

Establishing an Energy Management Culture in Paint

Alexis Kaminski

HMIN Paint & Plastics Environmental Engineer

Partners for Pollution Prevention

6/20/2018



BLUE SKIES FOR
OUR CHILDREN

Agenda

- Optimizing Equipment Start-Up Times
- Off-Shift Energy Communication
- Visual Management
- Compressed Air Reduction
- Lighting Reduction Projects
- Struggles, Progress, and Path Forward
- Q&A

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Optimizing Oven Start-Up Times

Initial goal: optimize start-up times to reduce idle time

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PAPO Equipment Service Weekly Start-up/Shutdown Confirmation

Equipment Name	Area Affected	Monday Start-up Completion Time	Tues-Fri Start-up Completion Time
Bumper Oven	Bumper Line	3:45 AM	4:40 AM
Topcoat Oven	TC Line	4:15 AM	5:00 AM
Surfacer Oven	Surf. Line	4:20 AM	5:25 AM
E-Coat Oven	PT/ED Line	5:35 AM	5:45 AM
Repair Oven	Main Line Repair	5:20 AM	5:35 AM
Sealer Oven	Sealer	5:30 AM	5:40 AM

Check sheet specifies start-up times for Mon and Tue-Fri

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Sealer Oven	Sealer	5:30 AM	5:40 AM

Strategy:

1. Gather start-up data on each oven
2. Determine Monday heat-up time
3. Determine Tue-Fri heat-up time
4. Calculate idle time before production
5. Adjust start-up times to reduce idle time
6. Verify oven ready in time for production

Optimizing Oven Start-Up Times

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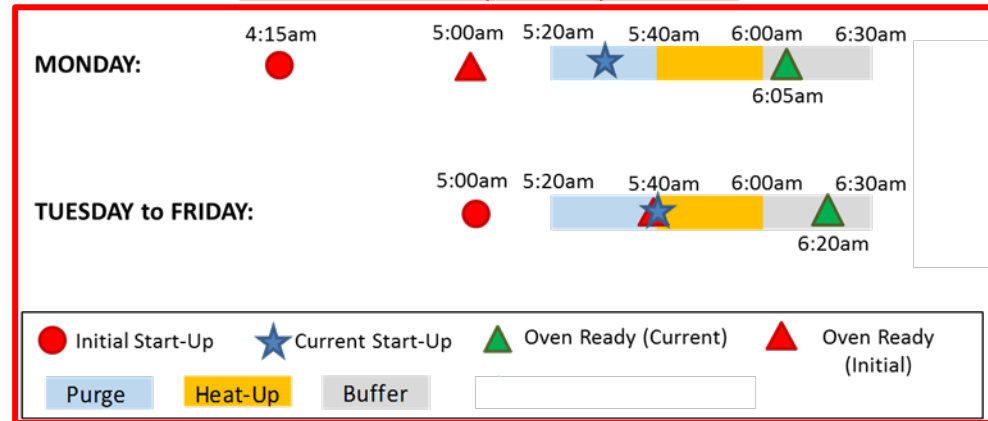
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Sealer Oven Start-up Time Optimization



Optimizing Oven Start-Up Times

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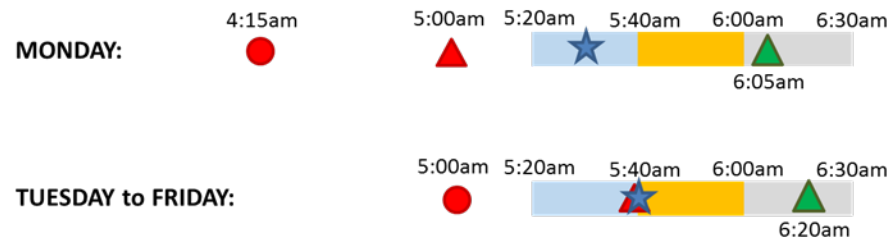
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Sealer Oven Start-up Time Optimization



Setback: perception that start-up takes longer when it is cold outside

- New goal: disprove temperature correlation; create easy-to-use permanent reference

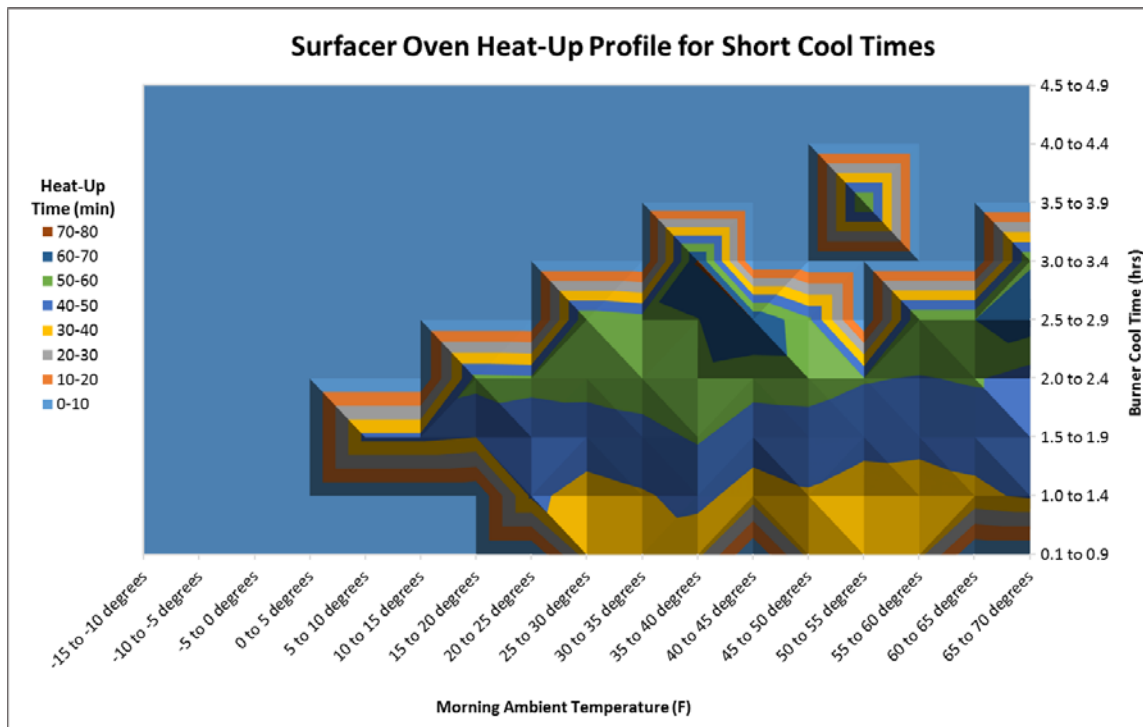
Optimizing Oven Start-Up Times

New goal: disprove temperature correlation and create easy-to-use permanent reference

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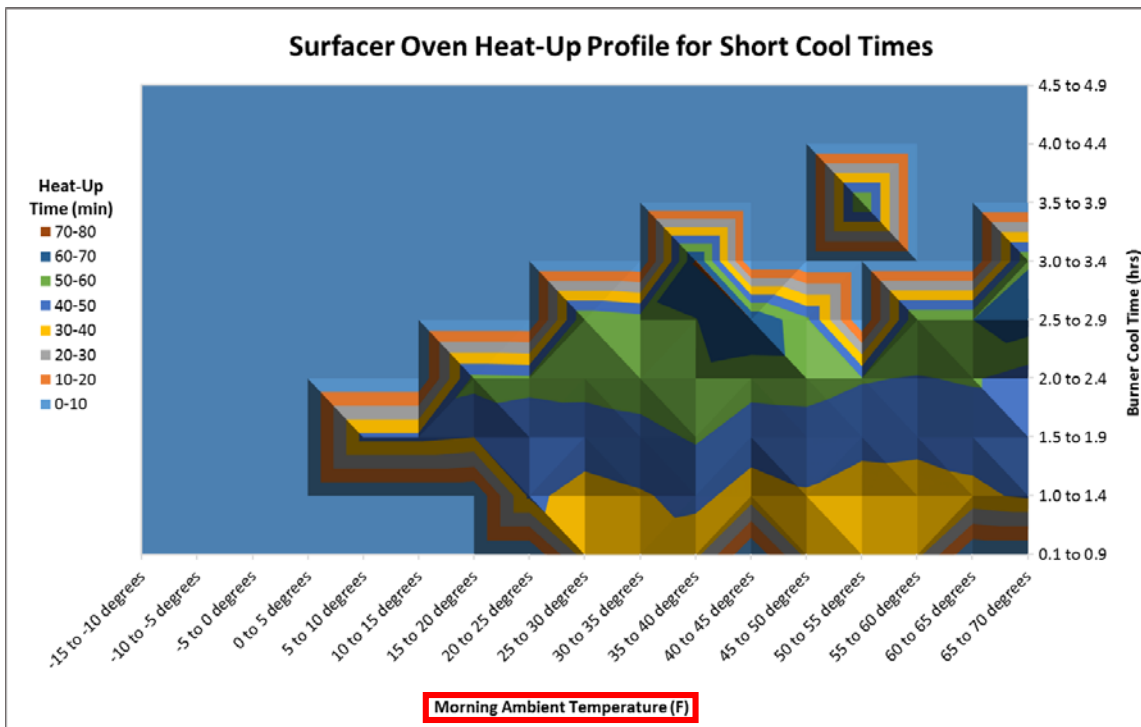
- Gathered start-up data for one year



Optimizing Oven Start-Up Times

New goal: disprove temperature correlation and create easy-to-use permanent reference

