Michelin North America

Energy Management

Presented By Brad Ikenberry, PE – Energy Manager

MICHELIN
A better way forward

Agenda

- Introduction
- Energy Management
  - Energy cost and breakdown
  - Environmental Footprint
  - Goals
  - Strategy
  - Site projects
  - Results

MICHELIN
A better way forward

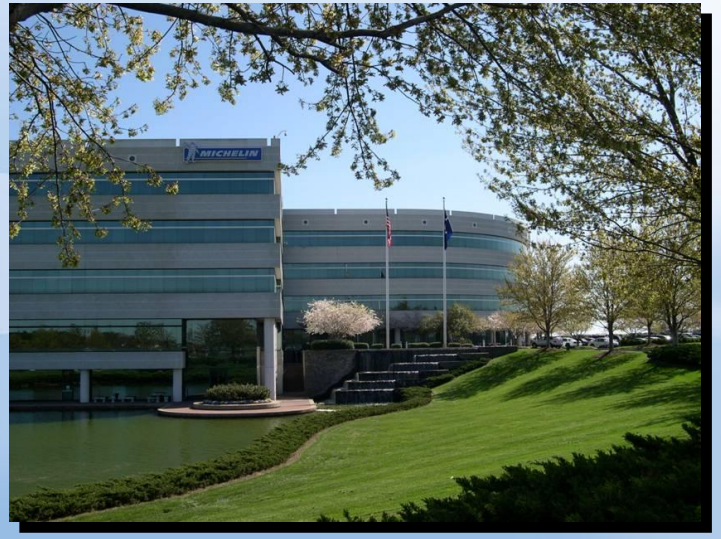
An Introduction to Michelin North America

- Sales in North America since the early 1900s
- 1971: manufacturing begins in Canada
- 1975: first U.S. plant
- 2002: manufacturing facility in Mexico

