Save Energy Now LEADER Web Conference
Project Implementation Seminar Series

10 - Preparing for Project Implementation
Measuring Energy Achievements

Fred Schoeneborn, CEM, CEA
September 8, 2010

Agenda

- Seminar **Series Overview**
- **Recap Seminar # 9** – “Financing”
- **Measuring Energy Achievements**

  Fred Schoeneborn - ORNL team

  Larry Fabina – ArcelorMittal
- **Questions**/Future Seminars

Project Implementation Series

- **12** One-hour seminars assisting *Save Energy Now* LEADER Companies
- Conducted every **second Wednesday** of the month
- Focus on **real world** examples and solutions
- Practical **tools** made available
- **Peer** *Save Energy Now* LEADER participants

Financing Project Implementation

- Get financial **help**
- Develop an **investment strategy**
- Involve your **Plant Controller**
- Consider your **Plant Manager**'s perspective
- Use subtle "**tricks**" to facilitate funding
- Engage your **TAM** to assist you

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Sharing by UAW-GM

- Highlighted **opportunities** and problems
- Stressed importance of **teamwork**
- Utilized DOE analytical **tools** and methods
- Summarized project **improvement schedule**
- Reviewed implemented projects and **savings**
- Used Plant and Corporate **funding**

Types of Energy Measurements

- **Metering** specific operations/equipment
- **Energy Intensity** per unit of product
- Energy consumption as a **% of operating budget**
- Consumption **reduction** measures
- **Project savings accomplishments**
- Measurements that align with your **culture**

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Only with Measurements Can You

- Verify **opportunities**
- Make a case for **improvements**
- Expedite **implementation**
- Convince management of **your value**
- Communicate **results**

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Meter Energy Consumption

If you do not measure your resources,
you do not manage them.

- **Un - Metered**
- **Un - Measured**
- **Un - Monetized**

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Metering Benefits

- Tracks usage for **billing**
- Assigns usage per area for **control**
- Differentiates resource usage per **space type**
- Determines usage for system **benchmarking**
- Identifies potential **opportunities** for savings
- Limits the impact of **problems**

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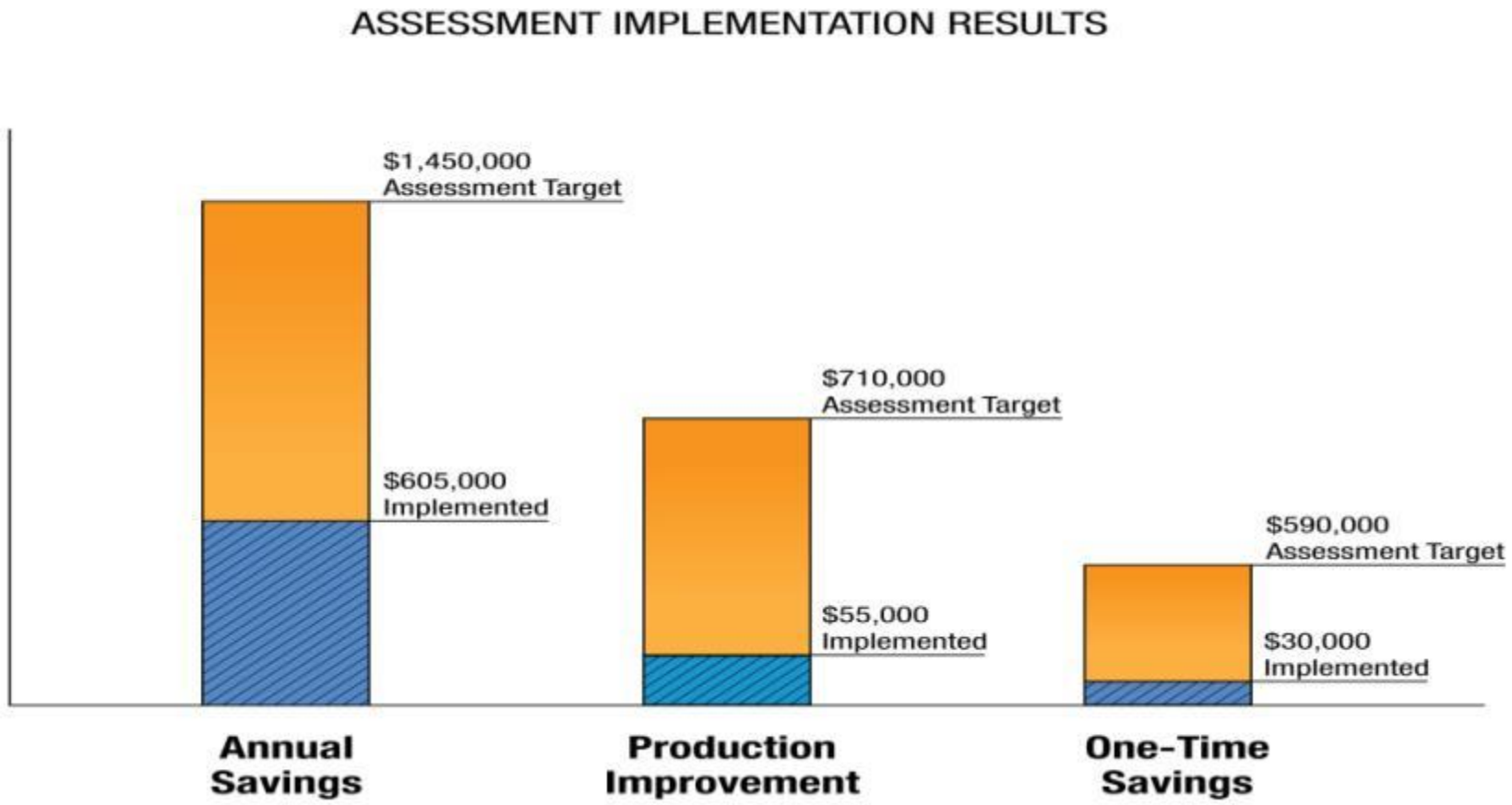
Thermometer Graph



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Implementation Scorecard

Assessment Project Implementation Scorecard

Key:

ON TIME	GRACE PERIOD (DAYS)	LATE
	10	

			STATUS			
Project Description	Subtask	Project Manager	Initial Assessment Due/Completed	Project Submitted Due/Completed	Project Implemented Due/Completed	Project Follow-Up and Verification Due/Completed
Steam System Repair		Joe Blow	9/1/2009	10/1/2009	12/31/2009	1/31/2009
			9/12/2009	10/3/2009	10/4/2009	10/5/2009
			10/6/2009	10/3/2009	10/4/2009	10/5/2009
			10/10/2009	10/14/2009	10/12/2009	10/13/2009
			10/10/2009			
			10/10/2009	10/11/2009	10/12/2009	10/13/2009
			10/10/2009	10/11/2009	10/12/2009	10/13/2009

Have a Metrics Roadmap

- **Vision** – Where is it taking us?
- **Goal** – What will be achieved?
- **Business Case** – What is it worth?
- **Action Plan** – How/when/who will you get there?
- **Communication Plan** – Who will you tell?

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Champion of Implementation

- Larry Fabina
- ArcelorMittal
- Manager of Continuous Improvement
- Focus is on Implementation

