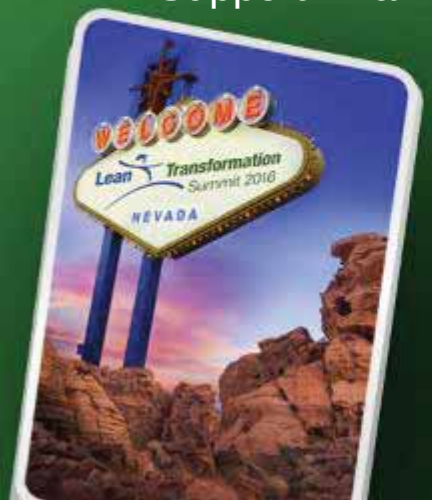
Propelling Ahead: Thrustmaster of Texas' Lean Journey

Presenters: Frank Montemayor
TMOT Support: Joe Bekker, Jason Small
LEI Support: David Westphal



Let's Deal With The Work

March 17-18, 2016 | Las Vegas


Thrustmaster
Thrustmaster
INTRODUCING THRUSTMASTER
PROBLEM STATEMENT
SOLUTIONS (TODAYS TOPIC'S)
ROAD MAP

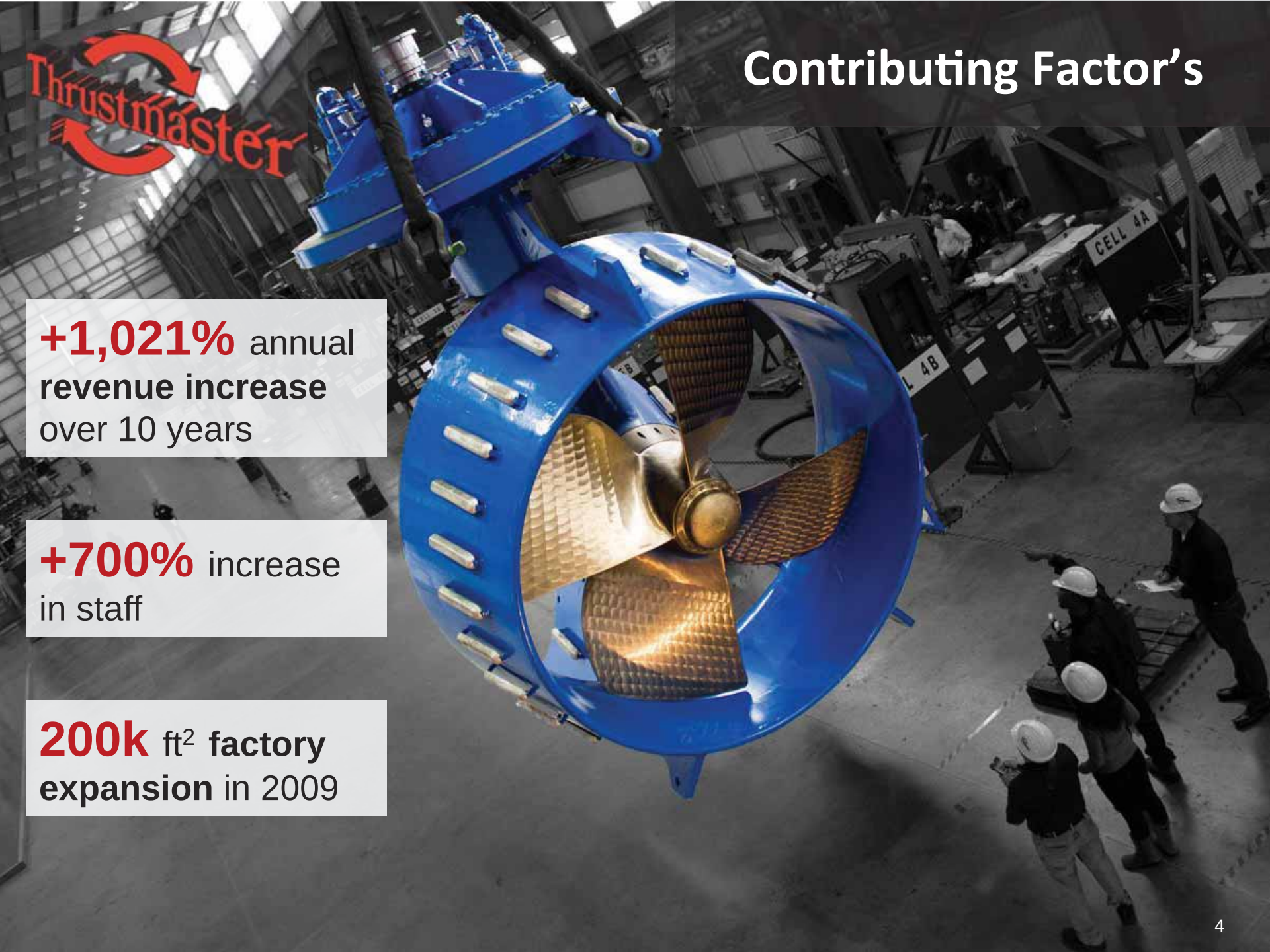
Problem Statement

Quality Issues (~50 FPY Est. Q1 ‘14)

Low On-Time Delivery (~20% Q1’14)

High Project Costs (>100% Target)

Contributing Factor's



+1,021% annual **revenue increase** over 10 years

+700% increase in staff

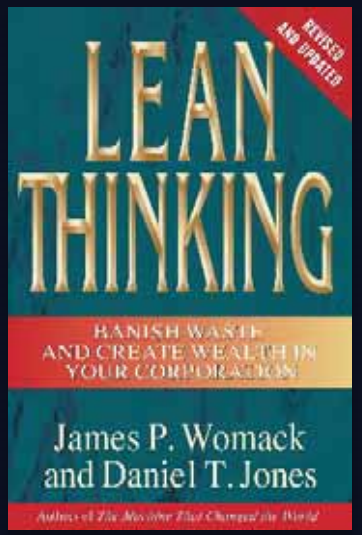
200k ft^2 **factory expansion** in 2009

UNSUCCESSFUL STRATEGIES

- MRP Scheduling
- Advanced Planning and Scheduling (APS)
- More Overtime
- More Labor and Support Resources
- Larger, more Complex and Expensive

“Software is not your problem, read this.”

- Best Advice from a Consultant



Learning Session Topics

- How the Vision was Set and Conveyed
- Setting the Foundation: Standard Work, Visual Management, Flow & Bottlenecks
- Replaced MRP Scheduling
- Problem Solving on the shop floor
- Leverage lessons learned in Product Development

Success in high-mix/low-volume, engineered-to-order market

Before the Journey

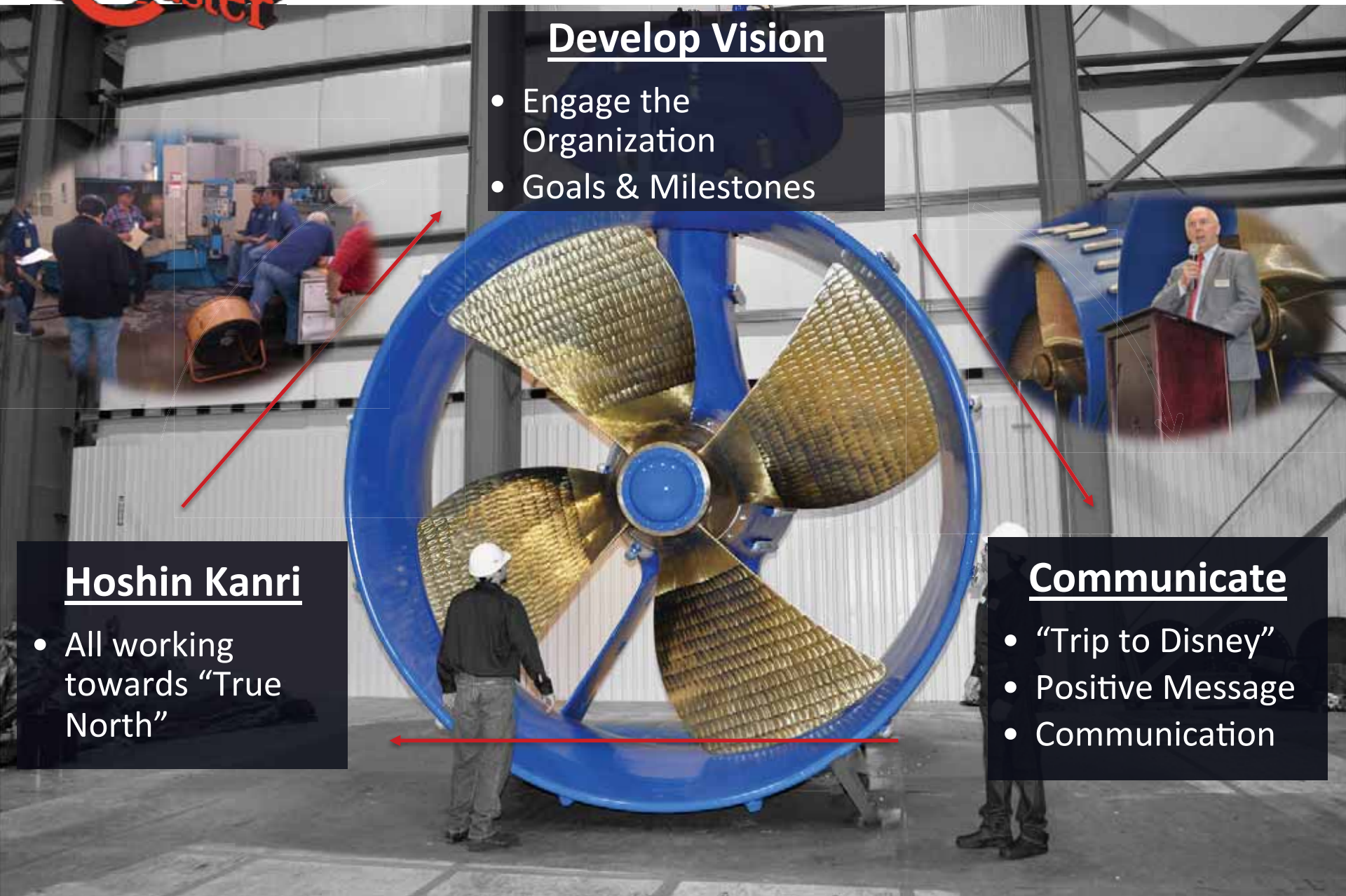
ENSURE COMMITMENT FROM UPPER MANAGEMENT

- Commitment must be firm and resolute.
- In it for the “long haul”

DETERMINE KEY DRIVERS NEGATIVELY IMPACTING THE COMPANY

- Quality Issues
- Low On-Time Delivery
- Unfavorable Project Cost

Setting the Vision



Develop Vision

- Engage the Organization
- Goals & Milestones

Hoshin Kanri

- All working towards "True North"