MICHELIN
A better way forward

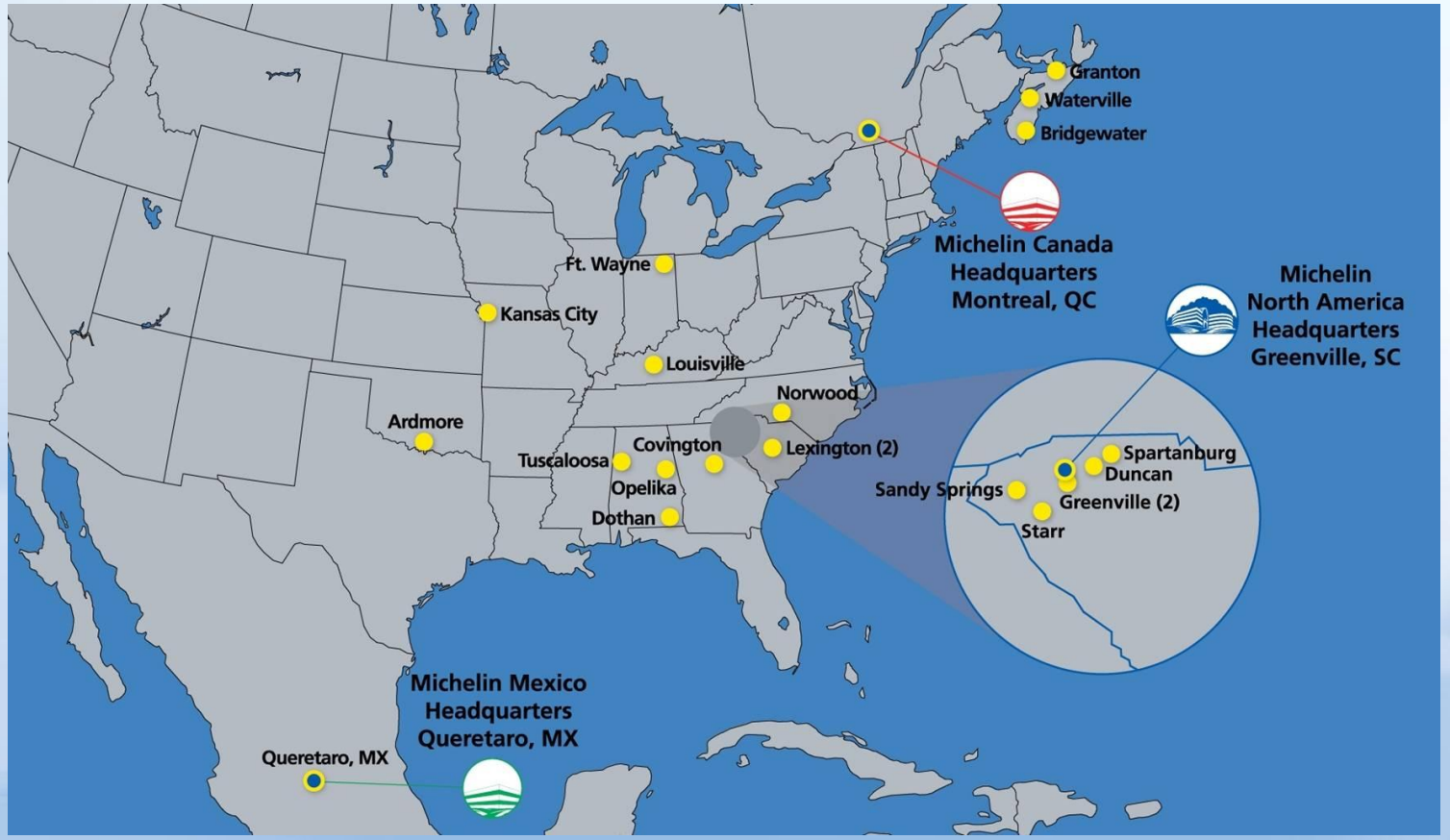
Where We're Located

- Headquartered in Greenville, SC
- R&D center in Greenville, S.C.
- Test track facilities in Laurens, S.C.
- More than
  22,000 employees