Measuring Energy Achievements

Larry Fabina, Manager, Continuous Improvement
ArcelorMittal

September 8, 2010

ArcelorMittal Overview
Global Company

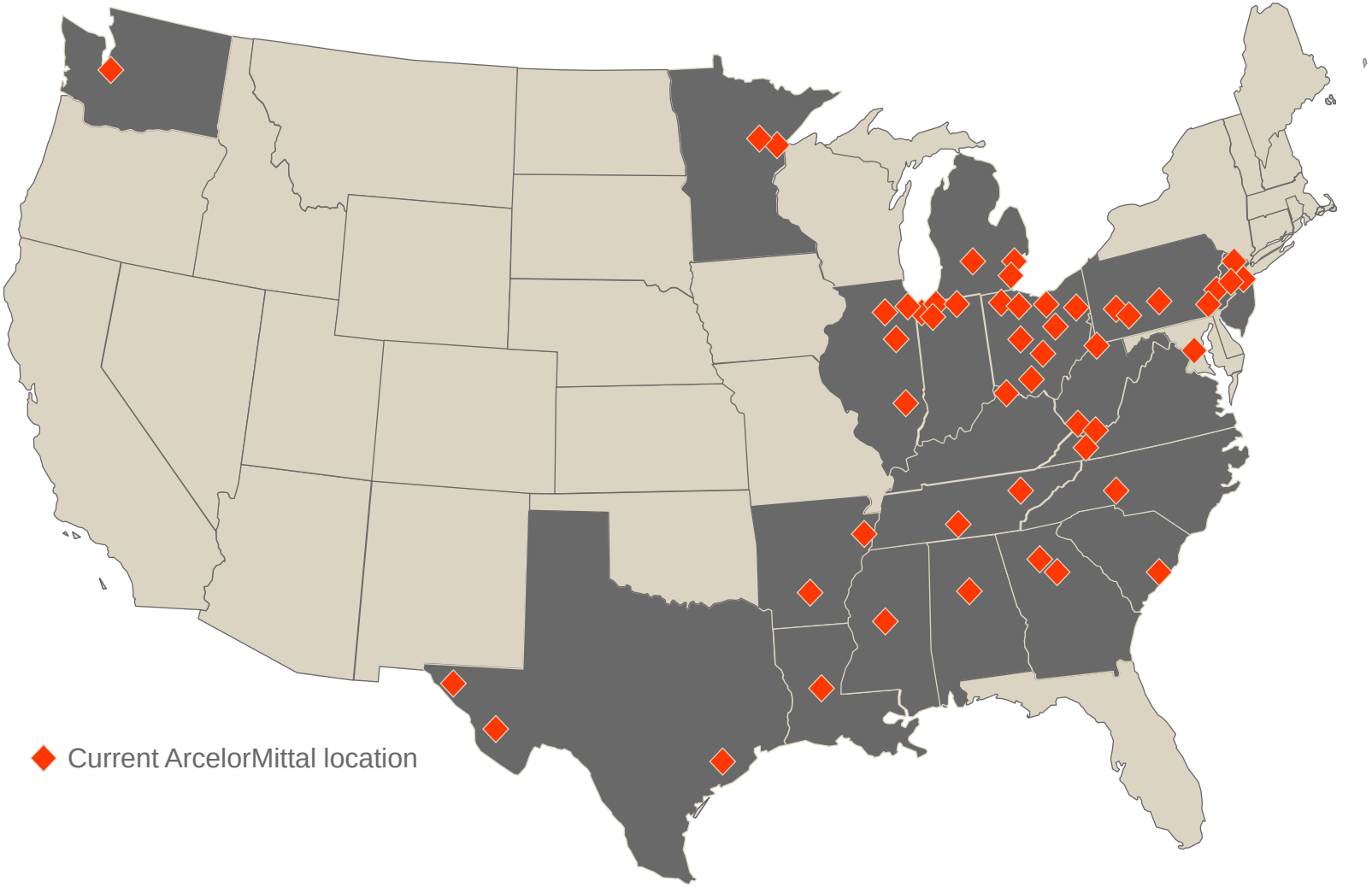
- The largest steel company in the world
- Presence in more than 60 countries
- 285,000 employees
- The leader in all major global markets, including automotive, construction, appliances, and packaging
- Leading R&D and technology, as well as sizeable captive supplies of raw materials and outstanding distribution networks
- Our vision is to provide the leadership that will transform tomorrow's steel industry

ArcelorMittal
United States Operations

- In the United States, ArcelorMittal employs approximately 21,000 people at 21 facilities. A significant part of the footprint in the United States is in Northwest Indiana at the Indiana Harbor and Burns Harbor facilities.

- ArcelorMittal USA is a vital component of the company's global footprint and foundation of the American manufacturing industry.

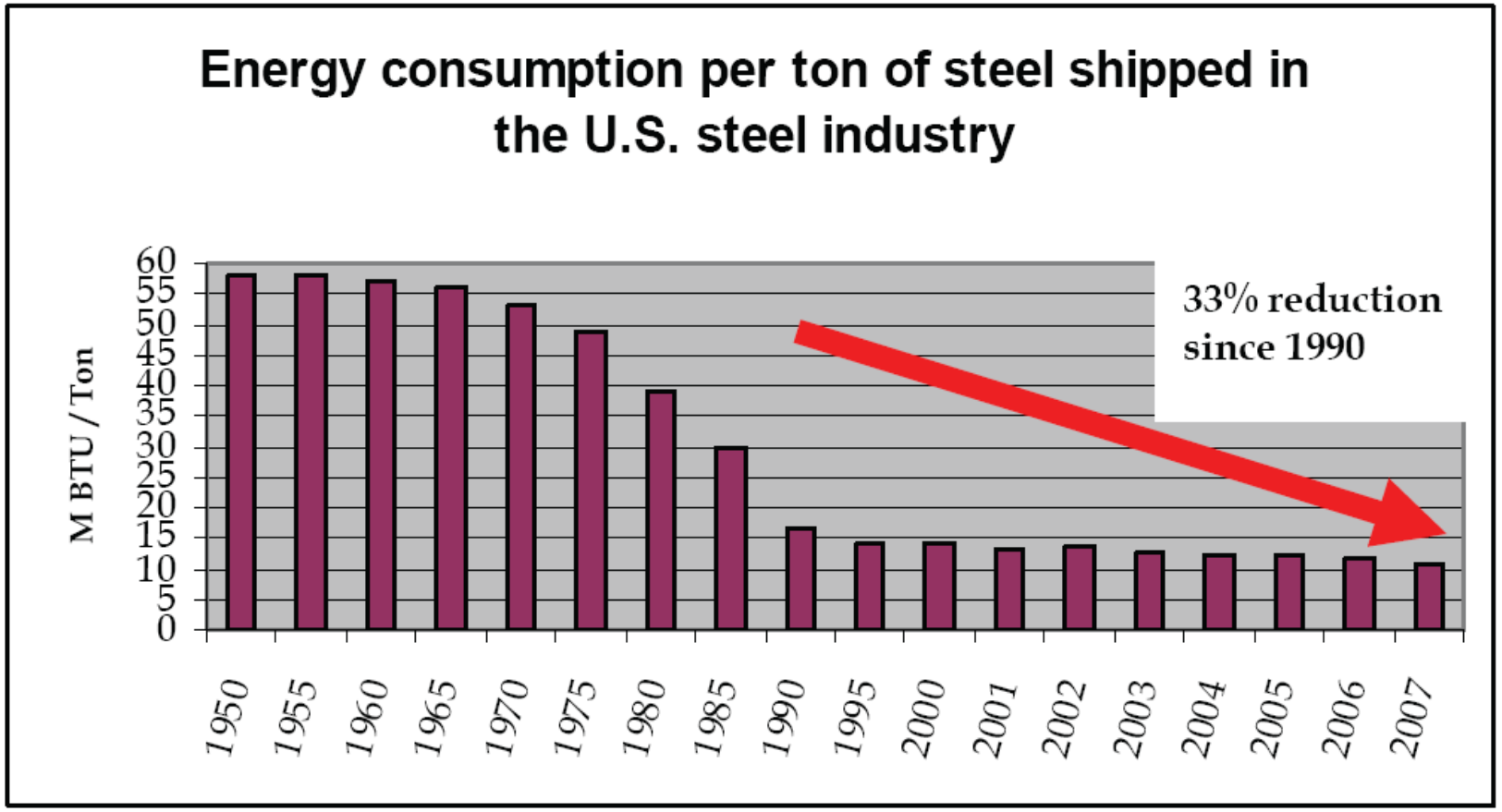
USA Facilities



Measuring Energy Achievements

U.S. Steel Industry – Energy Achievements

33% Reduction in Energy 1990 - 2007



Source: U.S. Department of Energy and AISI

Why Measure Energy Achievements?

- To know where you were, to know where you are and most importantly, to know where you plan to be.
- Helps in holding on to the gains (The Prize).
- To improve understanding what is occurring with energy your consumption.
- Recognize changes (better or worse).
- Brings recognition to the project, the results (The Prize) and the people that made the achievements happen.
- Good way to communicate success… up, down and sideways.

  Success builds Success.
- Benchmark and to share with others.

Measurements and Tracking

They play a major part in a project's success

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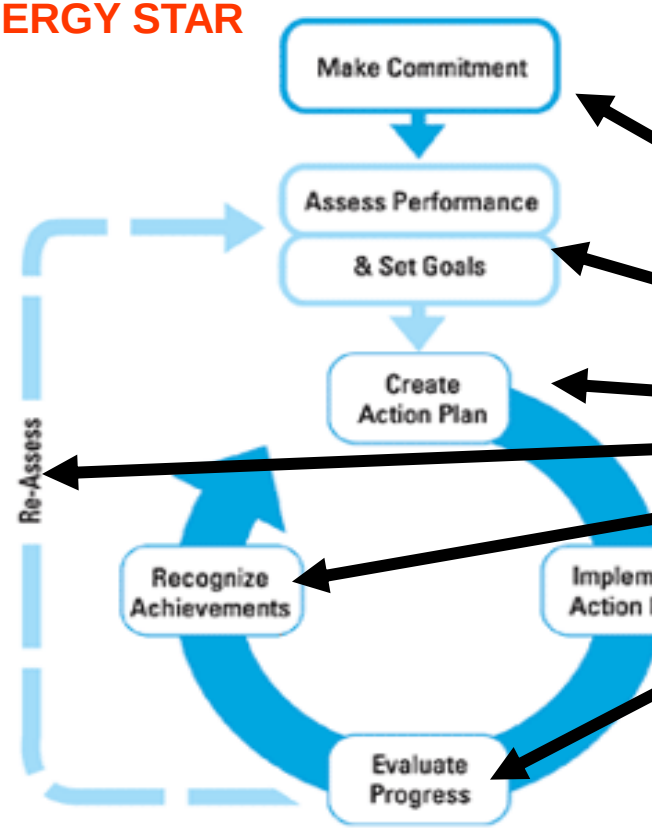
ENERGY STAR



PDCA

DMAIC

Measure, Measure and Measure!

Where do you start to access performance?

- **Attain and Collect data**
  - To be beneficial, data must be complete and accurate. It will be used for project reporting analysis, justification and goal setting.

