Rapid (AGILE) Deployment and Execution of Integrated Systems Engineering Principles and Methods in times of major Disruption

Project “V” from an ISE Perspective

Thank You to Our Partners

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  - Chapter #1
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  - Kentucky Chapter
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INSTITUTE OF INDUSTRIAL AND SYSTEMS ENGINEERS
AT THE OHIO STATE UNIVERSITY®

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LEADING HEALTHCARE IMPROVEMENT

IISE's Global Response—We Engineer Value (Even in Times of Major Disruption)

Webinars that Matter in the face of COVID-19

If you missed these timely, great Webinars, go to this link on the IISE Website and get to them.

https://www.iise.org/details.aspx?id=46729

30 Jan 2020: How to Design and Execute **Flow Workshops in Healthcare**—OSU University Hospital East Case Example (Scott Sink and Olivia Vance)

25 Feb 2020: Agile Principles and Methods to **Accelerate Critical Process Innovation** and Improvement—Joan Tafoya and Caitlyn Kenney

19 March 2020: **Creating Cultures** to Support Performance Excellence (crucial foundational element for surviving major disruptions!!) (David Poirier, President IISE)

Engineering Management Systems to Ensure Survival and Success

INSTITUTE OF INDUSTRIAL & SYSTEMS ENGINEERS

And to get to these latest two, same location/link…..

https://www.iise.org/details.aspx?id=46729

Navigating your Business Through the COVID-19 Crisis—7 April

Business Continuity Strategies and Tactics in Periods of Major Disruption—16 April

James A. Tompkins Ph.D.
Chairman, Tompkins International

tompkins

David Poirier, P.E.
CEO The Poirier Group

THE POIRIER GROUP

Engineering Management Systems to Ensure Survival and Success

Housekeeping

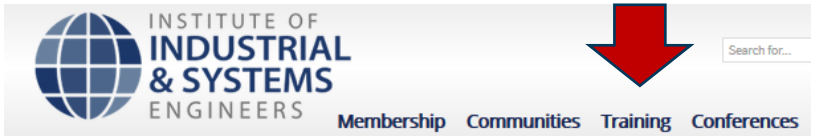
We've provided a handed out Jim's hot off the press white paper entitled "Restarting the Economy: Guidance for Public and Private Leaders" as a handout for today also!!

A webinar recording will be made available after the session, follow up e-mail.

Download the presentation **DURING** the Webinar, before it ends!! and request extra handouts after the webinar.

Questions? Type them in the CHAT window and we will answer as time permits.

Follow up questions are welcomed and contact information is provided at the end of the presentation.



https://www.iise.org/details.aspx?id=46729

And, the Recording and Presentation pdf will be available on IISE's website for IISE members shortly after the webinar date—Training/Webinars/Performance Excellence. ***Membership Has Privileges!!***

Project "V"
From An
Industrial Engineering Perspective

Steve Savoie
Sr Manager Industrial Engineering Process & Integration

May, 2020

GENERAL MOTORS

QUICK INTRO TO ME….

- 40+ years of Automotive Mfg. experience
- IE, Quality, Mfg. Operations, Mfg. Eng.
- IE Leadership Roles at GM and FCA
- Member of IISE and CISE

Education

BS - Industrial Engineering

→

Master of Business Administration

FOCUS AREAS FOR TODAY'S DISCUSSION….

1. IE Team - Strength & Resiliency
2. Pivoting the Team – The Project "V" Mission
3. Organizing, Focusing, & Leading the Team
4. IE / Lean Tools Applied (Driving Results)
5. Key Lessons, Learnings & Take-Aways

1. IE TEAM STRENGTH & RESILIENCY….

Global IE Network – Key Assignment for Savoie & Team (2016-18)

In a nutshell….my job….Build Resiliency back into IE for GM!

Key indicators of success (prior to Project V)

- Common processes, tools, and systems
- Key Performance Indicators (Hours per Unit, Deliverables, etc.)
- Engagement of the IE Team (Workplace of Choice Scores)

GENERAL MOTORS
Global Manufacturing Engineering

GM GLOBAL MANUFACTURING

IE Global Sub Councils:
- Plant Layout
- Ergonomics
- Throughput Simulation
- Engineering Content
- IE Tools
- Master Process Doc's

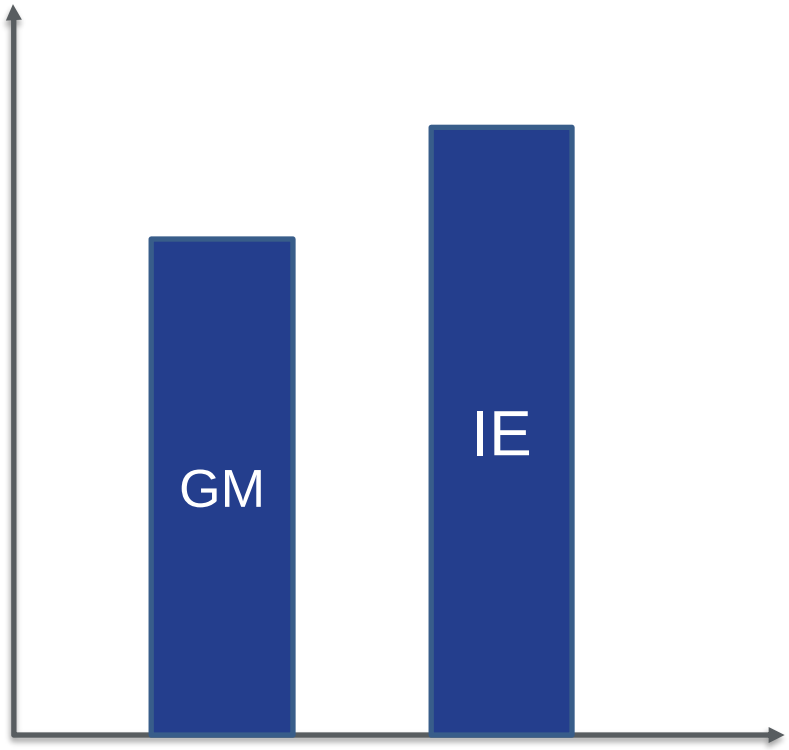
MLT

Responsible for:
- Standards & Tools
- Training & Support
- Processes & Systems
- Future Model Launch
- Technical Expertise
- Global Standardization

Responsible for:
- Driving Safety, Quality, & Productivity in current production
- Best Practice Sharing
- Global Standardization

ENGAGING INDUSTRIAL ENGINEERS

workplace *of* choice



Typical Results of GM's WoC Surveys

Strong IE Network

Innovation

Clear Expectations

Great Communication

Care About Our People

Challenging Assignments

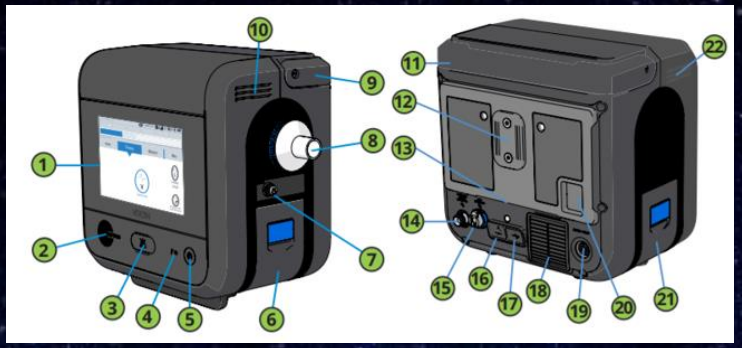
Solve Problems

Feedback, Feedback, Feedback

Cutting Edge Tools

Personal & Career Development

PROJECT “V” HIGHLIGHTS….



Project initiated on Friday March 20, 2020

Partnership between GM and Ventec Life Systems

- 30,000 Critical Care Ventilators for US Dept. of HHS by August, 2020
- Based on Ventec’s current product & process - facility in Bothell, WA
- Rapid scale-up of ~50x daily production at GM’s identified facility in Kokomo, IN

Key Challenges

- Supplier Capacity
- Processing Plan, Layout, Tooling & Equipment
- Onboarding and Training 1000+ person team in Kokomo

Enabled Production in Kokomo in unprecedented timeframe

- 11 days from “Building Identified” to “Start of Non-Saleable Production”
- Start of Regular Production began on Monday April 13, 2020

2. PIVOTING THE IE TEAM FOR PROJECT "V"….

IE Challenge – "Critical Path"

- Processing Plan → Layout, Tooling & Equipment, Systems
- Processing Details → Training 1000+ person team in Kokomo

Identifying and engaging the TEAM

- My first communication – Noon Saturday 3/21
- Managers and Key Leaders (4 total) engaged on Saturday
- 17 IE's kicked off on Sunday 3/22
- Delivered first Training Documents to Kokomo - 6 am on Monday 3/23

Building the PLAN (what IE's do best!)