- Gathered start-up data for one year
- **Disproved ambient temperature effect on heat-up time**

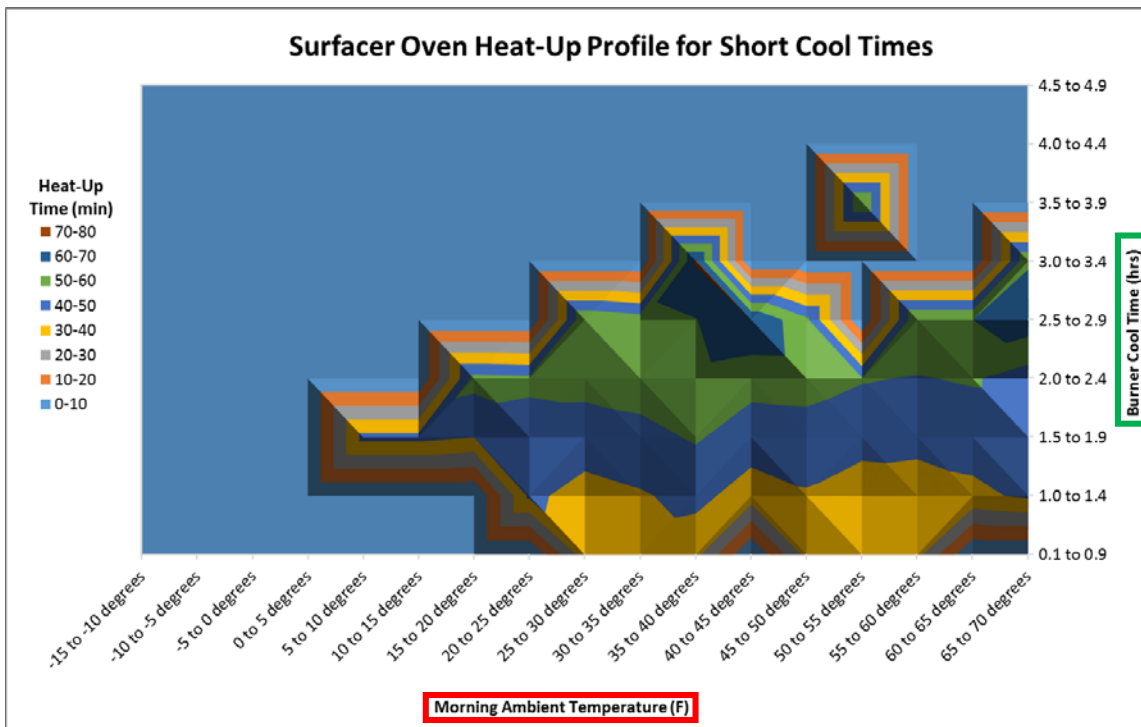


Heat-up time does not vary with ambient temperature

Optimizing Oven Start-Up Times

New goal: disprove temperature correlation and create easy-to-use permanent reference

- Gathered start-up data for one year
- **Disproved ambient temperature effect on heat-up time**



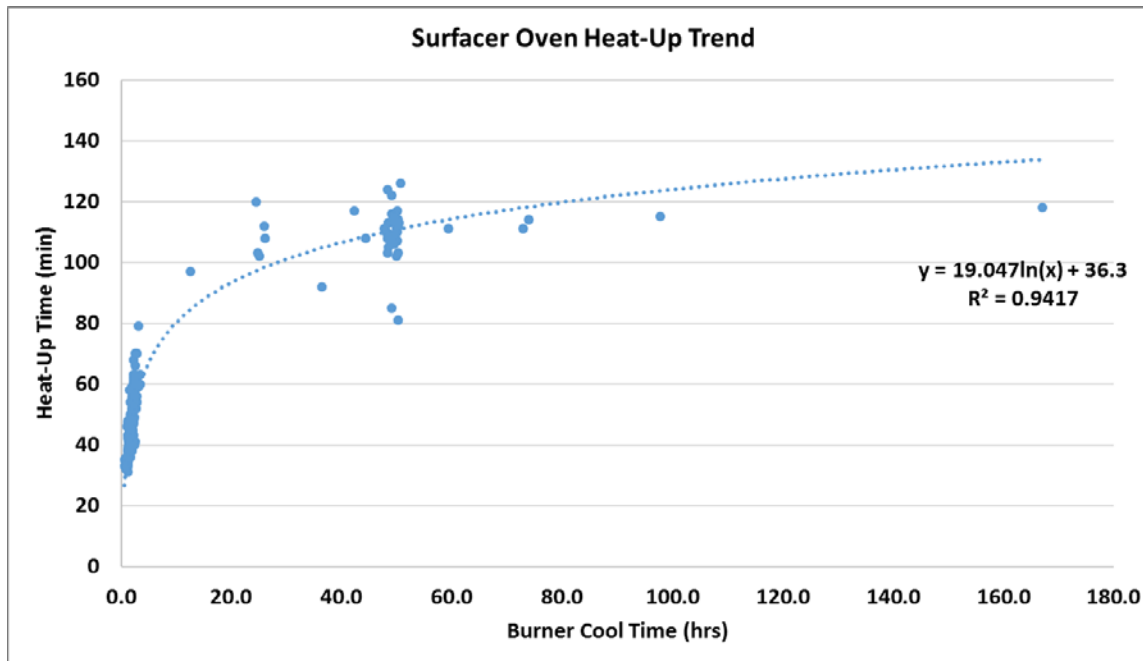
Heat-up time does vary with burner cool time (a.k.a. duration of time oven is off overnight)

Heat-up time does not vary with ambient temperature

Optimizing Oven Start-Up Times

New goal: disprove temperature correlation and create easy-to-use permanent reference

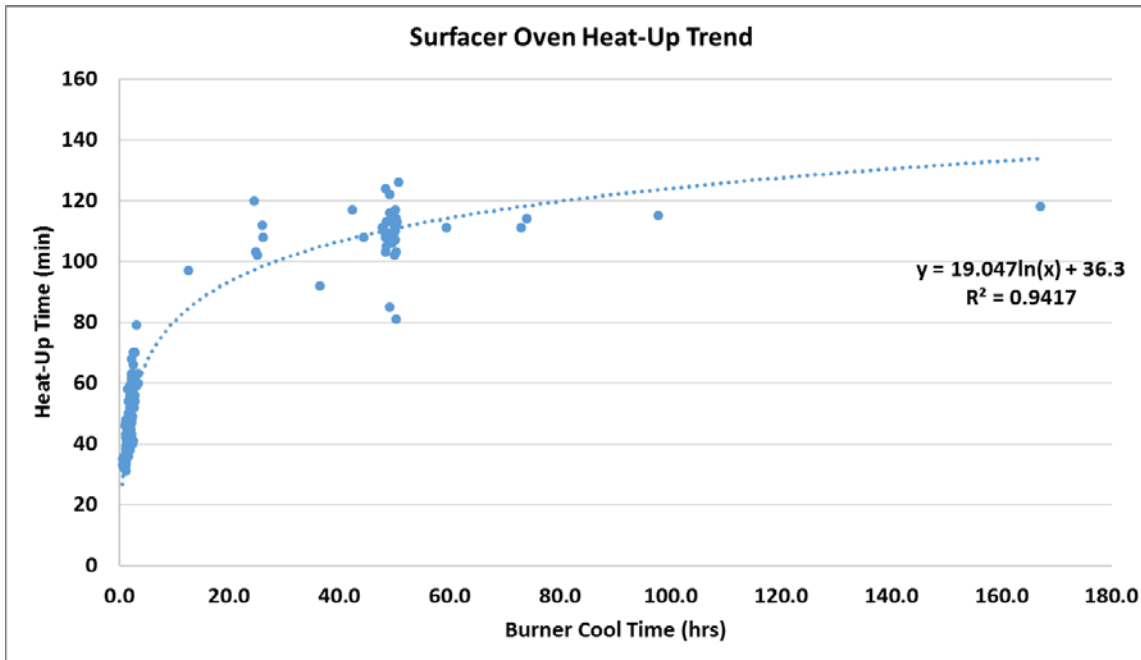
- Gathered start-up data for one year
- Disproved ambient temperature effect on heat-up time
- **Correlated heat-up time with overnight cooling time**



Optimizing Oven Start-Up Times

New goal: disprove temperature correlation and create easy-to-use permanent reference

- Gathered start-up data for one year
- Disproved ambient temperature effect on heat-up time
- Correlated heat-up time with overnight cooling time
- **Created start-up time tables using correlation equation**



Surfacer Oven

Start-Up Time Estimator

(between production days)