- **When collecting energy data consider the following**:
  - Determine the correct level of detail that is required.
    The level of data collection will vary from process to process and from organization to organization. Some may need to collect data from submeters on individual processes while others may only need their utility bill.

  - **Take into consideration all energy sources**
    - Account for all energy purchased and self-generated (electricity, gas, steam, waste fuels) in energy units (mMBtu, kwh, Mcf, lbs of steam, etc.) and on a cost basis.
    - Determine and document all energy uses—For the process or organization, energy bills, meter readings, and other use data.
    - Energy data may be gathered from the accounting department, be held centrally in one place, or can be acquired by contacting the appropriate utilities or energy service providers.
      - Obtain as much data as possible. Obtain at least several years of monthly data or at more frequent interval if available. Usually, more good data the better. The most recent data is the most important, but older data can prove to be very valuable!

  - **Need to collect non-energy data** to be able to benchmark and normalize the energy data. It may be necessary to collect non-energy related data for facilities and operations, such as building size, widgets produces, operating hours, tons of product, temperatures, and etc.

Tracking System

Establishing a tracking system will require an investment of people, time and money. However, once the system is in place, usually it will more than pay for itself by highlighting which facilities and processes use the most energy, pointing out areas that have the greatest opportunity for energy savings, and identifying when changes happen to the system that may be either good or bad.

Tracking System

- **Implement a Tracking System**

  A system for tracking energy performance can range from a simple run chart to Excel spreadsheets, control charts, detailed databases and IT systems.

  – **In Developing a Tracking System:**

    - The format of the tracking system will depend on the level and scope of information that will be tracked and the frequency of data collection.

    - Tracking systems must be easy to use and maintain, accurate, reliable, and up-to-date.

    - Tracking systems are an excellent tool to communicate energy performance to other parts of the organization (management and labor) and helps motivate change. Develop a presentation format that expresses energy performance data in ways that are easily understandable across the organization. A good tracking system should make such reporting easy and without explanation! It should be an “elevator speech” in itself!

Where to Start

- If possible, it is best to collect data from submeters.
- At a minimum, collect data by fuel type at process, an individual building or facility level, When an individual project is tracked at too high of a level, it may difficult to see the results because of the noise in the larger system.
- Use actual, not estimated data.
- Use data that is current and timely.
- Frequently gathered data (hourly, daily, weekly) is often much more useful then only an end of the month number.
- Use tracking systems to develop weekly, monthly, quarterly and annual reports that profile energy performance.
- Use tracking systems to allow facilities to benchmark performance to their peers.

Where to start?

- **Attain tracking data**
  - Review energy use and cost data
  - Organize reports and data from tracking and monitoring efforts
  - Determine appropriate data points – hour, day, week, month

- **Begin tracking**
  - Minimum – run chart
  - Track and review data on a regular basis – daily, weekly, monthly
    - Ask yourself, “Why are the results what they are? What are the drivers?”

- **Benchmark**
  - Compare energy performance to baselines (history)
    - Analyze energy efficiency achievements based on your established performance metrics
  - Compare performance against goals
  - Compare performance against like operations

How good is your energy efficiency?
The reason to benchmark!

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- **Benchmark**
  - Benchmarking can be done in many variations ways. The process, department and plant energy performance may be benchmarked to:
    - Similar processes
    - Peer operations – best in class / average performance
    - Current performance versus historical performance.
    - Recognize what losses occur that cannot be controlled … determine the opportunity!
  - Determine the level (equipment, process, facility or organizational) of benchmarking.
  - Conduct comparisons. Understand the differences!

Be aware and adjust for outside influences that can “camouflage” the results?

- **Normalize Data** - know and/ or remove the effect from factors that affect energy consumption in order to accurately understand you energy consumption.
  - The energy consumption of processes and facilities can vary greatly due to factors beyond the energy efficiency of the process, equipment and operations.
  - Determine key factors that need to be normalized to effectively understand the data. Examples of factors:
    - Temperature / Season / Climate
    - Facility size
    - Utilization rates / Hours of Operation
    - Delay rates
    - Productivity / Material changeovers
    - Fuel used – btu value / moisture in fuel
    - Occupancy levels
    - Production mix
    - Changed conditions
- **Determine a corrective variable**
    - Determine a suitable metric that can be used to correct for key normalization factors.

Why Normalizing is Important

Furnace Run Chart

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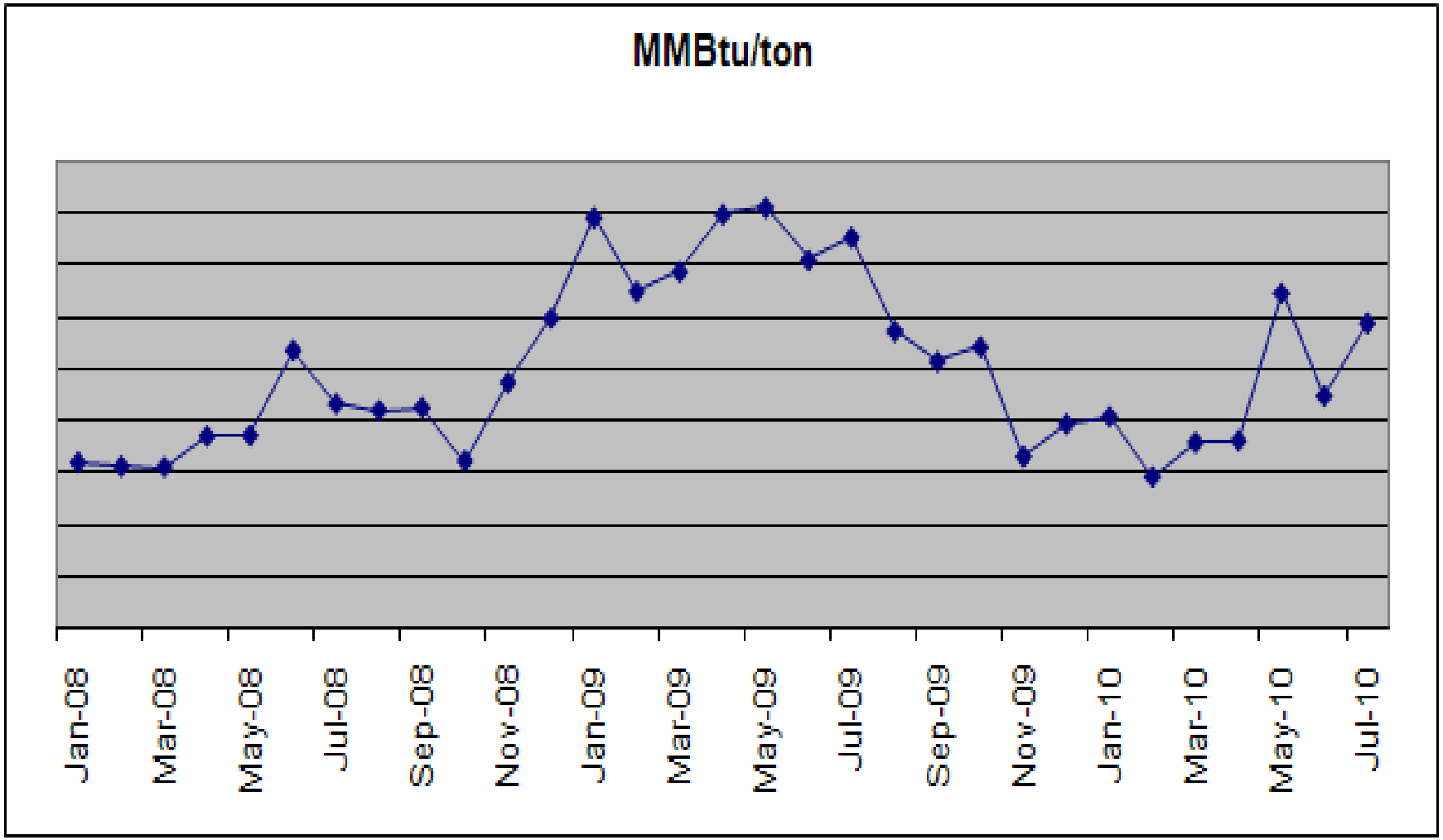
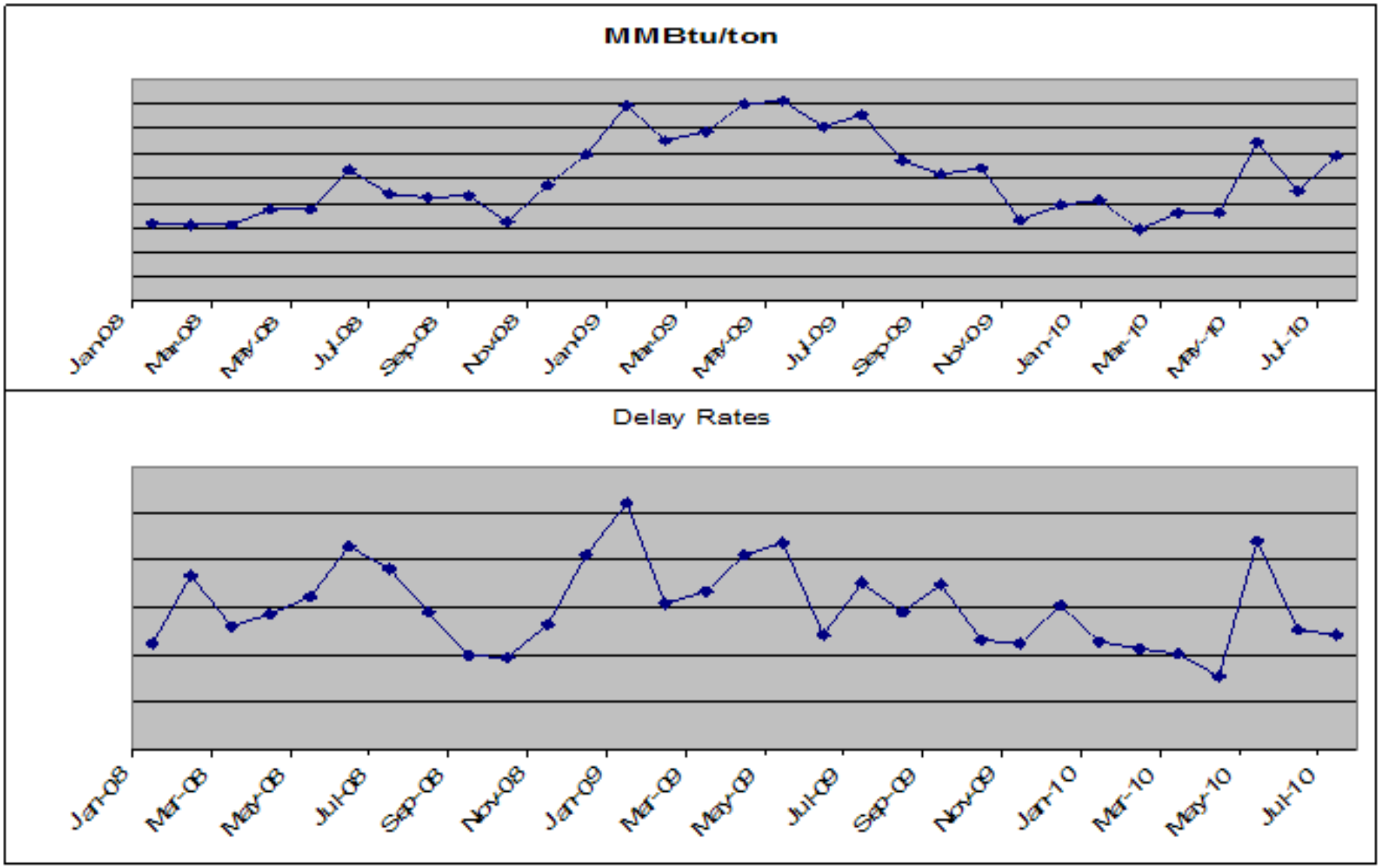