- Rough Line Balance agreed to with ME Team – Fri 3/27
- Initial JES & SOS documents delivered to Kokomo - Sun 3/29
- Two major revisions completed week of 3/30 (training curve response)
- All deliverables handed off & team in "Support Mode" – Wed 4/8

Line Balance Guiding Principles

1. Takt time – **one finished unit every 300 seconds**
   Confirmed by Throughput Simulation Results

2. Ventec's **WIN** (Work Instruction) - master document for Line Balance
   - SOS / JES (GM tools) utilized for Standardized Work

3. IE's used best Engineering Judgement for Cycle Time establishment
   - Utilized WIN, Ventec station videos, summary info, Q&A

Rapid Issue Escalation & Resolution (example)

Major Issues / Work Items and Assignments:

1. Material Planning (who/how/when) — Savoie / Schreiber
   Jason Daley will lead Planning Team. Team getting up & running as we speak.
2. Nonconforming Parts Handling — Hagler / Megdanoff / Schreiber
   Nabil El-Hage will lead Planning Team. Team up & running.
3. Peer Review Process — Bob Lee
   Bob developing process; details to be communicated.
4. WIN vs. SOS/JES — Savoie / Bernhardt / Heckler / Hardaway
   Complete both for now – additional IE resources coming to support. Decision pending.
5. Change Control — Dandalides
   George will be rolling out overall Change Control plan; details forthcoming.
6. Compressor Station IE Help — Hagler
   Steve Schroeder providing assistance
7. Ensure "Wall to Wall Coverage" — Kennedy / Brigmann
   Jason is the Headcount "eye of the needle" – funnel feedback & any changes!!

Issues identified 10 am Tue 3/24 Responses provided to IE Team 5:30 pm

3. ORGANIZING, FOCUSING, & LEADING THE TEAM….

Daily Team Huddles

Resource Allocation & Adjustments

Tracking Progress – Master Spreadsheet, Heat Map

Resolving Issues (Hammer and Slicer Projects)

Team Motivation & Recognition

Typical IE Team Daily Mtg. Agenda

- Safety (Pat)
  - https://www.facebook.com/MarkRoberYouTube/videos/216989136214688/
- Hot updates from Leader Calls (Rod/Steve)
- Quick status check
  - Yesterday's deliverables
    - Completion status; Concerns?
  - New work for today (punch list with timing)
- Open items
- Roundtable

Leveraged Talent: Pat O'Brien took over coordination of IE Team 2x daily meetings beginning Thu 3/26

Support Structure by Operation (page 1)

Contact	1.0 Compressor Pump	2.0 Metering Valve	3.0 Cough Assist	4.0 Exhalation Control Module	8.0 External Flow	9.0 Internal Flow
Industrial Engineer	 Kathryn Walterhouse	 Steve Schroeder	 Michele Burke	 Michele Burke	 Jim Frolka	 Joe Mears
ME - Assembly	 Otto Monje	 Timothy Mottin	 Anthony Davis	 Garrett Hurley	 Steve Sturtevant	 Zach Rivest
ME - Testing	 Zach Brunner	 Erick Hernandez-Mojica	 John C. Dunne	 Zach Brunner	 Richard Hartman	 Richard Hartman
Plant Industrial Engineer	 Lucas Gardner	 Paul Cole	 Jim Bonczyk	 Mohammad Hassan	 David Streit	 David Streit

Having the **IE Network** in place enabled rapid resource allocation & adjustments!

Resource Allocation and Adjustments (Example)

FW: 17.0 Rotary Valve New parts routing

Karyn Naimo

To Rod Hagler; Stephen Savoie; Patrick O'Brien

Reply | Reply All | Forward | ...

Sun 4/5/2020 12:55 PM

Retention Policy Inbox (3 years) Expires 4/5/2023

From: Karyn Naimo
Sent: Sunday, April 05, 2020 9:30 AM
To: Greg Henderson <greg.henderson@gm.com>
Cc: Patrick O'Brien <patrick.obrien@gm.com>; Stephen Savoie <stephen.savoie@gm.com>
Subject: RE: 17.0 Rotary Valve New parts routing

Hi Greg,
Thank you. I think several of us need to do this with the latest direction to process in series vs parallel. I am not sure what the process is to update part routings, but I know we need to provide this important info for the PFEP. Thank you for taking the initiative to do this for your area!!!

Pat and Steve,
Looking for your direction on owner of part routings. The process is not robust and is based on an excel spreadsheet originated from Product (Jeff Scramlin). I think it is time to address this with the plant to see who is managing part numbers there so this information is not lost.

Thank you,

Karyn Naimo
I.E. Integration Engineer
517-206-9876

RESULT….
- Realigned Part Routing responsibility to Mario Henry immediately
- Engaged Mfg. Operations team to identify long term owner/process

Tracking Progress – SharePoint Site

RE: Project V - Morning Check In - Location of Peer Review 'Heat Map'

Patrick O'Brien

Reply | Reply All | Forward | ...

To Elizabeth Lustenberger; Rod Hagler; Heather Heckler; Kevin Juzysta; Steven Schroeder; Karyn Naimo; Kathryn Walterhouse; Craig Waechter; Todd E Messman; ABDULLAH GHANIM; Joe Mears; Mario Henry; **+19 others**

Fri 3/27/2020 9:13 AM

Cc Michele Burke

Retention Policy Inbox (3 years) Expires 3/27/2023

As promised during our 7am call. The file for updating by 5pm is 'Project V – Information Readiness.xlsx'

Thanks.

Files > VENTEC > Summary of Process (heat map)

Name	Modified	Modified By	File Size	Sharing
Project V - Information Readiness.xlsx	5 minutes ago	Gabriela Sanchez	15.0 KB	Shared
Project V Line Bal Plan Kick-Off updated 24...	Tuesday at 7:18 AM	Kevin Juzysta	785 KB	Shared
Summary of Existing Data.xlsx	2 hours ago	Gabriela Sanchez	690 KB	Shared
Ventec1 OPs Detailed 24mar.pptx	5 hours ago	JOHN FISHER	4.24 MB	Shared