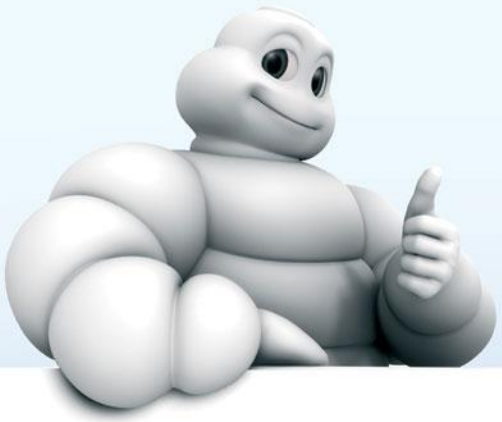


MICHELIN
A better way forward

19 Plants in Canada, U.S. and Mexico



MICHELIN
A better way forward

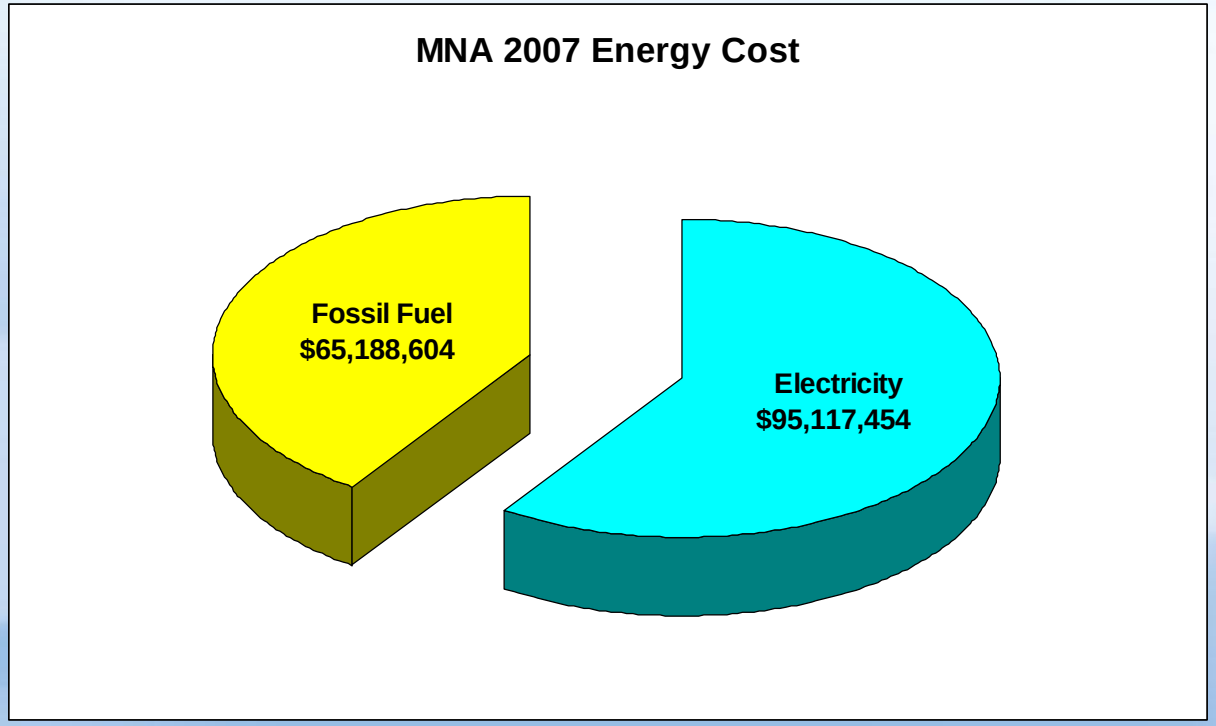


MNA Energy Management

MICHELIN
A better way forward

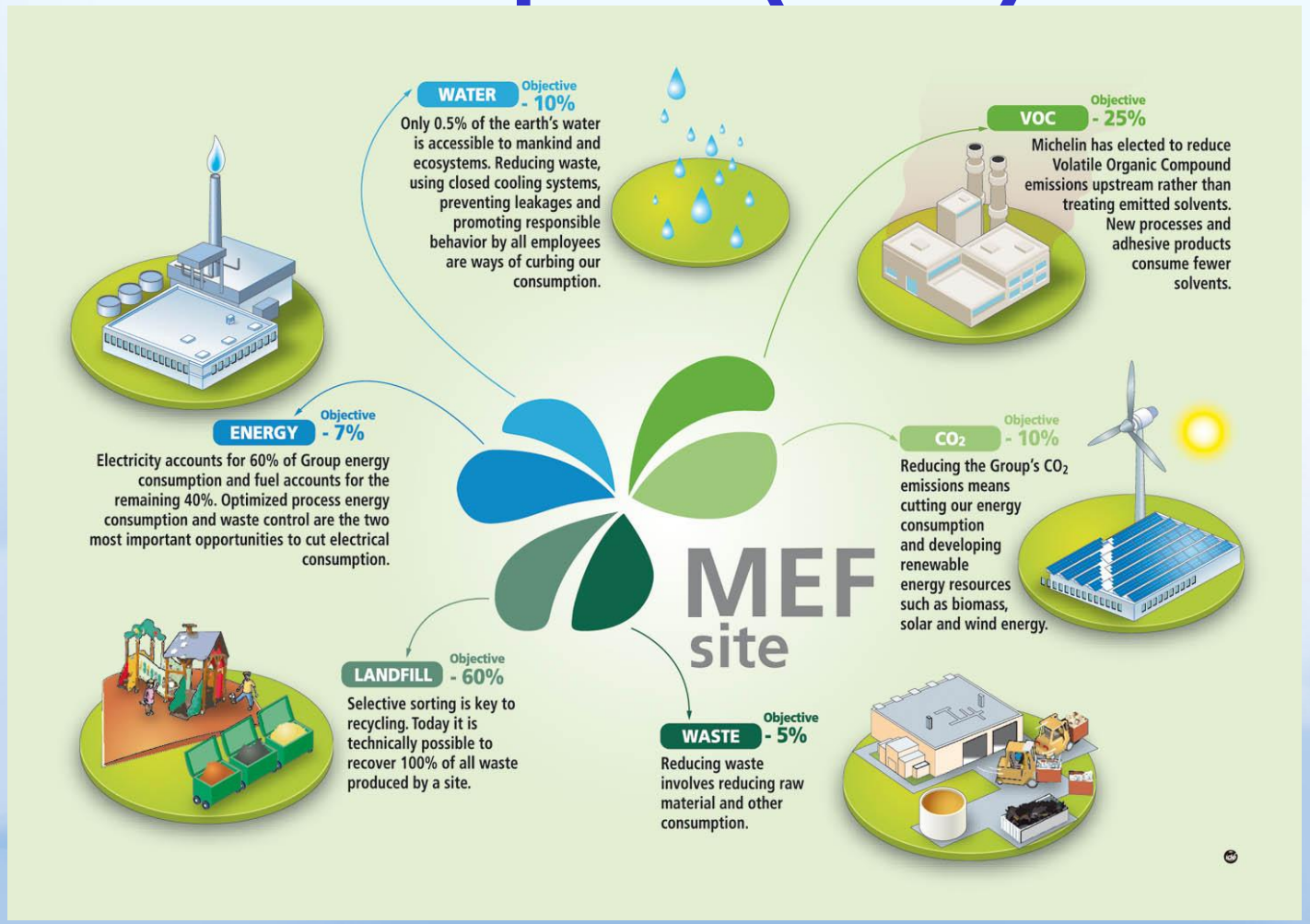
Energy Cost and Breakdown

MNA spends approximately $160 million on energy annually.



