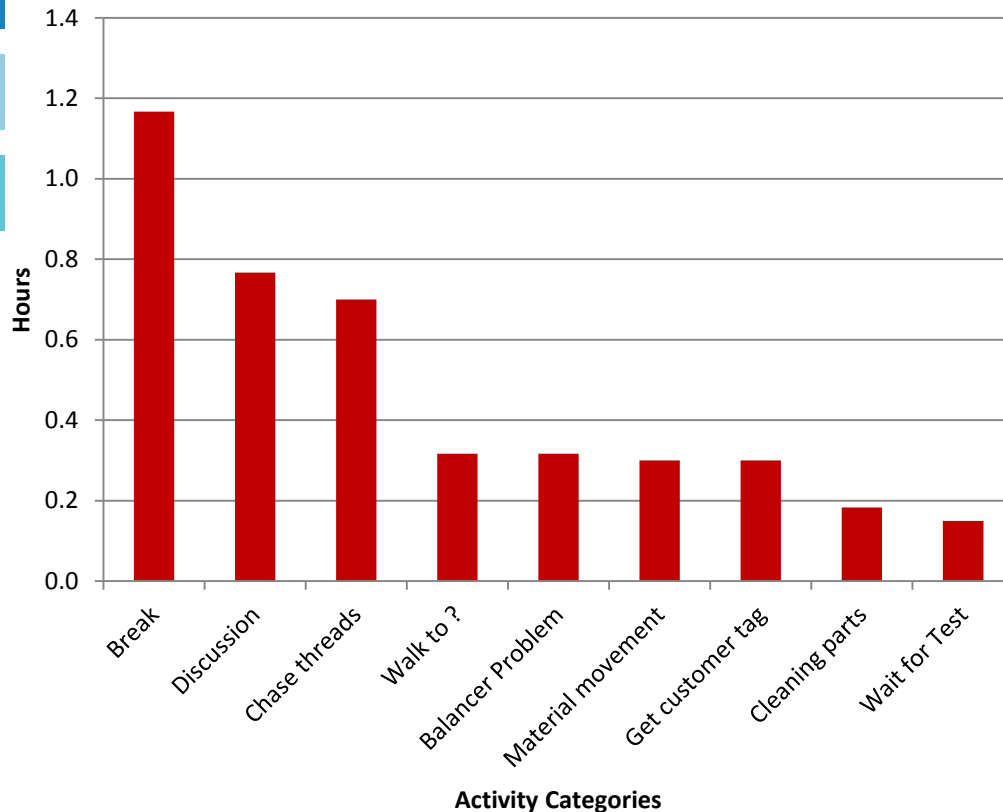


Rotor Winding

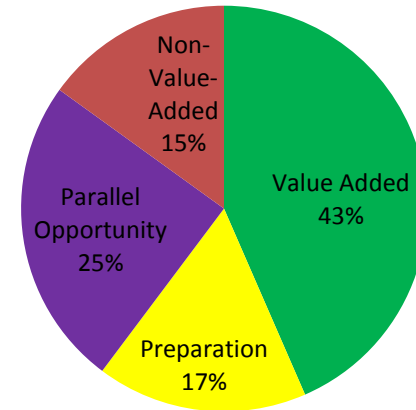


Work Observation Output

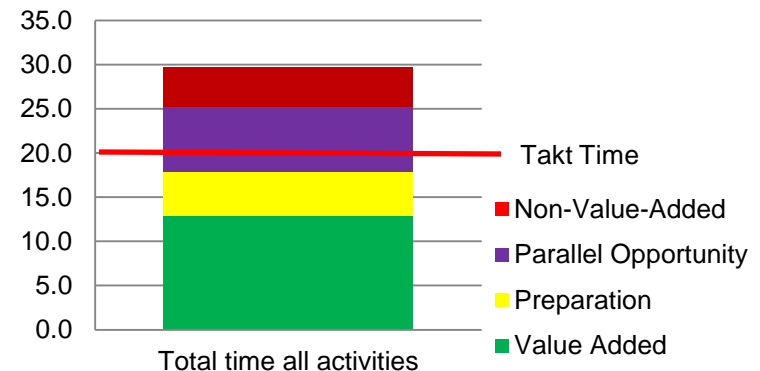
Rotor Assembly Non-Value Activity



Rotor Assembly Activity Breakdown

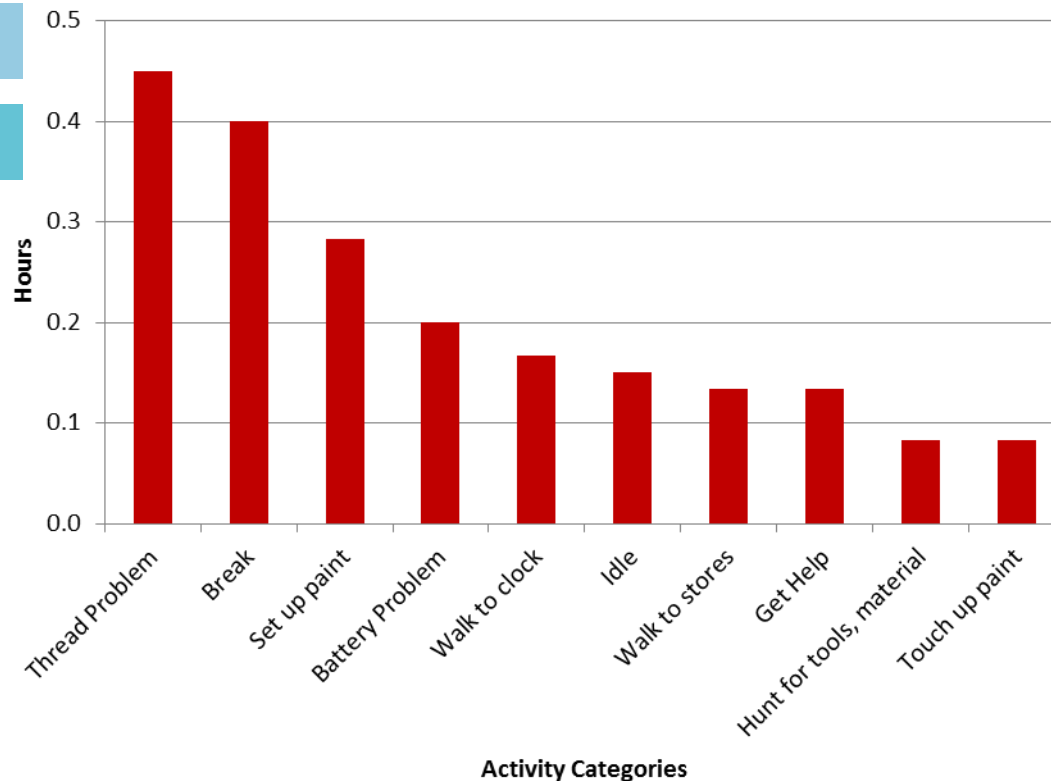


Rotor Assembly

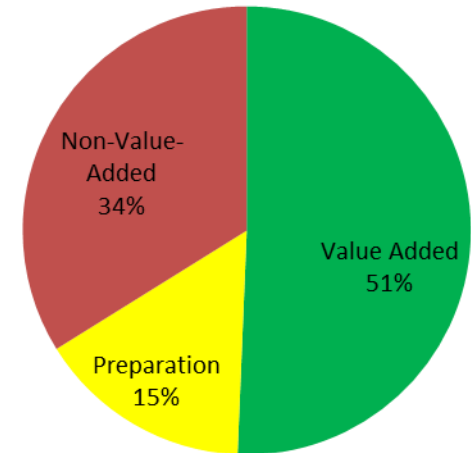


Work Observation Output

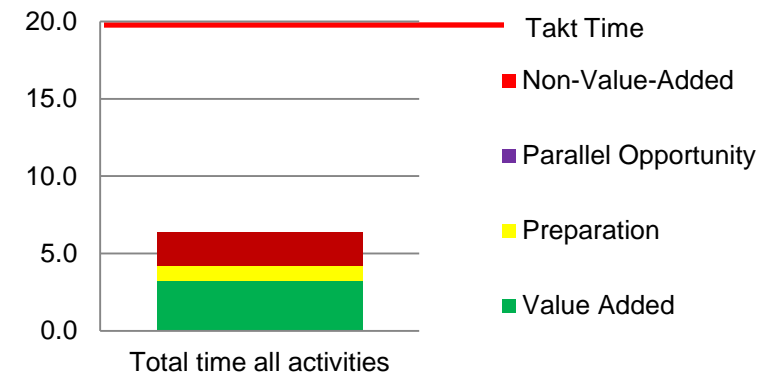
Wound Stator Non-Value Activity



Wound Stator Activity Breakdown

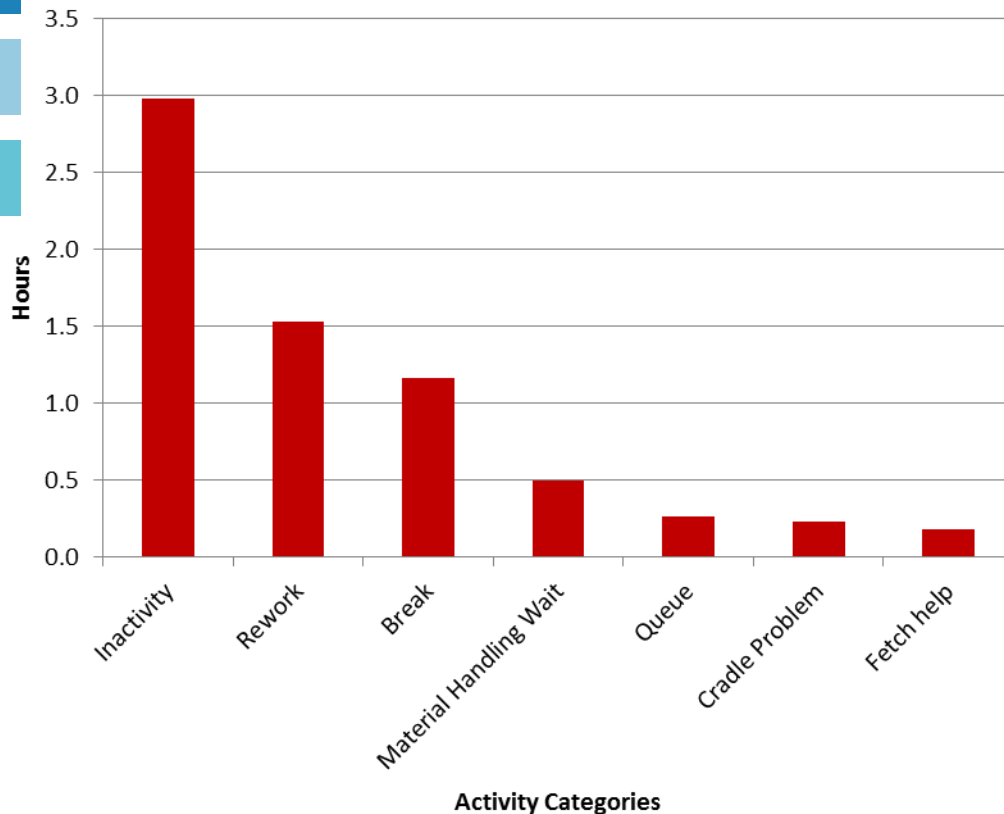


Wound Stator

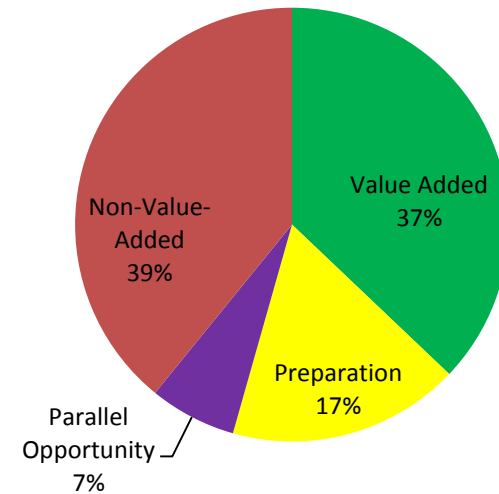


Work Observation Output

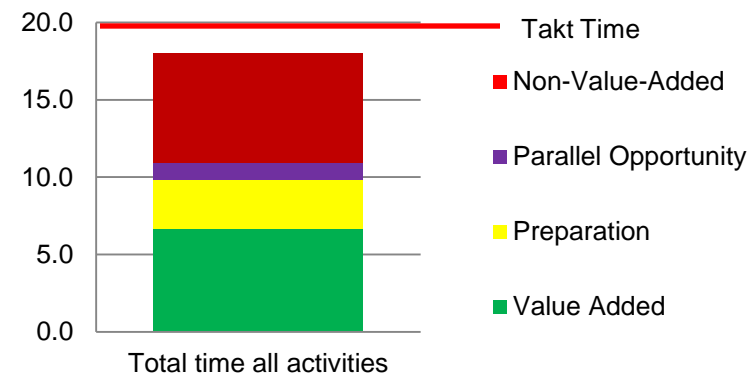
Stator Assembly Non-Value Activity



Stator Assembly Activity Breakdown



Stator Assembly






Next Steps

- Phase 1 Necessary Improvements:
 - List of opportunities made through observations – 2 months
 - Train shop, supervision, & support in Lean – 2 months parallel
 - Kaizen events in work areas – 2 months
 - Change material structures for pull & kanban 2 months parallel
