Precision Sand Gen IV –V8 Regenerative Thermal Oxidation Unit (RTO) Utilities Savings

Saginaw Metal Casting Operations and UAW Local 668

QN -Problem Solving
-Identify, Analyze, Plan, Implement ,Evaluate

Problem Description

- **Energy Challenge**
  - BPD Metrics
    - Reduce Energy Consumption
- **Environmental Challenge**
  - BPD Metric
    - Maintain 100% Compliance to Title V Air Permit Requirement

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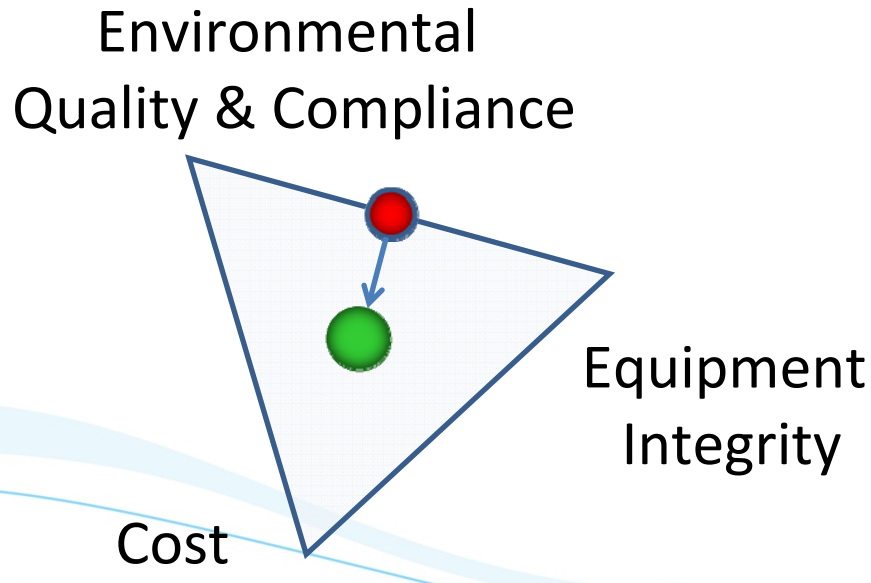
Problem Description

- The **R**egenerative **T**hermal **O**xidation Units were identified as the largest consumer of energy in Precision Sand.
- The **RTO** units are used to control atmospheric emissions by using filtration and heat.



- **No Compromises**
- Compliance with Title V Air Permit
- Requires Seamless Implementation (no production impact)
- Meet (SPQRCE) Goals

QN -Problem Solving
-Identify, Analyze, Plan, Implement ,Evaluate

Teamwork

Cross-Functional Team:

Maintenance Team:
Paul Conley
Adam Losee
Marc McCalebb
Mike Weise
Dan Gillis
Curt Canterbury

Product Team: Tim Botkins

Engineering: Rich Buerge
Joaquin Garcia
Terry Smith

Environmental: Renee Mietz
John Moldovan
Ray Ilkka
Laci Beltz

Utilities: John Sullivan
Gary Devereaux

Industrial Hygiene:
Mark Chambers

GM UAW: Duane Barron
Alex Nicol
Brent Maurer
Larry Jones

WFG funding for project:
Barry Croteau

Outside Contractors:
Tom Domson - W.A.Kibbe
Gary Lanham – CECO
Tom Madden - CMS
Barry Boulliane - BTEC

QN -Problem Solving
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Analytical Tools

- E$PI - Components, costs and potential savings
- Team Problem Solving

  -- 5 why's -- Root Cause -- Monitor & Evaluate – Design of Experiments

  -- Identify, Analyze, Plan, Implement, Evaluate
- Gas/Electrical Use Charts & Historical Data

  – Focus on greatest improvement
- Process Flow Diagrams & Blueprints – location & accessibility
- Design of Experiments / Statistical Methods

  -- Flame Ionization Detection Meters (FID)

  – Measure concentrations of duct gasses

  -- Concentration Charts – analysis of potential reductions
- PPCR – Implement changes to process

  -- Error proofing

QN -Problem Solving
-Identify, Analyze, Plan, Implement ,Evaluate
-5 Whys -root cause

Improvement Focus

- Duct Burners operate at 300°F each.