Communicate

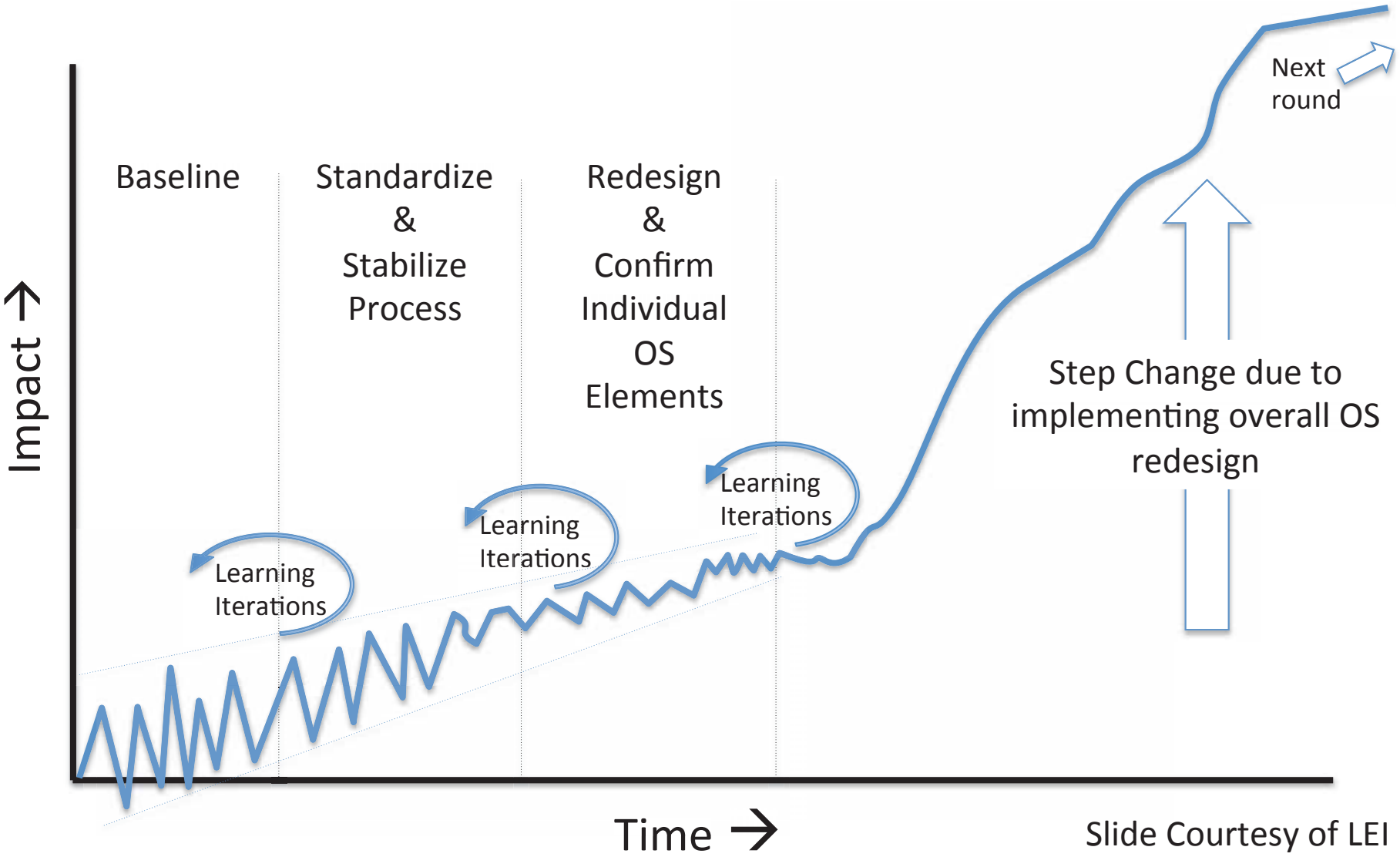
- "Trip to Disney"
- Positive Message
- Communication

Thrustmaster's Vision

"To be a World-Class Manufacturer, Safely Producing the Highest Quality Products, Delivered On-Time, while meeting or exceeding all Customer Expectations at a Fair Cost."

Vision Focus

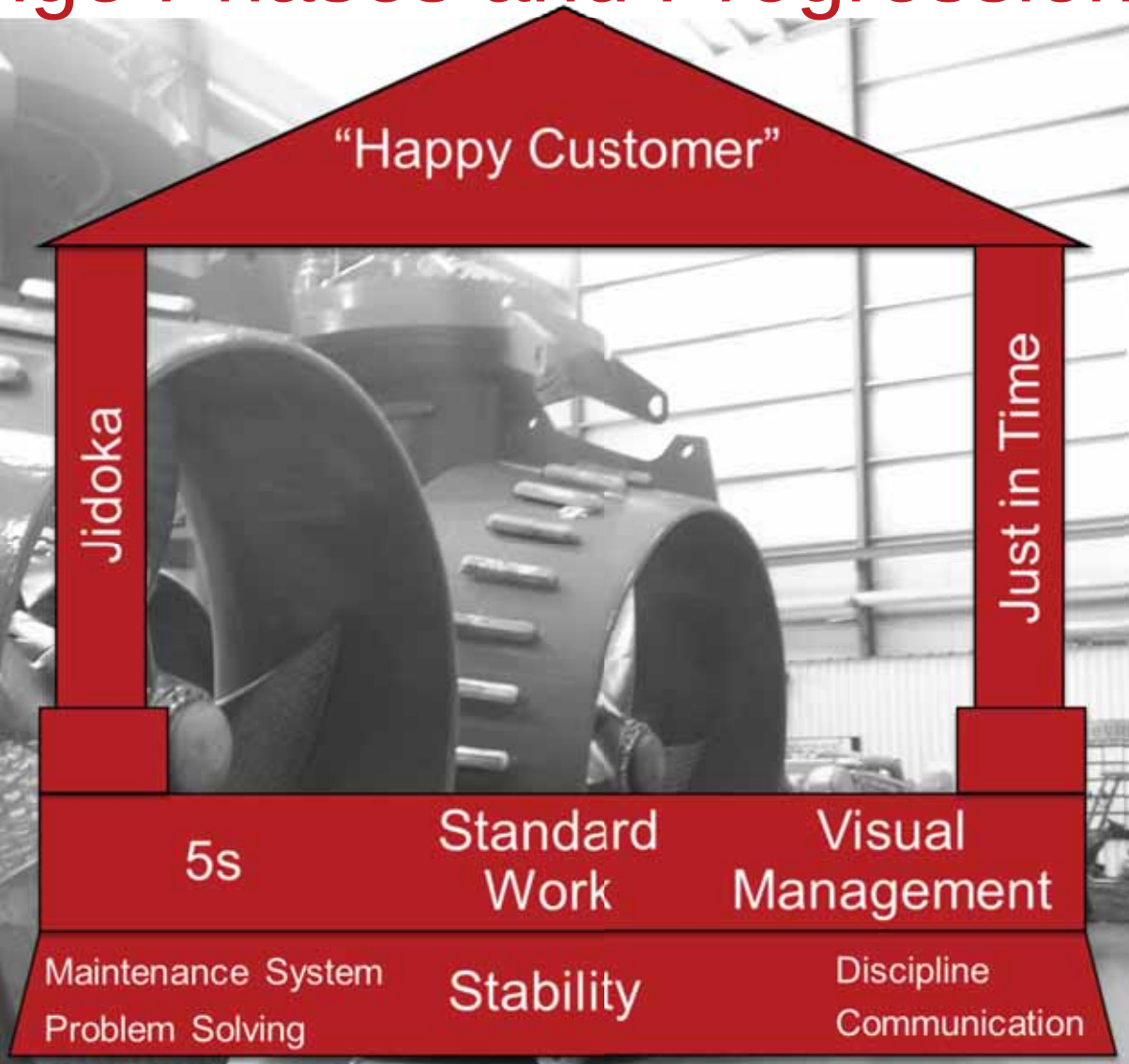
Lean Transformation Model – Change Phases and Progression



Slide Courtesy of LEI

Lean Transformation Model – Change Phases and Progression

- Set Normal from Abnormal
- See “score” at a glance
- Continuous Flow
- Takt Time



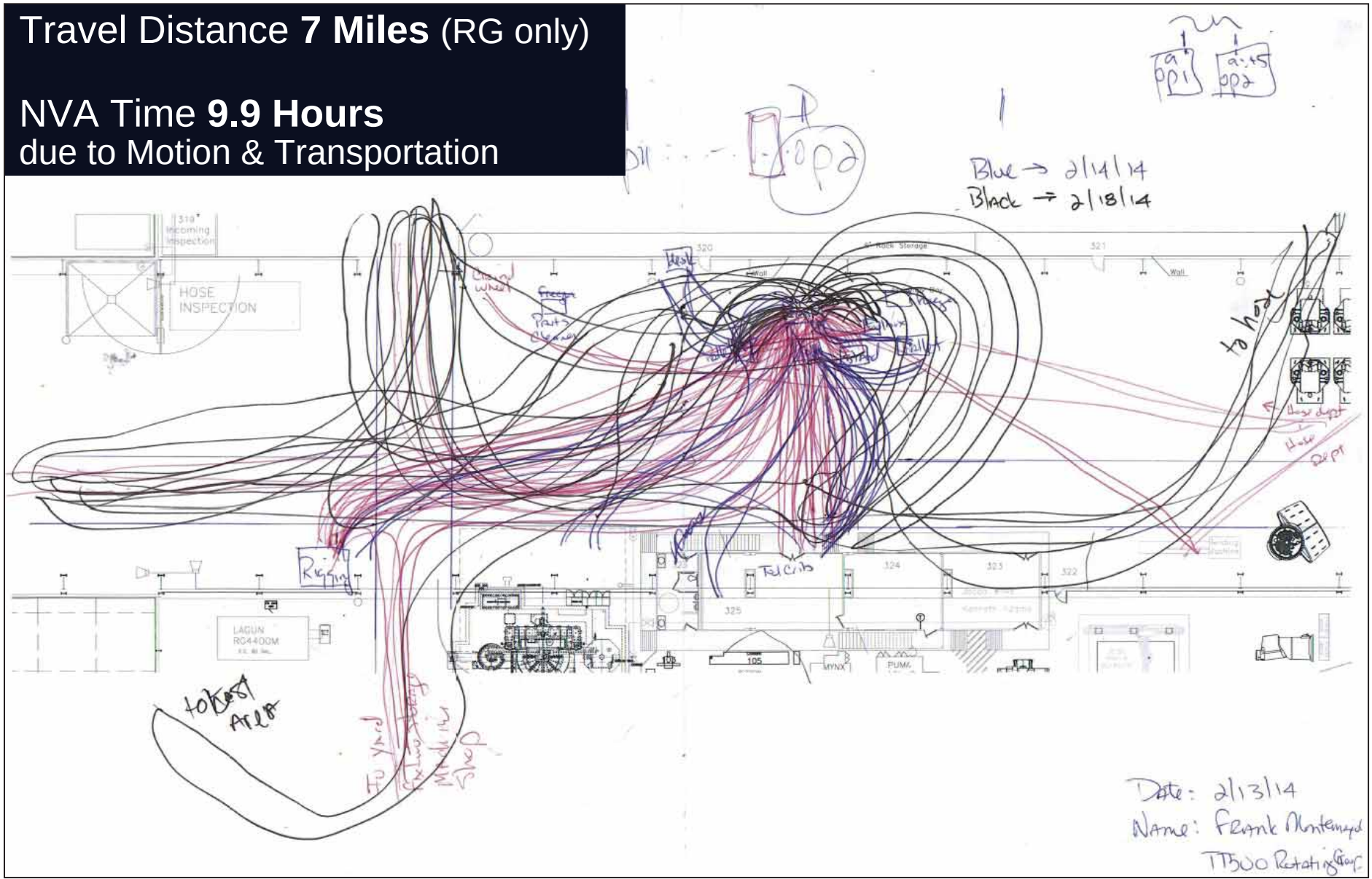
Go to the Gemba

- No Standard Work or work area’s
- No flow or pace
- Cannot see normal from abnormal

