

POLLUTION PREVENTION WASTE MANAGEMENT WORKSHOP

Save money – Reduce risk – Eliminate waste

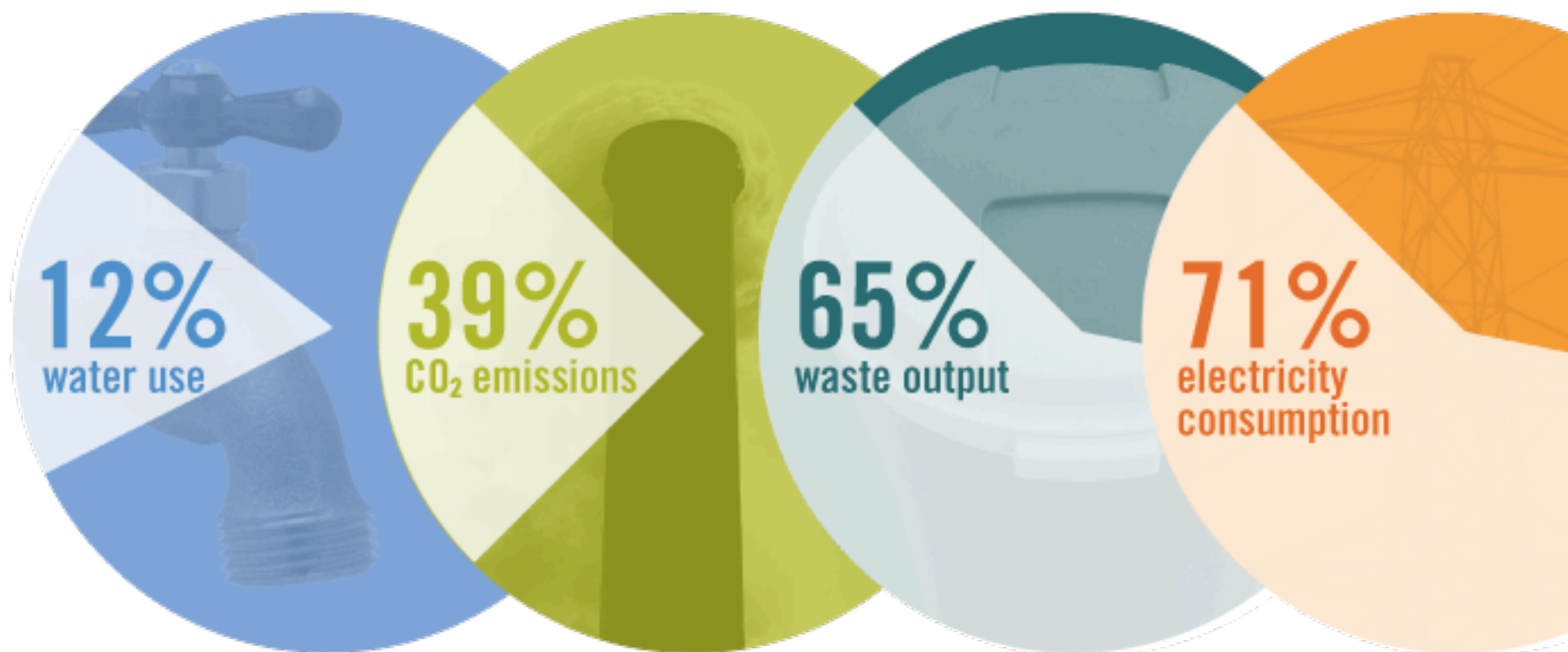
Pollution Prevention Success



Empowering Texas
Manufacturers to
Accelerate
Profitable Growth
and
Competitiveness



U.S. Building Impacts:



TMAC CUSTOMER FEEDBACK & IMPACT

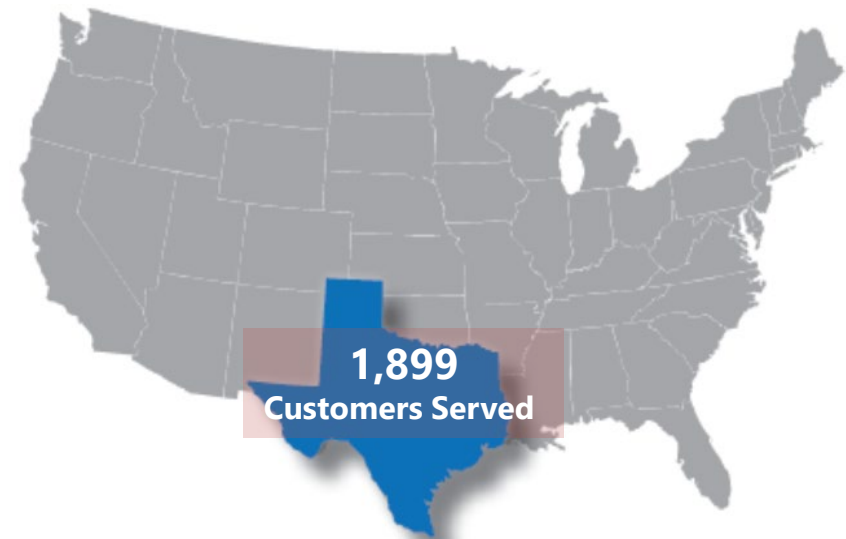
These are some of the insights our customers have shared in the last 5 years about their obstacles, the main reasons they work with us, and the benefits they have realized as a result of our engagements.

TOP CHALLENGES

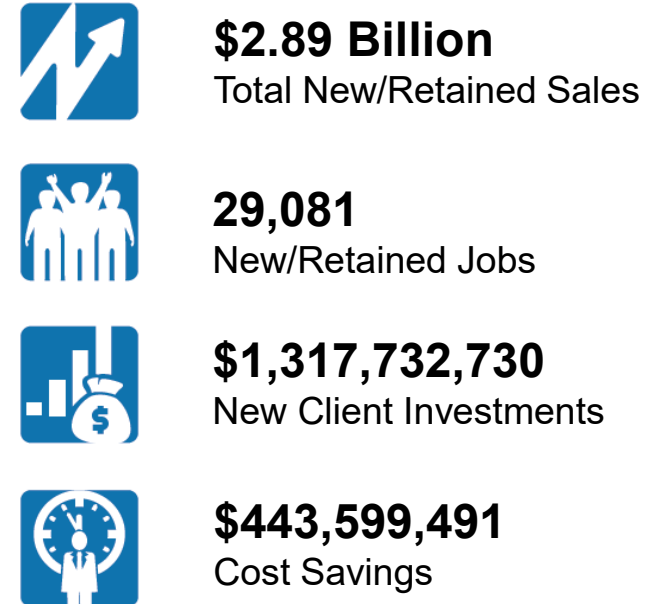


Pollution Prevention

Cumulative Summary 2005-2022	# People trained	Annual kWh Reduction	Carbon (tons) MTCO ₂ e*	Water Reductions (gallons)	Lean/Energy/Environmental Dollars Saved	Solid Waste-Reductions (tons)
151 Organizations	1,745	90,977,062	44,570	22,666,813	\$37,732,789	18,589



5-year Customer Reported Impacts



*Survey conducted by an independent third-party survey firm
 **Data from 2017Q4-2022Q3

Pollution Prevention

Pollution prevention, also known as “P2” or “source reduction,” is any practice that reduces or eliminates pollution at its source prior to waste management. With less waste being created, the likelihood of impacts to human health and the environment is reduced. Additionally, it is often less expensive for facilities to prevent pollution from being created than to pay for control, treatment, or disposal of wastes.

<https://www.epa.gov/trinationalanalysis/pollution-prevention>



How to See More P2 at its Source



**POLLUTION PREVENTION
WASTE MANAGEMENT WORKSHOP**
Save money – Reduce risk – Eliminate waste



Waste is “anything other than the minimum amount of _____ which are absolutely necessary to add value to the product.”

Are you using the minimum amount necessary:

- Energy-Electricity, natural gas, fuels
- Raw Materials-all inventory items
- Supplies/Packaging-consumable items, shipping materials
- Water-actual water usage, wastewater to sanitary sewer, water runoff
- Chemicals-all chemicals found on site
- Garbage-Hazardous, nonhazardous, solid, special wastes
- Emissions-GHG from electricity use, scope 1 & 2, exhausts to air, fumes, air particulates
- Wasted natural resources-petroleum products, wood, water, minerals



Open Vision

“The ability to use your eyes to observe any activity that triggers your brain to recognize the need for change. Open vision removes all silos of thinking and must consider that anything is possible”

Kurt Middelkoop, TMAC



Open Vision



An integrated approach will increase total cost savings and reductions by 35% compared to only addressing Lean wastes.