The Duct Burner uses heat to prevent emission condensation through the duct work as the emission waste stream travels to the main RTO chamber.

- Duct Burner original temperature set point of 300 °F was determined by Boiling Point of the emissions.

Investigate operating Duct Burner at a lower temperature ?? to decrease Gas Consumption while remaining compliant to the State Title V Air Permit

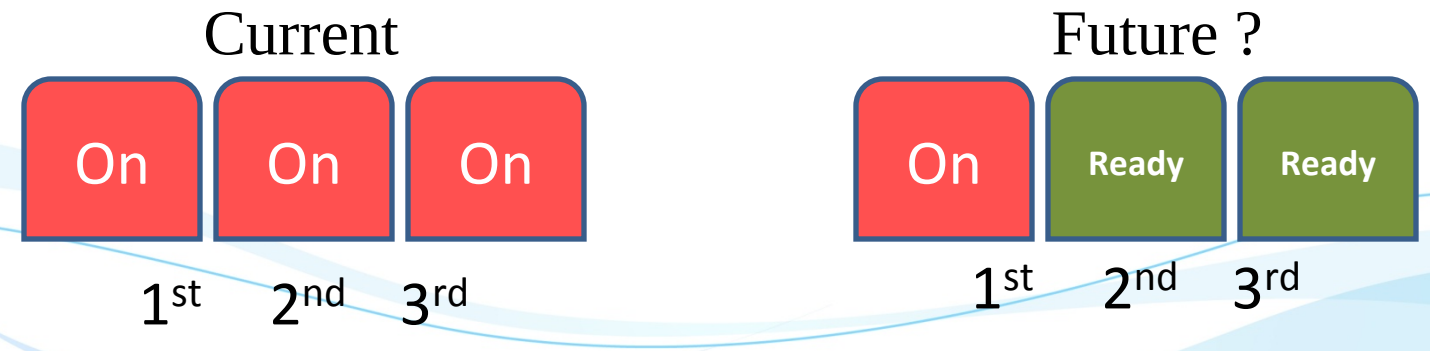
Current	Future
300°F	????? °F

QN -Problem Solving
-Identify, Analyze, Plan, Implement ,Evaluate
-5 Whys -root cause

Improvement Focus

- The RTO Units operate in Production Mode 24 hrs per day during the week and are placed in a Shutdown or Idle mode over the weekend. Both RTO Shutdown and Idle modes require a long recovery time and are not ideal for daily use.

Investigate creating an energy saving Production Standby Mode that will allow for quick recovery during the production week.



QN -Problem Solving
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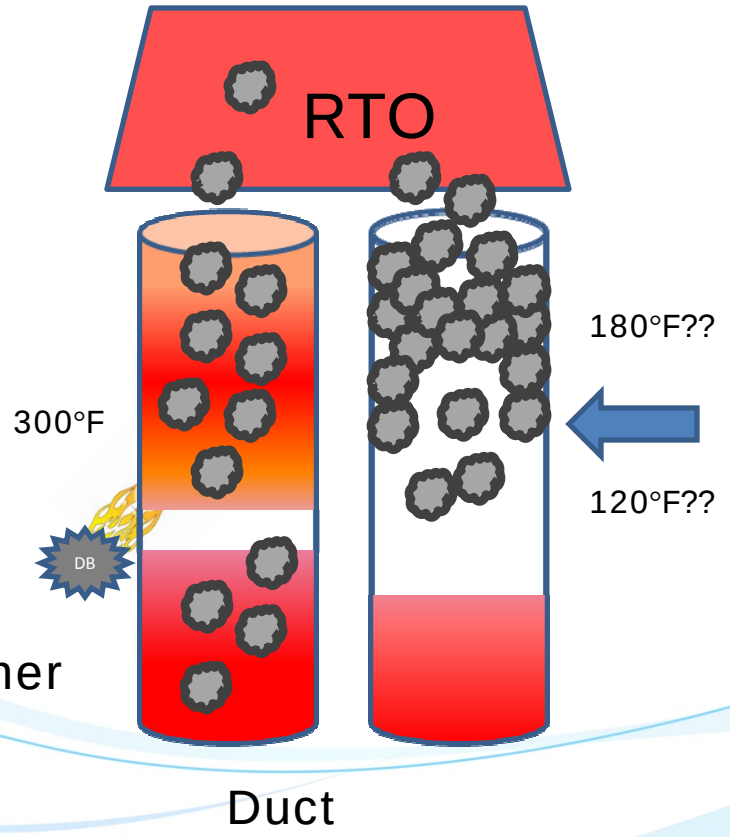
-5 Whys -root cause -