Normalizing
Btu/ton and delay rate



Normalizing
Btu/ton and Volume

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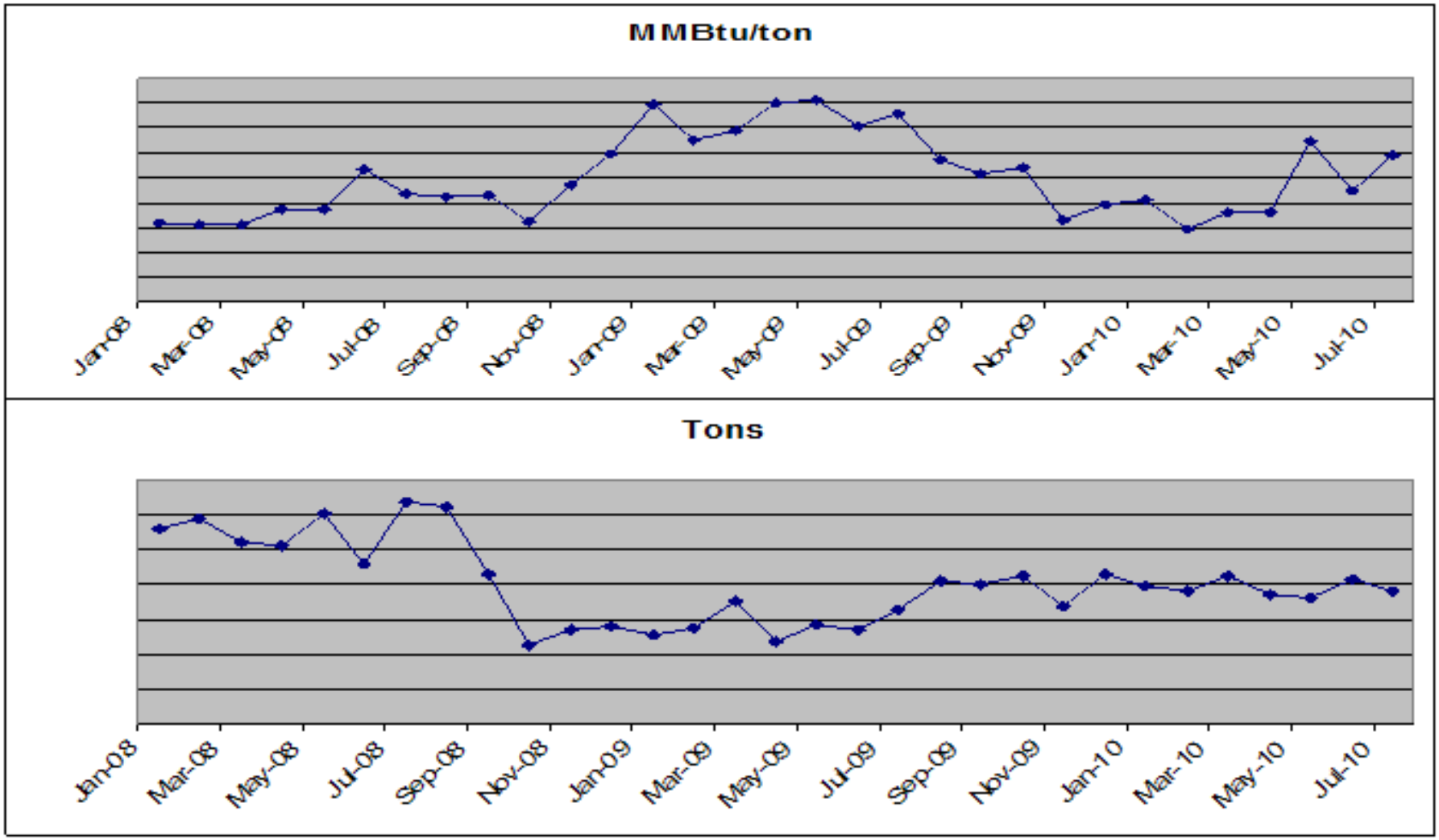
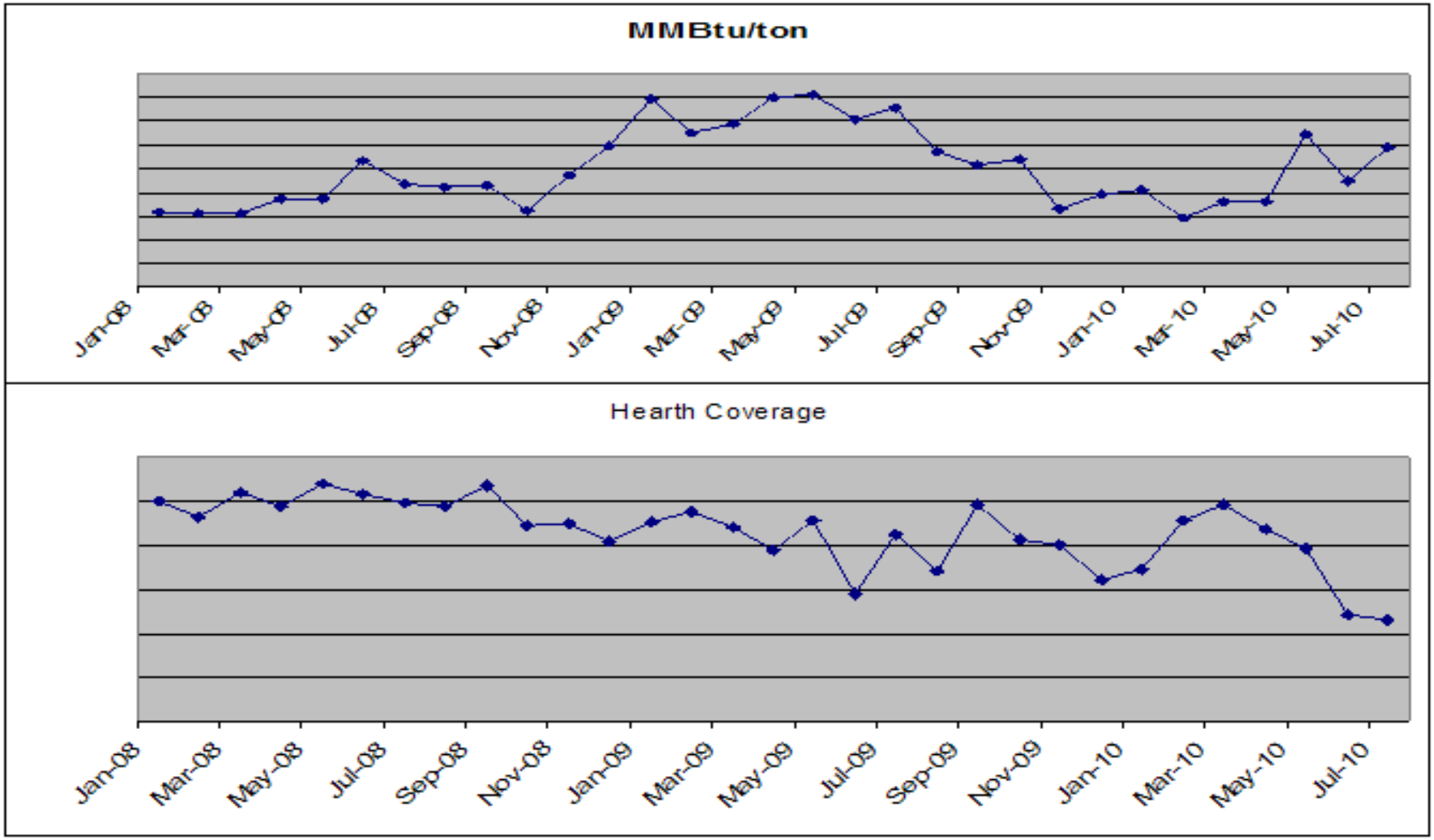
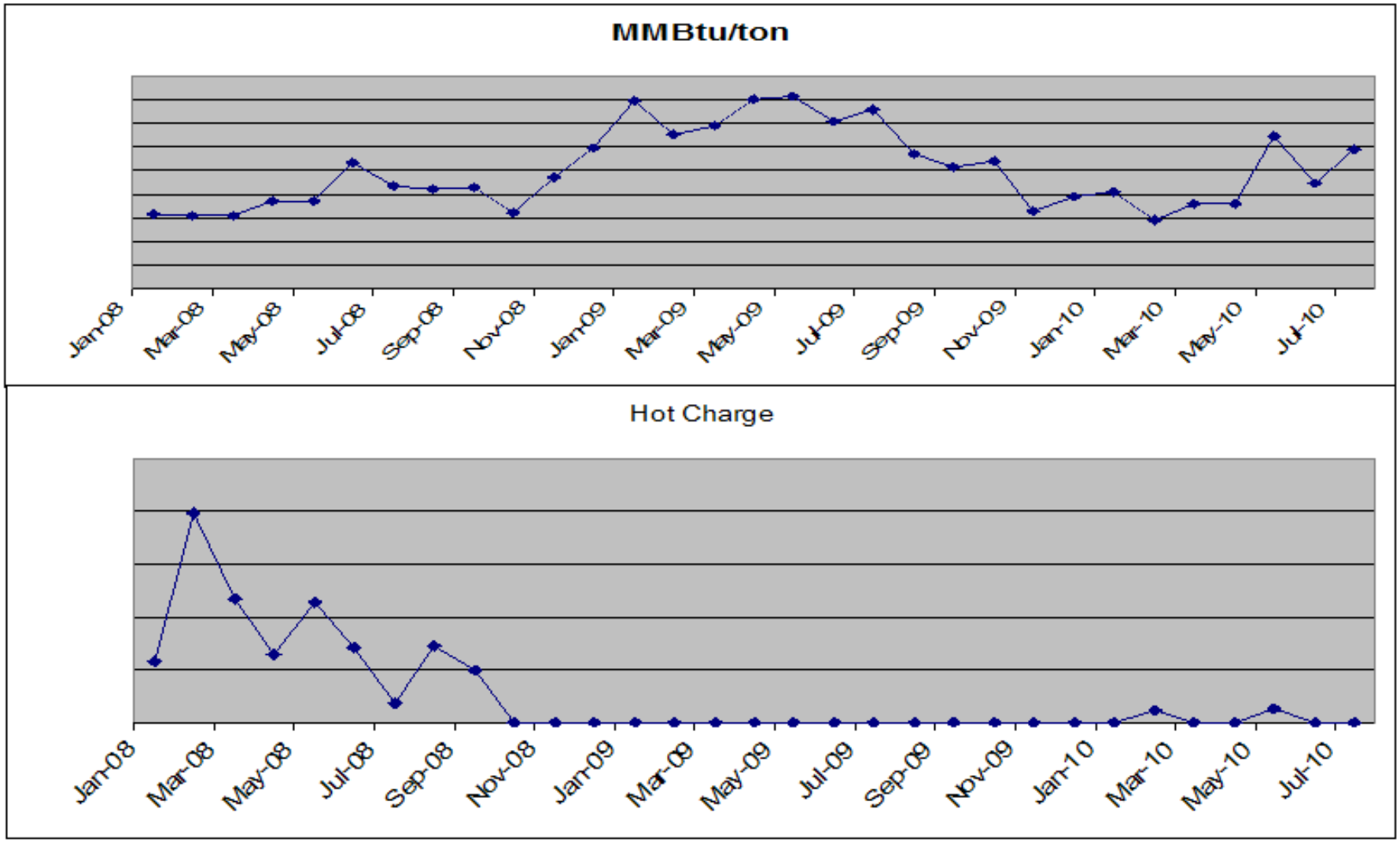