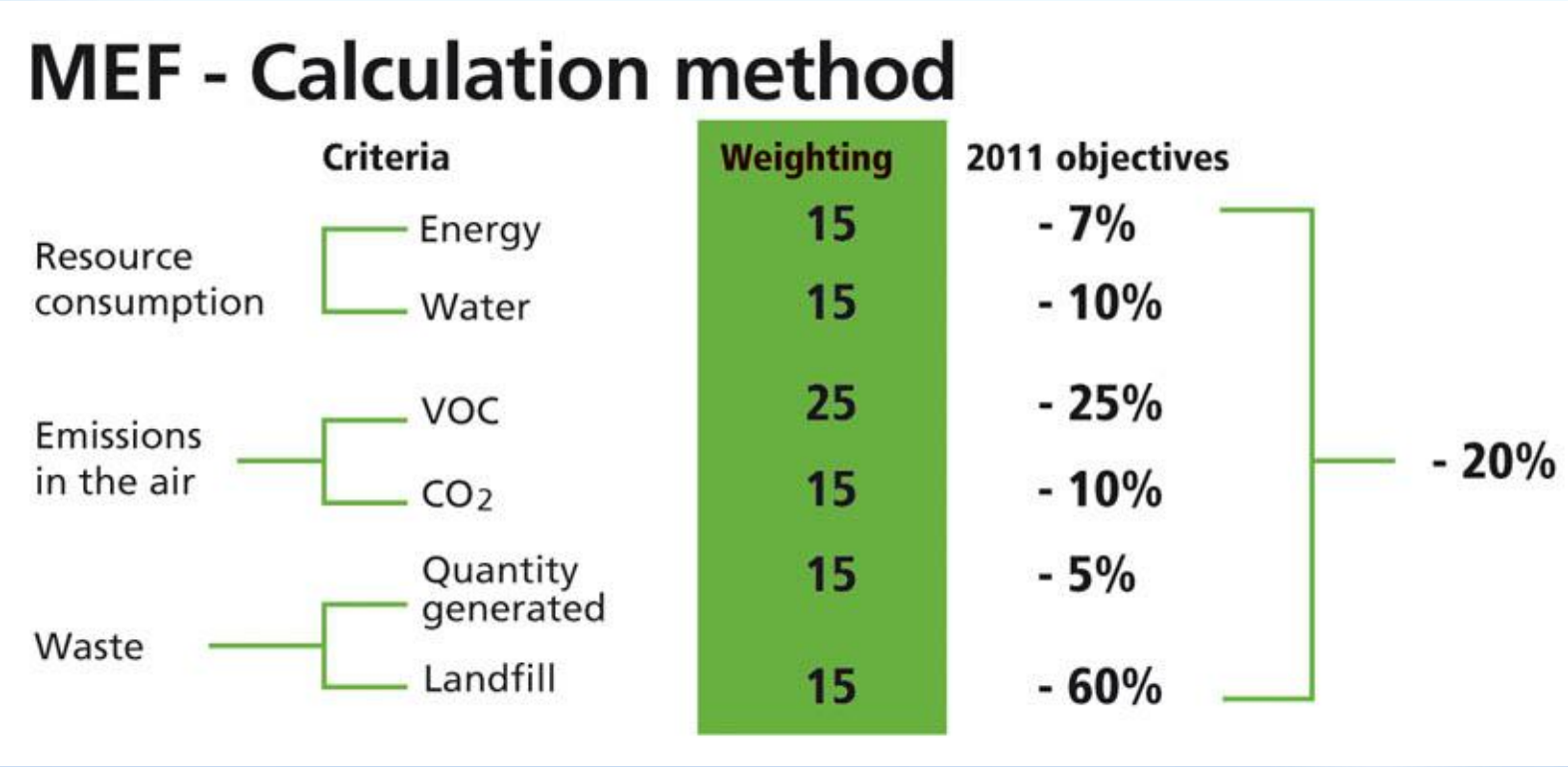
MICHELIN
A better way forward

Michelin Environmental Footprint (MEF)



MICHELIN
A better way forward

MEF Reduction Targets



- Initial MEF Reduction Target -20% by 2011
  - New Reduction Target – 30% by 2013
- Energy Reduction Target -7% by 2011

MICHELIN
A better way forward

MMW ➔ Energy Management

- Current Energy Mgmt Strategy evolved from Michelin Manufacturing Way (MMW) principals.
- Launched in February 2004, the MMW approach is based on a simple idea: focusing on best practices which we are already applying.
- Michelin Manufacturing Way aims to identify the best industrial practices in all areas and to help sites to implement them in a consistent and sustainable way.

MICHELIN
A better way forward

Energy Management Strategy

- Develop / train Energy Zone Managers group wide
- Conduct Energy Diagnostics in each plant over a two year period.
- Develop Energy Action Plans
- Develop / train Plant Energy Managers
- Develop cross functional Plant Energy Teams
- Implement a MNA Energy Best Practices Self Diagnostic
- Create a Central Energy Data Management System to facilitate internal benchmarking

MICHELIN
A better way forward

Energy Diagnostics

- Internal energy audit focused on identifying both energy best practices and energy reduction opportunities
  - Procurement (energy contracts)
  - Conversion (powerhouse and utility equipment)
  - Consumption (plant energy users)
- Energy Action Plans
  - Owned by the Plant Energy Teams
  - Sustainability plan for each action item
- Diagnostic completed every 3 years

MICHELIN
A better way forward

Energy Action Plan Example

MMW Energy Diagnostic Action Plan - Summary

Plant Name:	**OPELIKA**	**Date Follow Up Visit Scheduled:**	**Oct-08**
Date Diagnostic Completed:	**August 21, 2006**		
Date Last Revised:	**7/1/2008**		