To be ready at: 6:15 AM

Estimate Start-Up Time

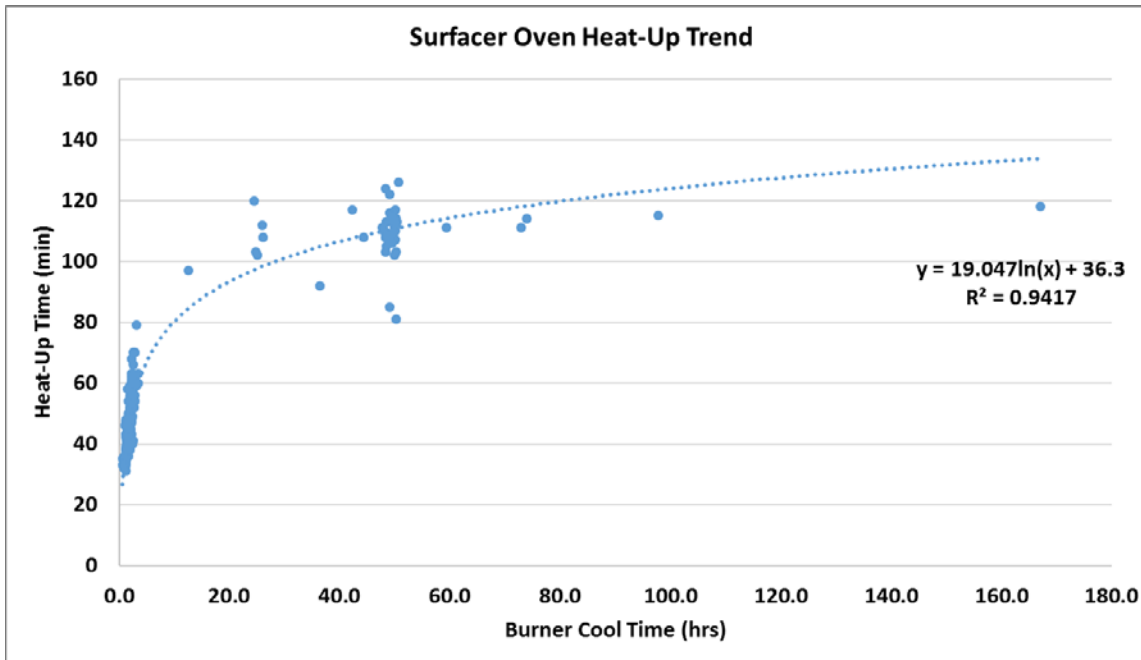
includes 6% margin of error
and 27 min purge

Shutdown Time	Start-Up Time
1:00 AM	4:55 AM
1:10 AM	4:57 AM
1:20 AM	4:58 AM
1:30 AM	4:59 AM
1:40 AM	5:00 AM
1:50 AM	4:59 AM
2:00 AM	5:02 AM
2:10 AM	5:02 AM
2:20 AM	5:02 AM
2:30 AM	5:03 AM
2:40 AM	5:06 AM
2:50 AM	5:05 AM
3:00 AM	5:06 AM
3:10 AM	5:08 AM
3:20 AM	5:09 AM
3:30 AM	5:10 AM
3:40 AM	5:12 AM
3:50 AM	5:14 AM
4:00 AM	5:15 AM

Optimizing Oven Start-Up Times

New goal: disprove temperature correlation and create easy-to-use permanent reference

- Gathered start-up data for one year
- Disproved ambient temperature effect on heat-up time
- Correlated heat-up time with overnight cooling time
- **Created start-up time tables using correlation equation**



Month Savings = 1293 min (21.55 hrs) = \$7,000 per year

no investment or expense needed for savings!

Surfacer Oven

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(between production days)

To be ready at: 6:15 AM

Estimate Start-Up Time

includes 6% margin of error
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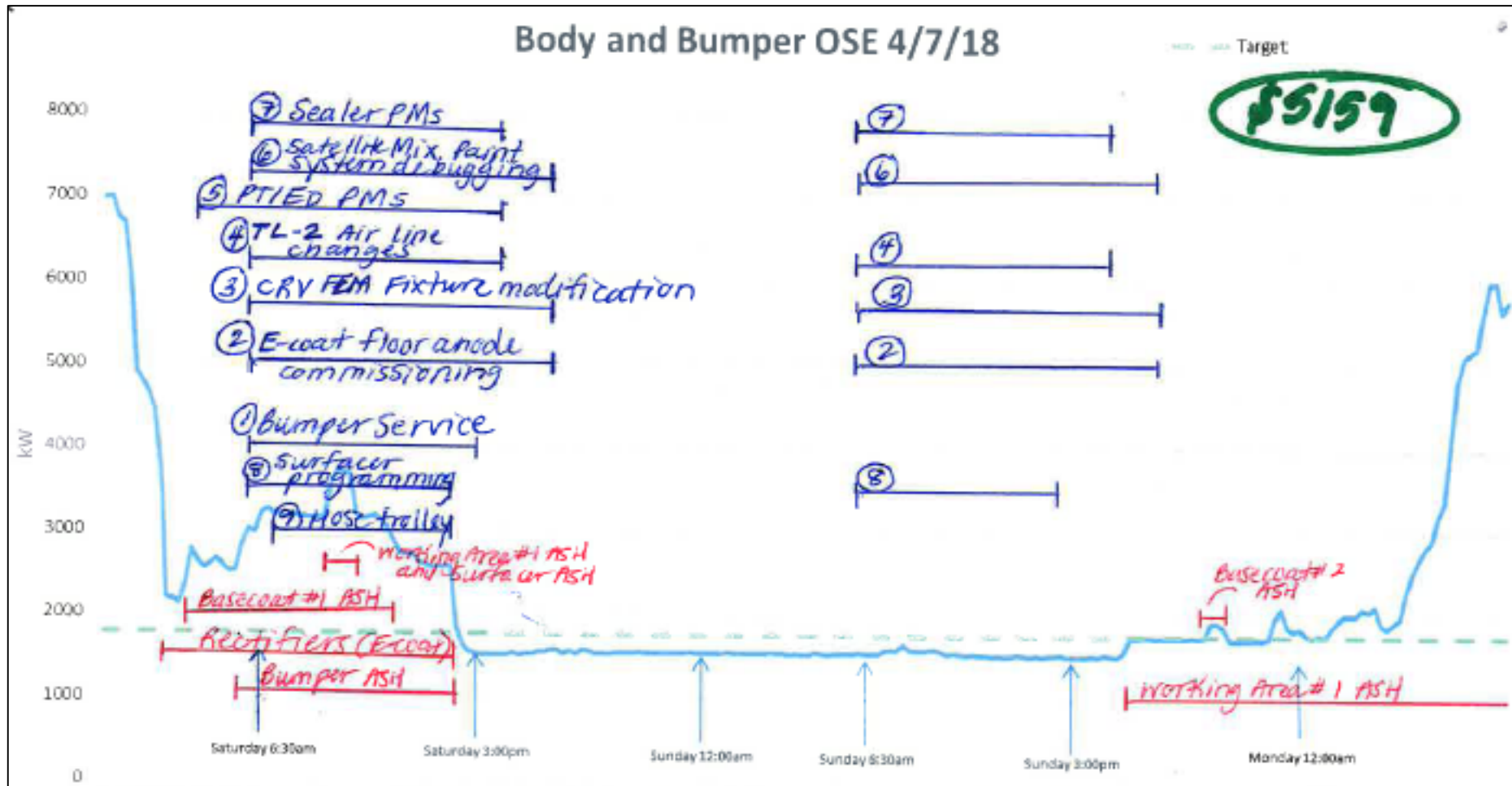
Shutdown Time	Start-Up Time
1:00 AM	4:55 AM
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1:40 AM	5:00 AM
1:50 AM	4:59 AM
2:00 AM	5:02 AM
2:10 AM	5:02 AM
2:20 AM	5:02 AM
2:30 AM	5:03 AM
2:40 AM	5:06 AM
2:50 AM	5:05 AM
3:00 AM	5:06 AM
3:10 AM	5:08 AM
3:20 AM	5:09 AM
3:30 AM	5:10 AM
3:40 AM	5:12 AM
3:50 AM	5:14 AM
4:00 AM	5:15 AM

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- **Off-Shift Energy Communication**
- Visual Management
- Compressed Air Reduction
- Lighting Reduction Projects
- Struggles, Progress, and Path Forward
- Q&A

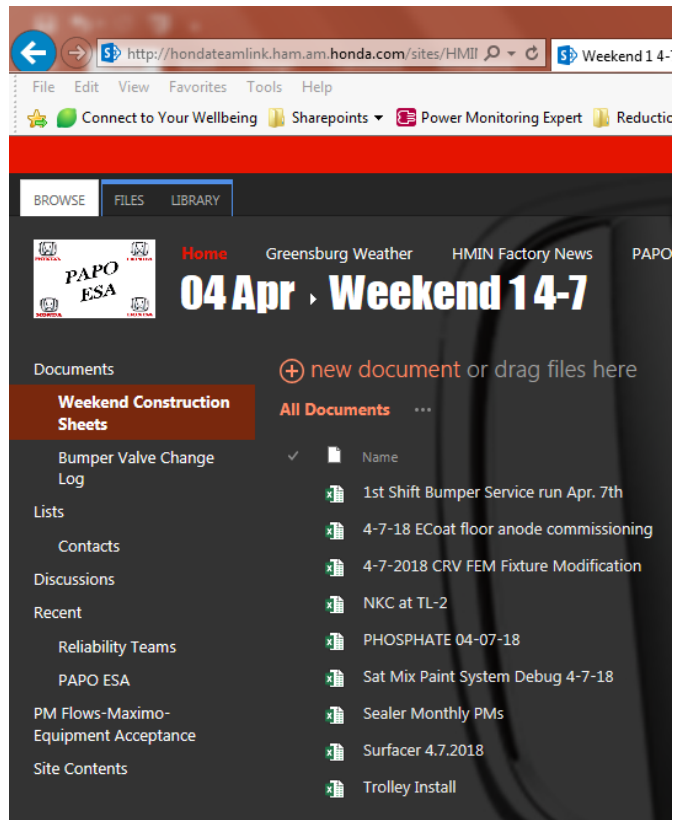
Off-Shift Energy Communication

Off-shift electricity usage is tracked weekly and is overlaid with weekend work activities



Off-Shift Energy Communication

Weekend work activities are pulled from the web



Off-Shift Energy Communication

Weekend work activities are pulled from the web

The screenshot shows a SharePoint web interface. The top navigation bar includes 'BROWSE', 'FILES', and 'LIBRARY'. The main content area displays a list of documents under the heading 'Weekend Construction Sheets'. A red arrow points to a document titled '4-7-18 ECoat floor anode commissioning' in the 'Documents' list.