Environmental Testing

•Why 300°F?

Based on Boiling Point

•Goal: Get Emissions to RTO for Destruction



•How low can we go ?

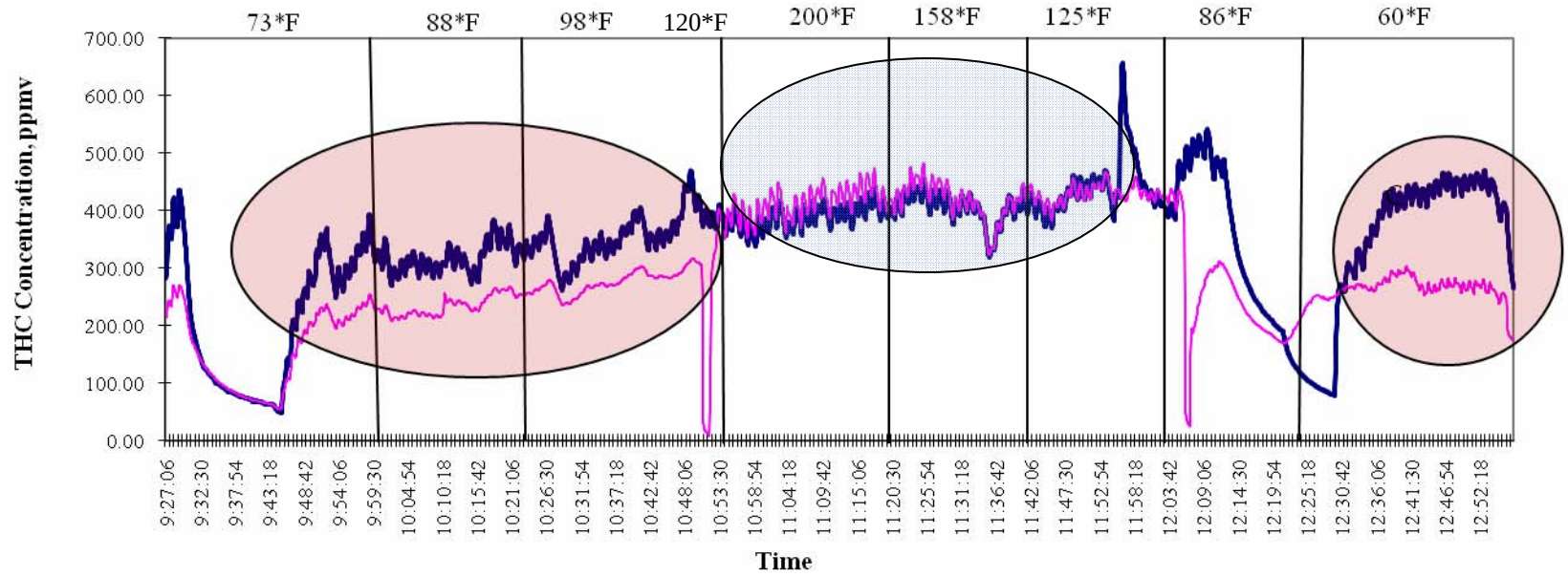
•Goal: Find the temperature that emissions start to condense

QN -Problem Solving
-Identify, Analyze, Plan, Implement ,Evaluate
– Design of Experiments