Item #	Subject	Action Item Description	Objective	Savings ($ / yr)	Cost ($)	ROI (yrs)	Project (Cap / Exp)	Target Completion
1	Fossil Fuel Savings	Decrease the number of presses maintained hot when not used-shutdown lines NIU.	Reduce electrical power and fossil fuel consumption by isolation of rows not presently in use	$400,000	$1,000	0.0	Expense	Jan-07
2	Fossil Fuel Savings	Implement a comprehensive steam trap maintenance program	Reduce generation of steam and use of water by recovering condensate from operations	$80,000	$60,000	0.8	Expense	Mar-07
3	Fossil Fuel Savings	Repair steam leaks and engage the users in maintaining repairs	Reduce generation of steam and use of water by reducing losses from leaks	$200,000	$175,000	0.9	Expense	Dec-07
4	Electrical Power Savings	Reduce compressed air leakage to 30 % and reduce plant air pressure to 87 psi at Phse. Engage the end users in maintaining repairs	Reduce electrical power use running compressors	$243,000	$240,000	1.0	Expense	Dec-07
5	Fossil Fuel Savings	Optimize blow down recovery and vent recovery in the Powerhouse	Improve efficiency of powerhouse operations with use of energy recovery methods	$50,000	$12,000	0.2	Expense	Jan-07
6	Electrical Power Savings	Turn off energy when not needed-modify setpoints in chilled areas and warehouse	Reduce power usage and fossil fuel use with setpoint adjustments	$30,000	$3,000	0.1	Expense	Jan-07
7	Fossil Fuel Savings	Shutdown steam/utilities to the entire facility during extended shutdowns	Fossil fuel and electrical power reductions	$15,000	$1,000	0.1	Expense	Apr-07
8	Fossil Fuel Savings	Install vent recovery for 800-850 rows of Curing condensate return system	Reduce steam generation, water use and fossil fuel use providing utilities to Curing	$20,000	$20,000	1.0	Capital	Jan-07
9	Fossil Fuel Savings	Eliminate condensate tank overflow/ replace non working condensate stations (4 untis)	Improve safety conditions,reduce water use, fossil fuel consumption used in generating steam	$40,000	$40,000	1.0	Capital	Jan-07
11	Fossil Fuel Savings	Shutdown one hot room for prewarming rubber.	Reduce steam generation, water use and fossil fuel use providing heat to the hot house.	$10,000	$1,000	0.1	Expense	Jan-07
			Totals	**$1,088,000**	**$553,000**			
			Energy Diagnostic Opportunities Under Investigation					
12	Electrical Power Savings	Install a master control system for compressor operations to optimize efficiency	Allow unloading of compressors with the use of a master controller therby saving electrical power	$40,000	$30,000	0.8	Capital	Dec-07
13	Energy Savings	Establish an energy reduction team for plantwide savings generation	Move energy monitoring to a lower level in plant operations thereby increasing savings	TBI				Jan-07

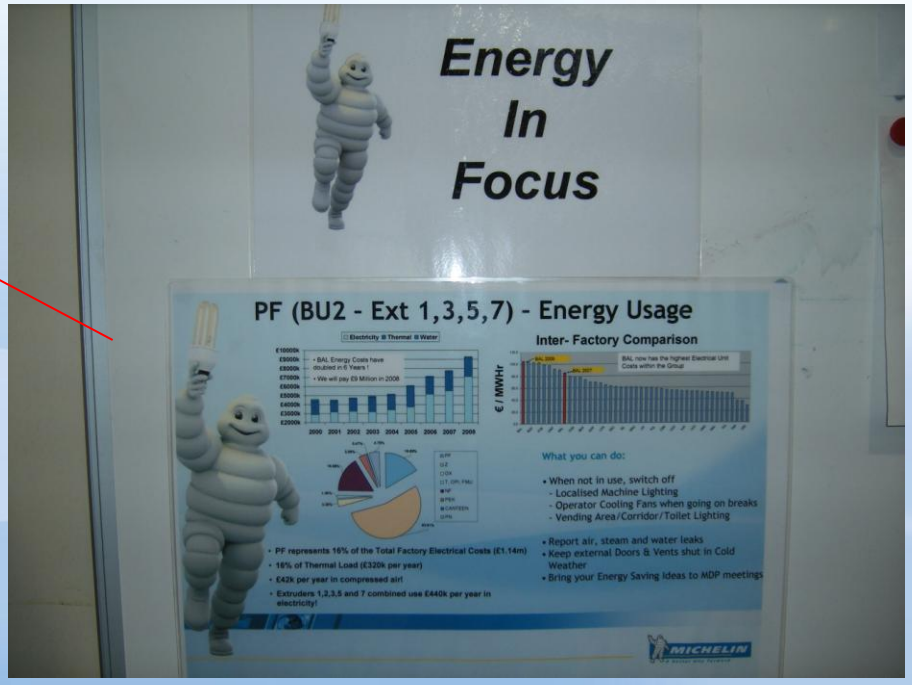
MICHELIN
A better way forward

Plant Energy Teams

- Supported by the Plant Leadership
- Led by the Plant Energy Manager
  - Typically the Powerhouse Manager
- Teams consist of members from a good cross section of the different plant production, utility and engineering areas
  - It is critical to get the Energy Users engaged
- Team Focus is on the action plans, tracking and trending key energy indicators and energy awareness communication