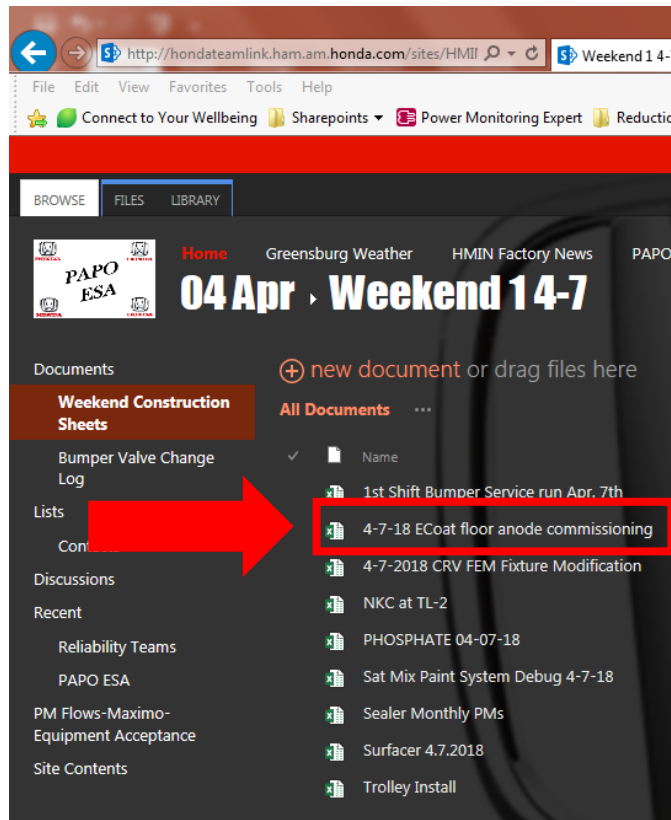
PAPO Department Project & Weekend Work Request Form

Work Area		Phosphate / Ecoat	
Project Description			
Floor anode commissioning			
Originator Contact:			
Name:	Austin Strong	Phone:	Radio:
Project Lead (if different than Originator) Contact:			
Name:		Phone:	Radio:
Associates Performing Tasks			
Associate Name	Assoc. #	Zone	Date (XX/XX/XX): 4/7/2018
Austin Strong	37525	Indirect	
Aaron Joseph			
Attach additional manpower on back			
Does job/project require special skills and or experience other than safety related requirements? (If yes, please explain)			
NO			
Job/Project Details			
Activity & Detailed Description of Work Performed	Date (XX/XX/XX): 4/7/2018	Date (XX/XX/XX): 4/8/2018	
Rectifier LOTO			
Wire tie-in and Program update			
Test and debug			
Attach additional activities on back			

Work request forms detail hours, work area, associates involved

Off-Shift Energy Communication

Weekend work activities are pulled from the web



PAPO Department Project & Weekend Work Request Form

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Associates Performing Tasks																										
Associate Name	Assoc. #	Zone	Date (XX/XX/XX): 4/7/2018												Date (XX/XX/XX): 4/8/2018											
			0	2	4	6	8	10	12	14	16	18	20	22	0	2	4	6	8	10	12	14	16	18	20	22
Austin Strong	37525	Indirect																								
Aaron Joseph																										

Body and Bumper OSE 4/7/18

Target

\$5159

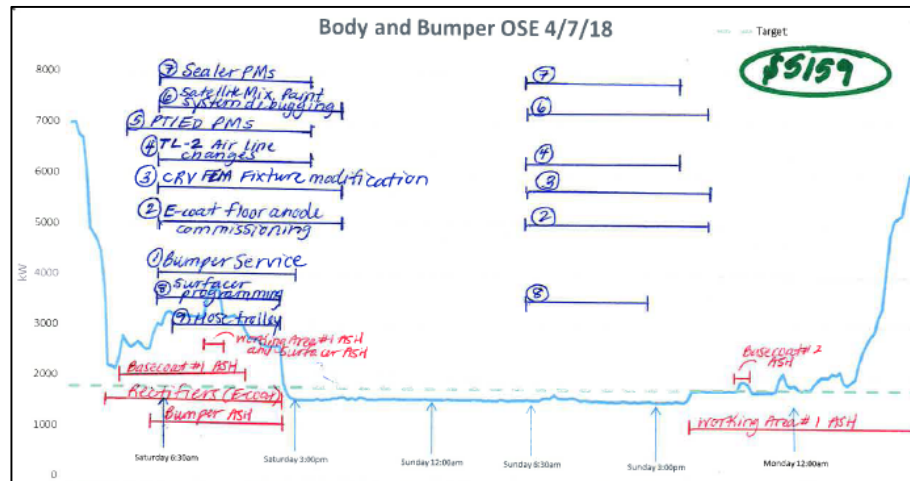
② Sealer PMS
 ② Safe Mix Paint
 ② Primer PMS
 ④ TL-2 Air Line changes
 ③ CRY FEM Fixture modification
 ② Ecoat floor anode commissioning
 ① Bumper Service
 ③ Surfacer programming
 ① Host trailer
 Working Area #1 ASH and Bumper or ASH
 Bumper ASH
 Rectifilers (Ecoat)
 Bumper ASH
 Working Area #2 ASH
 Working Area #1 ASH

⑦
⑥
④
③
②
③
②

Saturday 8:30am Saturday 3:00pm Sunday 12:00am Sunday 6:30am Sunday 3:00pm Monday 12:00am

Work request forms detail hours, work area, associates involved

Off-Shift Energy Communication



WEEKEND OFF-SHIFT ENERGY SNAPSHOT

Month: APR

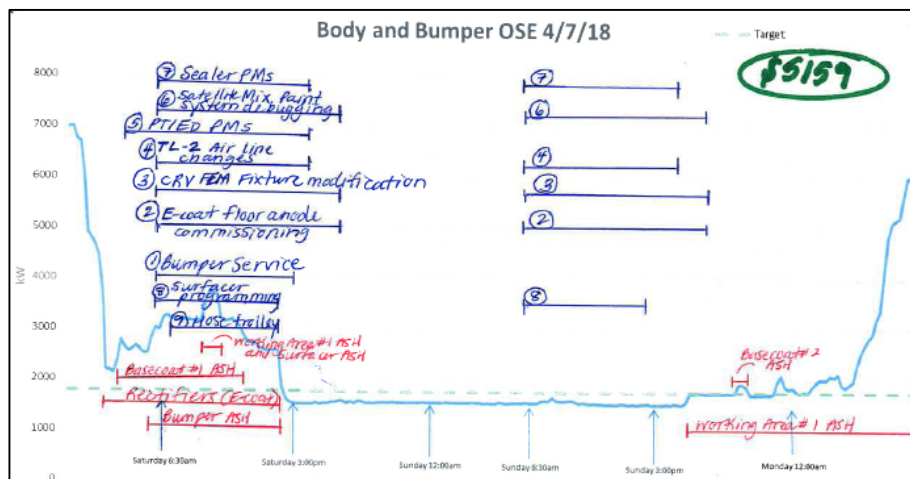
Year: 2018

PA/BPA Off-shift hours: 3AM Sat to 12AM Mon

PO Off-shift hours: 12AM Sat to 10PM Sun

Date	Electricity Usage (kWh)					Total Cost	Judge	Comments
	PA/BPA	PO	Total	Target	Gap			
4/1	29,795	1,814	31,609	44,555	-29%	\$ 1,896.52	●	
4/7-4/8	86,603	5,374	91,976	83,541	10%	\$ 5,518.58	✗	<ul style="list-style-type: none"> Bumper service (1st shift) E-Coat Rectifiers running for Anode Installation Basecoat #1 ASH running on Saturday for ES PMs
4/14-4/15	72,848	5,615	78,463	83,541	-6%	\$ 4,707.77	●	

Off-Shift Energy Communication



WEEKEND OFF-SHIFT ENERGY SNAPSHOT

Month: APR

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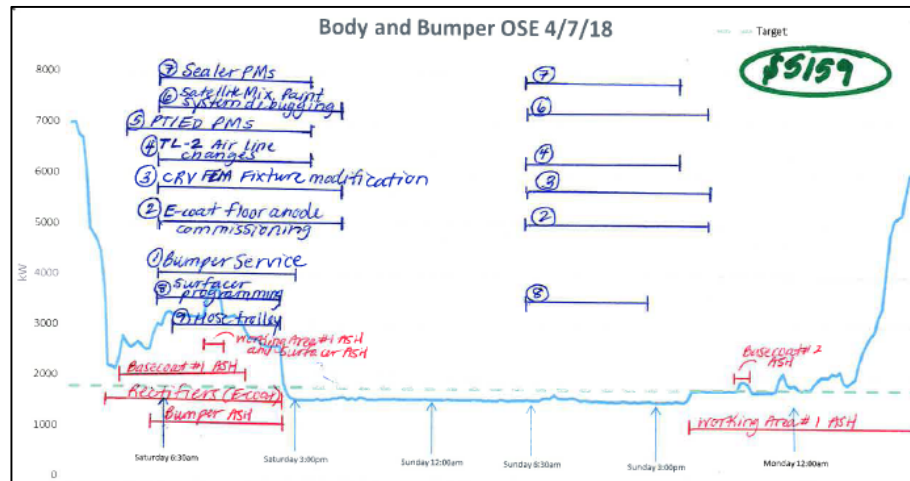
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If over target, contributing activities are called out

Off-Shift Energy Communication



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Month: APR

Year: 2018


PA/BPA Off-shift hours: 3AM Sat to 12AM Mon















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If over target, contributing activities are called out

Off-Shift Energy Communication

 Mon 3/19/2018 10:10 AM
 Alexis Kaminski
 RE: Off-Shift Energy Analysis 3/3-3/4

To  John McCullum;  Robert Allen;  Dean Parish Jr
 Cc  Taylor Mowery;  Jeff Loeffler;  Jonathan Nelson;  Roxanna Metz;  David Benham;  Steve Oster;  Mike Pease;
 Dave Honnert;  Adam Hullemeier;  Dean Parish Jr;  Brad Ashley

Retention Policy 5 Year Delete (Never) Expires Never
 You replied to this message on 3/26/2018 10:10 AM.