Environmental Testing

Dew Point Test

- **Dew Point Test showed a minimum acceptable temperature of 150 ° F**



QN -Problem Solving
-Identify**, Analyze, Plan**, Implement ,Evaluate
– monitor and evaluate

Results

SAGINAW METAL CASTING OPERATIONS
RTO PRIMARY BURNER SET POINT REDUCTION

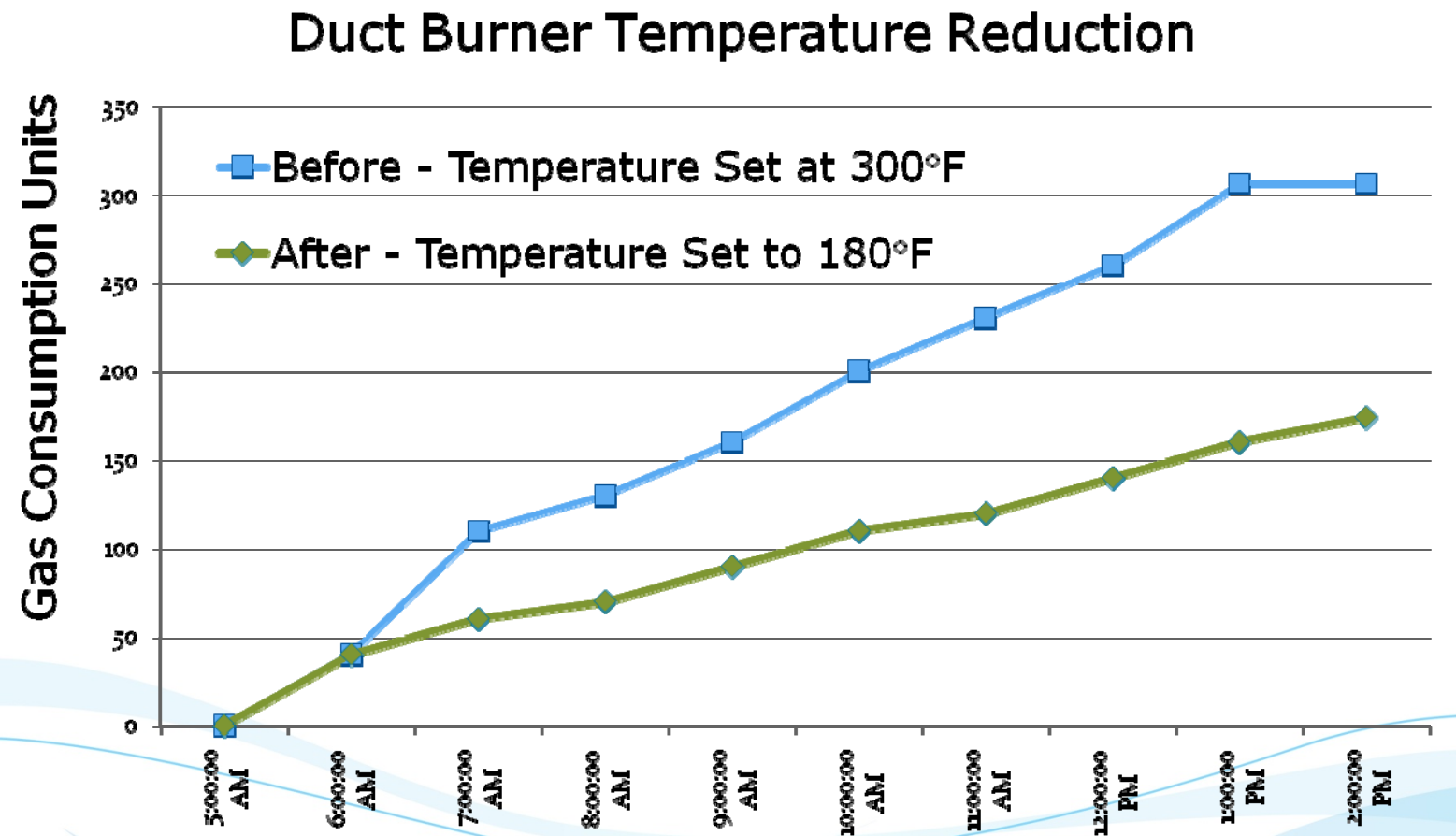
BASED ON ENERGY SAVINGS CALCULATIONS WEIGHED AGAINST EXISTING CONDITIONS

PROJECT NUMBER	PROJECT DESCRIPTION BY AREA	DETAILED ENG COSTS	MECHANICAL COSTS	ELECTRICAL COSTS	COST SUBTOTAL	GAS SAVINGS	ELECTRIC SAVINGS	SAVINGS SUBTOTAL	PAYBACK PERIOD
RTO1.03 RTO2.03 RTO3.03	PROJECT INVOLVES REDU THE PRIMARY BURNER SE FROM 300 DEG. F. TO 180 SET POINT REDUCTION BA EXTENSIVE TESTING. MA DETERMINED TO CONDEN OF AIRSTREAM AT 120 DE POINT WILL PROVIDE A DU TEMPERATURE OF 150 DE	$12.600	$0	$0	$12.600	$438.658	$0	$438,658	
								$438,658	

GEN IV
Saving $.92 CPU

QN -Problem Solving
-Identify, Analyze, **Plan, Implement** ,Evaluate
– monitor and evaluate

Results



Results

QN -Problem Solving
-Identify, Analyze, Plan, Implement ,Evaluate
– monitor and evaluate