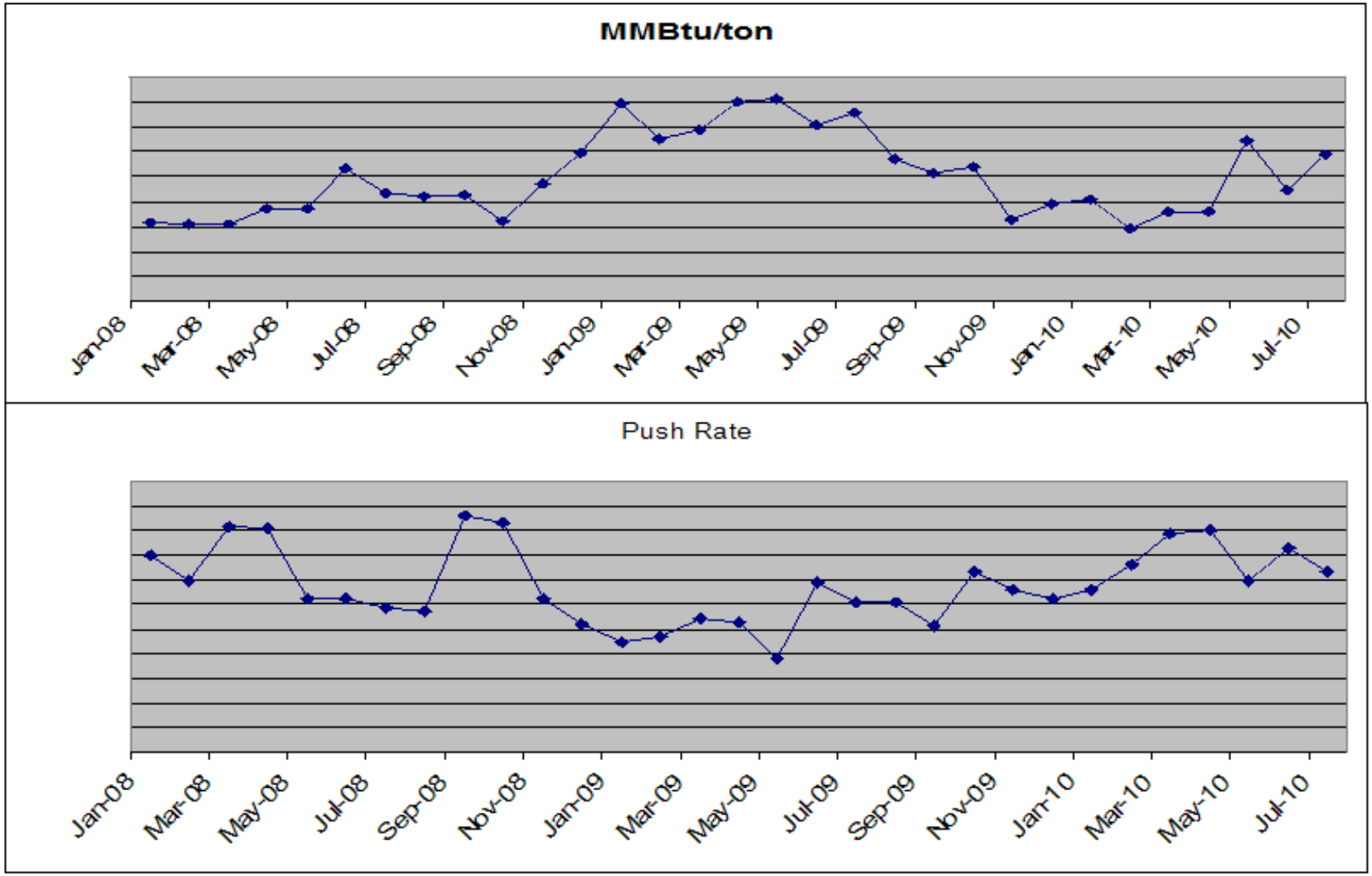
Normalizing Hearth Coverage



Normalizing
Btu/ton and Hot Charge



Push Rate


MMBtu/ton
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10
Push Rate
Jan-08
Mar-08
May-08
Jul-08
Sep-08
Nov-08
Jan-09
Mar-09
May-09
Jul-09
Sep-09
Nov-09
Jan-10
Mar-10
May-10
Jul-10