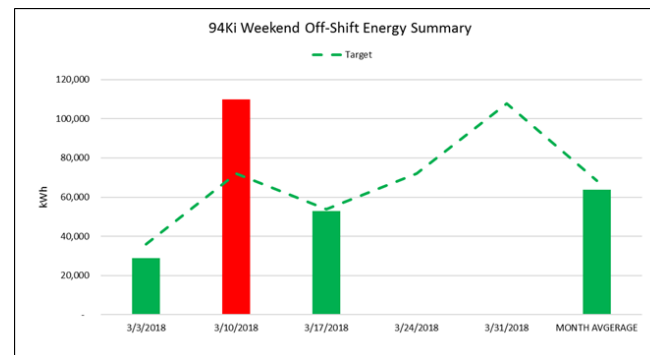
 OSE 3-17-18.pdf
 131 KB

Hello everyone...attached is the off-shift energy analysis for this past weekend.

OSE was in the **green** this past weekend with PAPO **2% under target**. Please note that the production shift on Saturday was omitted from the off-shift energy total for the weekend. The only question I have is why the bumper booth was running on Sunday – there were no activities scheduled for bumper, maybe there was cleaning or maintenance activity? Any feedback as to why the bumper booth was running on Sunday would be much appreciated. Otherwise, good weekend for off-shift energy!

As always, thank you very much for your support! 😊

OFF-SHIFT ENERGY WEEKEND SNAPSHOT								
Month: MAR		Year: 2018		Off-shift hours: 3AM Sat to 12AM Mon				
Date	Electricity Usage (kWh)					Total Cost	Judge	Comments
	PA/BPA	PO	Total	Target	Gap			
3/3/2018	27,400	1,439	28,839	35,951	-20%	\$ 1,730.34	●	+Awesome weekend for off-shift energy! +Production Saturday omitted
3/10/2018	99,952	9,959	109,910	71,902	53%	\$ 6,594.63	✖	+ Bumper service (2nd shift) + Repair and Working Area #1 ASH on all weekend + Clearcoat #2 ASH on from Sunday morning to Mon
3/17/2018	48,283	4,633	52,916	53,927	-2%	\$ 3,174.94	●	+ Right on target! + 1st Shift Saturday production omitted
3/24/2018				71,902				
3/31/2018				107,854				
MONTH AVERAGE	58,545	5,344	63,888	68,307	-6%	\$ 3,833.30		



Example of e-mail communication with PL's and management – kW graphs are attached as well

Off-Shift Energy Communication

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 RE: Off-Shift Energy Analysis 3/3-3/4

To John Mccullum; Robert Allen; Dean Parish Jr

Cc Taylor Mowery; Jeff Loeffler; Jonathan Nelson; Roxanna Metz; David Benham; Steve Oster; Mike Pease; Dave Honnert; Adam Hullemeier; Dean Parish Jr; Brad Ashley

Retention Policy 5 Year Delete (Never) Expires Never

You replied to this message on 3/26/2018 10:10 AM.

PDF OSE 3-17-18.pdf
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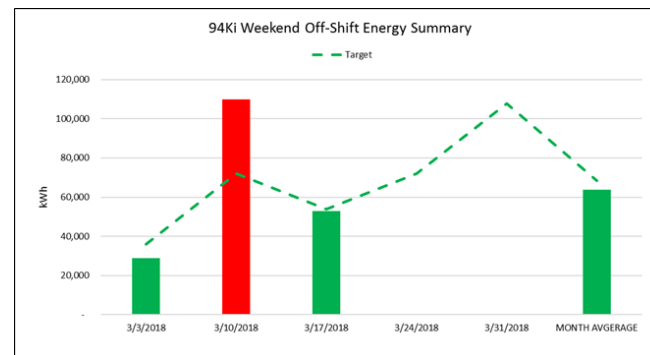
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3/24/2018				71,902				
3/31/2018				107,854				
MONTH AVG/RAGE	58,545	5,344	63,888	68,307	-6%	\$ 3,833.30		



Example of feedback – big help for PDCA

Mon 3/19/2018 3:55 PM
 Mike Pease
 RE: Off-Shift Energy Analysis 3/3-3/4

To Alexis Kaminski; John Mccullum; Robert Allen; Dean Parish Jr

Cc Taylor Mowery; Jeff Loeffler; Jonathan Nelson; Roxanna Metz; David Benham; Steve Oster; Dave Honnert; Adam Hullemeier; Dean Parish Jr; Brad Ashley

Retention Policy 5 Year Delete (Never) Expires Never

You replied to this message on 3/20/2018 7:28 AM.

So in bumper we had Standard Automation in here greasing robots. I had the air on for them. Thanks

They will be in here this weekend again Sunday

Agenda

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- Off-Shift Energy Communication
- **Visual Management**
- Compressed Air Reduction
- Lighting Reduction Projects
- Struggles, Progress, and Path Forward
- Q&A