SAGINAW METAL CASTING OPERATIONS
RTO STANDBY MODE DEVELOPMENT

BASED ON ENERGY SAVINGS CALCULATIONS WEIGHED AGAINST EXISTING CONDITIONS

PROJECT NUMBER	PROJECT DESCRIPTION BY AREA	Electrical Cost before Standby per year	Gas Cost before Standby per year	COST SUBTOTAL without Standby	Electrical Cost with Standby per year	Gas Cost with Standby per year	COST SUBTOTAL with Standby	SAVINGS SUBTOTAL	PAYBACK PERIOD
RTO #1 RTO #2 RTO #3	**Create an RTO stand by state** where RTO is "Ready for Fume" stat supporting PLC logic to allow to be Pre-Heated but **running reduced air volume and gas consumption.** This will be implemented by keeping the F Air Dampers closed and pullin fresh air through the RTO at Id Exhaust Fan Speed until the C Cooling Conveyor, or Shakeou to send Process Fumes. RTO **Burner will operate at r gas levels, Exhaust Fan wil at reduced speeds (12.5 Hz Hz) and the Cartridge Colle Bag House will remain off** unti Precision Sand Process is ready to send process related fumes								
	TOTALS	**$546,783**	**$932,138**	**$1,478,921**	**$346,856**	**$648,030**	**$994,886**	**$484,035**	