IE “Master Spreadsheet” and “Heat Map” of Key Deliverables Status

						V Pro Model								
						Assembly				Testing				
Number	Cell	Does this operation designated as a requiring "KNACK" (add call comment on what KNACK is)	Kokomo Station Strategy Scenario 1: Parallel Scenario 2: Parallel Assy; Sequential to Testing Scenario 3: Sequential Scenario 4: Combination parallel and sequential assembly & testing	Recommended Distribution of Work	IE	LATEST Cycle Time (SOS, SIM)	Comments	Number of Operators Required (Use Headcount Decision Tab and Round Up)	Comments	LATEST Cycle Time (SOS, SIM)	Comments	Number of Operators Required (Use Headcount Decision Tab and Round Up)	Comments
2.0	Metering Valve	YES	Scenario 2		S. Schroeder	17.5	FTQ is 90%, rework in cycle	5	Do not have a full video of operation. Some estimates still in cycles.	60	Per Ventec: Cycle time includes mounting part, push test and function test. Test time can be 45 to 75 minutes with an average of 60.	2	Simulation assumes all work content within the 60 minute cycle and 0% failure rate.
3.0	Cough Assist	Yes. (small parts…KNACK. Keep washer in palm of hand. With opposite hand, thread screw through center hole of washer.)	~~Scenario 3~~ Scenario 2		J. Shamim/Carolann Grant Michele Burke	6.67	Still Waiting for info on low end model. HH to get WIN data from Steve on 3/26/20. WIN received today at 10 am. Estimated processing times for new/revised process (no video was provided).	2	Still Waiting for info on low end model. HH to get WIN data from Steve on 3/26/20. WIN received today at 10 am. Estimated processing times for new/revised process (no video was provided). ME wants to protect for 3 testers.	4.17	Still Waiting for info on low end model. HH to get WIN data from Steve on 3/26/20. WIN received today at 10 am. Estimated processing times for new/revised process (no video was provided). ME wants to protect for 3 testers.	1	Still Waiting for info on low end model. HH to get WIN data from Steve on 3/26/20. Data received today at 10 am. Estimated processing time @ 2.0 hours after data received.
4.0	Exhalation Control Module	No	Scenario 2		KC Stoneman / C. Waechter Michele Burke	5.35	walk time for labels removed and explanation time for operations removed. Test set up removed from assembly operator	3		10.94	FTQ 92% test set up time added	1	Test group want to set up one station to run 2 tests at a time (capable of 11.1 JPH) ME and IE request 2 stations running 2 tests each or 1 station that can run 3
8.0	External Flow		Scenario 1		J Frolka/T. Messman	10	15 minutes glue and cure - move to next assembly	3	added an additional assembly operator	20	Used the Video time	2	Tester move between stations
9.0	Internal Flow		~~Scenario 3~~ Scenario 2		Joe Mears	11.56	Processing to allow for work during process time and separating work between operators reduced # of cure/glue stations needed	3		17.5	Testing variation FTQ 92% 2 testers, each running two tests simultaneously (4 total)	2	Find out from R. Hartman how scanning works with tester
10.0	Front Case	No (only small washers & screws)	Scenario 1		M. Henry 586-864-5496	17.0	Video runtime missing parts scanning and material restock allowance. Good operator on video.	4		0.0	No test	0	No test
11.0	Back Case	No (only small screws)	Scenario 1		M. Henry 586-864-5496	17.4	No video for this model (only WIN-00161). Used videos for VCSN Pro. Less content on base model.	4	Protected for VCSN Pro assembly	0	No test	0	No test
12.0	Chassis		Scenario 2		K.Juzysta	9.2	Video has content that is not on this model	4	Equipment based if on High End Model requirements	9.5	OAX is not on this unit which is in video. If so it takes testing time off	4	Potential to remove some testers/heads. Test and assembly work removed (found out on 3-25-2020). Tester
13.0	Inlet Accumulator												
14.0	O2/Power Bracket												
15.0	O2 Accumulation												
16.0	External O2 Controller												
18.0	Center Band												
19.0	Final Assembly												
20.0	Final Test 1 & 2												

Information Readiness Status (Heat Map)

First group of scenario changes Second group of scenario changes

Question	1.0 Compressor Pump	2.0 Metering Valve	2.1 Metering Valve Test	3.0 Cough Assist	4.0 Exhalation Control Module	8.0 External Flow	9.0 Internal Flow	10.0 Front Case	11.0 Back Case	12.0 Chassis Assembly	12.0 Chassis Tester	13.0 Inlet Accumulator	14.0 O2 / Power Bracket	15.0 O2 Accumulation	16.0 External O2 Controller	17.1 Rotary Valve (Motor)	18.0 Center Band	19.0 Final Assembly	20.0 Final Test 1&2	NEW: Patient Interface Port Asm	Receiving Inspection	VSCN Post Production Test	Final Packaging to Shipping
Are your SOS documents complete (& saved to OneDrive) to the point where Kokomo can start using them for operator training?																							Final update based on
Based on the information provided and your best Engineering judgement, do you feel that the proper manning and equipment are allocated to achieve the 12 JPH target for Station?																							
Are you and the ME for your area ‘on the same page’?																							
Throughput Simulation Model Complete																					N/A		
Layout Changes Done? (Only stations impacted by change in direction)		N/A	N/A		N/A	N/A		N/A	N/A	N/A	N/A								N/A	N/A	N/A	N/A	
ME knows about Additional Tools / Equipment needed? (Only stations impacted by change in direction)		N/A	N/A		N/A	N/A		N/A	N/A	N/A	N/A								N/A	N/A	N/A	N/A	
Buy-off from Kokomo IE (Only stations impacted by change in direction)		N/A	N/A		N/A	N/A		N/A	N/A	N/A	N/A								N/A	N/A	N/A	N/A	
Material Implications Communicated. Part routing & split parts routing sent to Vinicius De Marco.		N/A	N/A		N/A	N/A		N/A	N/A	N/A	N/A								N/A	N/A	N/A	N/A	
IT Implications communicated		N/A	N/A		N/A	N/A		N/A	N/A	N/A	N/A								N/A	N/A	N/A	N/A	
Manpower Changes? (Only stations impacted by change in direction)		N/A	N/A		N/A	N/A		N/A	N/A	N/A	N/A								N/A	N/A	N/A	N/A	

RPS – 2 SLIDE QUICK OVERVIEW (SLIDE 1)

"Heat Maps" help to identify Project Needs

Hammers

← Business Areas →

← Key Tasks / Deliverables →

High Priority

Slicers

Information Readiness Status

Throughput Simulation Model Complete: ✓

Question	1.0 Compressor Pump	2.0 Mastering Valve	2.1 Mastering Valve Test	3.0 Cough Assist	4.0 Exhalation Control Module	8.0 External Flow	9.0 Internal Flow	10.0 Front Case	11.0 Back Case	12.0 Chassis Assembly	12.0 Chassis Tester	13.0 Inlet Accumulator	14.0 O2 / Power Bracket	15.0 O2 Accumulation	15.0 O2 Controller	16.0 External O2 Controller	17.1 Rotary Valve (Meter)	17.2 Rotary Valve (Assembly)	17.3 Rotary Valve (Test)	18.0 Center Band	18.0 Center Band (Test)	19.0 Final Assembly	20.0 Final Test 1&2	NEW Patient Interface Port Asm
Are your SOS documents complete (& saved to OneDrive) to the point where Kokomo can start using them for operator training?																								
Based on the information provided and your best Engineering judgement, do you feel that the proper manning and equipment are allocated to achieve the 12 JPH target for Station?																								
Are you and the ME for your area 'on the same page'?																								
Is there a unique station address displayed on the SOS/WIN?					N/A																			
Is the SOS accurate (including build sequence)?																								
Are all "Major Steps", "Key Points" & "Reasons Why" clearly defined?																								
Has a special "Knack" been identified for this operation? Is the Knack identified in the SOS/JES?					N/A																			
Are Mandatory Sequences included in the SOS/JES?														N/A										N/A
Are their any quality standards for the operation that need to be identified?					N/A																			
Ensure the time from the Video is included in the SOS time. Don't need to be to the GM level of accuracy, plus or minus 30 seconds per element is okay																								
The testing elements are documented (not all the JES detail but a placeholder) for each test done on each SOS, with the time for the test (see line 1)		N/A						N/A	N/A											N/A				N/A
Any part scanning time is included in the SOS time (if you did not include the text in the in JES, that is okay for right now- assume all parts are scanned)																								
The test time, if on the critical path, is included on the SOS, if not on the critical path document on the JES element name, with the time to do the test		N/A						N/A	N/A											N/A				N/A
If you have and fasteners, the PPO team is looking for the torque to be called out on the JES element (where ever it makes sense in the name or on the What line)																								
Did you add allowance time for material handling																								
Did you provide ME the Required number of material bins?																								
Have all parts been validated against current BOM in each build configuration?																								
Have any discrepancies been found between the WIN and the video of the operation? If YES, what is the resolution plan?																								
Are there any open questions relative to the build of your product? Is any information still needed?																								
Has the 'heat map' been updated, validated & communicated to ME & comprehended in the layout																								
Are you confident that you have all parts, testing, and build processes comprehended for both models?																								
Have any discrepancies been found between the WIN and the video of the operation?																								
If YES, is there a resolution plan, and is there a plan to process necessary information by COB 3/27/20?																								
If YES, does the discrepancy need a resolution plan, and if so is there a documented plan underway?																								
Have you updated the SOS document(s) for your operation(s) to accurately reflect the current status / plans for each station?																								
All special build conditions (where appropriate) properly comprehended for each model?																								
Overall cycle times for Assembly and Test reflect what is posted in the Master Spreadsheet?																								
All work elements captured and documented in the proper sequence for each model?																								
Have you created JES documents for your operation(s) that are aligned to the SOS(s) for all work elements?																								
Have the latest JES documents been provided to Daniel H. / Santosh?					N/A																			
Has the master spreadsheet been updated with all appropriate information?																								
Have you documented build differences between V Pro and VCSN Pro in the Master Spreadsheet (if any exist)?		N/A	N/A		N/A									N/A							N/A			
Do you have full confidence in the Selected Operator Cycle Time that you have determined for Assembly and Testing?																								
Do the number of Assembly and Test operators planned match cycle time requirements (1 part every 5 minutes)?																								
Proper number of workstations and major equipment?																								
All parts, tools & equipment comprehended in the layout?					N/A																			
Have you communicated with your Test ME counterpart(s) (if relevant for your station) to ensure alignment with their plans?		N/A						N/A	N/A											N/A				N/A
Do you fully understand and have you comprehended all testing requirements within your station?		N/A						N/A	N/A											N/A				N/A
Proper number of test stations and test equipment?		N/A						N/A	N/A											N/A				N/A
All test equipment comprehended in the layout?		N/A						N/A	N/A											N/A				N/A
Do you have any questions or concerns (not comprehended above) relative to your operation(s)? If NO, what items still need to be defined / what is your plan & timing to rectify?					N/A	N/A								N/A										