Visual Management Board



Visual Management Board



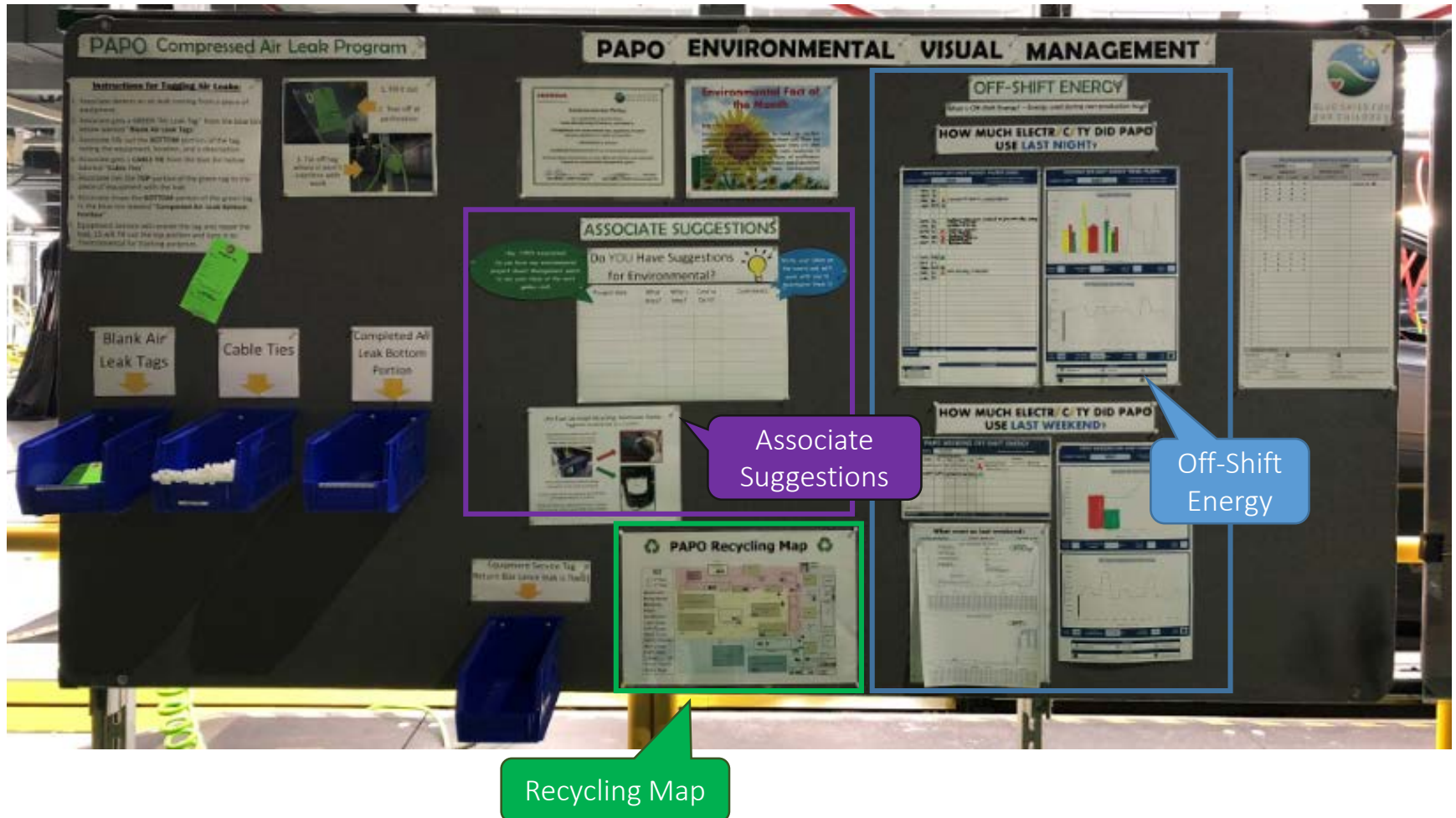
Visual Management Board



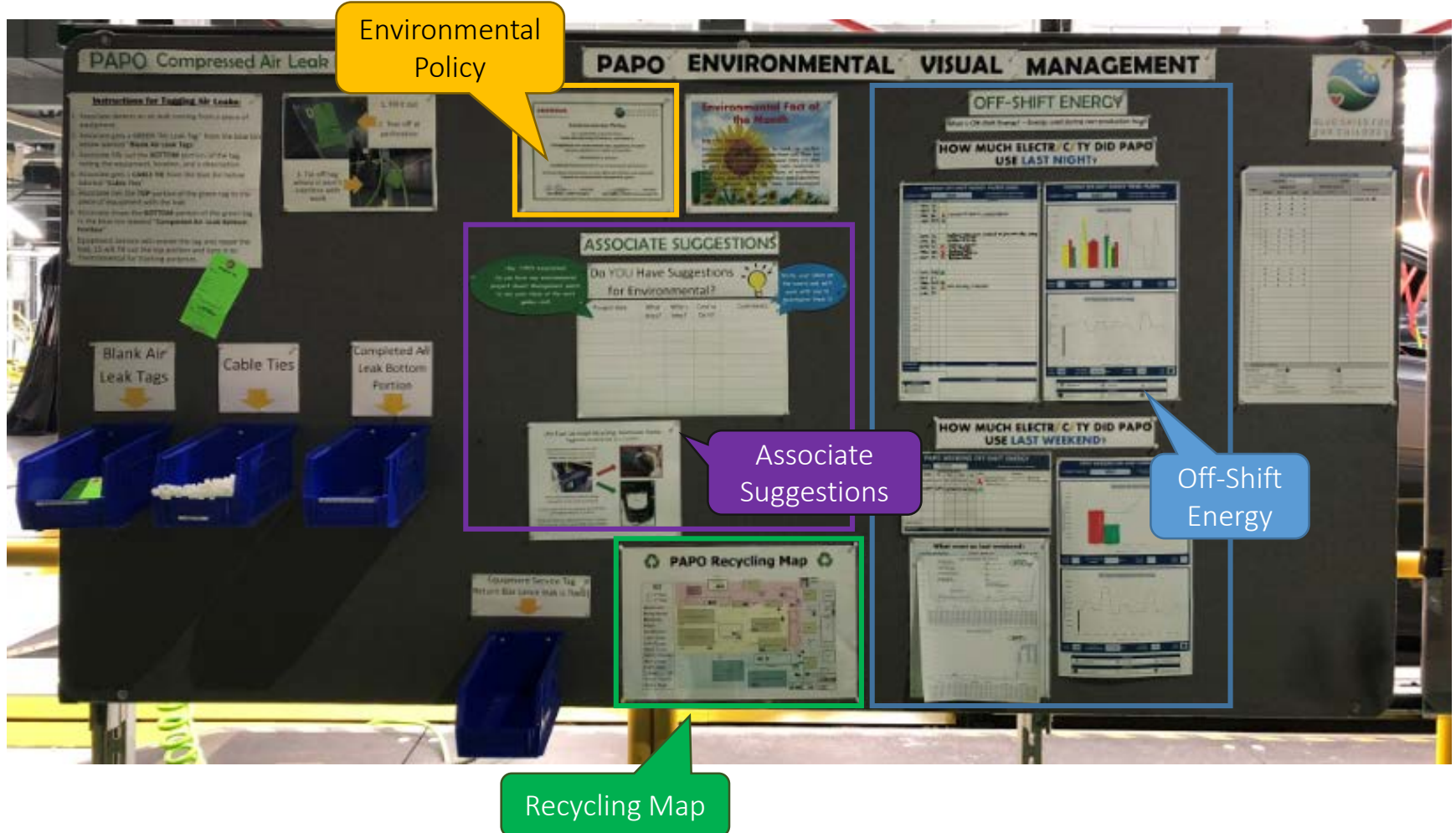
Recycling Map

Off-Shift Energy

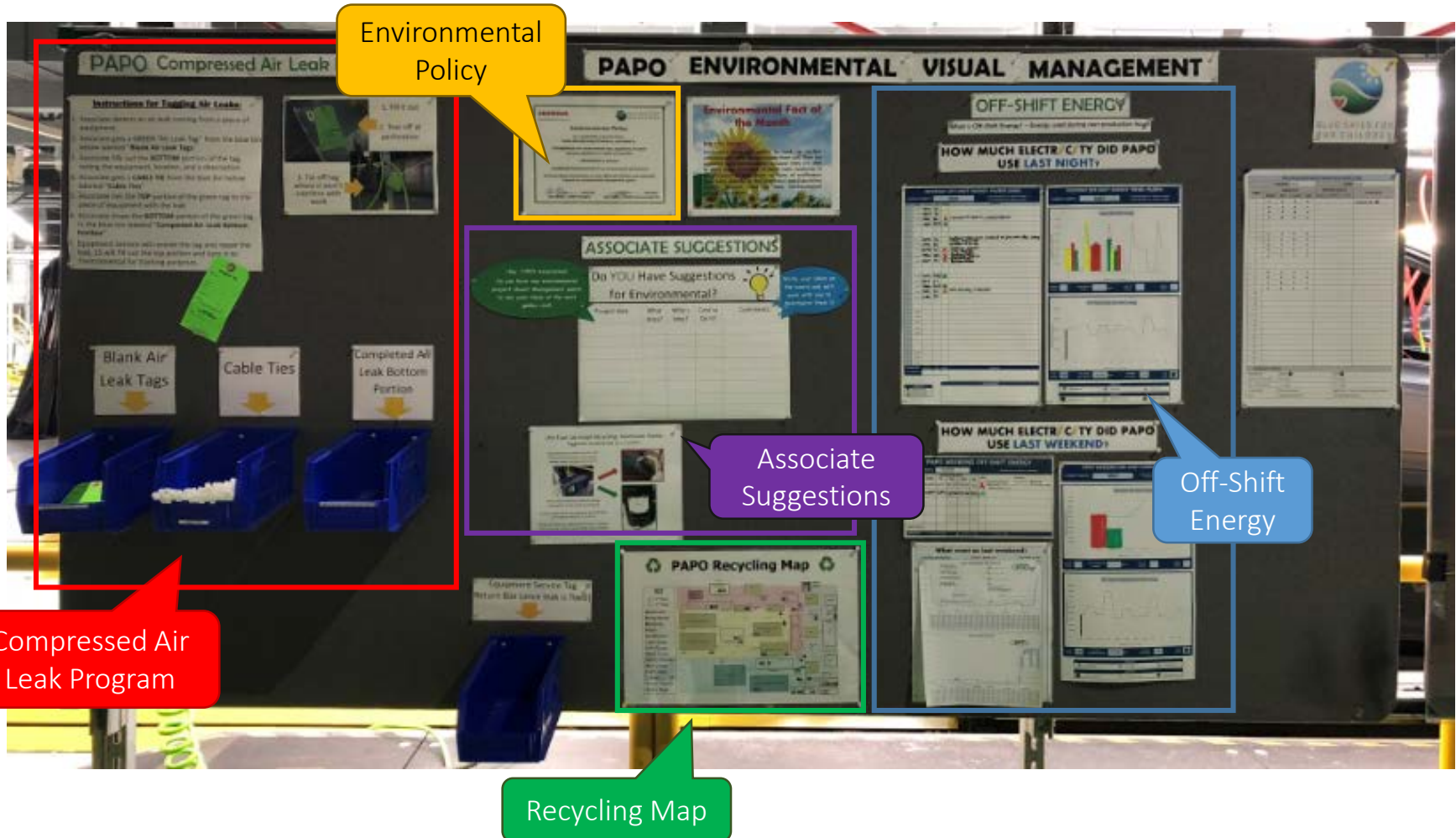
Visual Management Board



Visual Management Board



Visual Management Board



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Compressed Air Leak Tagging Contest



0001 AIR LEAK TAG

Equip ID: _____

Leak Location: _____

Requestor: _____

Shift # _____ Date: _____

Remarks: _____

Repaired By: _____ Date: _____

Repair OK by: _____

Hang this tag on or near leak. Write additional information on the back of the tag if necessary.

0001 AIR LEAK REPAIR REQUEST

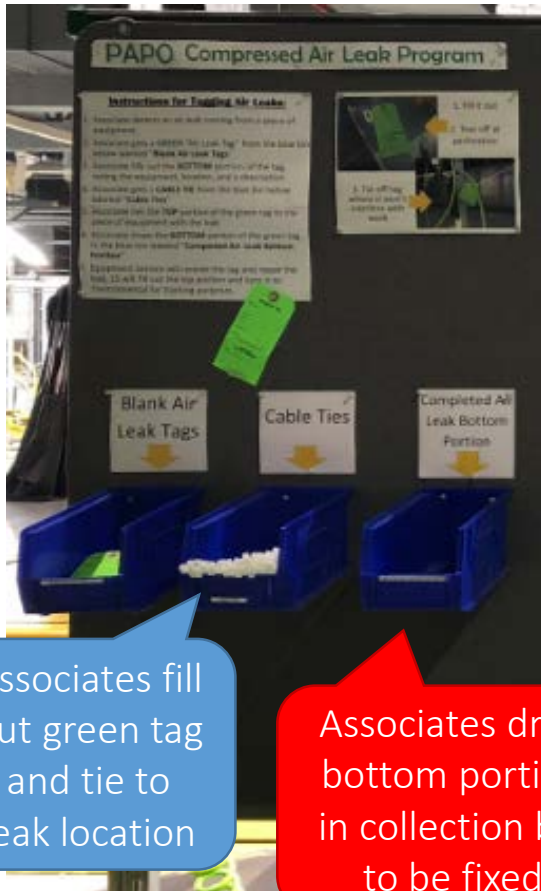
Equip ID: _____

Leak Description and Location: _____

Requestor: _____ Date: _____

Turn in this section into maintenance. Write additional leak description info on the back.