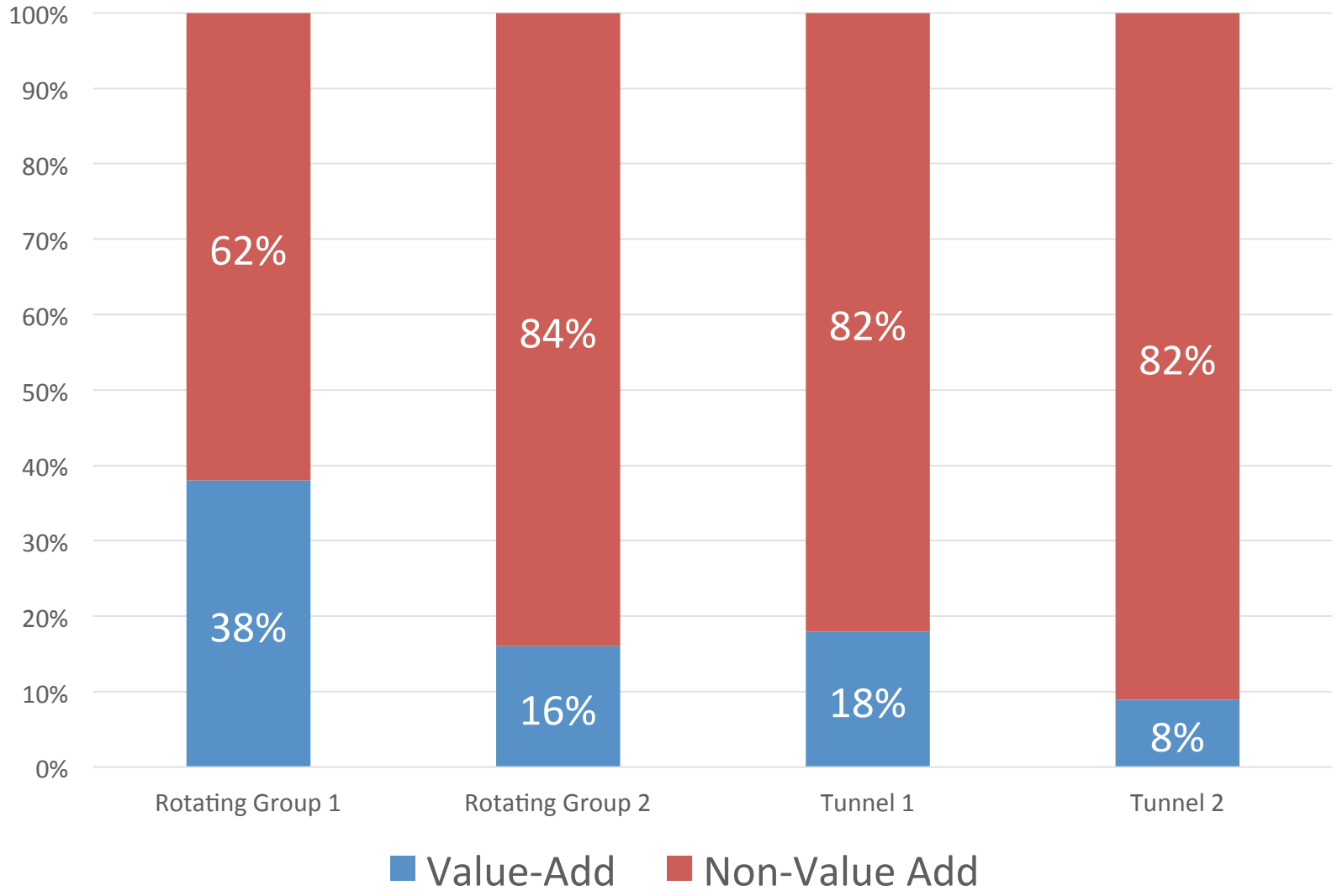
“Where there is no standard, there can be no Kaizen” Taiichi Ohno

Travel Distance **7 Miles** (RG only)

NVA Time **9.9 Hours**
due to Motion & Transportation



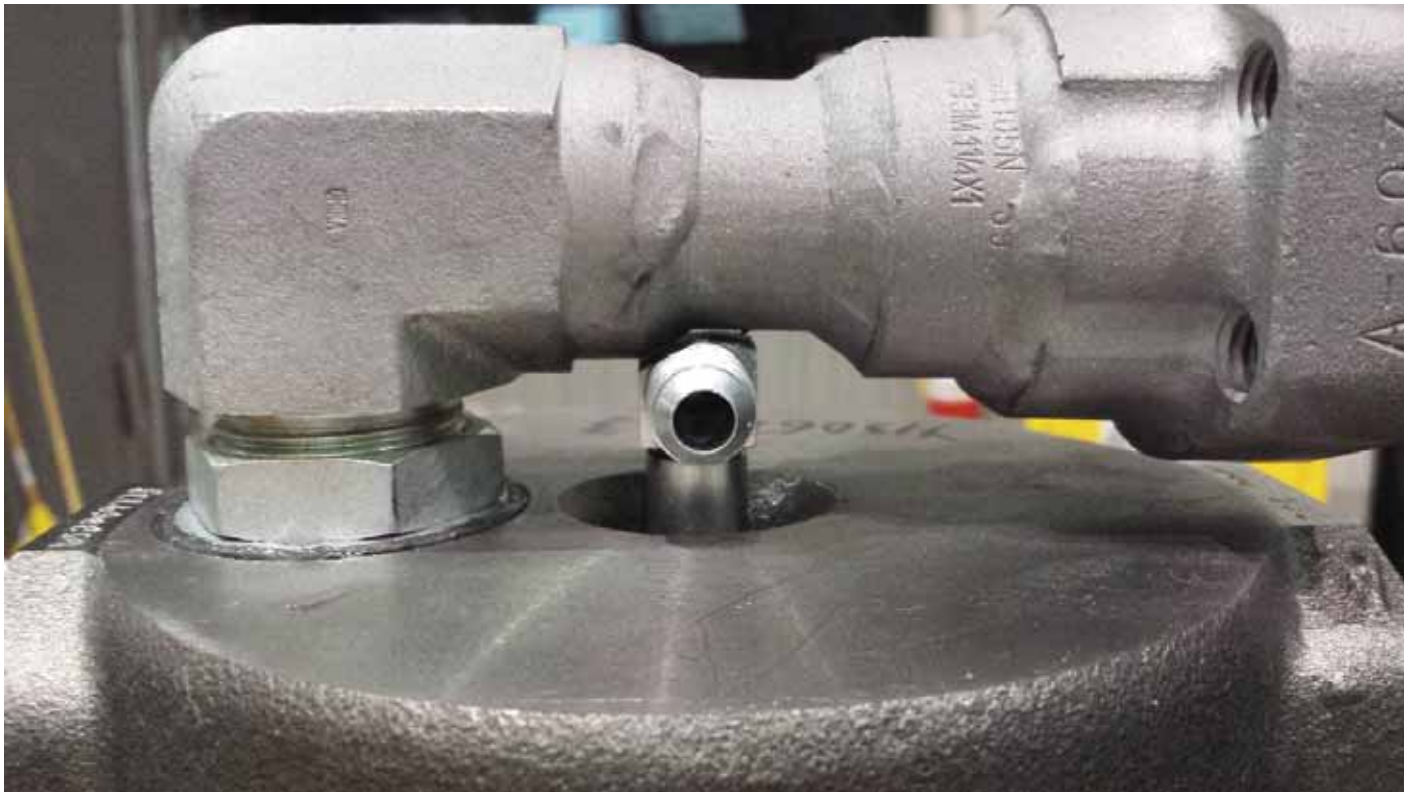
Observe, Ask Why and Quantify



Non-Value Add Example

- Interference issue
- Problem/defect absorbed into the assembly process (became normal)

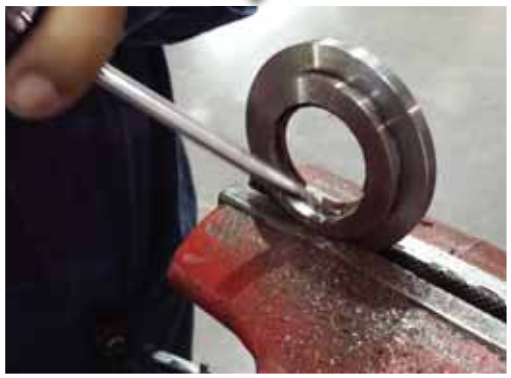
Non-Value Add Example 2



- Lost 30-minutes

Non-Value Add Example 3



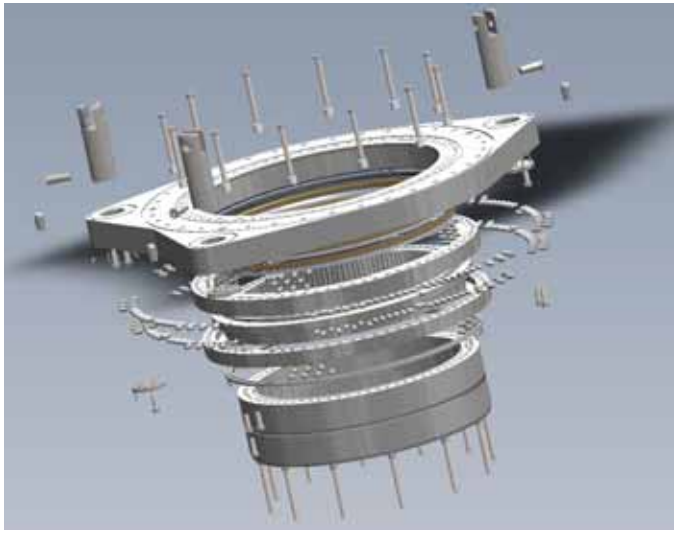



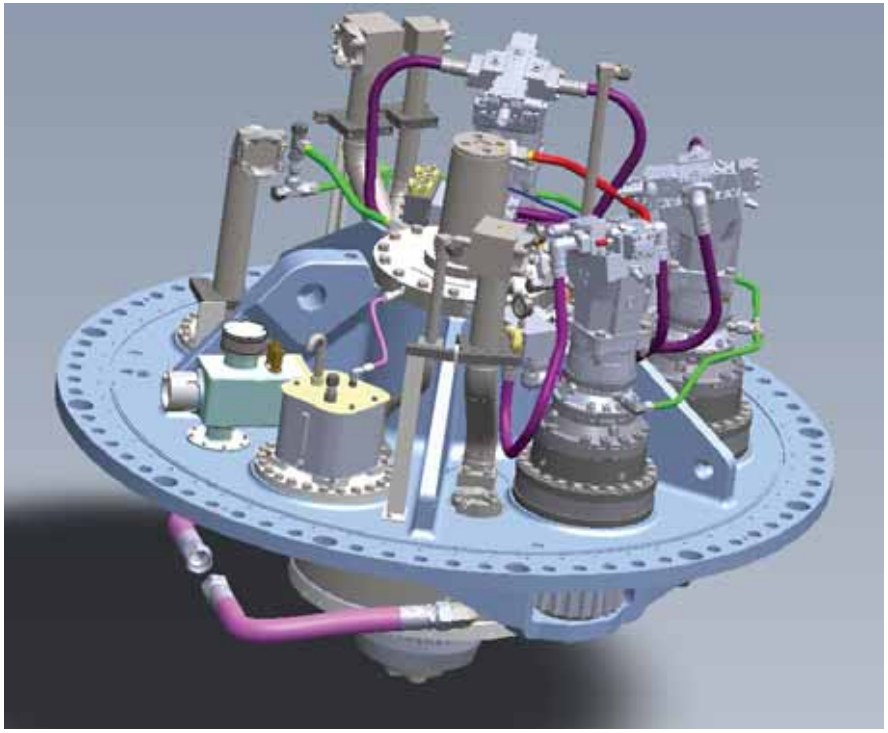
- Sealed motor, but seal not required
- 20 minutes lost
- High potential to damage part

Standard Work

Flange Mount

- > 1,200 components
- No time-based assembly procedures



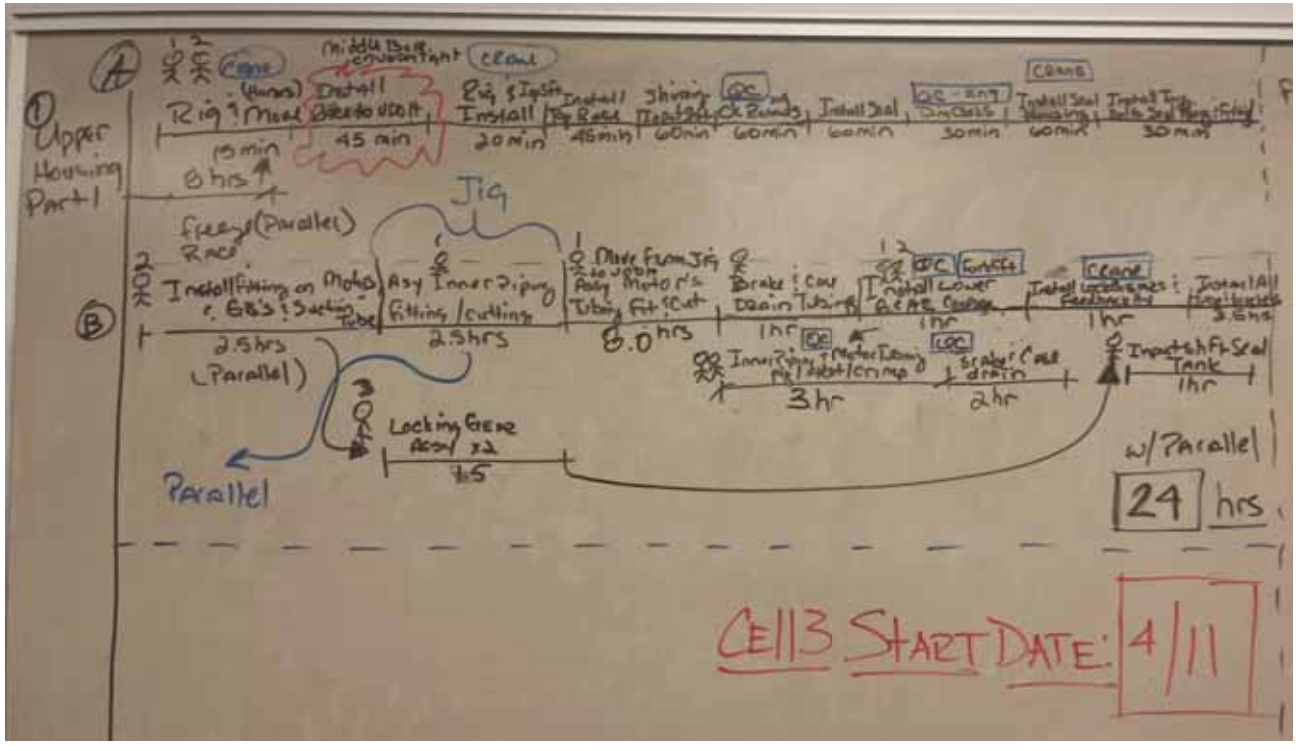


Upper Housing

- Complex assembly
- > 1,500 components
- Low FPY
- Process time 8-10 days

Standard Work: Time-based Work Sequence

- Developed workflow and process time
- Gave visibility to the type and quantity of resources needed
- Process Time = 24 man-hours (reduction of ~5-days)