Btu/ton Normalized

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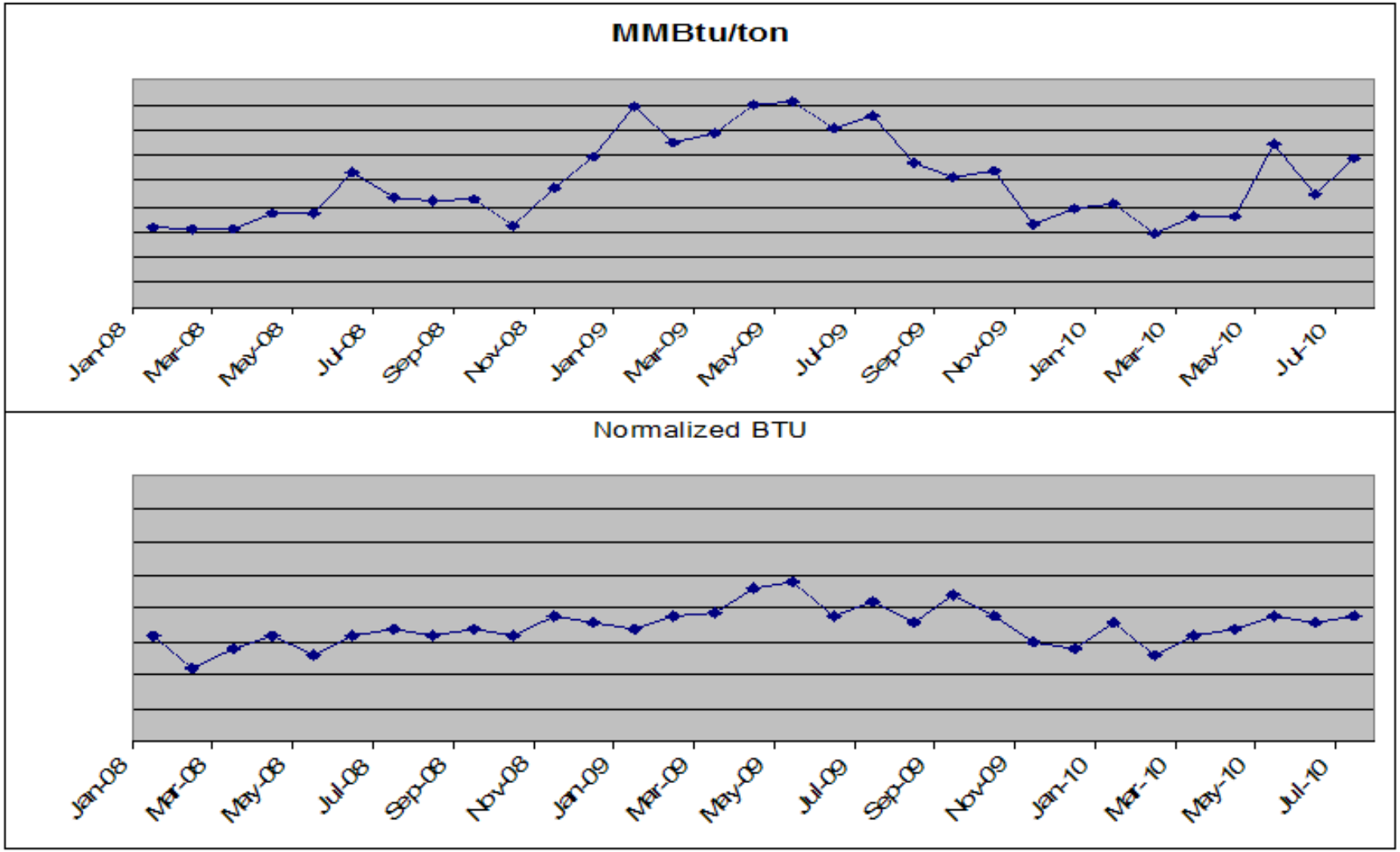

Normalizing
Other

- Furnace Condition (Water Leaks, Refractory)
- Fuel type and calorific value
- Produce Mix

Therefore, you need to know what the chart is telling you and more! It is not easy at times to determine how well an energy improvement really is performing.

Tracking and Charting

Monthly Dashboard

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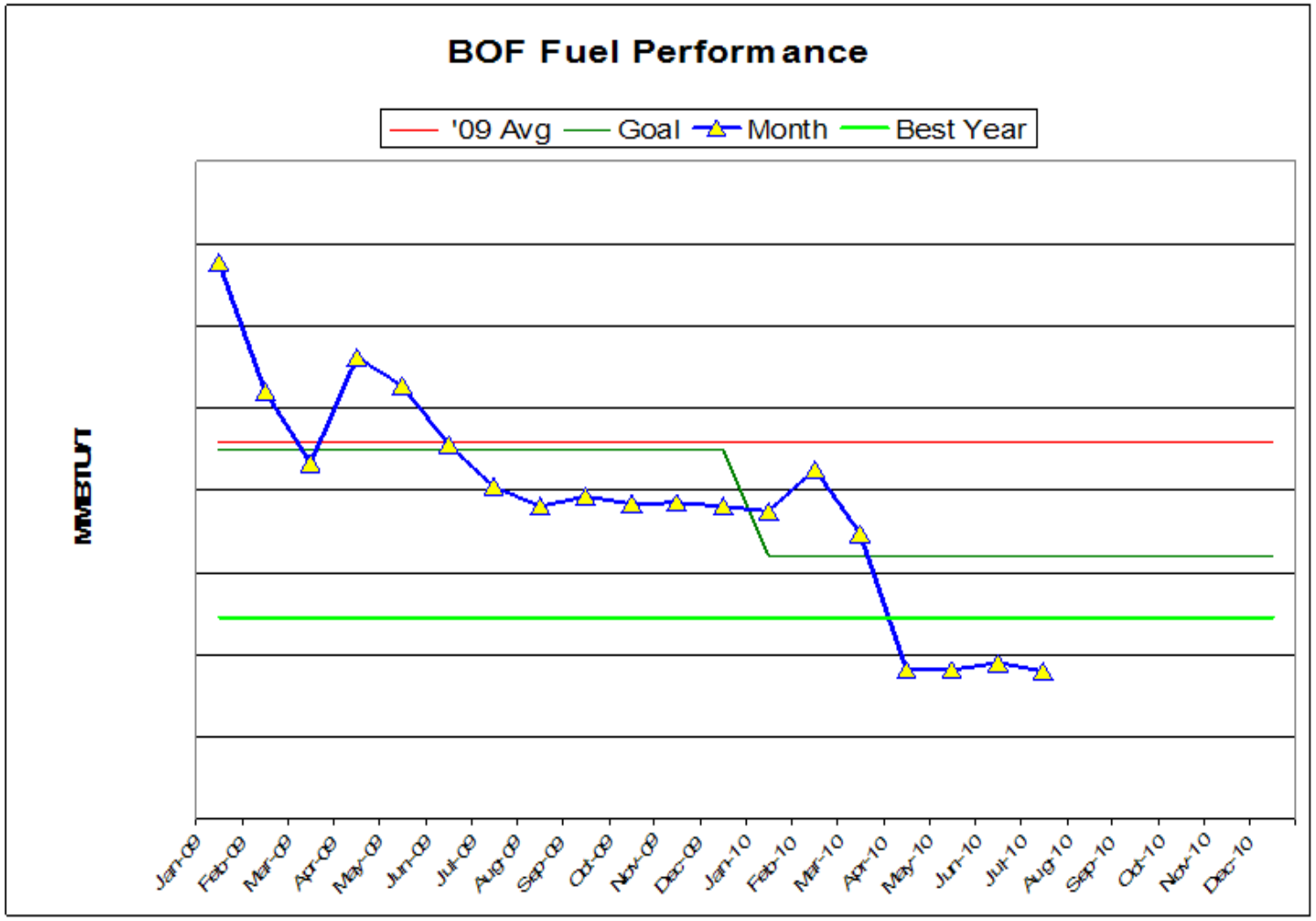
Burns Harbor - Electricity Metrics

Green = attained goal | Yellow =better than prior year | Red = worse than prior year

Division	Facility	Measurement (Production Tons)	2006 Average MWh/t	2007 Average MWh/t	2008 Average mMWh/t	Jan. 2008 Actual MWh/t	Feb. 2008 Actual MWh/t	March 2008 Actual MWh/t	April 2008 Actual MWh/t	May 2008 Actual MWh/t	June 2008 Actual MWh/t	July 2008 Actual MWh/t	Aug. 2008 Actual MWh/t	Sept. 2008 Actual MWh/t	Oct. 2008 Actual MWh/t	Nov. 2008 Actual MWh/t	Dec. 2008 Actual MWh/t
Coke Ovens	1 & 2 Batteries	Coke Produced	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Iron Producing	C & D	Iron Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Sinter Plant	Sinter Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Steel Producing	BOF	Liquid (raw) Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	#1& #2 Casters	Slab Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
160 Plate Mill	Mill	Produced Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Hot Strip Mill	Mill	Produced Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Finishing	Batch Anneal	Produced Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Pickle Line	Produced Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Temper Mill	Produced Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
0.015	Tandem Mill	Produced Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	CHTL	Produced Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	HDGL	Produced Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Powerhouse	Power Station	Steam Produced	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Total	Purchased	BH Shipped Tons	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Run Chart from the Dashboard



Holding on to the Prize!