Compressed Air Leak Tagging Contest



Associates fill out green tag and tie to leak location

Associates drop bottom portion in collection bin to be fixed

0001 AIR LEAK TAG

Equip ID: _____

Leak Location: _____

Requestor: _____

Shift # _____ Date: _____

Remarks: _____

Repaired By: _____

Date: _____

Repair OK by: _____

Hang this tag on or near leak. Write additional information on the back of the tag if necessary.

0001 AIR LEAK REPAIR REQUEST

Equip ID: _____

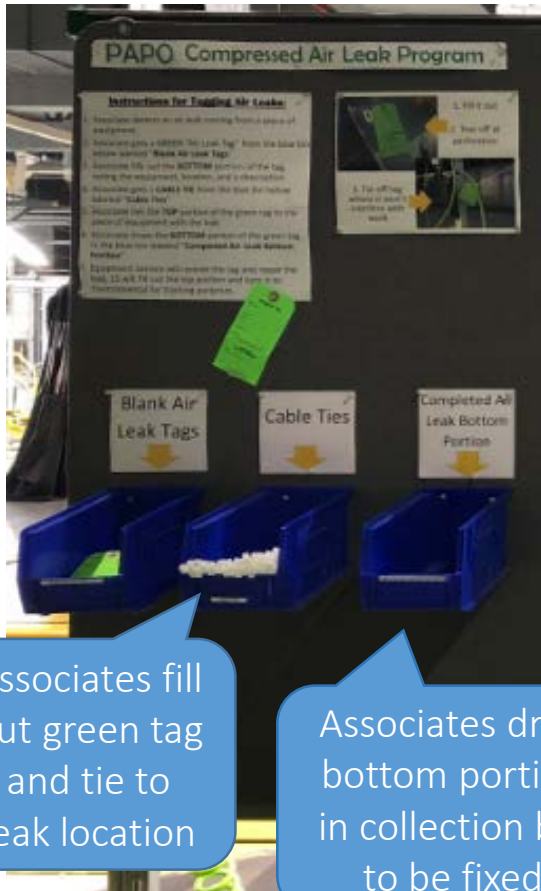
Leak Description and Location: _____

Requestor: _____

Date: _____

Turn in this section into maintenance. Write additional leak description info on the back.

Compressed Air Leak Tagging Contest



Associates fill out green tag and tie to leak location

Associates drop bottom portion in collection bin to be fixed

Date: June 4, 2018
To: Paint/Plastics Associates
From: Paint/Plastics Department Managers
Re: Compressed Air Leak Program

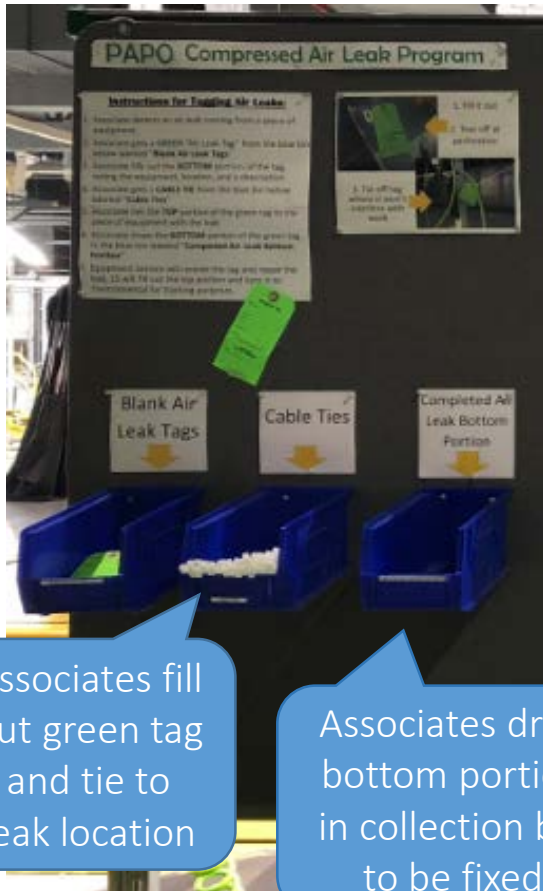
Contest is underway!

Please Read:

PAPO will have a competition for the Compressed Air Leak program beginning today, Monday June 4 through Friday June 29. During this time, any associate who turns in a green compressed air leak tag will be automatically entered into a drawing for a cafeteria incentive. Please see below for additional details and rules of the contest.

Associates that turn in air leak tags will be entered to win a cafeteria incentive

Compressed Air Leak Tagging Contest



Date: June 4, 2018
To: Paint/Plastics Associates
From: Paint/Plastics Department Managers
Re: Compressed Air Leak Program

Contest is underway!

Please Read:

PAPO will have a competition for the Compressed Air Leak program beginning today, Monday June 4 through Friday June 29. During this time, any associate who turns in a green compressed air leak tag will be automatically entered into a drawing for a cafeteria incentive. Please see below for additional details and rules of the contest.

Associates that turn in air leak tags will be entered to win a cafeteria incentive

2014



Contests in prior years helped to:

- Increase awareness of program
- Boost associate participation
- Increase # air leaks found and fixed

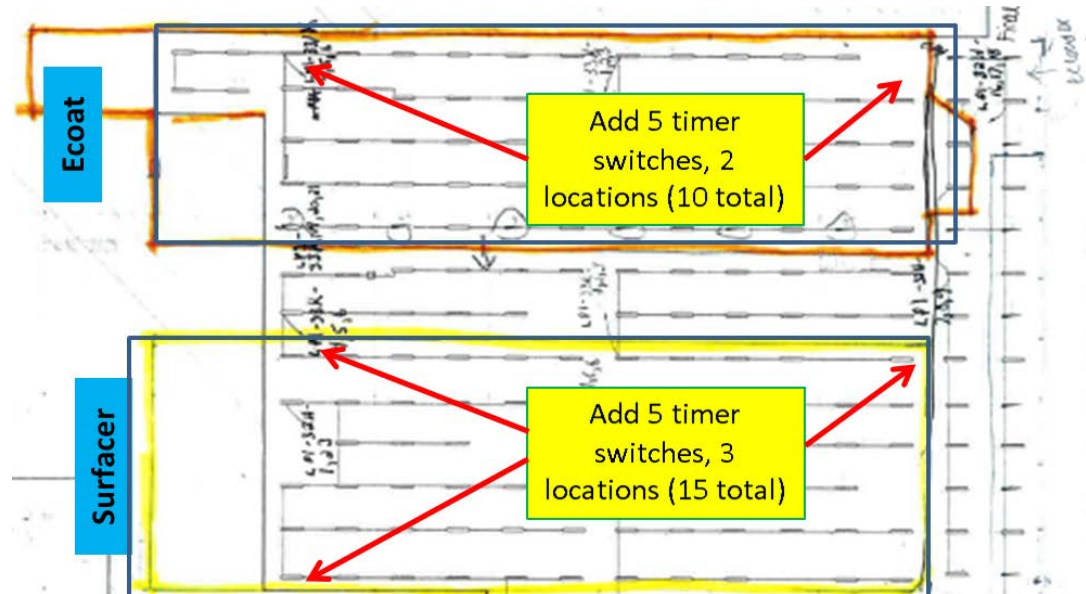
Agenda

- Optimizing Equipment Start-Up Times
- Off-Shift Energy Communication
- Visual Management
- Compressed Air Reduction
- **Lighting Reduction Projects**
- Struggles, Progress, and Path Forward
- Q&A

Lighting Reduction Projects

1st Iteration (2014) Timers for lighting in E-coat and Surfacers storage areas

- Lights always on while associates rarely enter those areas
- Timers ensure the lights go off even if associates forget to flip the switch

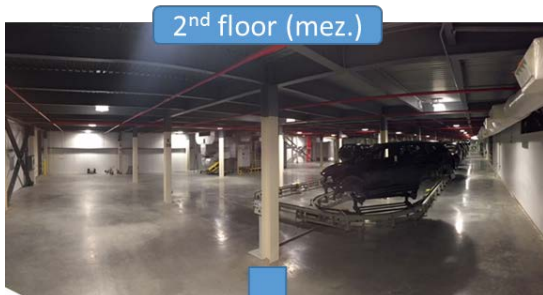
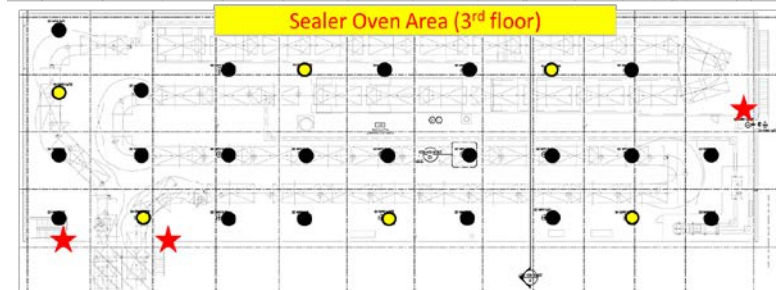
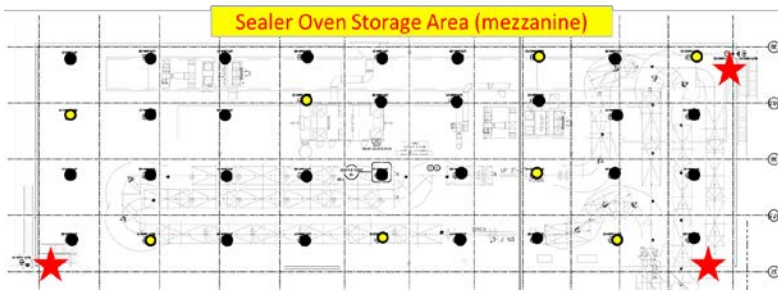