GEN IV
Saving $1.02 CPU

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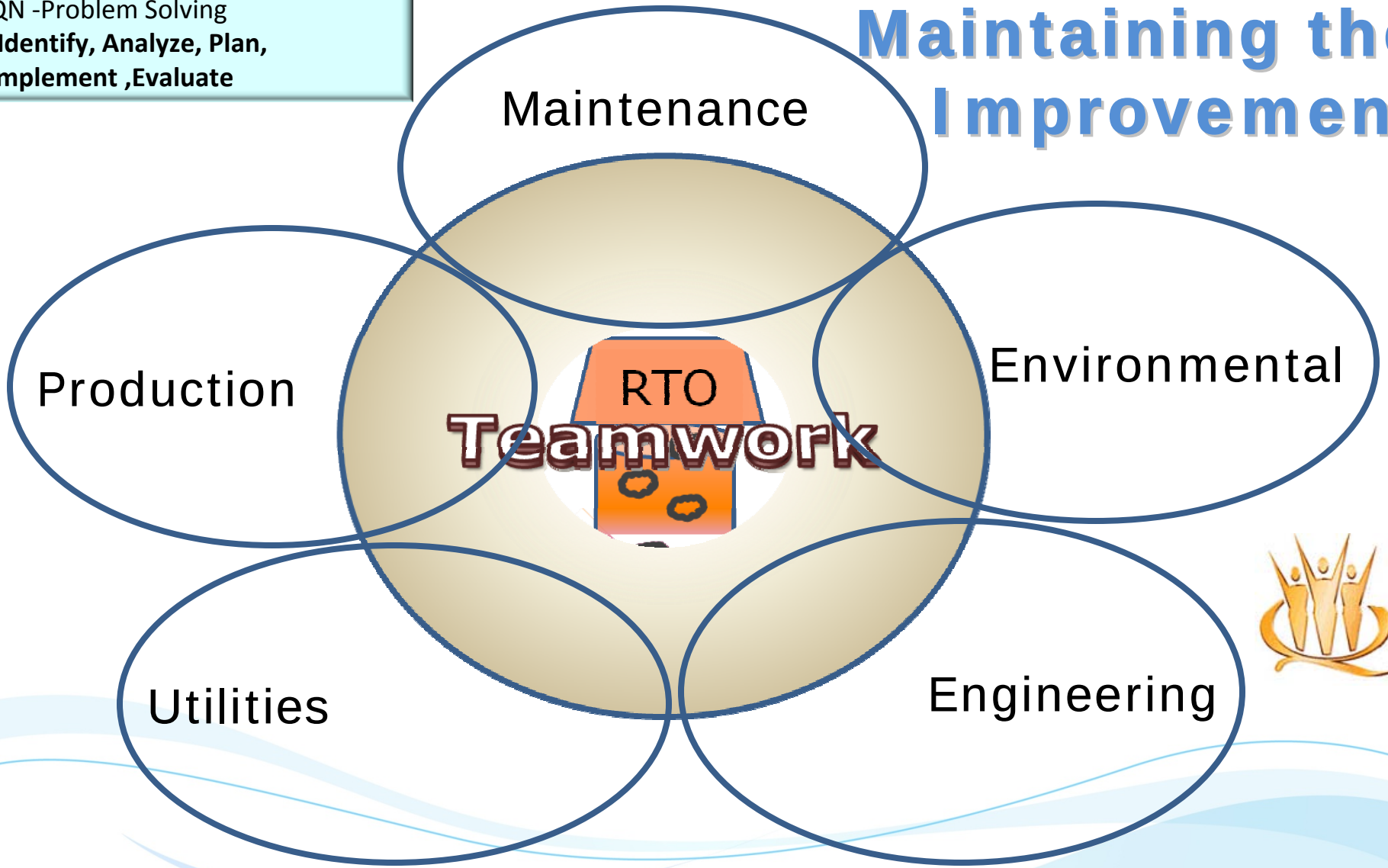
Maintaining the Improvement