STEP 1: WATCH PROCESS STEP



Questions to ask:

- *Who is the customer?*
- *How does this step add value for the customer?*
- *At what moment in time does the value-added process begin?*
- *At what moment in time does the value-added process stop?*

The goal is to maximize transformation time.

STEP 2-REVIEW FOR LEAN WASTES

STEP	PROCESS STEP	OPPORTUNITY TO ADD VALUE TIME (sec)	VALUE TIME (sec)	Lean	Energy	Environmental	Safety/Ergonomics	Financial	WHY	WHERE	WHEN	WHO	HOW	ELIMINATE	COMBINE	REARRANGE	SIMPLIFY
1	Lower suspended parts on hangers into dipping tank																

STEP 3: ADDRESS EACH LEAN WASTE

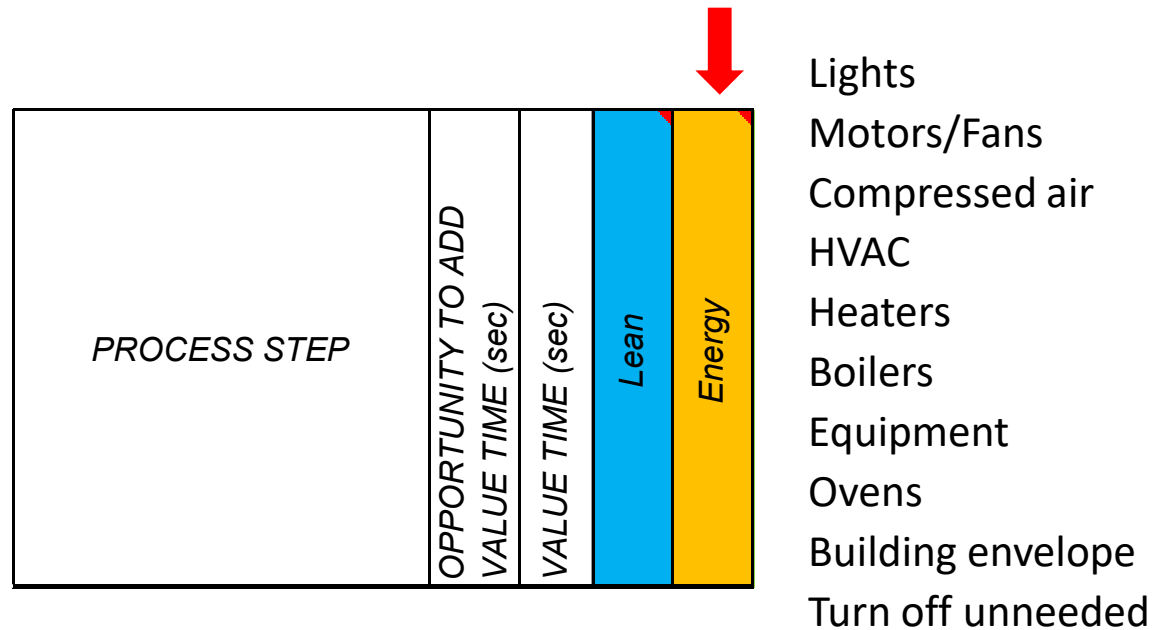
- D-Defects
- O-Overproduction
- W-Waiting
- N-Non-utilized resources
- T-Transportation
- I-Inventory
- M-Motion
- E-Extra processing