Identify *PRIORITY* Projects

- "Hammer" Projects
- "Slicer" Projects

Identify Project Leads & Teams

Train, Coach, & Communicate

Visual Tracking of Projects

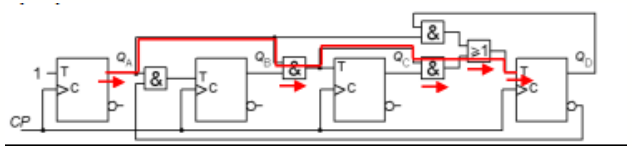
RAPID PROBLEM SOLVING – QUICK OVERVIEW

Hammer & Slicer Projects – Key Steps

Step 1: Define "DONE"

Write it Down!

Step 2: Build High-Level Project Plan



Determine the Critical Path

Step 3: Run the Play!

Move through steps in sequence

"Look Ahead" (To next steps)….

only when you are "waiting"

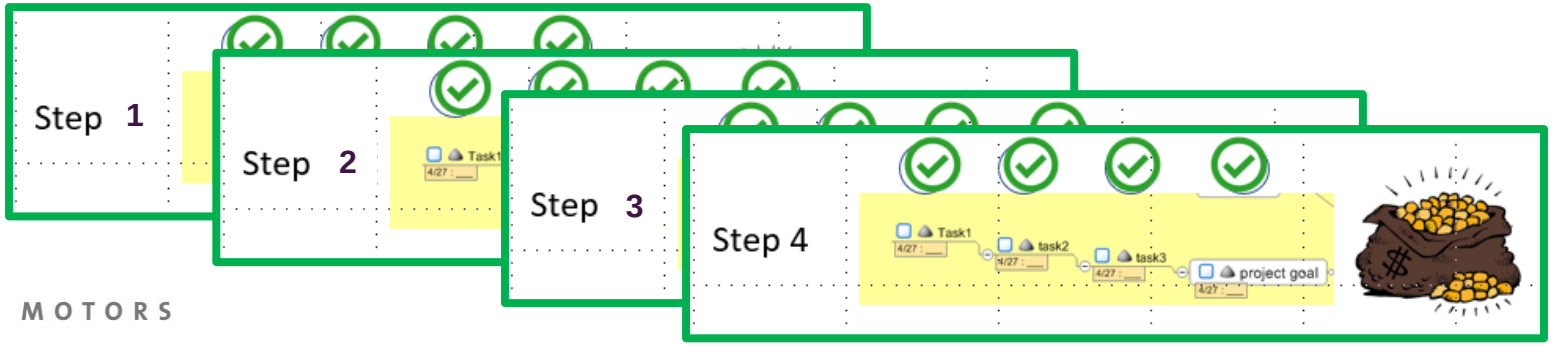
Project Activities:

- DECIPHERING
- PROCESSING
- WAITING

Avoid:

- "I thought….."
- "I am assuming…."
- "I hope…."

STAY ON the Critical Path!



LASTLY… Confirm DONE!

4.1 IE Team Internal Communications (Examples)

REQUEST FROM STEVE: Action Items from Today's Non-Conforming Layout ...

Stephen Savoie

To Colleen Greskowiak; James M. Cleveland; Nabil El-Hage; James L Fortune; Rod Hagler; Jason Brown; Joseph W Joseph II; Larryson Foltran; Megan Rupp; Alanna J Musser; **+2 others**

12:31 PM

Cc Patrick O'Brien

Team, I have a request. I am not picking on Colleen!! I just grabbed this note to make a point to all; I am getting flooded with emails on this and other topics…and I'm sure all of you are too.

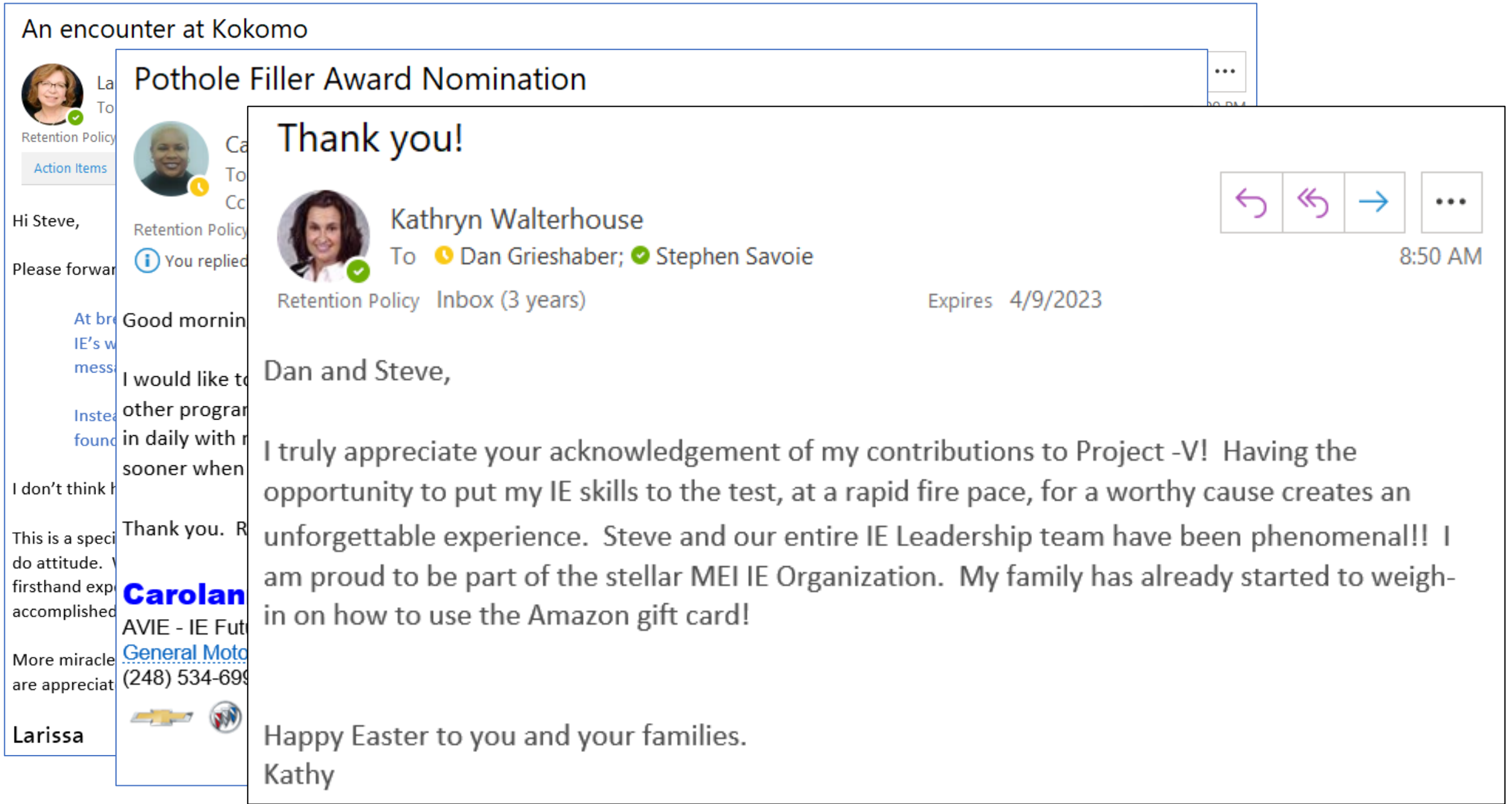
My Request….Please include only those individuals that **NEED** to be copied on emails related to this topic. **Work ALL Critical Path Items by Personal Contact**.