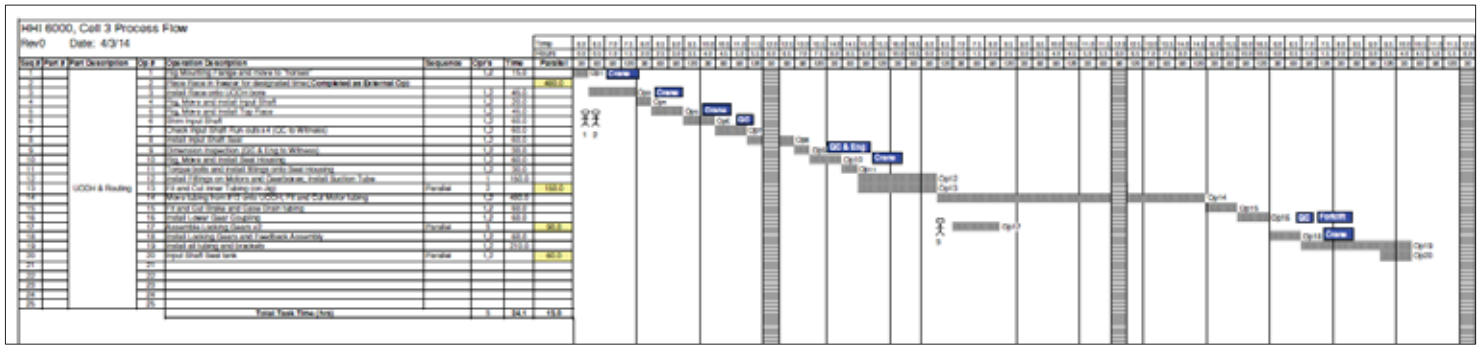


Standard Work: Time-based Work Sequence Developed

HHI 6000, Cell 3 Process Flow

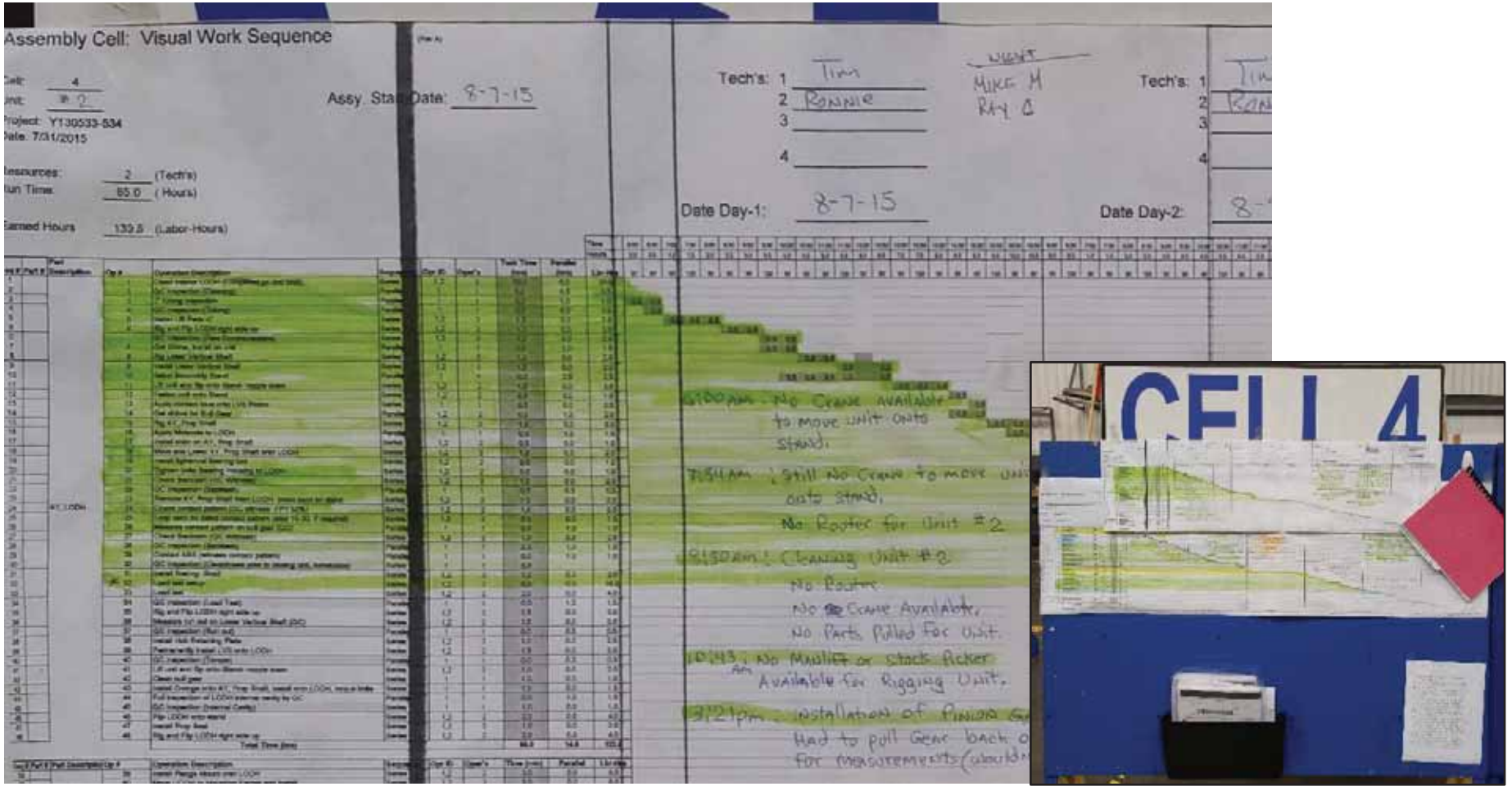
Rev0 Date: 4/3/14

Seq #	Part #	Part Description	Op #	Operation Description	Sequence	Opr's	Time	Time Hours Parallel
1			1	Rig Mounting Flange and move to "horses"		1,2	15.0	
2			2	Place Race in freezer for designated time (**Completed as External Op**)				480.0
3			3	Install Race onto UODH bore		1,2	45.0	
4			4	Rig, Move and install Input Shaft		1,2	20.0	
5			5	Rig, Move and Install Top Race		1,2	45.0	
6			6	Shim Input Shaft		1,2	60.0	
7			7	Check Input Shaft Run-outs x4 (QC to Witness)		1,2	60.0	
8			8	Install Input Shaft Seal		1,2	60.0	
9			9	Dimension Inspection (QC & Eng to Witness)		1,2	30.0	
10			10	Rig, Move and Install Seal Housing		1,2	60.0	
11			11	Torque bolts and install fittings onto Seal Housing		1,2	30.0	
12			12	Install Fittings on Motors and Gearboxes; Install Suction Tube		1	150.0	
13		UODH & Routing	13	Fit and Cut Inner Tubing (on Jig)	Parallel	2		150.0
14			14	Move tubing from #13 onto UODH; Fit and Cut Motor tubing		1,2	480.0	
15			15	Fit and Cut Brake and Case Drain tubing		1,2	60.0	
16			16	Install Lower Gear Coupling		1,2	60.0	
17			17	Assemble Locking Gears x2	Parallel	3		90.0
18			18	Install Locking Gears and Feedback Assembly		1,2	60.0	
19			19	Install all tubing and brackets		1,2	210.0	
20			20	Input Shaft Seal tank	Parallel	1,2		60.0
21			21					
22			22					
23			23					
24			24					
25			25					
				Total Task Time (hrs)		3	24.1	13.0

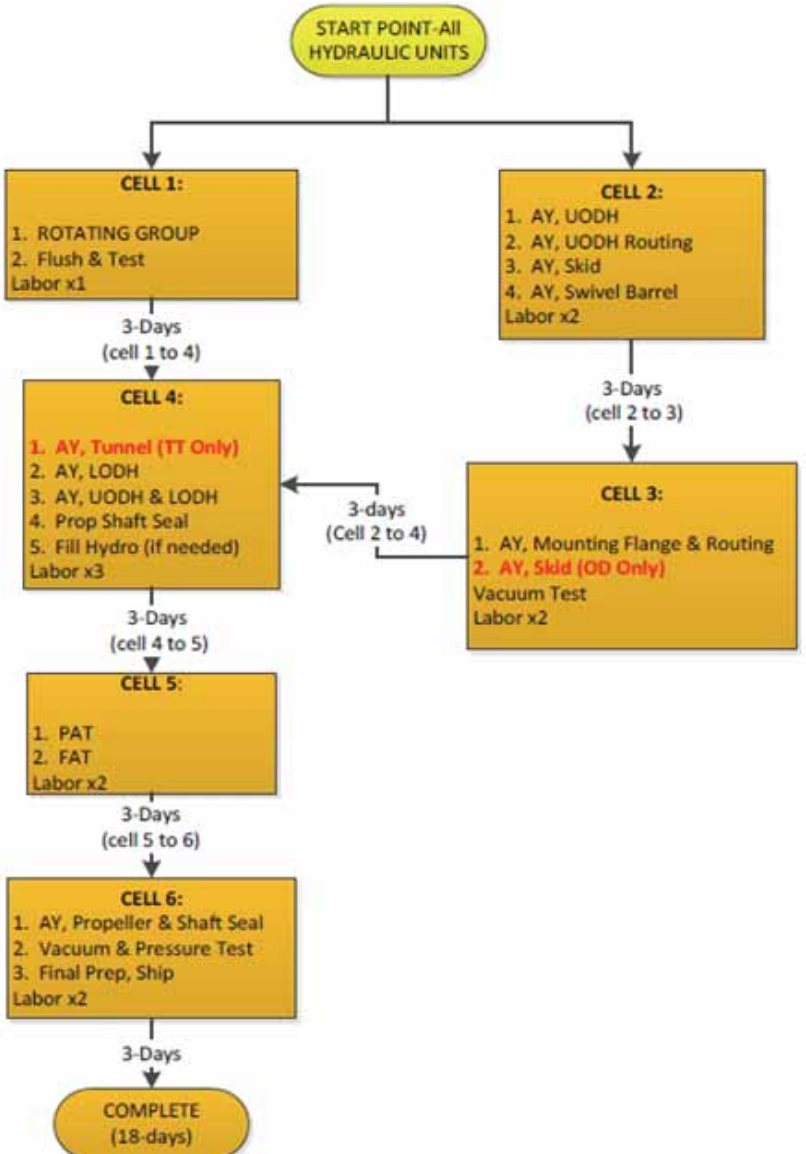


Standard Work: Time-based Work Sequence

Ability to see at-a-glance whether the assembly cell is normal or abnormal compared to the plan