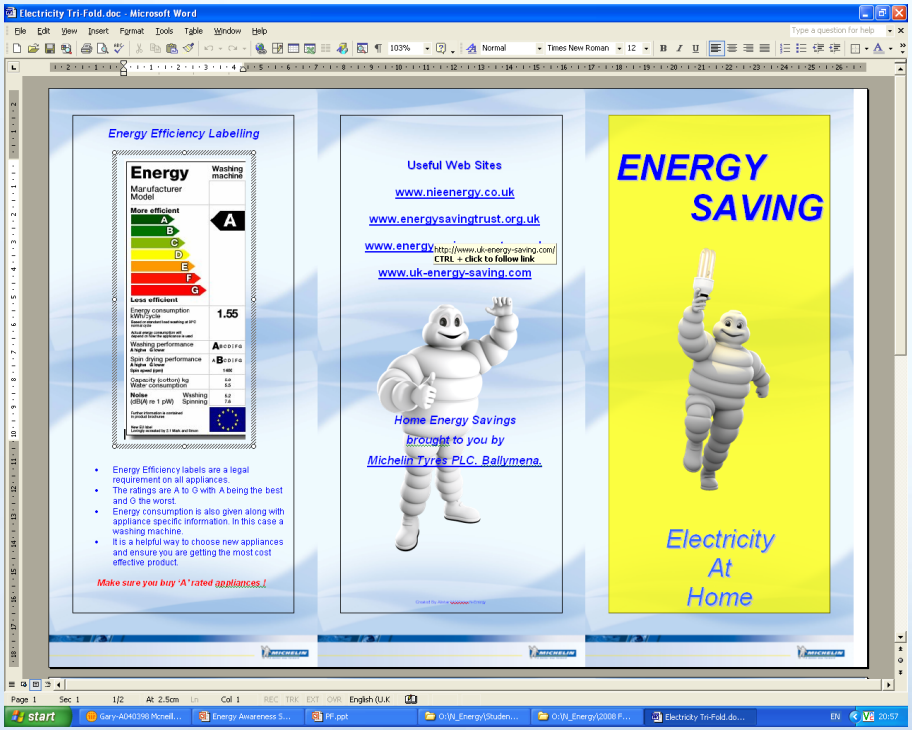
MICHELIN
A better way forward

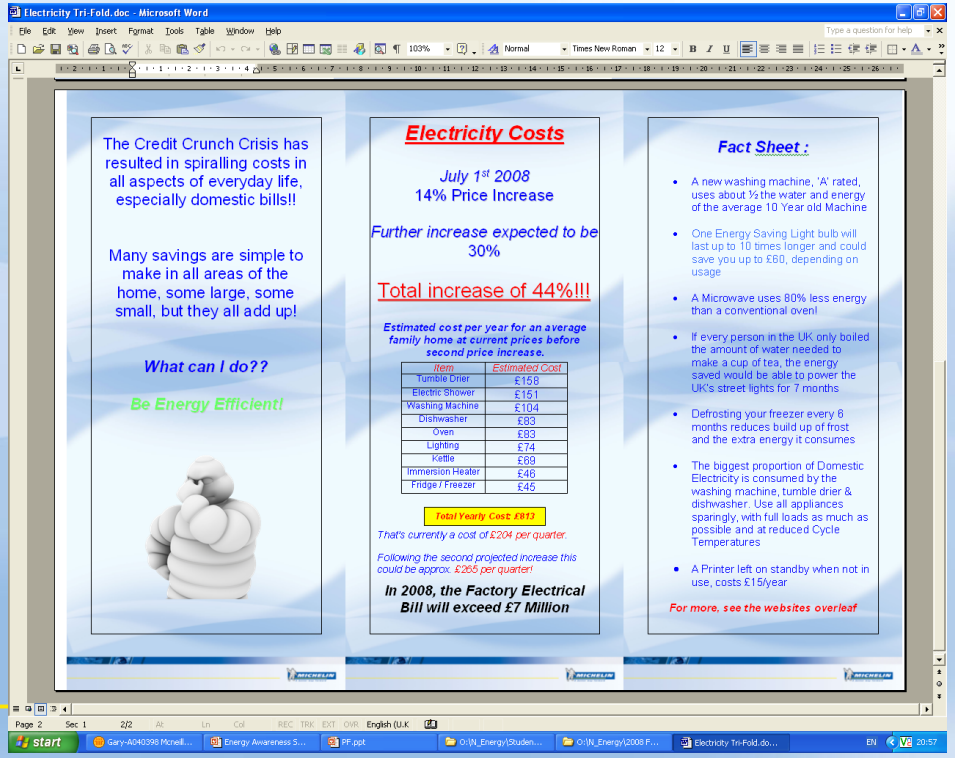
Energy Awareness Communication



MICHELIN
A better way forward

Employee Handout





US3 Air Consumption Indicator

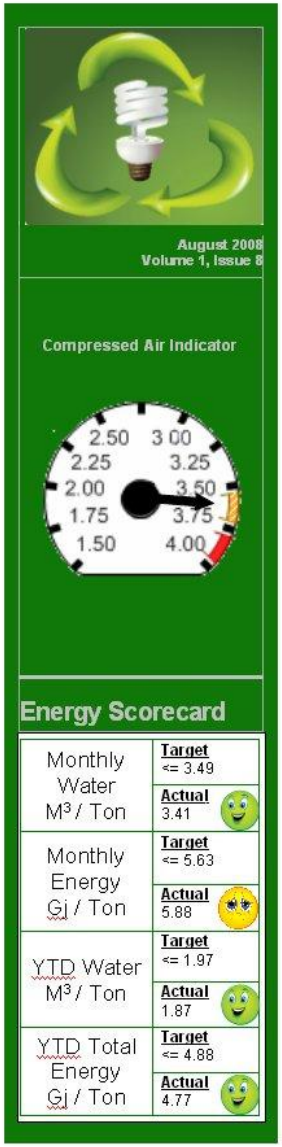
Compressed Air Indicator

Located on US3 Intranet homepage to allow all shops to place priority on repairing air leaks.

MICHELIN
A better way forward

US3 Energy Team

- Chartered by a Plant Progress Team with reporting to UOT.
- Comprised of members from all areas of the facility.
- Monthly newsletter posted at all MdP stations.



August 2008
Volume 1, Issue 8

Compressed Air Indicator

Energy Scorecard

Monthly Water M^3 / Ton	Target	<= 3.49
	Actual	3.41
Monthly Energy Gj / Ton	Target	<= 5.63
	Actual	5.88
YTD Water M^3 / Ton	Target	<= 1.97
	Actual	1.87
YTD Total Energy Gj / Ton	Target	<= 4.88
	Actual	4.77

US3 Energy News

Scorecard Review

We did not meet our July objective for energy use due to the extended shutdown. The base load of the facility for lighting, air conditioning and compressed air was too great to overcome with the loss of production tonnage during the month.

This is an indicator that we all need to focus on reducing the base load of our facility so we can be more cost effective during our market driven turndowns.

The good news is that we are still on target for the yearly energy indicator!

Project Update

Energy Efficient Lighting Project