Steve's Philosophy….**EMAIL IS AN INFORMATION REPOSITORY, NOT A RAPID COMMUNICATION TOOL!!!**

Thanks for your great work and support.

Steve

Team Recognition (formal & informal)…you can't do "too much"!!!



IE / LEAN TOOLS APPLIED:

DRIVING RESULTS….

OTHER IE / LEAN TOOLS APPLIED.....

Line Balance

Reality Capture

Ergonomic Standards & Analysis

Throughput Simulation

GoPro Time Lapse of Installation

Line Balance Example (Center Band Station)

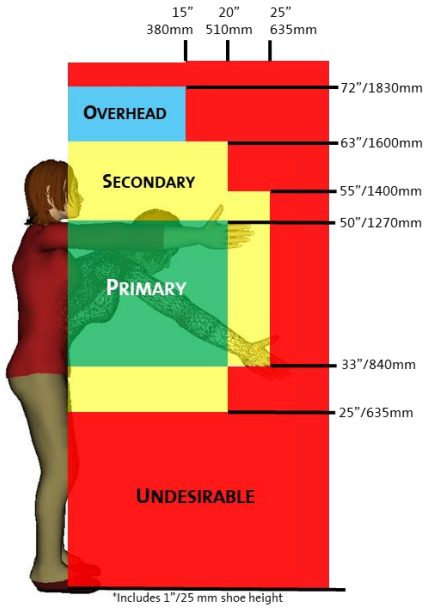
CENTER BAND plan								
			VPro - based on WIN 276					
	NOTE: BELOW TIMES DO NOT INCLUDE SCANNING AND PART MOVEMENT BETWEEN STATIONS (EST 100 SEC PER STATION)					17	2	2
WIN Element Number	Operator #	Description:	SOS Elements	Time	Station Time	PRT-00474-000 Screw	PRT-00755-000 O-Ring	PRT-00315-000 Grommet
6.2	1	Prep work, Patient Interface P	retorque and blow chassis	126.5	469.5			
6.3			PIP	147				
6.3.5			External Flow Module secure	74				
6.3			tubes to PIP	94				
6.3			Cable to EFM	28				
6.4.4	2	Cough Assist, Tube install, Blo	EFM tube to PIP	16	509	2		
6.4			Cough Assist and tube	104				
6.4			install coupler to cough assist	82				
6.4			connect tubes to cough assist	63				
6.4			sub assemble 2 tubes, install bellow	32				
6.4.12			tube to chassis port below cough assist	13				
6.5.7			s/a blower bracket with dampeners	120		2		
6.5			attach coupler to blower	24				
6.5			install blower	55				
6.6.1	3	Rotary Valve, Metering Valve,	rotary valve (video has VCSN version)	45	492		1	
6.7			Install Metering Valve	254				
6.8			wire routing	32				
6.9.1			Internal Flow	161		2		
6.10.2	4	Inlet Accumulator, Exhalation	Inlet Accumulator	42	530	2		
6.10.3			Inlet Accumulator	54		1		
6.10			Inlet Accumulator	18				
6.10			tube to chassis one end only, other routed	16				
6.10.8			coupler to accumulator	30				
			inspection of everything to this point	26				
6.10.10			Route tube(00522)	4				
6.10.11-13			Install coupler (00373)	60				
6.11.1-7			Exhalation Control - 3 of 4 tubes and cable only	280				
	5	Secure Exhalation Control	4th tube (side of exhalation control)	20	330			
6.11.7			secure exhalation control - 2 fasteners	60		2		
6.12			bellow	10				
6.13			Controls	90				
6.14			Controls connections	150				
6.15.1-6	6	O2 Asm & Power Bracket	O2 Asm & Power Bracket - cable and tube to barb	300	370	4		
			secure power bracket	70				
6.15.7 - 10	7	Battery Instal and Closeouts	Battery	60	220			
6.16.1			Battery close out	60				
6.16.2-3			Suction Output Cover - including grommet	100			1	1
6.16.4-9	8	Patient Filler, Oxygen Accumu	Patient Filter - including grommet	150	460			1
6.16.10			Grommets included above	0				
6.17.2			Oygen Accumlator	250		2		
6.18			Serial Label	60				
				3380.5	56.3			
				seconds	minutes			

Technology Created a 3D Virtual World that Enabled People to Work from Anywhere

Matterport
Pro2 Camera

- **Reality Capture**: Having **an Immersive Photogrammetry(IPG)**/virtual world for the facility was an invaluable tool. It allowed engineers to virtually work in the facilities 24/7.

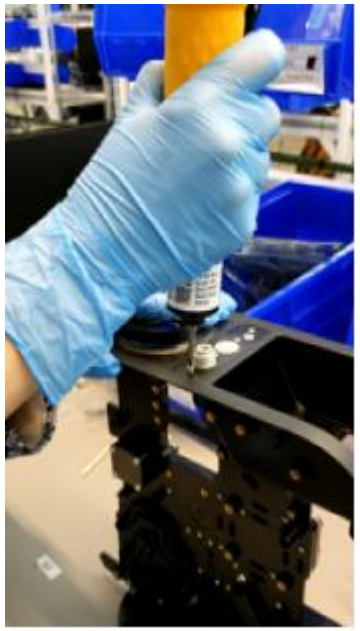
Global Standards and Ergonomic Analysis enabled Ergo Solutions



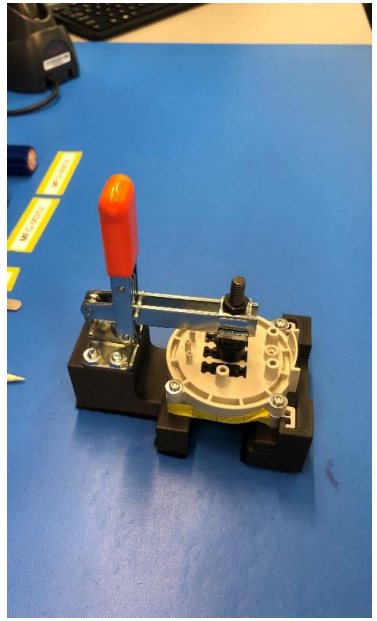
Global GM Ergonomic standards supported workstation setup and design

Maximum Acceptable Effort (MAE) calculated & incorporated

Effective Duration, Peak Effort, and Required Recovery Time calculated & incorporated