 - Monitor progress on baseline measures of WIP & Lead Time – ongoing
 - Budget 1st phase = \$45,000
- Phase 2 Intermediate Focused Factory:
 - Move cells to Focused Factory - 2 months
 - Assign Focused Factory personnel & cross train – 1 month
 - Practice new methods, procedures, organizational structure – 2 months
 - Budget Estimate for 2nd phase: \$30,000
- Phase 3 Fully Integrated Focused Factory:
 - Stator VPI & Paint integrate into Focused Factory
 - Rotor VPI, Assembly, Test capital improvements & integration
 - Coil Mfg. & Rotor Winding into Focused Factory

Approval



I confirm my approval for you to proceed with the exciter focused factory as a pilot and test of the whole concept.

Please develop a proposal for the resources needs for each stage.

Company President

Resource Needs

Exciter Focused Factory Opportunities & Resources

Item	Priority	Function / Opportunity Phase 1	Group	Est. Cost	Hours	Responsibility
		Pole Stacking				
1.	B	Add small chop saw for trimming threaded rod http://www.kalamazooind.com/products/abrasive-saws/k7b-abrasive-saw/	Tooling	600	0	
2.	B	Add bench grinder for trimming threaded rod http://www.kalamazooind.com/products/disc-sanders/ds10-10-disc-sander/	Tooling	500	0	
3.	B	Dust collector for above items	Tooling	200	0	
4.	A	Kanban laminations & other materials for 4009, 2908 http://help.sap.com/saphelp_470/helpdata/en/cb/7f8c6543b711d189410000e829fbbd/frameset.htm	Materials	0	40	
5.	B	Clean & paint station designed for cell	Mfg. Eng.	4000	40	
6.	C	Move dies next to lamination storage (press room hunts for dies each time)	Supervisor	0	4	
7.	B	Routings for threaded rod not consistent; combine	Routing	0	4	
8.	A	Review staking process (nuts to studs)	Mfg. Eng.	0	2	
9.	B	Identify & kit tools	Supervisor	100	2	
10.	A	Design & build drill jigs (template jig)	Tooling	1000	16	Paul Gray
11.	A	Resurface base flat on drill	Machine Shop	0	6	
12.	A	Obtain T-nut & stud for drill base anti-rotate device	Operator	0	1	
13.	C	Using wrong type of punch; train and provide proper tool	Supervisor	0	1	
14.	B	Provide thread plug gages	Quality	400	1	
15.	B	Provide air drill & bits for chamfering holes	Supervisor	200	1	
16.	B	Provide index for taps & drills Huot EDP# 12600	Supervisor	0	0	
17.	C	Stacking fixture not holding assy. Square & flat	Tooling	0	2	
18.	B	Review stacking process not to print 156C533 note 2	Mfg. Eng.	0	2	
19.	C	Caddy for laminations	Tooling	500	8	
20.	B	Procure proper drill machine (2 spindle gang press) Use gang press at diode wheel assy & replace with ?	Tooling	2000	8	
21.	B	Drill leaks oil	Maintenance	0	2	
		Rotor Stacking				

Employee Involvement

- “We have no right to call anything knowledge except where our activity has actually produced certain physical changes in things.”
- Pragmatic knowledge has the essential feature to maintain the continuity of knowing with an activity which purposely modifies the environment.
 - John Dewey, 1916

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