The energy efficient lighting project replaces the current metal halide lighting fixtures with T5 type fluorescent fixtures. These new energy efficient lighting fixtures will reduce the lighting load for the facility. This is important because lighting is one of the largest base load contributors that we need to minimize. This will make US3 better able to compete in the global business environment. We would like to thank everyone for their continued support during the deployment of this major energy project for US3.

Moving Forward

There are currently several renewable energy or energy conservation projects being studied here at US3. Here's a little about each:

- Adsorption chilled air handler – Replacing existing air handler with adsorption type unit that provides cooled air and dehumidification using heat recovered from the curing vent recovery system.
- LED replacement outdoor lighting – New energy efficient LED bulbs for all outdoor parking lot and street lighting. 250W LED replacement consumes only 28W of energy!
- Solar water heating – Solar water heating to supplement electrical water heating at wellness center and several areas inside facility.

Your Participation

If you are interested in participating on the energy team or have ideas, please share these with one of the energy team members in your area.

Energy Team Members:
Dan Bruinsma, Rex Bryant, Hilay Gami, Chris Groomes, Brad Ikenberry, John Jackson, Casey Johnson, Greg Jolley, Danny McCullah, Ed Powell, Shawn Wagoner

Energy Savings Ideas

- Use energy efficient appliances and electronics with Energy Star® rating.
- Convert incandescent lighting to CFL (Compact Fluorescent Lamp).