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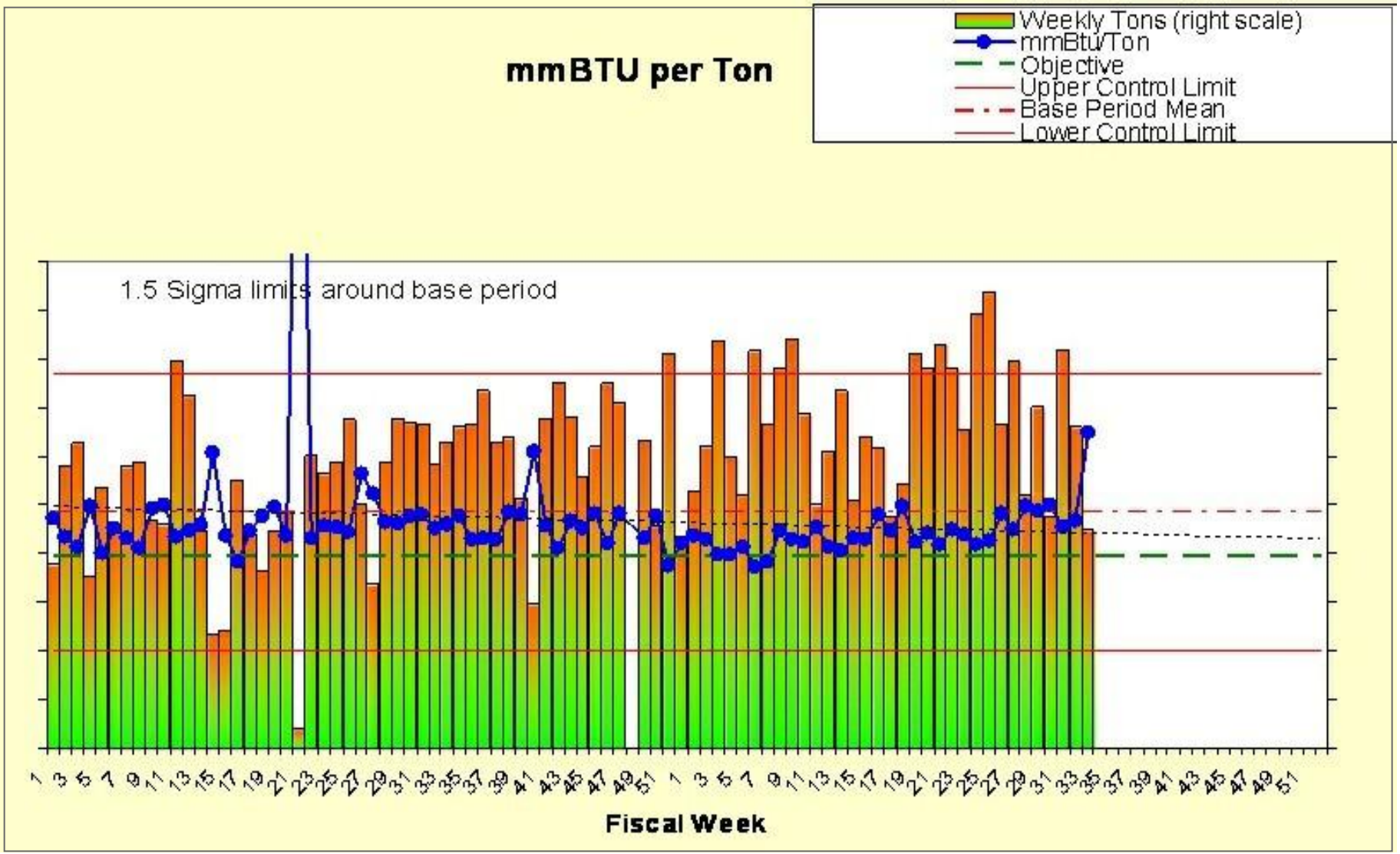

Holding on to the Prize!
Online Statistical Process Control (OSPC)

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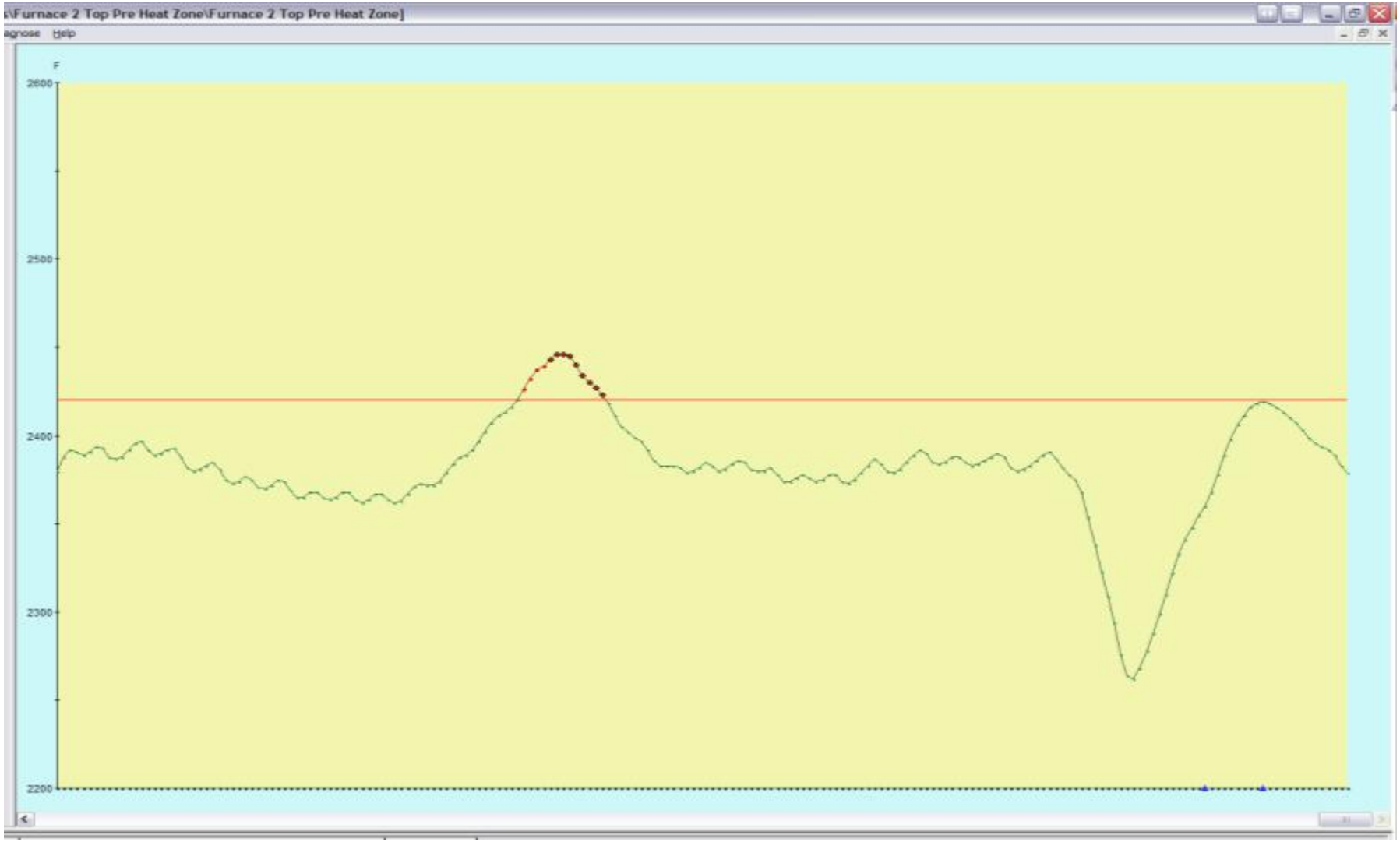

Project Tracking Sheet

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USA Operations Process Improvement Action Plan

Plant Name:		Project Number	Project Manager	Financial Analyst	Expct. Yrly Savings	Project Cost	% Complete	Report Month
Division Name:								
Project Name:					Project Type	Benchmark	Start Date	Completion Date
Objective:								

Global Savings Source:	Base KPI Value	Baseline Period	January KPI Value	2009 KPI Value	Target 2010	Target 2011	KPI Unit	Monthly Savings	YTD Savings
Global Savings Source:	Base KPI Value	Baseline Period	January KPI Value	2009 KPI Value	Target 2010	Target 2011	KPI Unit	Monthly Savings	YTD Savings
Global Savings Source:	Base KPI Value	Baseline Period	January KPI Value	2009 KPI Value	Target 2010	Target 2011	KPI Unit	Monthly Savings	YTD Savings

Action Plan				
Steps	Description	Person Responsible	Target Completion Date	Timing Status

Project Tracking

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ArcelorMittal USA Projects — *Jul 2010*