STEP 4: RECORD AND QUANTIFY

5:X147	PROCESS STEP	OPPORTUNITY TO ADD VALUE TIME (sec)	VALUE TIME (sec)	Lean	Energy	Environmental	Safety/Ergonomics	Financial	WHY	WHERE	WHEN	WHO	HOW	ELIMINATE	COMBINE	REARRANGE	SIMPLIFY	IMPROVEMENT IDEA	Financial Savings	Sales growth	Electrical kWh Savings	Water Reductions	Hazardouse Wastes
1	Lower suspended parts on hangers into dipping tank	15		Waiting									X				X	How can we reduce time to get parts down into solution? Can hoist motor have varabile speed control? Save 10 seconds labor with variable speed.	\$6,167				
1	Lower suspended parts on hangers into dipping tank	15		Waiting									X				X	Variable speed will also increase available time to use the tank to make more products for growing customer demand.		\$83,333			
1	Lower suspended parts on hangers into dipping tank	15		Waiting								X	X	X				Why does the operator have to manually hold button down to lower parts into tank? Can there be a down postion setting that once pushed will bring parts to the correct level? Save 13 seconds to advance parts.	\$8,017				

STEP 5: ADDRESS ENERGY WASTES



STEP 6: RECORD AND QUANTIFY

	PROCESS STEP	OPPORTUNITY TO ADD VALUE TIME (sec)	VALUE TIME (sec)	Lean	Energy	Environmental	Safety/Ergonomics	Financial	WHY	WHERE	WHEN	WHO	HOW	ELIMINATE	COMBINE	REARRANGE	SIMPLIFY	IMPROVEMENT IDEA	Financial Savings	Sales growth	Electrical kWh Savings	Water Reductions	Greenhouse MTCO2e	Hazardouse Wastes
1	Lower suspended parts on hangers into dipping tank	15			Heaters								X					Heaters manually controlled. Add thermocuplers to controll temperatures.	\$3,200		40,000		21.7	
1	Lower suspended parts on hangers into dipping tank	15			Heaters								X					Add floating spheres to reduce heat loss.	\$6,200		77,500		42.07	
1	Lower suspended parts on hangers into dipping tank	15			Lighting								X					Sky lights provide adequate light during the day. Opportunity to turn off lights on sunny days to reduce electricity.	\$134		1,680		0.912	

STEP 7: ADDRESS ENVIRONMENTAL WASTES



	<i>PROCESS STEP</i>	<i>OPPORTUNITY TO ADD</i>	<i>VALUE TIME (sec)</i>	<i>VALUE TIME (sec)</i>	<i>Lean</i>	<i>Energy</i>	<i>Environmental</i>

- Minimum Amount Necessary
- Emissions
- Water
- Solid Waste
- Hazardous Waste
- Impacts on People
- Wasted Materials
- Compliance/permits
- % Recycled content
- Neighborhood/community

STEP 8: RECORD AND QUANTIFY

	PROCESS STEP	OPPORTUNITY TO ADD VALUE TIME (sec)	VALUE TIME (sec)	Lean	Energy	Environmental	Safety/Ergonomics	Financial	WHY	WHERE	WHEN	WHO	HOW	ELIMINATE	COMBINE	REARRANGE	SIMPLIFY	IMPROVEMENT IDEA	Financial Savings	Sales growth	Electrical kWh Savings	Water Reductions	Greenhouse MTCO2e	Hazardous Wastes
1	Lower suspended parts on hangers into dipping tank	15				Minimize							X					Add floating spheres to reduce chemical evaporation. Reduce chemical usage.	\$3,600				0.762	
1	Lower suspended parts on hangers into dipping tank	15				Water							X					Add floating spheres to reduce water usage.			5,500	0.01		

STEP 9: ADDRESS SAFETY RISKS



	<i>PROCESS STEP</i>	<i>OPPORTUNITY TO ADD VALUE TIME (sec)</i>	<i>VALUE TIME (sec)</i>	<i>Lean</i>	<i>Energy</i>	<i>Environmental</i>	<i>Safety/Ergonomics</i>
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SAFETY- OBJECTS MAY:

- Fall
- Move
- Turn
- Come off
- Drop
- Flip around
- Spring/Pop-up
- Crush
- Collapse
- Burn/Fire
- Leak
- Explode