Lighting Reduction Projects

2nd Iteration (2017) Timers for high bay lights in Sealer Oven storage areas

Estimated savings:

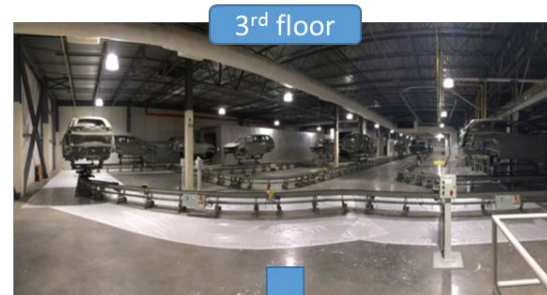
Annual Cost Savings	\$ 3,127.01
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63 lights on
no timers

vs.

14 lights on
timers

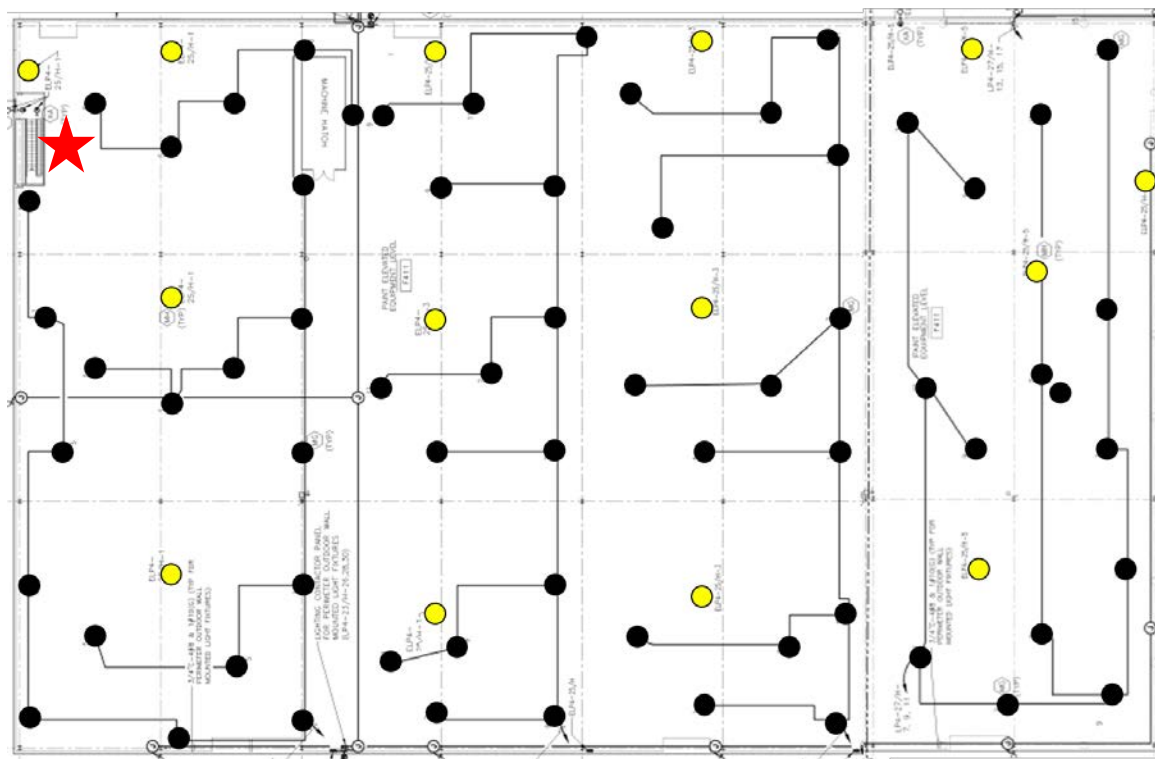


Lighting Reduction Projects

3rd Iteration (*underway*) Motion sensors for high bay lights in Penthouse

Estimated savings:

Annual Cost Savings	\$ 4,148.08
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Sensors will detect associate coming up stairs (lights on) and down stairs (lights off)

80 lights on
no sensors vs. 14 lights on
sensors

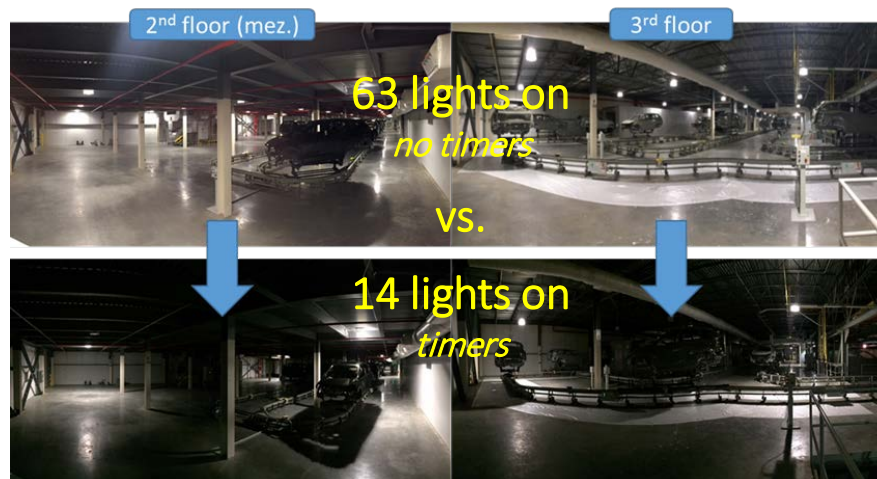
Lighting Reduction Projects

Iteration 1:
E-coat and Surfacers
Night Storage

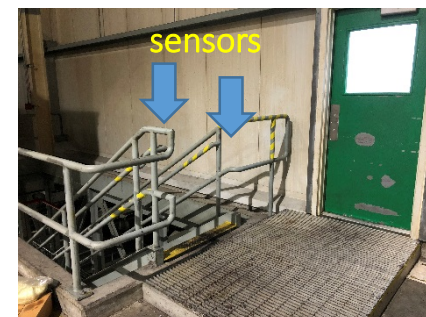
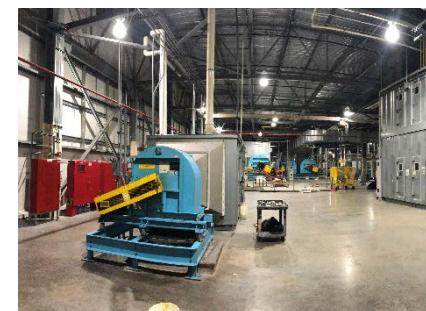


Total Annual Savings	
Iteration 1	\$2,352
Iteration 2	\$3,127
Iteration 3	\$4,148
Total	\$9,627

Iteration 2:
Sealer Oven Storage



Iteration 3:
Penthouse



Agenda

- Optimizing Equipment Start-Up Times
- Off-Shift Energy Communication
- Visual Management
- Compressed Air Reduction
- Lighting Reduction Projects
- **Struggles, Progress, and Path Forward**
- Q&A

Struggles, Progress, and Path Forward

Struggle points

- Getting buy-in from associates
- Sharing easy-to-understand information
- Learning curve on equipment operations



Struggles, Progress, and Path Forward

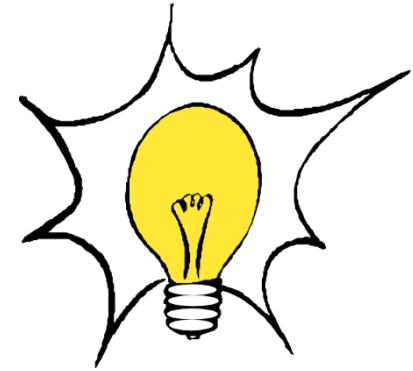
Struggle points

- Getting buy-in from associates
- Sharing easy-to-understand information
- Learning curve on equipment operations



Learnings

- Data and thorough analysis is powerful
- Communication is key
- Get the right people involved



Struggles, Progress, and Path Forward

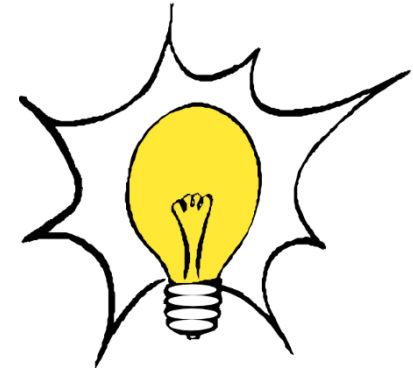
Struggle points

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Learnings

- Data and thorough analysis is powerful
- Communication is key
- Get the right people involved



Overall Take-aways

- Ask lots of questions – never assume you have all of the information
- Be open-minded and adaptable
- Consider how one project idea can be applied to multiple areas

Questions?