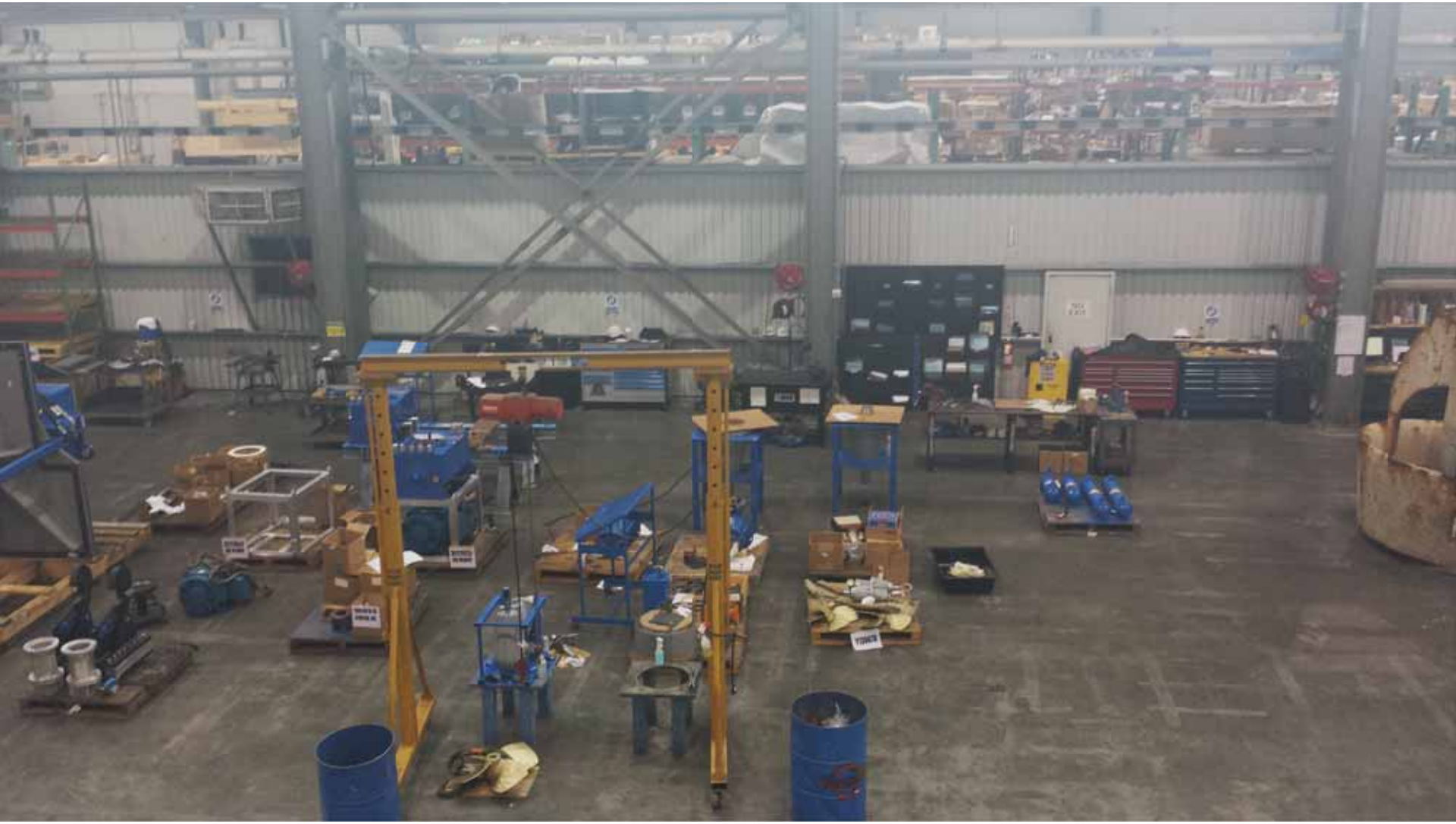


Standard Work: Assembly Process Flow



- Assembly cells are well defined with posted standard work
- Ability to “see” flow

Workplace Organization: Assembly Layout- Before



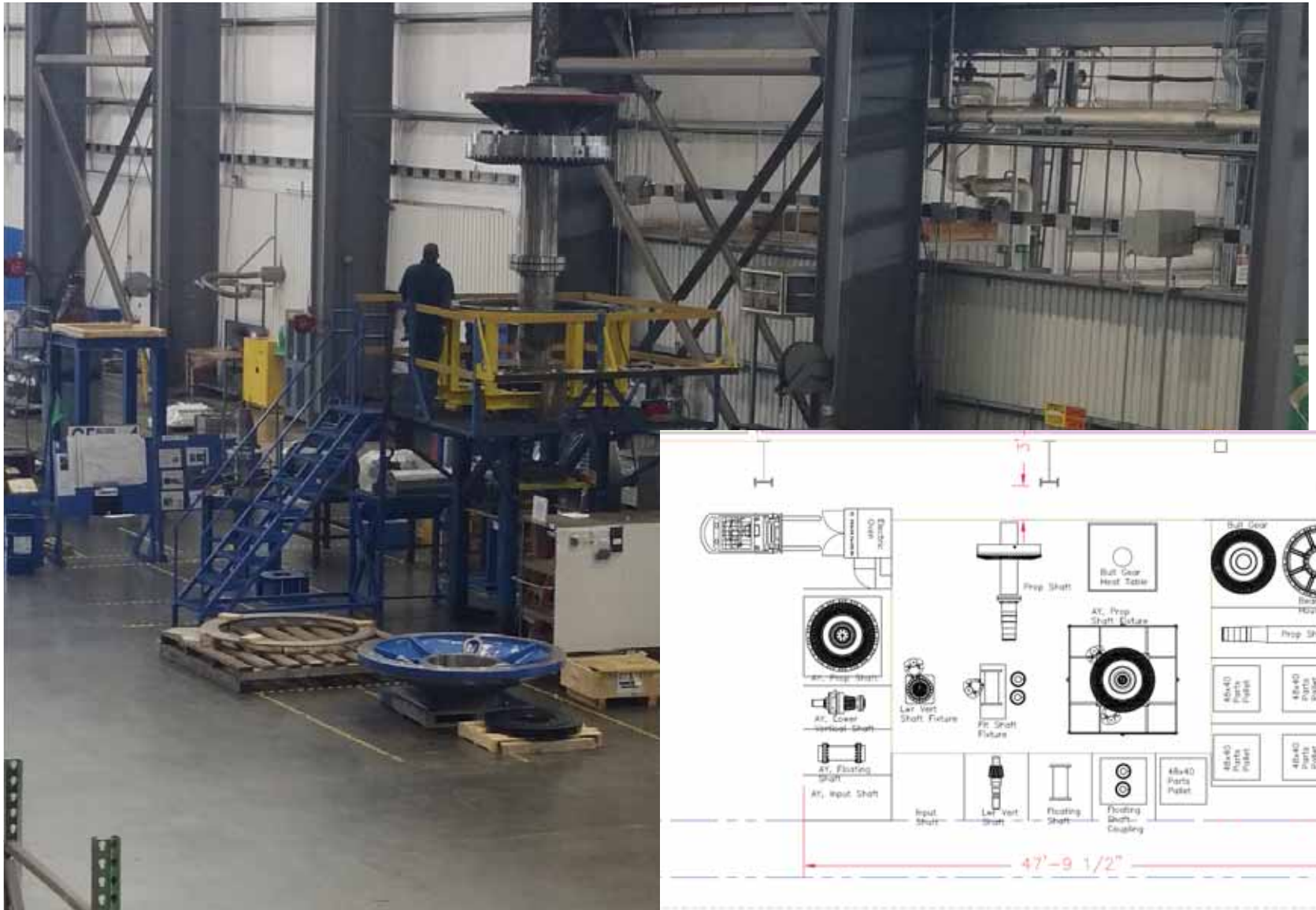
Workplace Organization: Assembly Layout- After

Workplace Organization: Assembly Layout- After

- Assembly cells are well demarcated with posted standard work
- Clear Locations for inbound and outbound materials

Workplace Organization:
Assembly Layout- Before

Workplace Organization: Assembly Layout- After

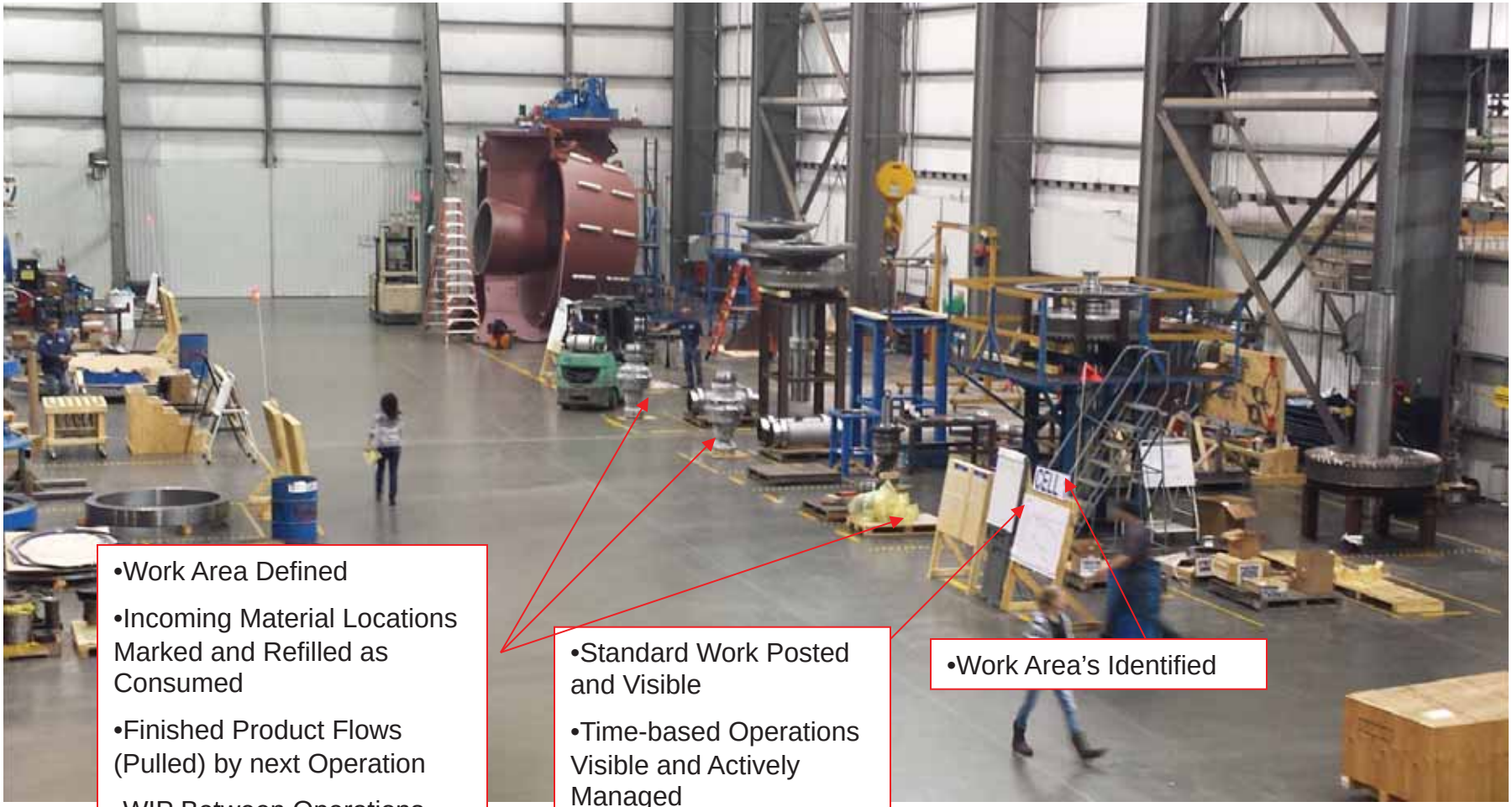


Workplace Organization:
Assembly Layout- Before

- Work Flow Not Visible
- Work Area's not Defined
- Time-Based Tasks Unable to be Measured
- No Standard Work Present

- Could not distinguish between WIP or Finished Product
- WIP Between Operations Not Quantifiable
- Current Operation or Work Status Unknown Visually
- Labor Resources per Operation Unknown Visually

Workplace Organization: Assembly Layout- After

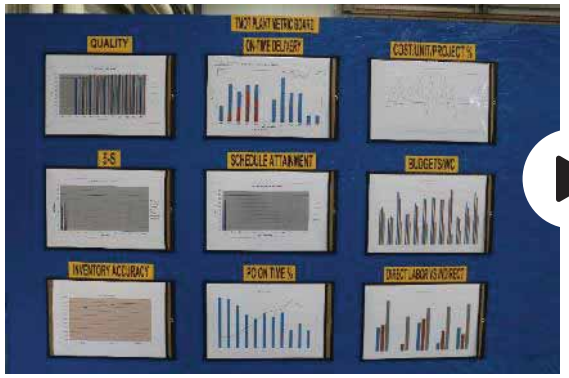


- Work Area Defined
- Incoming Material Locations Marked and Refilled as Consumed
- Finished Product Flows (Pulled) by next Operation
- WIP Between Operations able to be counted easily