STEP 10: RECORD AND QUANTIFY

	PROCESS STEP	OPPORTUNITY TO ADD VALUE TIME (sec)	VALUE TIME (sec)	Lean	Energy	Environmental	Safety/Ergonomics	Financial	WHY	WHERE	WHEN	WHO	HOW	ELIMINATE	COMBINE	REARRANGE	SIMPLIFY	IMPROVEMENT IDEA	Financial Savings	Sales growth	Electrical kWh Savings	Water Reductions	Greenhouse MTCO2e	Hazardous Wastes
1	Lower suspended parts on hangers into dipping tank	15					Come off						X					Parts could fall off hangers and splash chemicals onto operators. Provide PPE to reduce risk of injury. Safety glasses, chemical resistant clothing. Prevent one lost time injury.	\$4,000					

STEP 11: ADDRESS FINANCIAL



<i>PROCESS STEP</i>	<i>OPPORTUNITY TO ADD VALUE TIME (sec)</i>	<i>VALUE TIME (sec)</i>	<i>Lean</i>	<i>Energy</i>	<i>Environmental</i>	<i>Safety/Ergonomics</i>	<i>Financial</i>
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Labor Costs
Material Costs
Work In Process
Inventory Turns
Profit

STEP 12: RECORD AND QUANTIFY

PROCESS STEP	OPPORTUNITY TO ADD	VALUE TIME (sec)	Lean	Energy	Environmental	Safety/Ergonomics	Financial	WHY	WHERE	WHEN	WHO	HOW	ELIMINATE	COMBINE	REARRANGE	SIMPLIFY	IMPROVEMENT IDEA	Financial Savings	Sales growth	Electrical kWh Savings	Water Reductions	Greenhouse MTCO ₂ e	Hazardous Wastes
	VALUE TIME (sec)																						
SUMMARY OF ALL STEPS																		\$25,151	\$83,333	\$119,180	5,500	42	

Success Stories



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WASTE MANAGEMENT WORKSHOP**
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Thermocouple Installation



Thermocouple location



Lights programmed with the following logic:

Tank temp > 140 °F, **Red**

Tank temp < 110°F, **Amber**

110 °F ≤ Tank temp ≤ 140°F, **Green**

Program logic runs in the Moxa UC-3111



Polypropylene UFO's Installed in Black Dye Tank


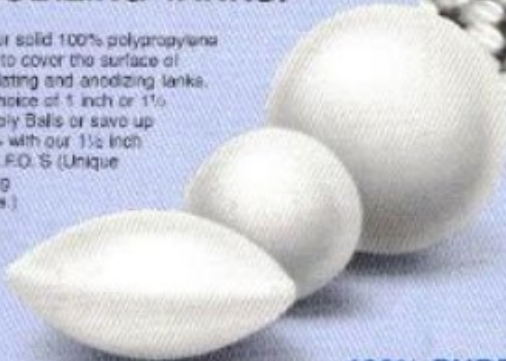
REDUCE FUMES & AIR POLLUTION

CONSERVE ENERGY WITH 100% POLYPROPYLENE

TANK FLOATS

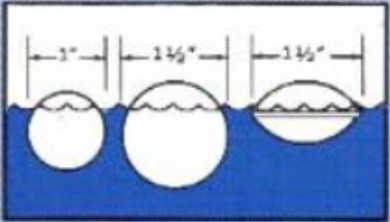
FOR PLATING AND ANODIZING TANKS!

Use our solid 100% polypropylene Floats to cover the surface of your plating and anodizing tanks. Your choice of 1 inch or 1½ inch Poly Balls or save up to 25% with our 1½ inch Poly UFO'S (Unique Floating Objects.)