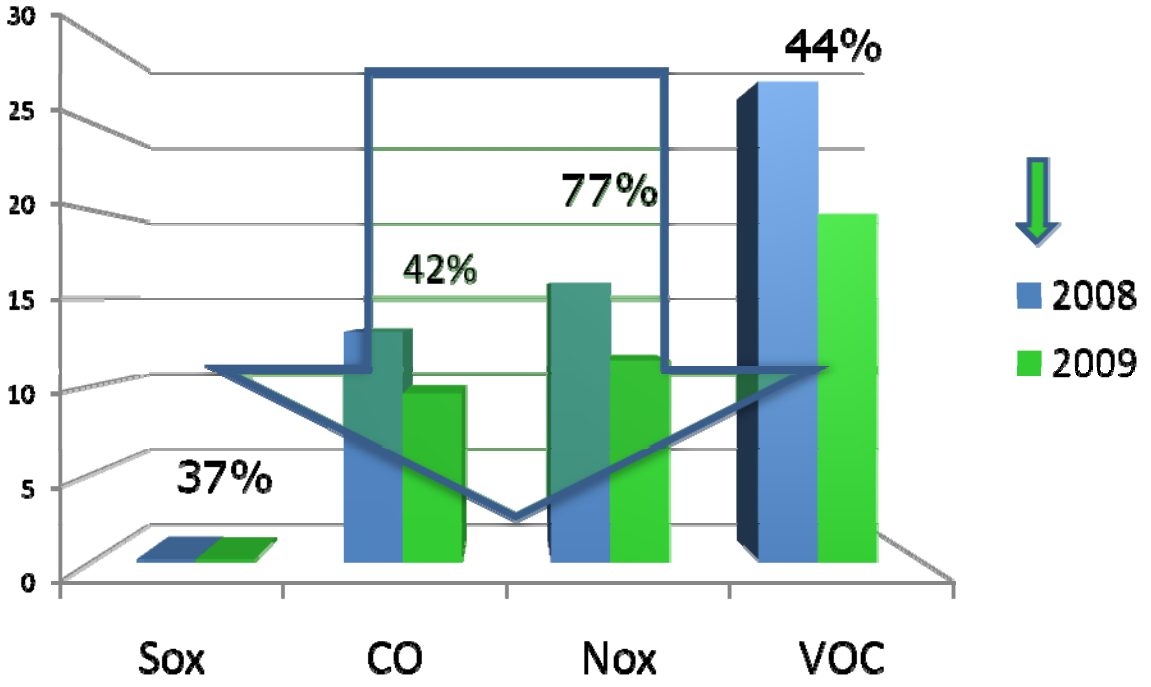
QN -Problem Solving
-Identify, Analyze, Plan, Implement ,**Evaluate**
CELEBRATE!

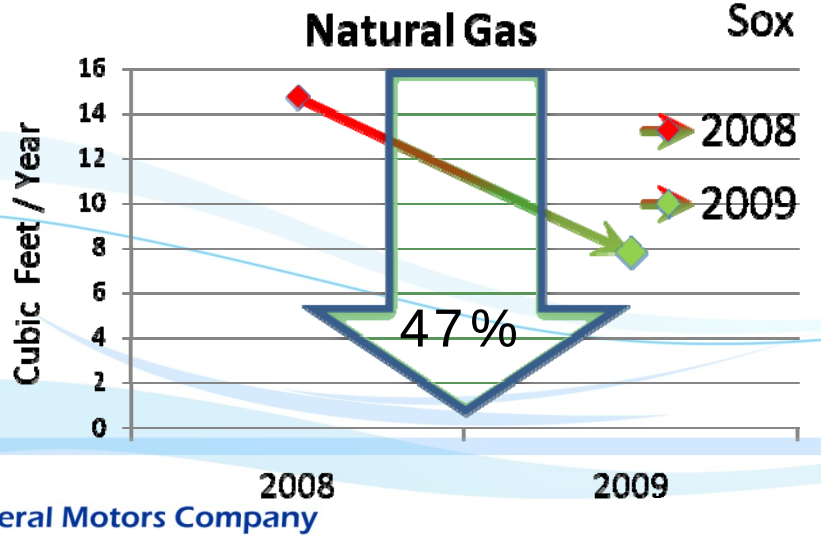
GREEN SAVINGS

•Green Change – Reduction in Carbon Footprint

•Despite a 28% increase in production 2008 to 2009 for the GEN IV-V8 line

•Decreased Fees based on Emissions Reductions $700





•47% Reduction in RTO Natural Gas Usage

QN -Problem Solving
-Identify, Analyze, Plan, Implement ,Evaluate

- Continuous Improvement

LESSONS LEARNED

- Lost Foam Cells 4 & 5
  - Used same methodology on ECOTEC product line

ECOTEC -- Duct Burner Operating Temperature

Natural Gas Savings **$320,000**

ECOTEC
Savings $ .60 CPU

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CELEBRATE!

Cost Savings

GEN IV V8 -- RTO Stand-By Idled State

Electric and Natural Gas Savings **$484,035**

GEN IV V8 -- Duct Burner Operating Temperature

Natural Gas Savings **$438,658**

ECOTEC -- Duct Burner Operating Temperature

Natural Gas Savings **$320,000**

Total Annualized Cost Savings **$1,242,693**

SMCO Plant
Savings $ .70 CPU