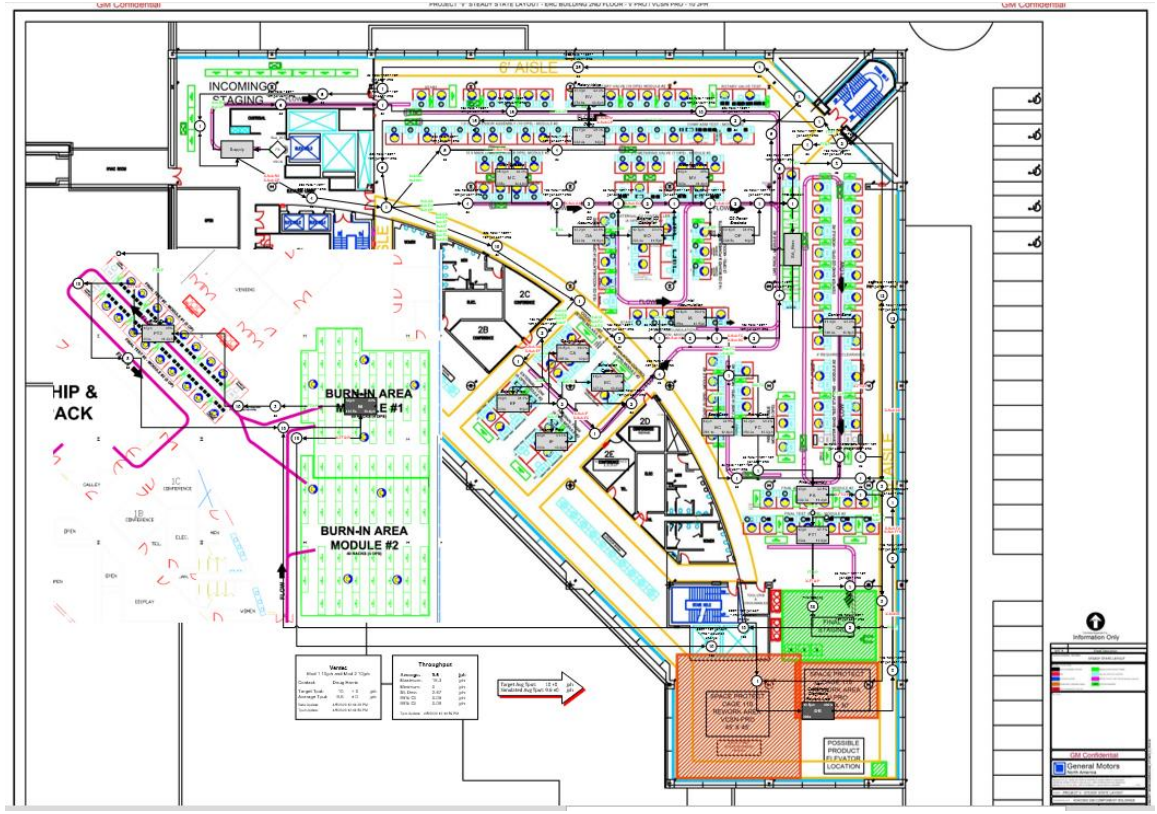


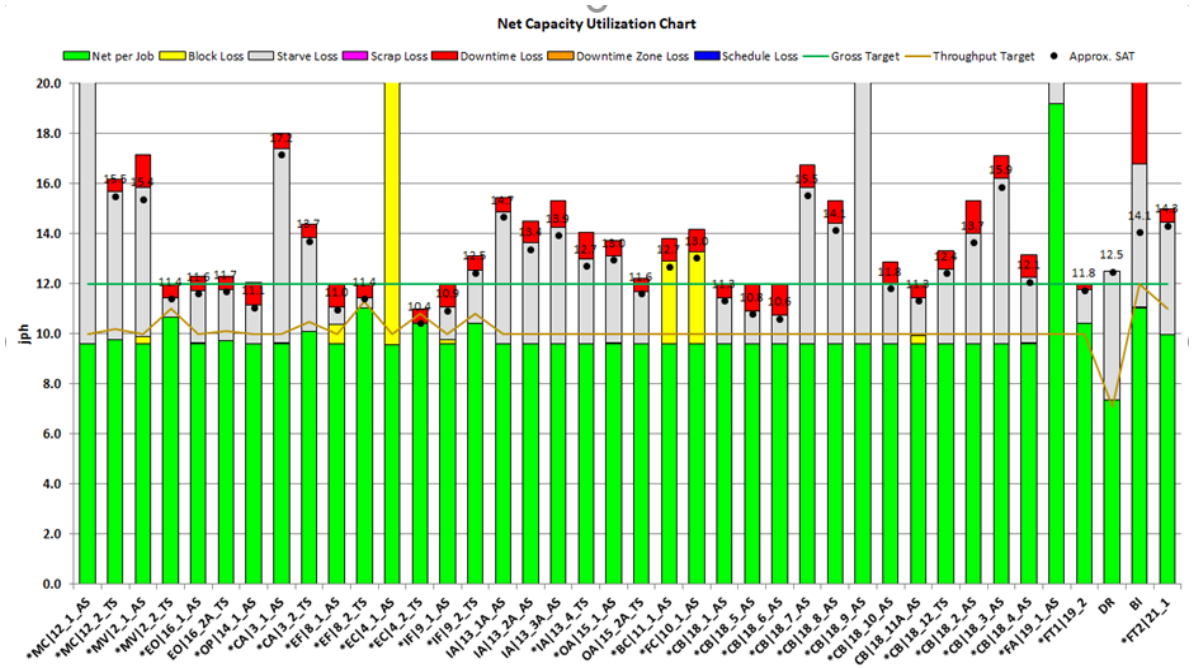
Inline power tools added to reduce hand tightening and increase throughput



Fixtures added to eliminate hand stress on higher torque applications

Our Throughput Simulation Tools Enabled a Quick Response on Projects





- **Simulation Tools** delivered fast and accurate results. The ability to overlay models on top of AutoCAD provided a highly informative visual displays for team and management reviews

- The **capacity utilization chart** was highly useful in identifying and communicating system bottlenecks

https://www.youtube.com/watch?v=-KBp2WdqvMM

KEY LESSONS, LEARNINGS, AND TAKE AWAYS….

KEY LEARNINGS, LESSONS, AND TAKE AWAYS….

Leadership Lessons

Team Survey Results

Stress Tips & Some Fun Reflections

Q & A

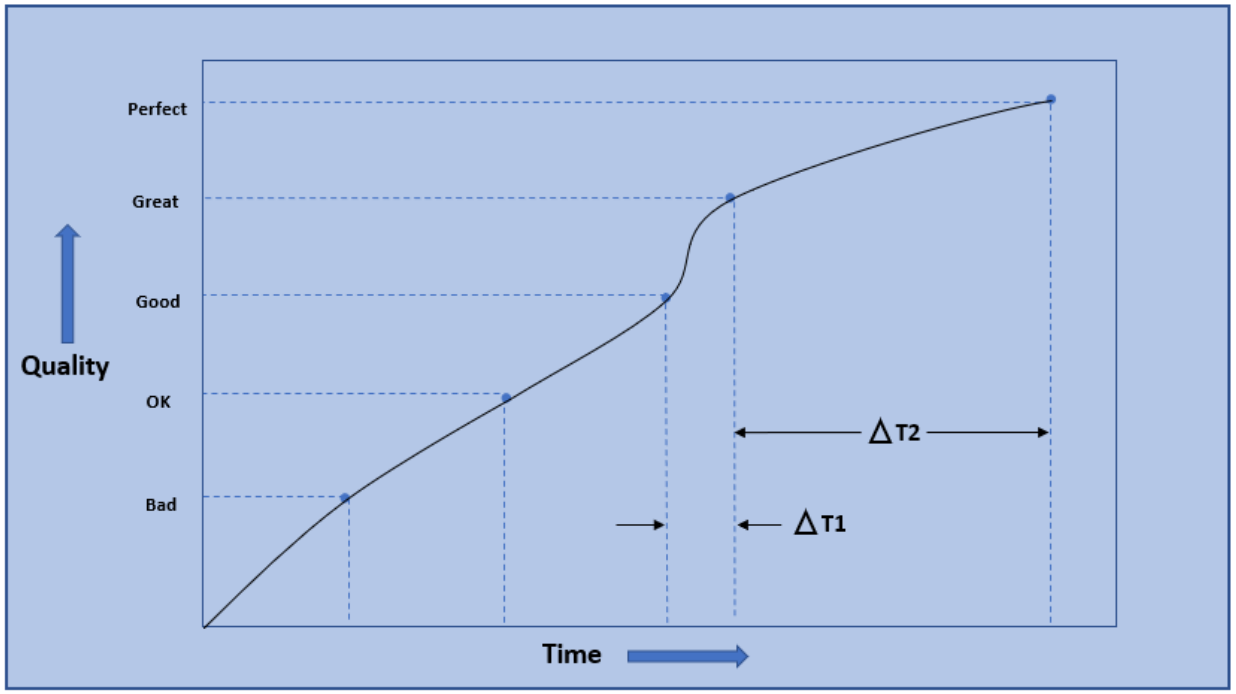
Leadership Lessons (Examples….)

Lesson 1 – Good is the enemy of Great (Jim Collins)….but PERFECT can be the enemy of DONE!

When team members have the attitude that "good enough is good enough" it can stifle greatness. Jim Collins very effectively points this out in his book *Good to Great*.

However as indicated in the chart below, while the time interval between "Good" and "Great" (ΔT1) can be minimal the time interval between "Great' and "Perfect" (ΔT2) can be massive!

Engineers have an amazing tendency to strive for perfection. However there are times (especially under extreme time pressure) when you MUST move on to the next task! You can always come back and CI later.