- REDUCE FUMES
- REDUCE HEAT LOSS
- REDUCE EVAPORATION
- REDUCE DRAGOUT
- REDUCE EXHAUST MAINTENANCE

100% PURE VIRGIN POLYPROPYLENE



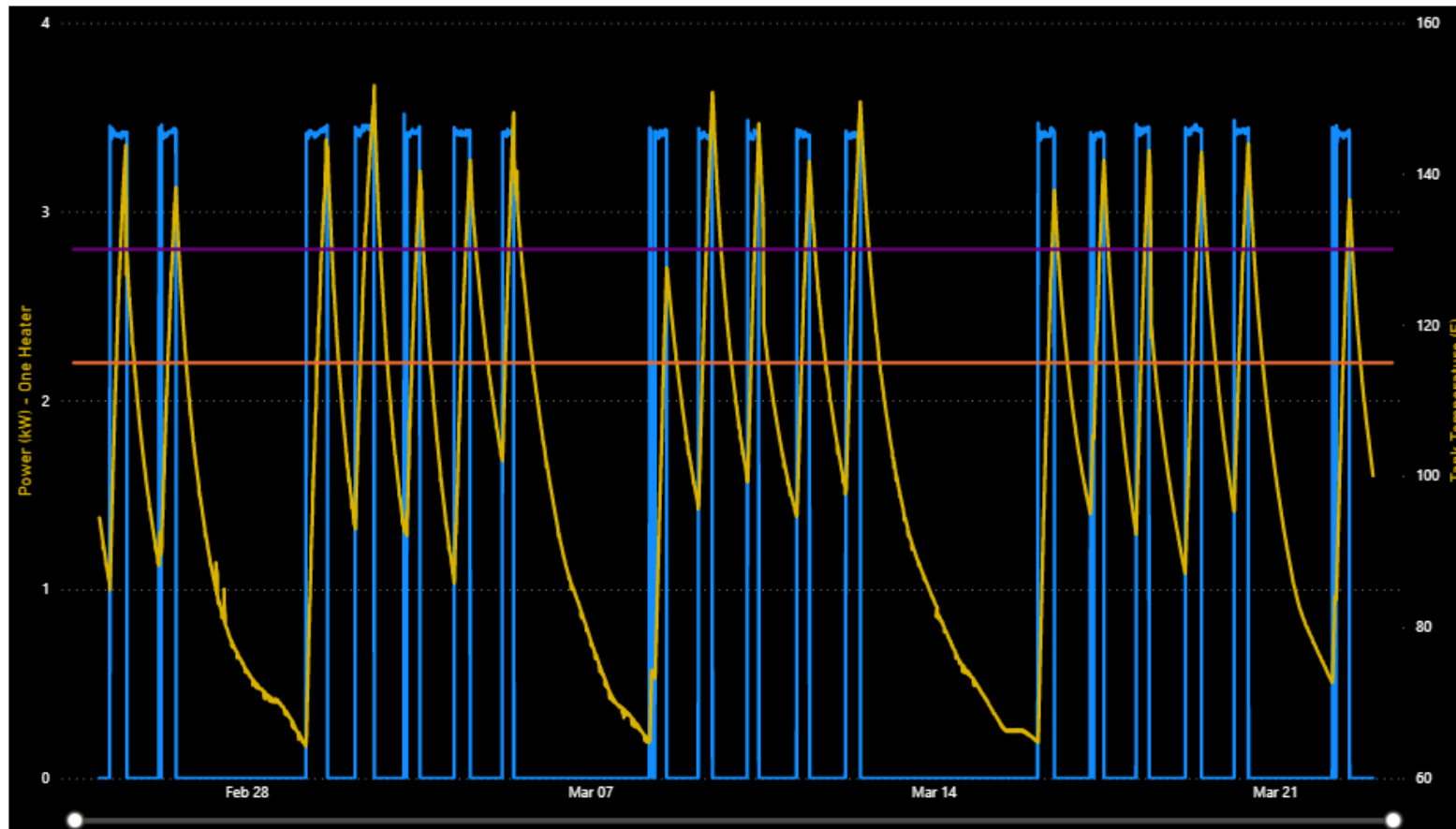
1 INCH DIAMETER POLY BALLS
 COVERAGE: Approximately 172 balls per surface foot.

1½ INCH DIAMETER POLY BALLS
 COVERAGE: Approximately 74 balls per surface foot.