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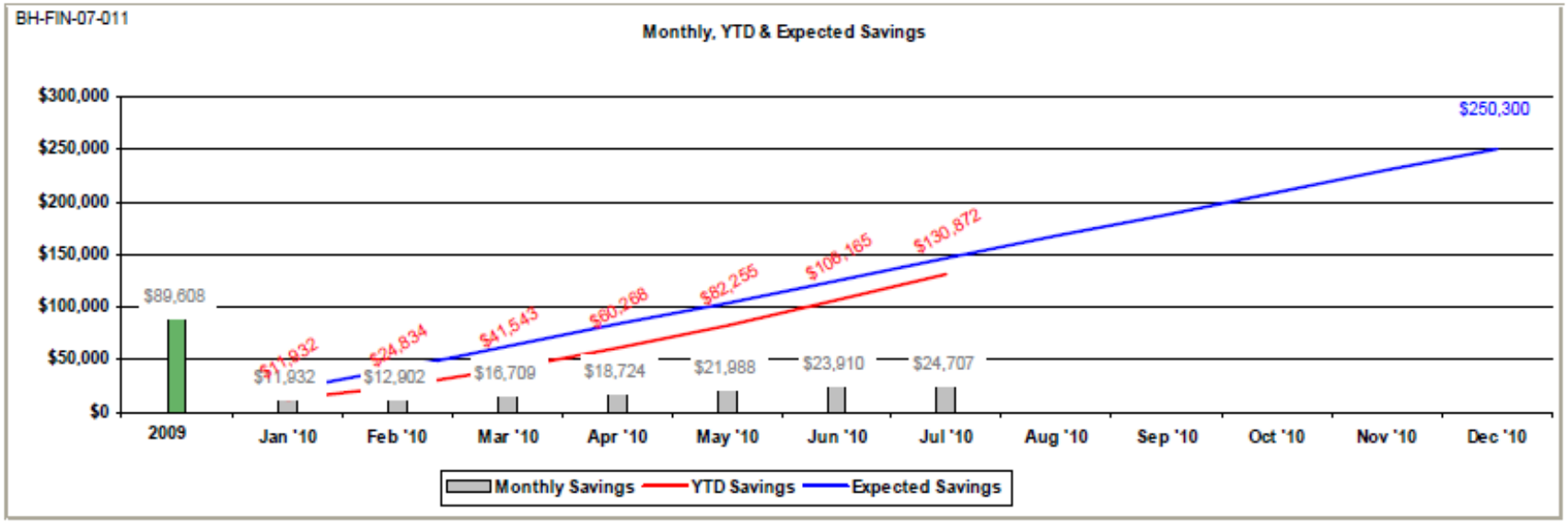
Plant:	Division:	Project Number	Project Manager	Financial Analyst	Expected Yearly Savings	Project Cost	% Complete	Report Month
Burns Harbor	Finishing Mill	BH-FIN-07-011			$250,300	$160,400		Jul 2010

Project Name:	ProjectType	Benchmark	Start Date	Completion Date
Replace the high bay lighting in the shipping bays.			Feb 2008	

Project Objective: Install EE lighting that can be automatically shut down when not needed.

			July	2009	2010	2011		Savings	
Global Savings Source A: Energy	Base KPI Value	Baseline Period	KPI Value	KPI Value	Target	Target	KPI Unit	Monthly	YTD
								$24,707	$130,872
Global Savings Source B:	Base KPI Value	Baseline Period	KPI Value	KPI Value	Target	Target	KPI Unit	Monthly	YTD
Global Savings Source C:	Base KPI Value	Baseline Period	KPI Value	KPI Value	Target	Target	KPI Unit	Monthly	YTD



Project Tracking

ArcelorMittal

ArcelorMittal USA Projects — Jul 2010

ArcelorMittal

Plant:	Project Number	Project Manager	Financial Analyst	Expected Yearly Savings	Project Cost	% Complete	Report Month
Burns Harbor							
Division: Finishing Mill	BH-FIN-07-011			$250,300	$160,400		Jul 2010
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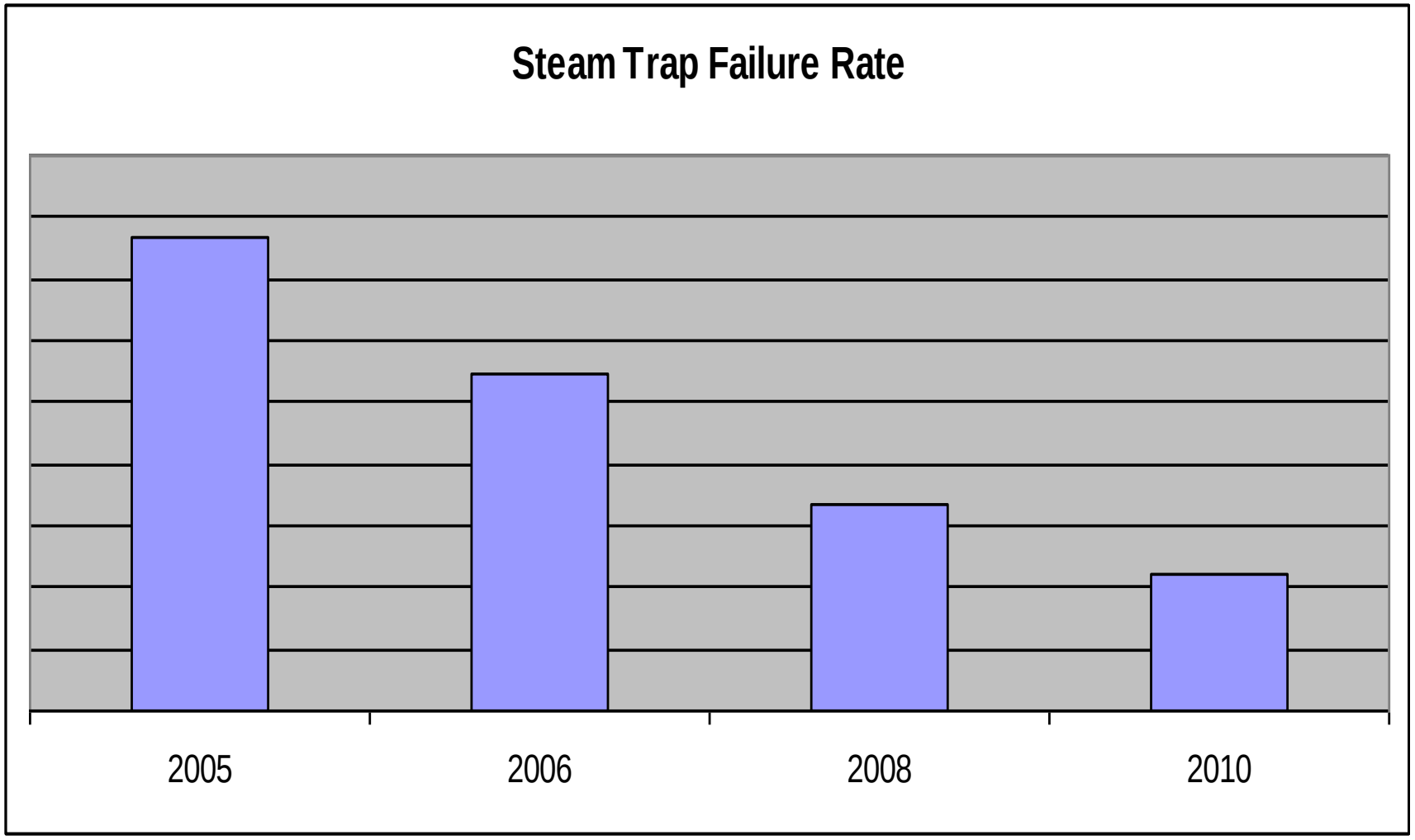
									$24,707	$130,872
Global Savings Source B:		Base KPI Value	Baseline Period	KPI Value	KPI Value	Target	Target	KPI Unit	Monthly	YTD
Global Savings Source C:		Base KPI Value	Baseline Period	KPI Value	KPI Value	Target	Target	KPI Unit	Monthly	YTD

Step	Description	Person Responsible	Completion Date	Timing Status
Replace Lighting in #3 Shipping	Replace Lighting in #3 Shipping and Install Automatic Shut Down Controls		Apr 2008	Completed
Replace Lighting in #4 Shipping	Replace Lighting in #4 Shipping and Install Automatic Shut Down Controls		Dec 2009	Completed
Replace Lighting in #1 Shipping	Replace Lighting in #1 Shipping and Install Automatic Shut Down Controls		Jul 2010	Completed
Replace Lighting in #2 Shipping	Replace Lighting in #2 Shipping and Install Automatic Shut Down Controls		Apr 2010	Completed

Steam Trap Failure Rate



A Few Common Mistakes That We Made

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- Not tracking back far enough in history
- Not tracking the right data
- Bad Data
- Not drilling down to the process level
- Data/ Charts not reviewed frequent enough
- Not asking, “What is the data showing us”
- Not fully understanding what can affect the data

Questions?

THANK YOU!

Next Seminar in the Series

- **October 13**, 2010
- **2:00 p.m.** Eastern
- **Communicating Accomplishments**
- Guest Speaker from Raytheon
- Please **register**

Feedback

- **Welcome** comments regarding Seminar Series
- Seminars are **your sessions**
- Make seminars **meaningful** for you
- Feedback aids **continuous improvement**
- Send **comments to** Lindsay Bixby at: lbixby@bcs-hq.com

Your Implementation Case Studies

- Let DOE help you **CELEBRATE**
- Highlight **Accomplishments in Implementation**
- **Recognize** your team's efforts