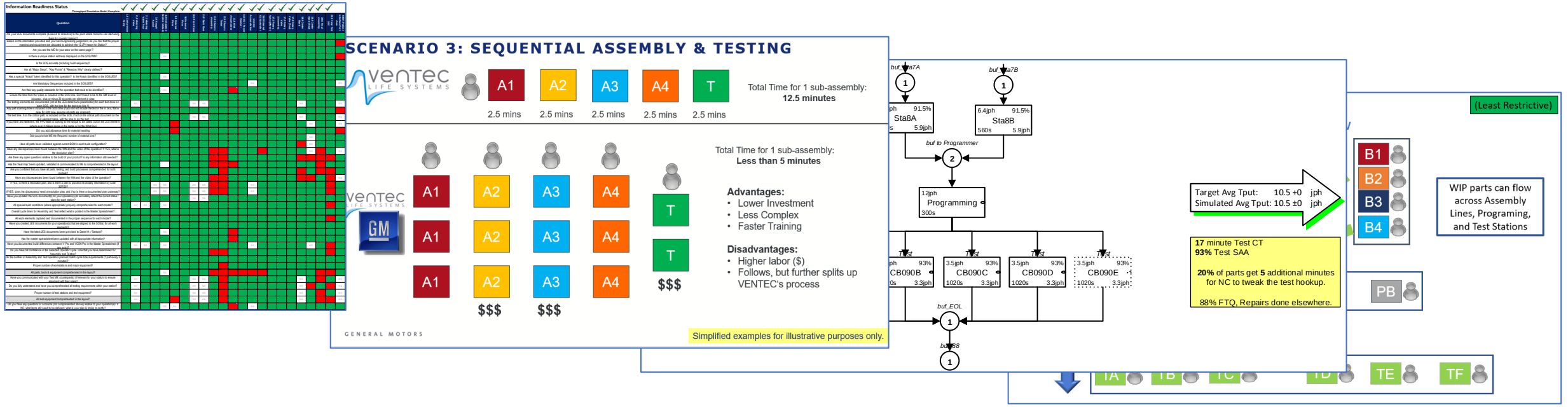


Leadership Lessons (Examples….)

Lesson 2 – VISUAL DISPLAY of information is critical to understanding; particularly when working in a virtual environment!

There is no ability to make “eye contact” over Skype (to confirm understanding)….leaders need to engage meeting participants by checking for understanding, summarizing key points, and following up with written instructions / expectations.

Good visual displays can convey in SECONDS information that otherwise can be difficult or even impossible to convey verbally. However, they can be TIME CONSUMING to create! Assign a “non critical path” resource to help create visuals whenever possible.

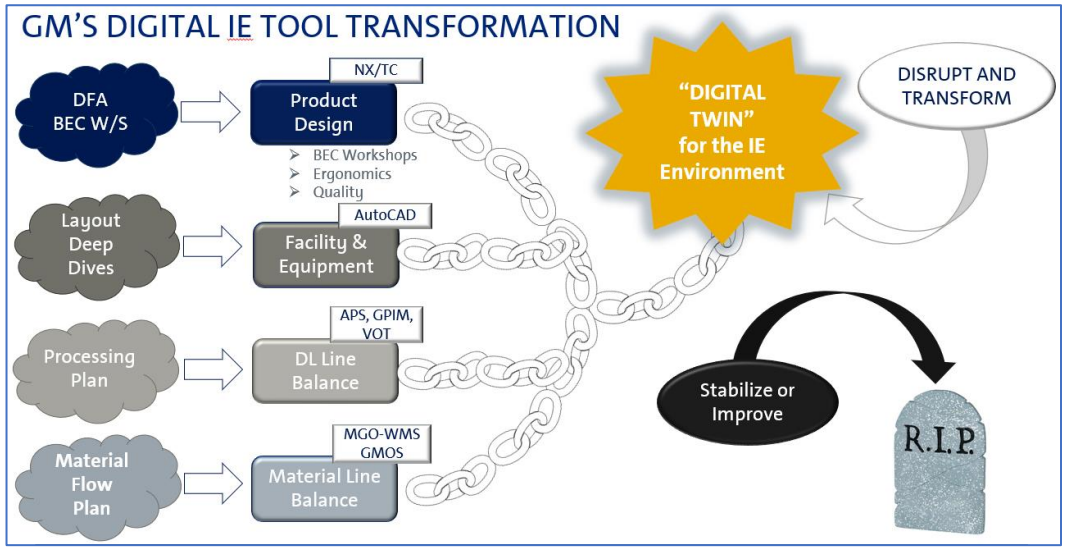


Leadership Lessons (Examples….)

Lesson 3 – Focus on your TOP PRIORITIES today / right now! However…don't neglect the need to LOOK AHEAD and make sure your strategies, plans & resources are optimal!

Jim Tompkins points out very eloquently that maintaining the "status quo" is the equivalent of a death sentence for your business entity. Continuous improvement is a very good start. However in order to THRIVE in today's fast paced environment, business entities need to find ways to DISRUPT and TRANSFORM!

Remember Steven Covey's sage advice…."There are tasks that are URGENT and those that are IMPORTANT. Don't get so focused on the "urgent" things (Quadrant 3) that you totally neglect the IMPORTANT ones (Quadrant 2)!"

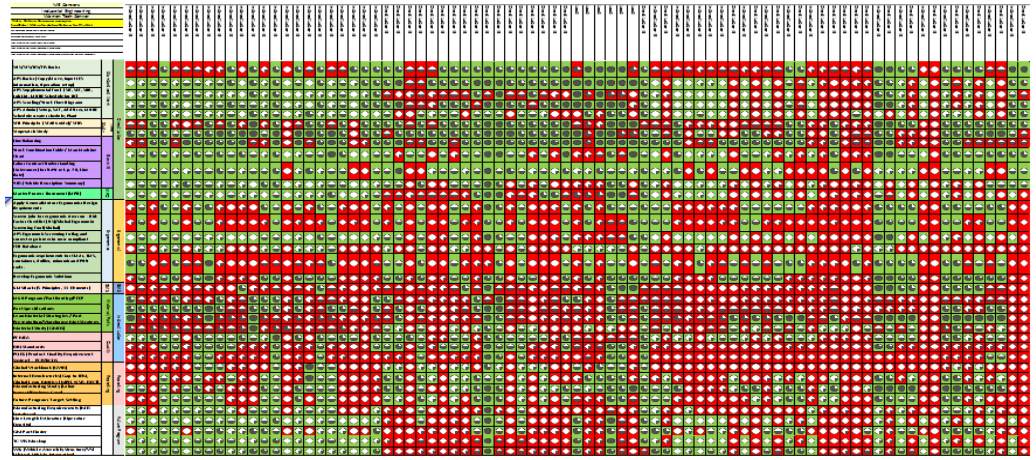


Leadership Lessons (Examples….)

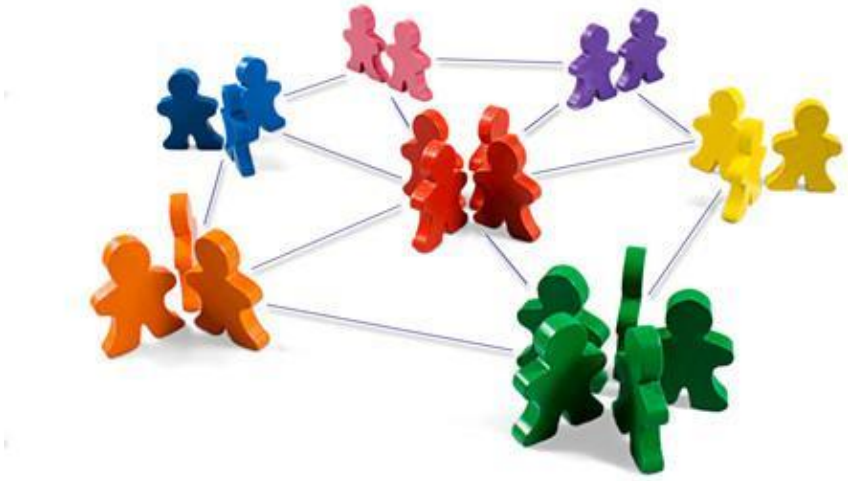
Lesson 4 – Cross functional knowledge and relationships make a difference!

Cross Trained People helped to bridge gaps. Example: People having knowledge of Ergonomics, Simulations and Industrial Engineering helped us move faster.