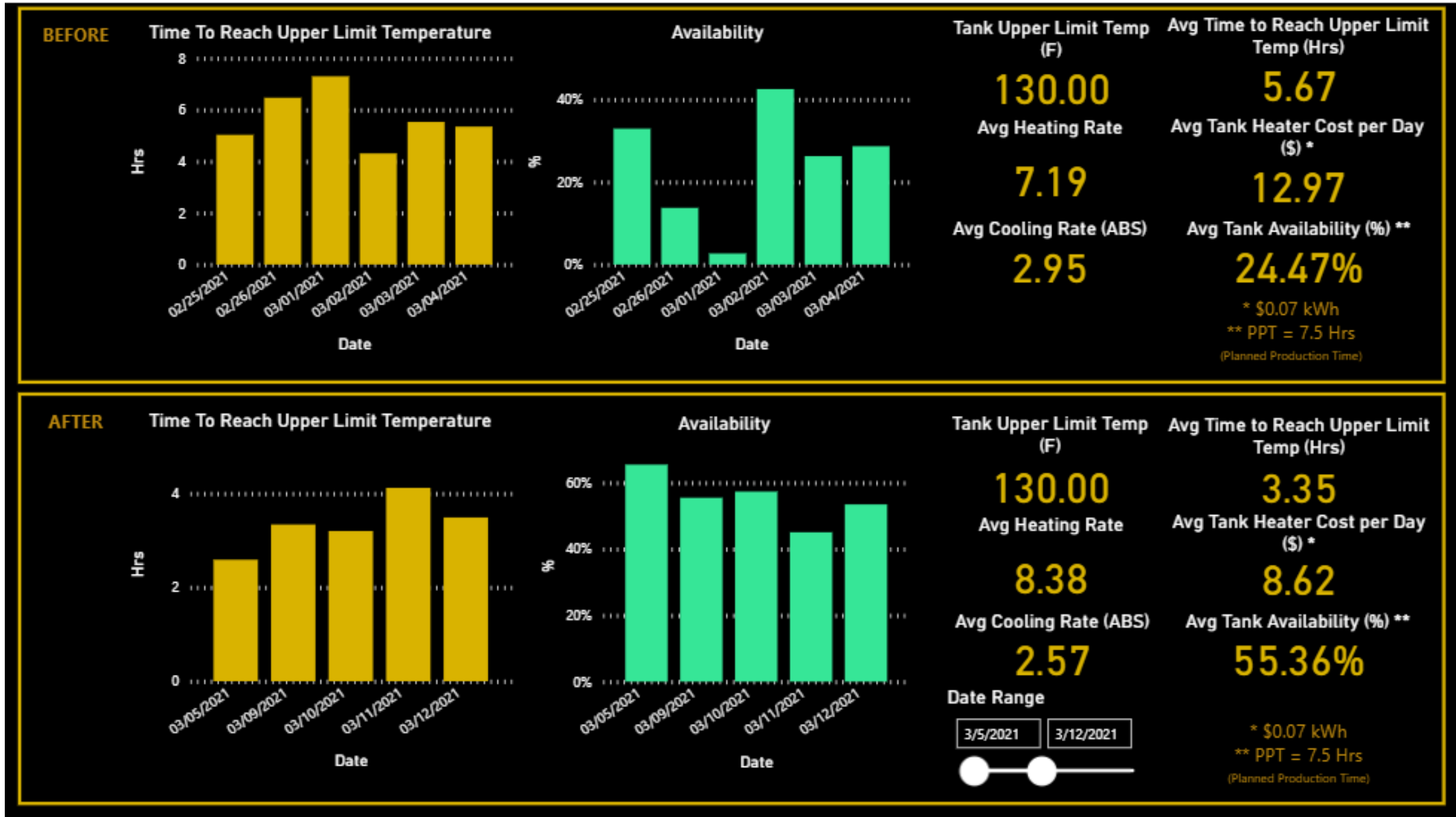
1½ INCH DIAMETER UFO'S
 COVERAGE: Approximately 74 Poly UFO'S per surface foot.

Typical Data Visualization

- Time series visualization from Power BI of tank temperature (gold) and heater power (blue) from 02/25 - 03/22.



Before and After UFO Insulation



Results



Values from Data Acquisition					
Time Period	Avg. Heating Rate	Avg. Cooling Rate	Avg. Availability	Avg. Tank Heater Cost per Day	
Before Insulation - 02/25/21-03/04/21	7.19	2.95	24.47	\$	12.97
After Insulation - 03/05/21-03/12/21	8.38	2.57	55.36	\$	8.62
% Changes and Estimated Savings					
Time Period	% Heating Rate Increase	% Cooling Rate Decrease	% Availability Increase	\$ Tank Heater Cost per Day Decrease	\$ Decrease in Tank Heater Cost per Year
After Insulation - 03/05/21-03/12/21	16.55	12.88	30.89	\$ 4.35	\$ 1,135.35
Assumptions					
* Estimated Working Business Days in 2021:		261			
* Assumed \$0.07 kWh					
* Assumed Planned Production Time = 7.5 hrs per day					

NORTEX METAL FINISHING

www.NorTexMetalFinishing.com

2-272-6600

and Texas



TMAC
Work Smart. Grow Smart.™





NPIC installed low-flow nozzles to each of the 12 faucets which will now save over 83,000 gallons of water each year.