- Standard Work Posted and Visible
- Time-based Operations Visible and Actively Managed
- Labor Resources Per Cell established and Managed

- Work Area's Identified

Visual Management

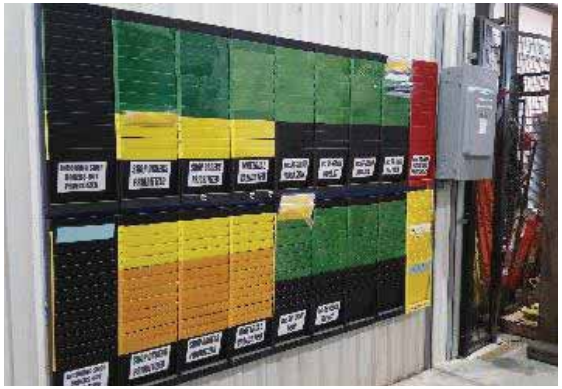


Operations KPI's

- Quality
- On-Time Delivery
- 5s
- Schedule Attainment
- PO on Time %
- Cost/Unit/Project %
- Budgets/WC
- Direct Labor Vs Indirect

Assembly Schedule

Visual Machine Schedule

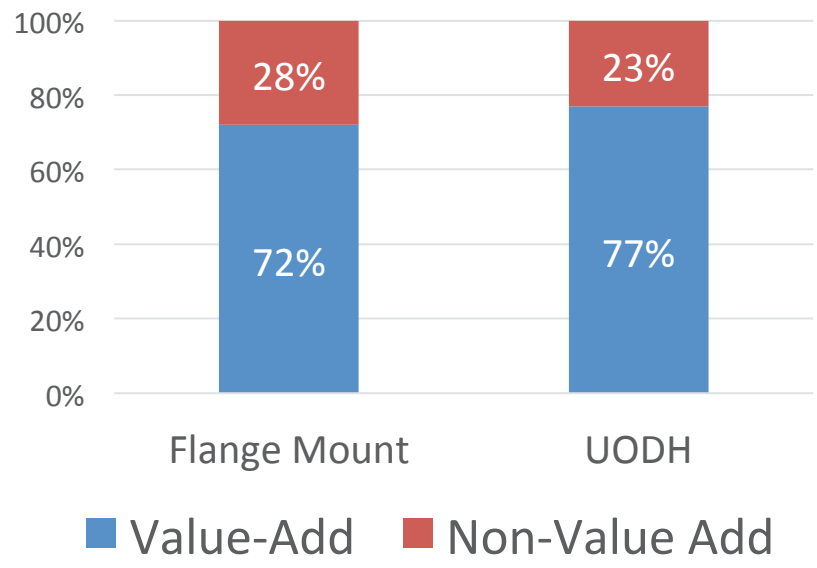


Visual Schedule

Visual Flags

Quick Wins

- Reduced Non-Value Add Activity
- Reduced assembly process time by 50% on Flange Mount
- Able to clearly see normal from abnormal
- Flow was visible
- Increased OTD by 67% in less than 6-months