Need to **build relationships in advance**. We leveraged great relationships from the IE Network and our Vendors (Matterport in Seattle, GPS and Plant IEs, ME Centers, etc.)



Skills Survey Heat Map



Team Survey Results (4 point scale)

Items Done Well…

- **“OneDrive" site** **3.7**
- **Recognition** **3.5**
- **IE Leadership Team** **3.5**
- **“Pull system" for help** **3.5**

Room for Improvement…

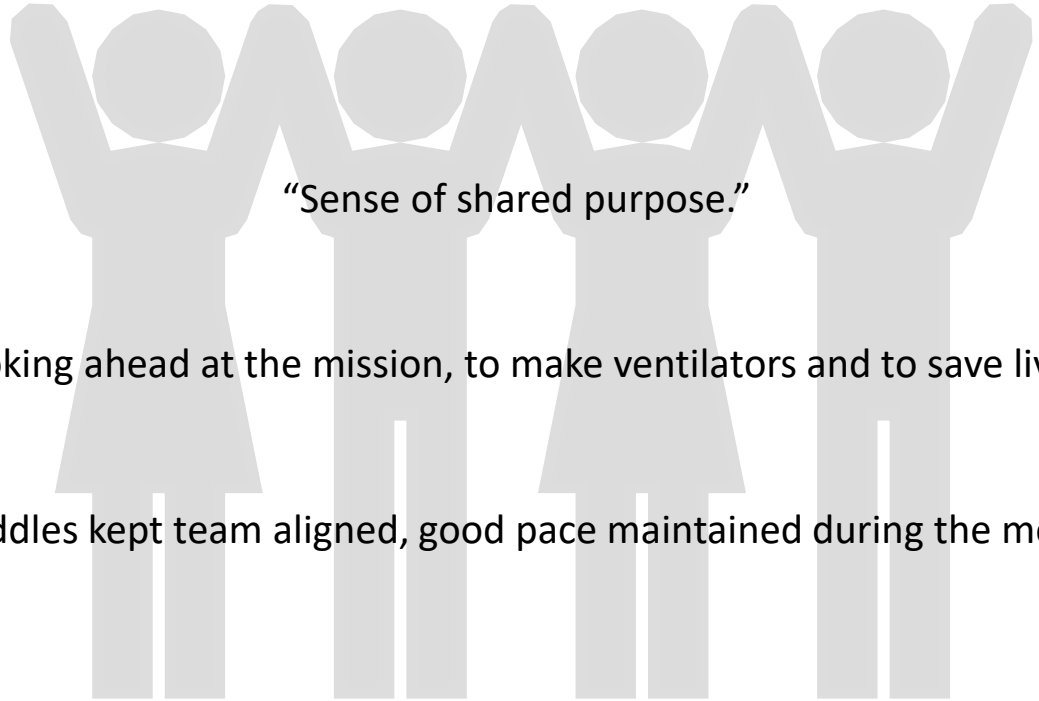
- Processing Scenarios **2.5**
- Test station requirements **2.6**
- Ventec Videos **2.9**
- WIN Documents **2.9**

Question:

What ONE SINGLE THING most enabled your individual success and our team's overall success on this project?

Answers:

"One Team mentality…and the willingness of everyone to help out, answer questions or just be a sounding board when needed."



"Sense of shared purpose."

"Looking ahead at the mission, to make ventilators and to save lives."

"Daily huddles kept team aligned, good pace maintained during the meetings…"

Teamwork

Communication

Information

Focus

Leadership

Urgency

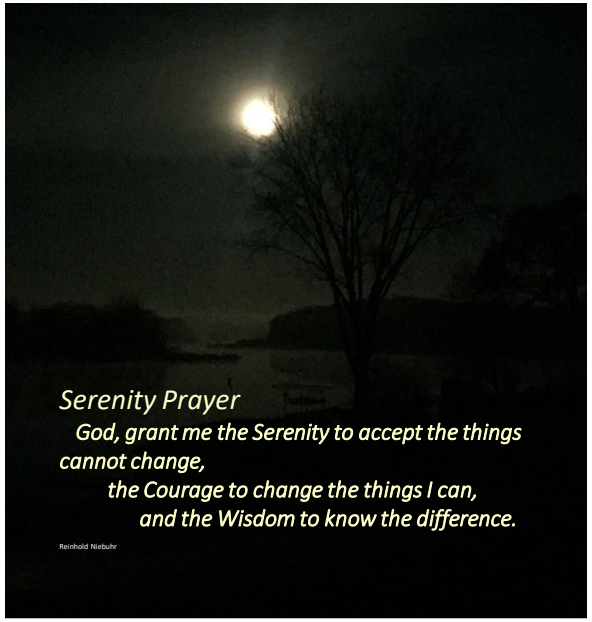
From an Instant Message exchange with my boss….

[4/4/2020 9:45 AM] Dan Grieshaber:

I know … the team has really, really showed their strength … not a surprise to us, but externally this team will always be looked at differently as a result!

IE is back on the map for General Motors!!

Stress Tips, and some Fun Reflections….



Project “V”

Fun Pandemic Outcomes

Q & A

Thank You!

OUR VISION

We see a world with

ZERO CRASHES

ZERO EMISSIONS

ZERO CONGESTION

and our people are the driving force behind making this a reality.

INSTITUTE OF INDUSTRIAL & SYSTEMS ENGINEERS

NOT TO MISS!!!
15 May 11-12 EDT

Registration URL
https://attendee.gotowebinar.com/register/2275662921110670860

SELLING OUT

Restarting the Economy: Guidance on the Backside of the Disruption

James A. Tompkins Ph.D.
Chairman, Tompkins International

tompkins

For Attending you'll receive a copy of Jim's recently published ***"Restarting the Economy: Guidance for Public and Private Leaders".***

Most importantly, you will get to hear Jim share his sound thinking and insights and guidance.

Jim is a Keynote Presenter for IISE's Annual Conference in New Orleans in early November.

Engineering Management Systems to Ensure Survival and Success

The Role of Data and Information (Engineered Management Systems) in Periods of Major Disruption

Driving Benefits Realization Faster with Operational Analytics

Ben Amaba,
Global Chief Technology Officer
Data Analytics and AI Elite Team,
Industrial Manufacturing
IBM

Jared Frederici,
North American Program Lead,
The Poirier Group

INSTITUTE OF INDUSTRIAL & SYSTEMS ENGINEERS

19 May
11-12 EDT

Registration URL
https://attendee.gotowebinar.com/register/7750037857013457675

Upcoming Webinars that Matter

STANDARD

Pioneering and Engineering a New World

TUE, JUN 2, 2020 11:00 AM - 12:00 PM EDT

PANELISTS
Jim Dobson

Registration URL
https://attendee.gotowebinar.com/register/7543160346538640907

Jim's focus is on how businesses and industry can plan through all the logistical challenges of the upcoming Series of Curves we will face. A perfect follow on to Jim Tompkins Webinar the 15th. Exactly what the early Pioneers faced, VUCA (Volatility, Uncertainty, Chaos and Ambiguity) around every bend!!

STANDARD

Resilience Reexamined: Reengineering How We do Business and Ensure Public Safety

TUE, JUN 9, 2020 11:00 AM - 12:00 PM EDT

PANELISTS
Vinny Monteiro

Registration URL
https://attendee.gotowebinar.com/register/8455049111256904975

Vinny is going to share insights to the strategies and methods that the State of Utah (and others) are taking to migrate successfully through the Stages of Recovery while keeping Employee and Public Safety and Health as a MUST DO Objective.

STANDARD

Service Systems Engineering Outstanding Innovations (IBM, Beijing Tongren Hospital, Chick-fil-A, and Mayo Clinic)

TUE, JUL 7, 2020 11:00 AM - 12:00 PM EDT

PANELISTS
Vittal Prabhu / Aly Megahed / Kathryn Zavaleta / David Reid / Xiaolei Xie

Registration URL
https://attendee.gotowebinar.com/register/8367755584608147723

Professor Prabhu from Penn State will moderate for :10 minute, TedTalk style executive summaries from the four Finalists for IISE's Prestigious Outstanding Service Systems Engineering Award. (Chick-fil-A, IBM Research in AI, Beijing Tongren Hospital, and Mayo Clinic)

IISE's Annual Conference

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Thank You!

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