NPIC added a cardboard compactor and bailer which will recycle 2.4 tons of cardboard and prevent future disposal of cardboard to the landfill.



TMAC used a thermal camera to show the team how heat was escaping from their molding machines. NPIC is now investigating insulation solutions to help reduce heat loss, save energy and maintain consistent injection temperature.



The team identified opportunities to reduce compressed air consumption by repairing leaks and adjusting compressor settings to better match the actual demands of their equipment. These improvements will reduce energy consumption by 69,000 kWh annually and will reduce energy costs by more than \$5,800 annually.



Drying Room Process Sensors



Sensor Data Humidity and Temperature



Cycle Number	Time	Cycle Time (hrs)	Relative Humidity, %
0	8/4/23 8:10 AM	-	-
1	8/5/23 9:44 AM	25.6	30.42
2	8/6/23 8:26 AM	22.7	27.58
3	8/7/23 8:28 AM	24.0	25.09
4	8/8/23 10:15 AM	25.8	23.31
5	8/9/23 8:18 AM	22.0	26.26
6	8/10/23 8:06 AM	23.8	31.12
7	8/11/23 9:01 AM	24.9	26.01
8	8/12/23 9:16 AM	24.2	26.86
9	8/13/23 8:51 AM	23.6	25.82
10	8/14/23 9:19 AM	24.5	25.3
11	8/15/23 7:48 AM	22.5	27.15
12	8/16/23 12:14 PM	28.4	33.7
13	8/17/23 7:51 AM	19.6	28.69
14	8/18/23 8:19 AM	24.5	27.93
15	8/19/23 8:34 AM	24.2	29
	Average	24.03	27.62
	Min	19.6	23.3
	Max	28.4	33.7

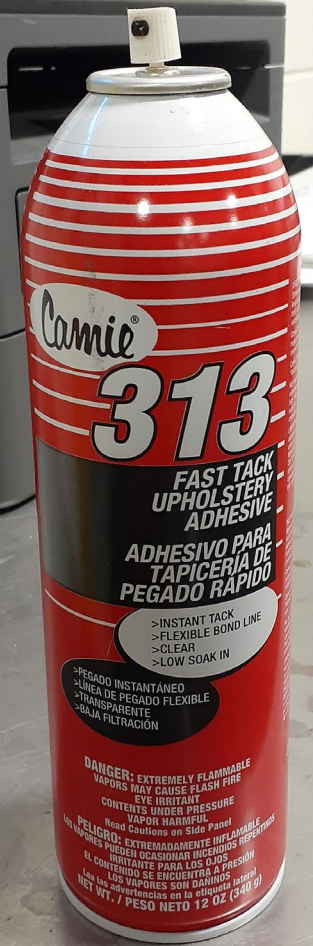




SOURCE + BLEND + INNOVATE



Truck Loading



The Results

- Reduced 1,446 lbs impacting air quality
- Reduced product loss by \$38,000 annually
- Eliminates landfill disposal of 1,850 cans per year
- Improves operator working conditions





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COLLIN STREET BAKERY
Baked in Corsicana, Texas since 1896



- 8 E3 Smart Sensor Assessments**
- Environmental Justice**
- Sensor/Video Monitoring**



Pollution Prevention Grant Delivery Measures

- Number of identified environmental & energy reduction opportunities
- Number of **projects implemented and verified**
- Number of attendees/staff involved and trained on benefits of E3 assessment
- Establish reductions: Hazardous Waste, Water reductions, Energy Use, Dollars saved, GHG reductions





E3 SMART SENSOR

 **E3: ECONOMY · ENERGY · ENVIRONMENT**
SUPPORTING MANUFACTURING LEADERSHIP THROUGH SUSTAINABILITY





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