Workplace Organization: Before and After Kaizen Event

Before

After

Before/After

Schedule Attainment: 30% to 80%

Workplace Organization: Part Presentation

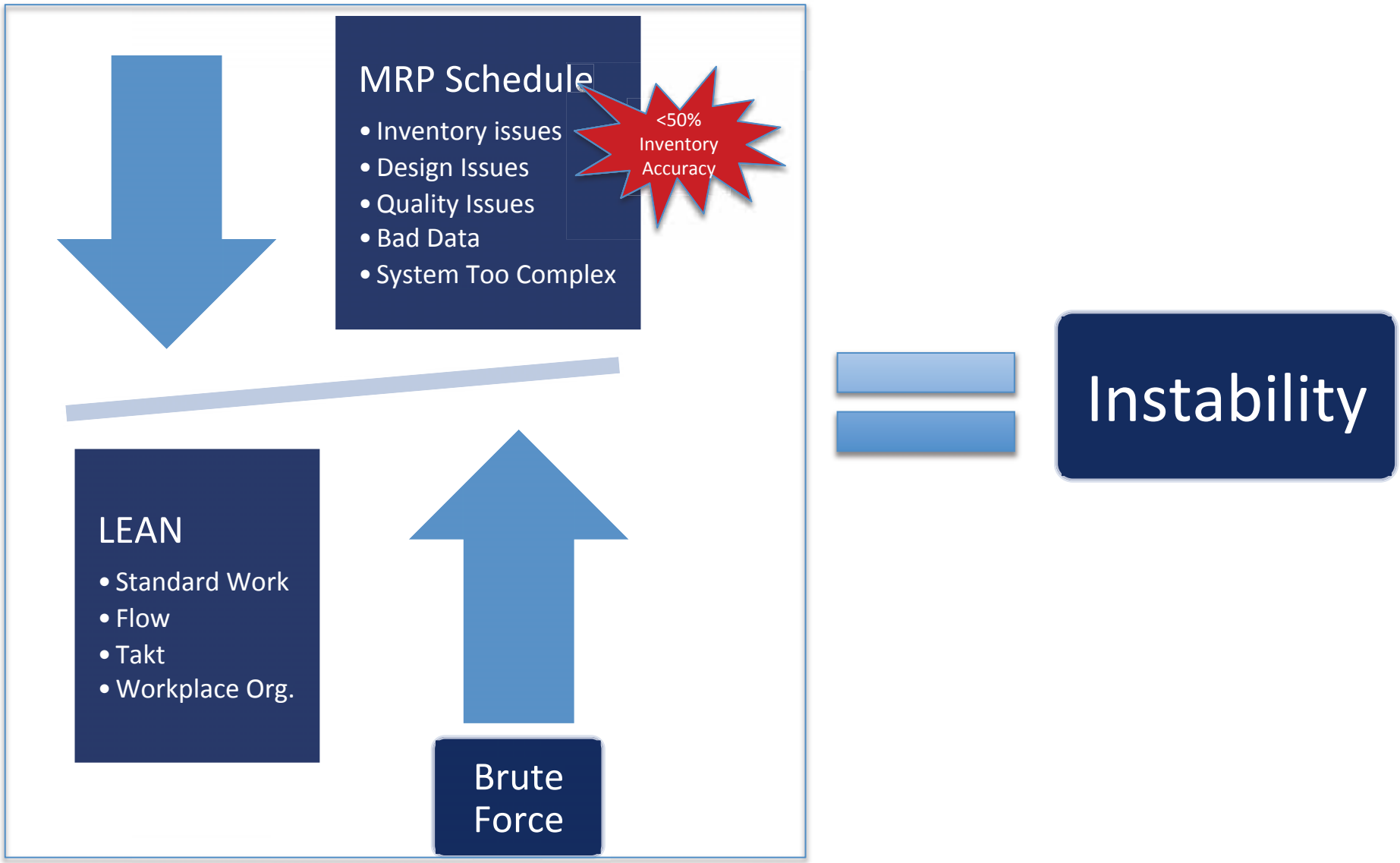
Before

After

Workplace Organization: Tools

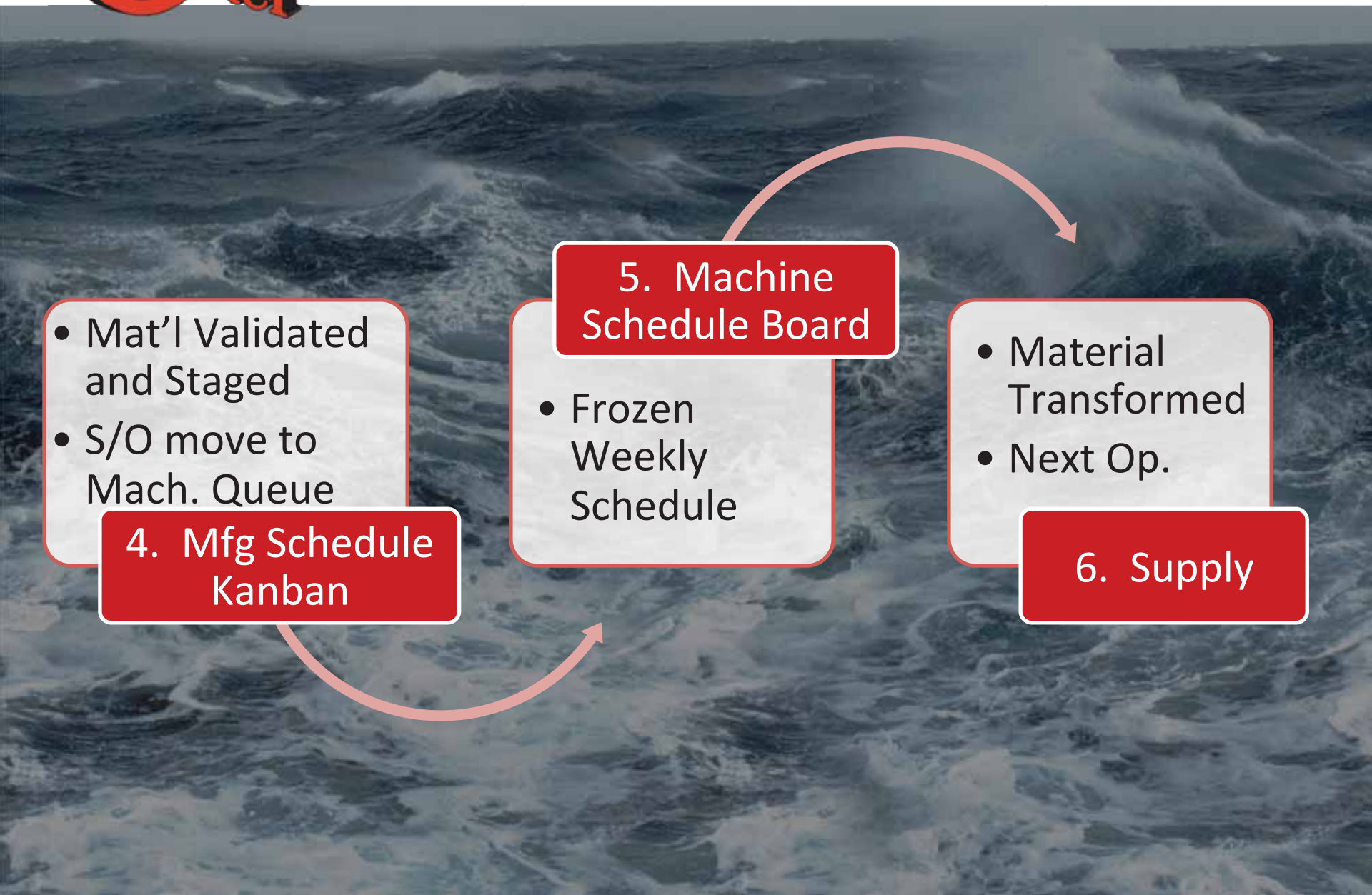
After

Visual Schedule: MRP Scheduling



Visual Schedule: Process Flow

Visual Schedule: Process Flow

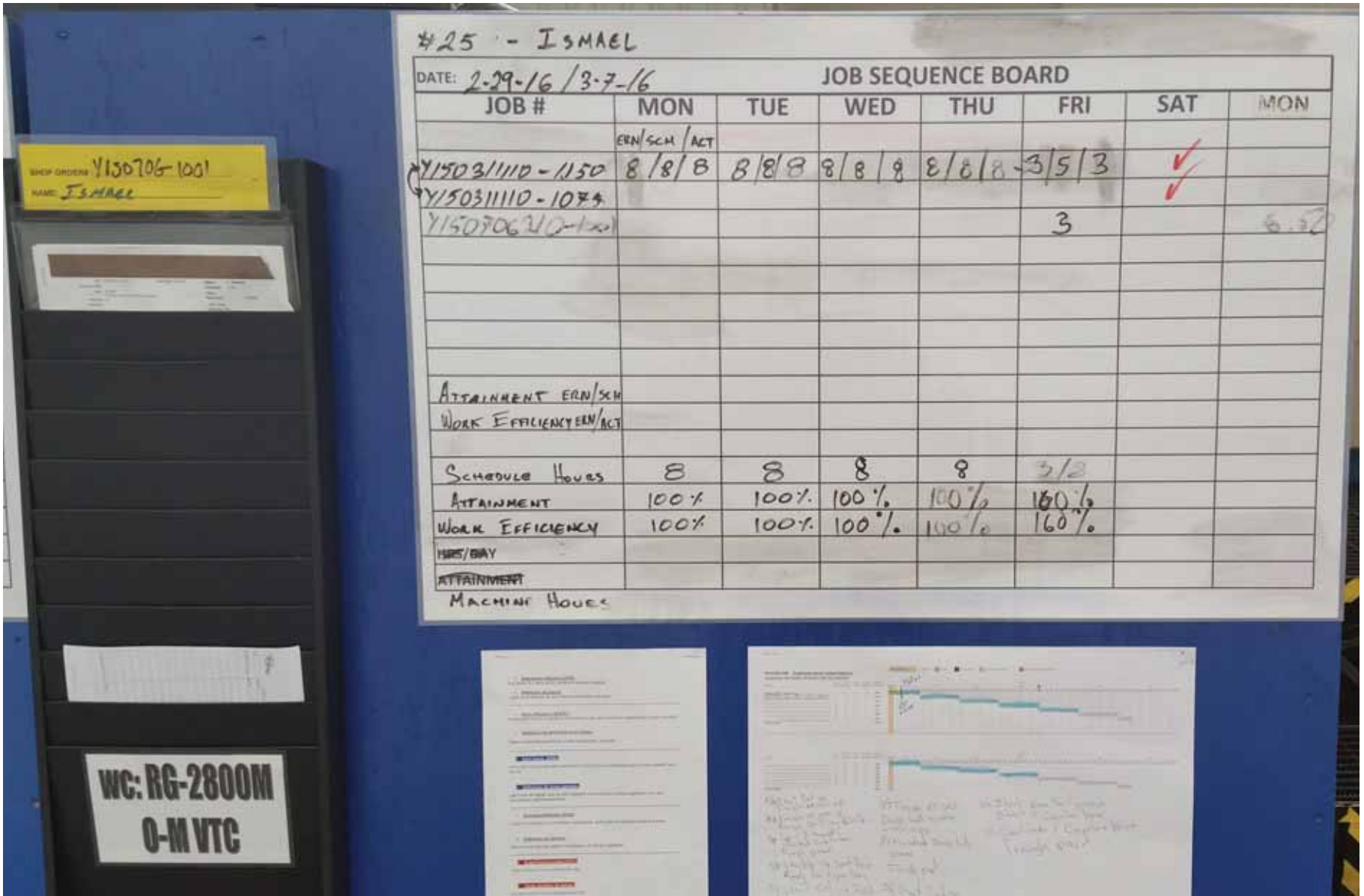


Visual Schedule: Purchasing Kanban

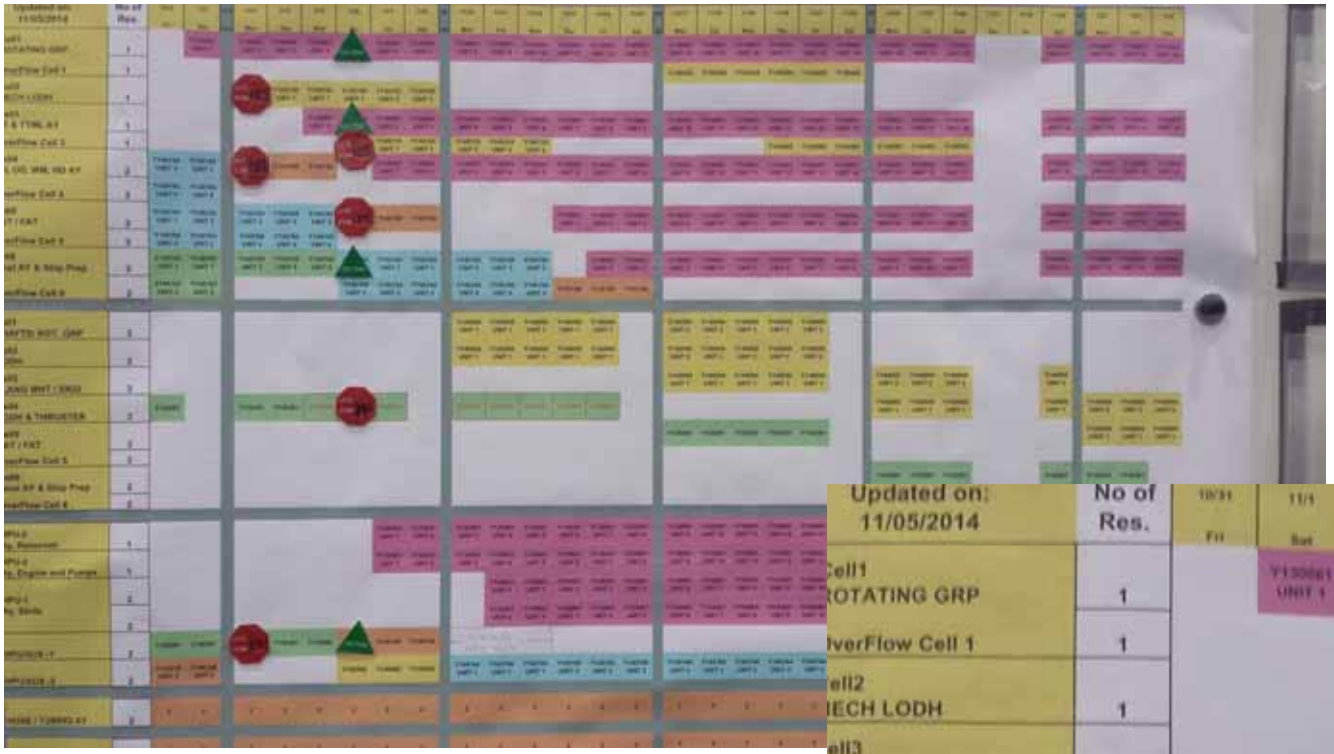
Visual Schedule: Production Control Kanban

Visual Schedule: Manufacturing Kanban

Visual Schedule: Machine Schedule



Visual Schedule: Assembly Schedule



Results: On-Time Delivery

Target was 90%

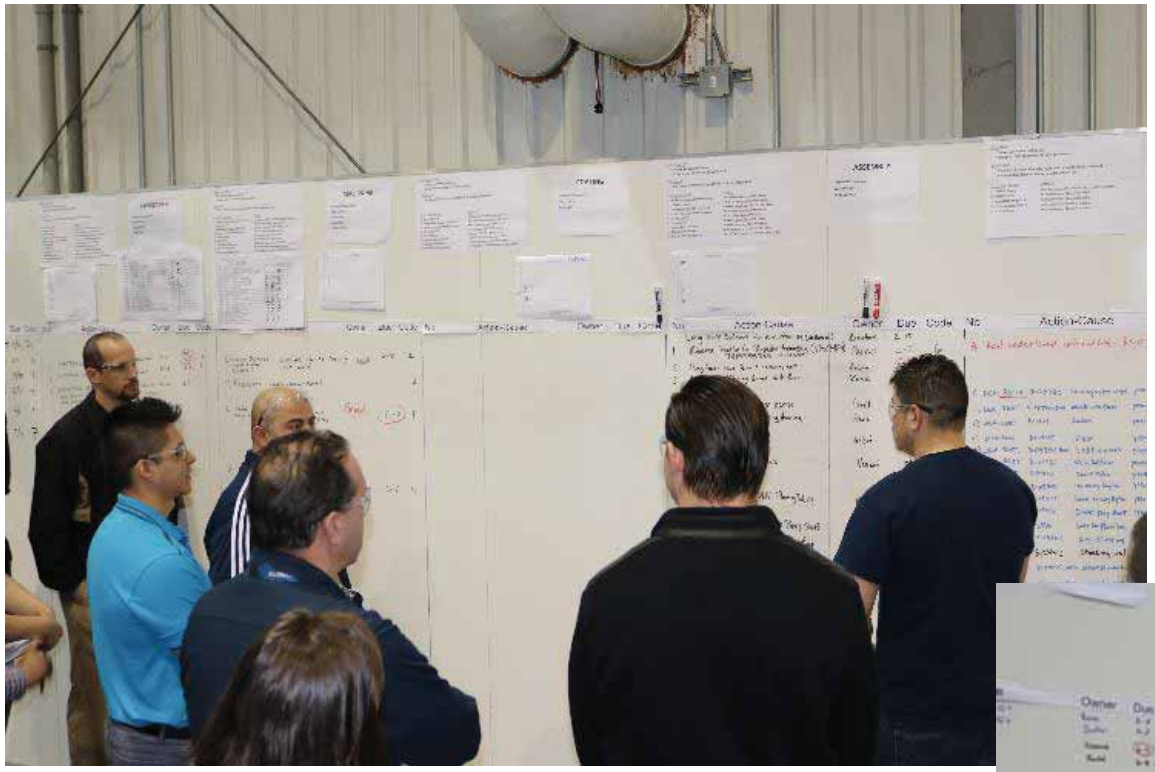
+67% OTD Improvement

14-Jan	0%
14-Mar	22%
14-Jun	25%
Oct-14	33%
Jan-15	100%
Jun-15	100%
Sep-15	100%
Dec-15	100%
Jan-16	100%

% On-Time

Results: Actual Job Cost vs. Target Cost

Problem Solving: Team Board Meeting

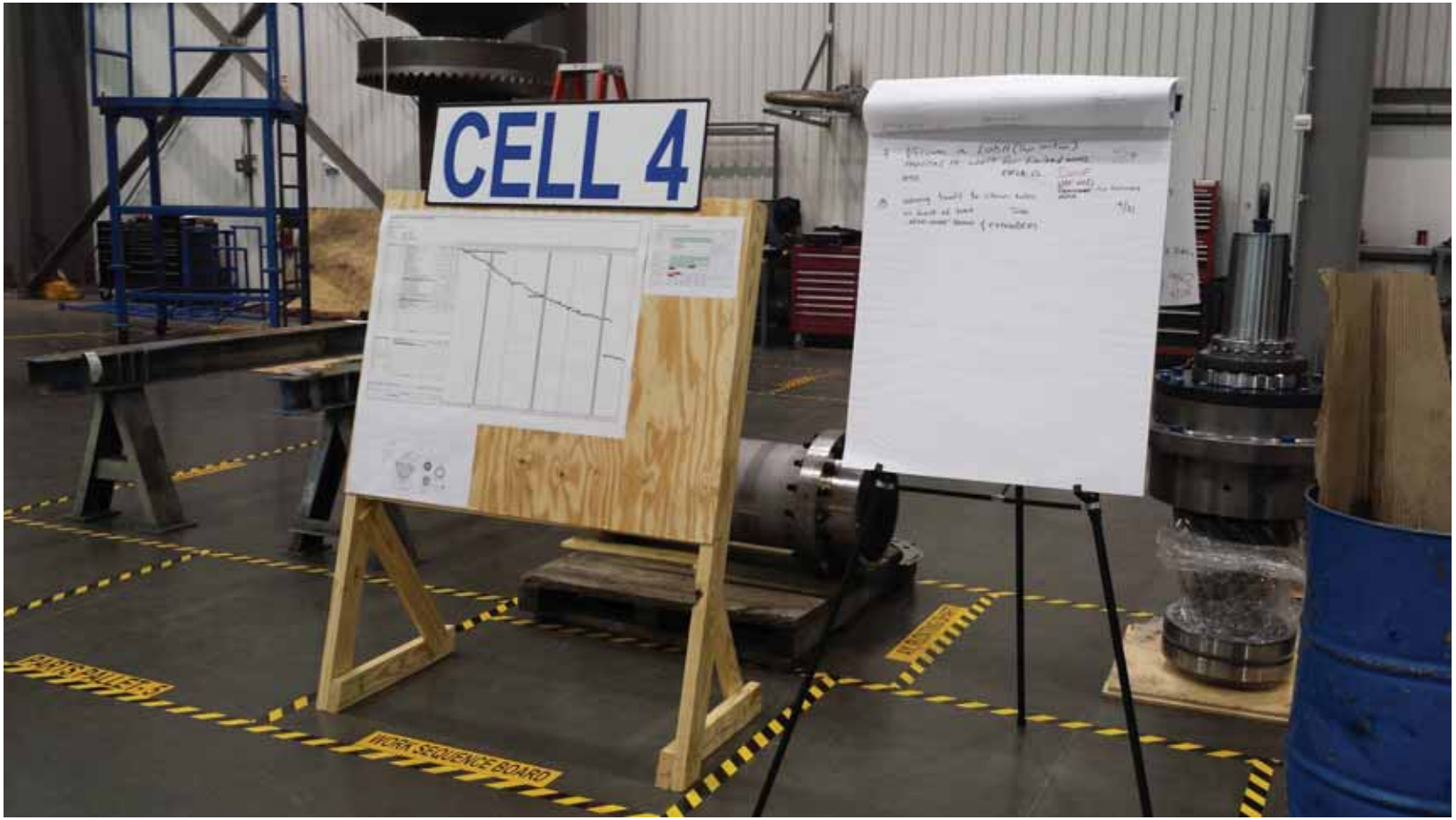


Problem Solving: Moved Support Services to Shop Floor

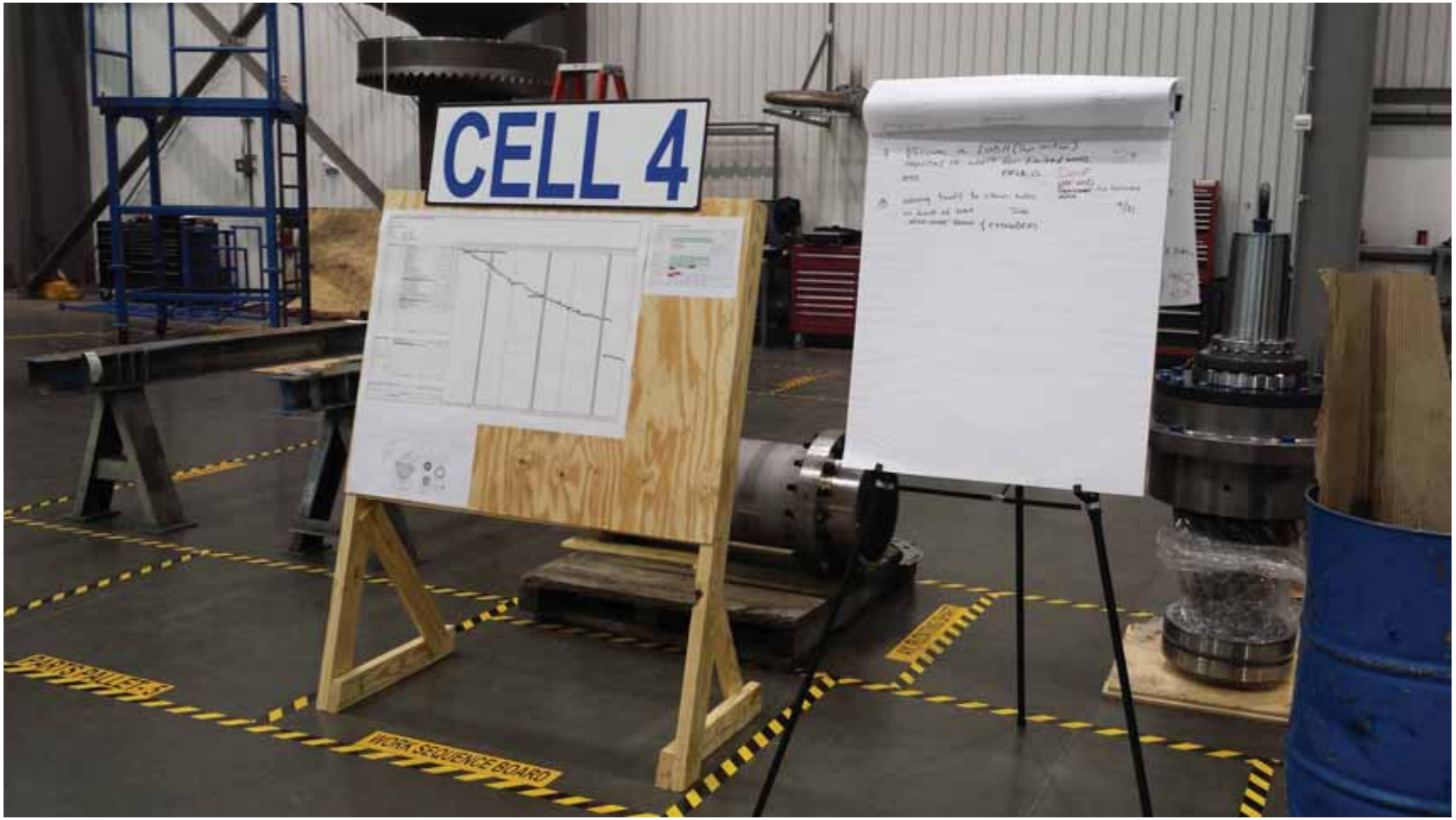
1. Support Services were relocated to the Gemba
   - Manufacturing Engineers
   - Schedulers
   - Design Engineer (Rotation)
2. Created CI Teams, Kaizen Teams and Mentored potential future leaders
3. Instituted A3's as the standard problem-solving methodology; Trained and deployed
4. Fostered an "Open" door culture.

Problem Solving at the Gemba

Problem Solving: Communication Board

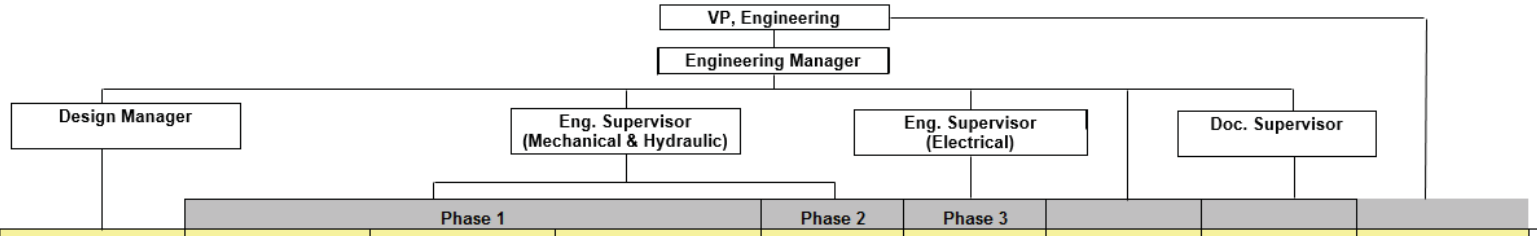


Problem Solving: Communication Board



Lean Product Development

ENG. FUNCTIONAL EXPERT CHART

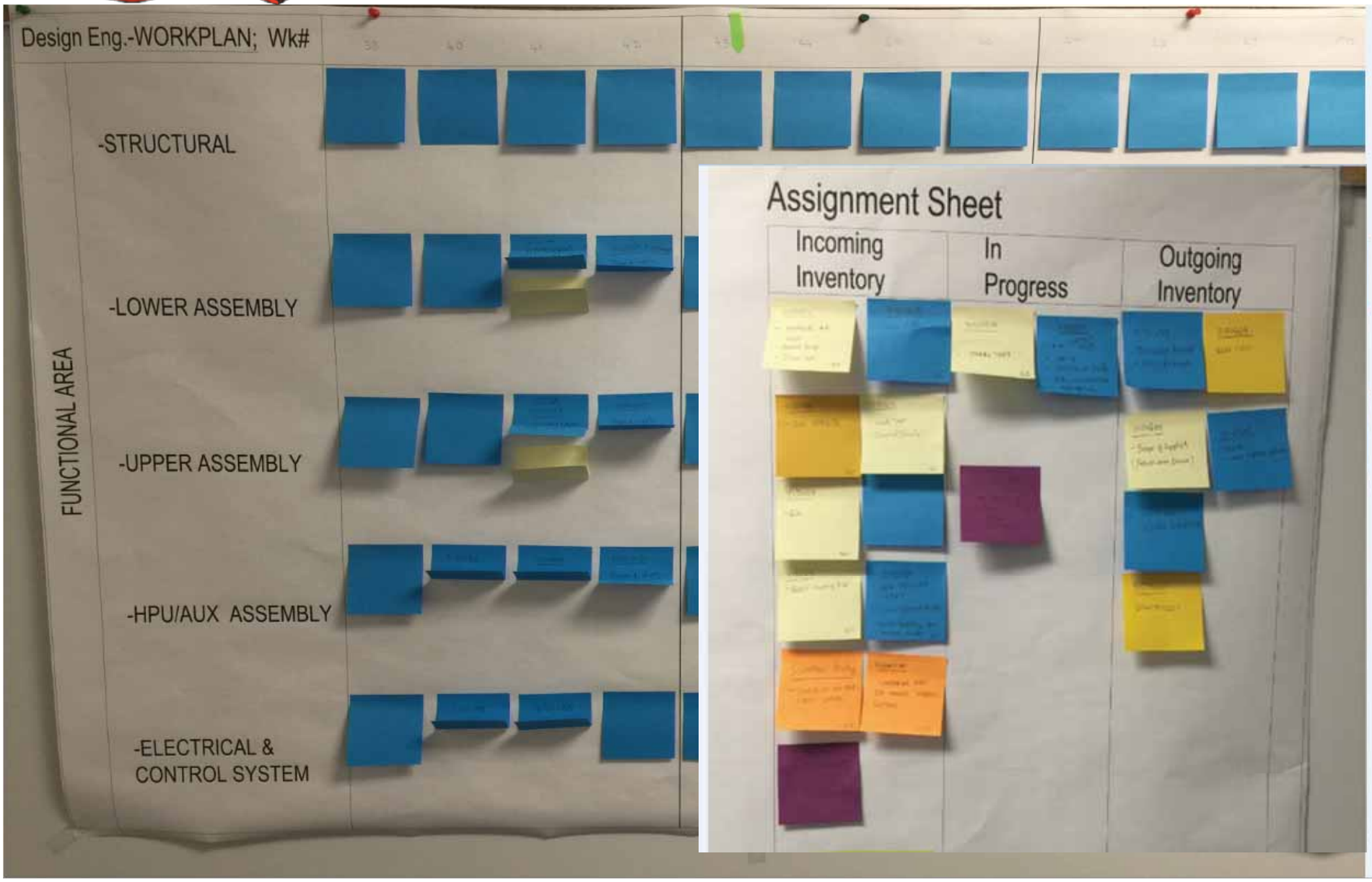


		Phase 1			Phase 2	Phase 3			
Functional Area	**Project Drawings**	**Structural**	**Lower Assemblies**	**Upper Asemblies**	**HPU/AUX Assemblies**	**Electrical/ Control Systems**	**Class**	**Documentation/ Manuals**	**New Product Development (R&D)**
Functions	Thruster GAs	Props Nozzle Receptacles Canisters Thruster Mounts Wells Plotforms Thruster Skids Coating	Props Nozzles LODH Spiral Bevels Rotating Groups Prop Seals Rope Guards Line Cutters Coating	UODH Slewing Bearings Steering Feedback Upper Gears Couplings Shaftlines Clutches PTO's Plumbing/Routing Stems Floating Shafts Swivels Cylinders Latches Guidebars Coating	Power Units (Electric Motor & Engine Driven) Steering Hpu's Lube Oil Systems Head Tanks Seal Oil Tanks HPU Skids Filter Separators Heat Exchangers Plumbing/Routing GAs P&IDs HP&Ds Coating	Controls Panels VFDs Electric Motors Interfaces GAs Schematics Functional-Descriptions (FDS)	Applicable Class to the Project/Job Scope of Supply - Drawing		
Engineers	-	1. Tang* 2. Shaw	1. Kenner* 2. Jacek 3. Tang	1. Linzy* 2. Garrett	1. Nagur*	1. Chandan* 2. Venkat	1. Venkat	1. Elisa* 2. Mike	1. Shaw (Thruster)* 2. Venkat (Controls)
Designers	1. Jim Levy	1. Orlando	1. Erik 2. Chris	1. Erik 2. Chris	1. Chirs 2. Erik	-	-	-	1. Orlando

Functional Group Member Responsibilities
- Complete Design
- Standardization
- Define input/output for each functional group
- Improve quality of work

*Functional Group Lead

Lean Product Development




Thrustmaster
Journey Continues
Kaizen
Problem Solving
Flow
Pilot Line
Visual Management
5s
Standard Work
Hoshin Kanri
Convey Vision
VSM
Develop Vision
LEAN JOURNEY ROADMAP

Thank you, Questions?

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