MICHELIN

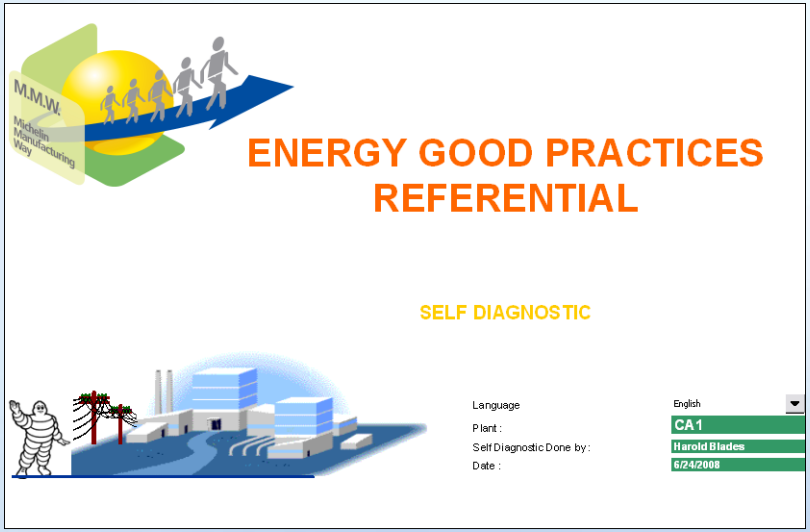
MICHELIN
A better way forward

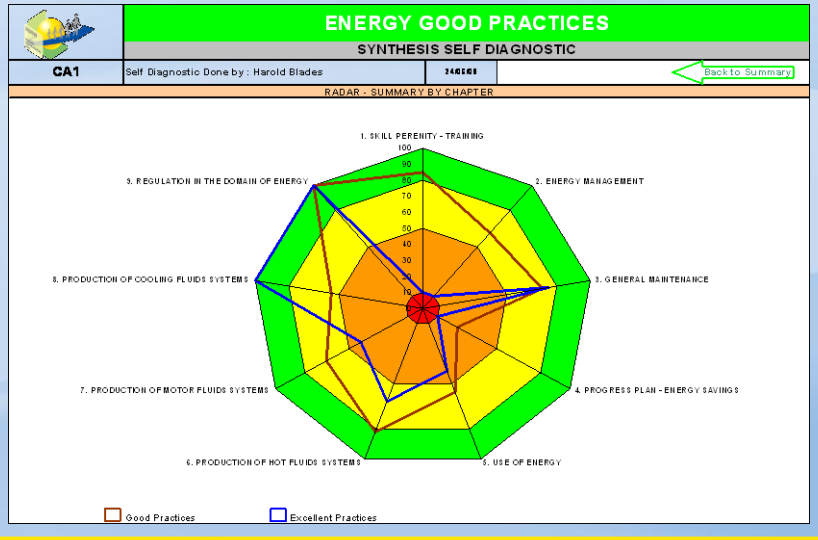
Energy Best Practices Self Diagnostic

- Developed from both internal best practices and industry standards
- Plants score themselves in nine critical areas related to Energy and Utilities Management
  - Training, Energy Management, General Maintenance, Progress Plan, Use of Energy, Production of Hot Fluid Systems, Production of Motor Fluid Systems, Production of Cooling Fluid Systems, and Regulation in the Energy Domain.
- Results used to develop focus areas for next Energy Diagnostic

MICHELIN
A better way forward

Energy self diagnostic





ENERGY GOOD PRACTICES

2. ENERGY MANAGEMENT

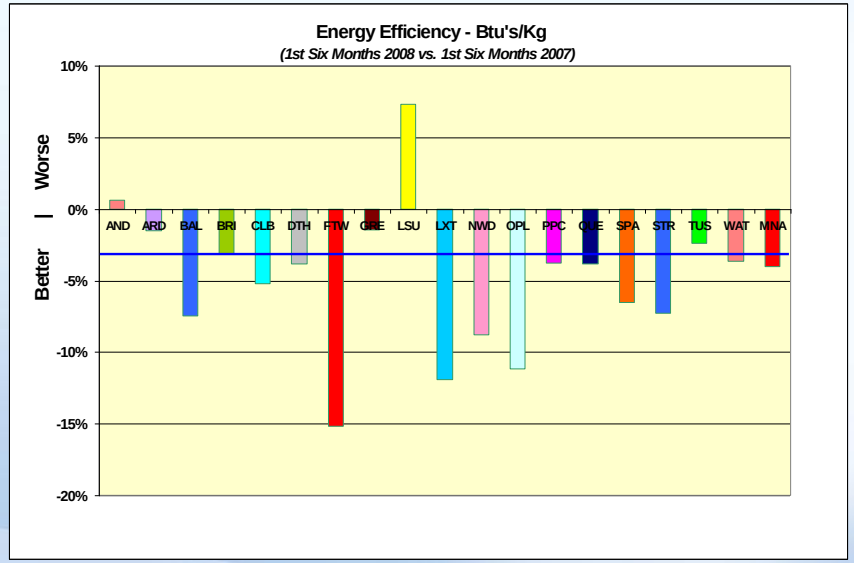
CA1 | Self Diagnostic Done by : Harold Blades | 24/06/08 | Back to Summary

	Good Practices			Excellent Practices	
Energy Contracts					
BP2.01	The Tech Manager and the Utilities Manager have access to a copy of purchasing contracts for electricity, gas, water and sub-contracts linked to energy	10			
BP2.02	The Tech Manager and the Utilities Manager know the influential parameters of each contract (example for electricity: power demand)	10	PE2.01	Once a year the Utilities Manager sends to Purchasing updated tables of influential parameters for each contract	X
BP2.03	Before the renewal anniversary date of a contract, the Utilities Manager sends to Purchasing the updated tables of influential parameters for contract renegotiation	X			
Tableau de bord					
BP2.04	The tableau de bord of Utilities includes two types of indicators : - Utilities Performance Indicators - Plant Energetic Performance Indicators	5	PE2.02	The tableau de bord of Utilities includes the Utilities Performance Indicators and the Plant Energetic Performance indicators listed in appendix	1
BP2.05	The Utilities Performance Indicators are displayed in the boiler house control room, they are analysed by the Operation Team for immediate action if going back to the norm is necessary	1			
BP2.06	The Plant Energetic Performance Indicators are calculated by the Utilities Technician and discussed with the Utilities Manager. The deviations are the object of immediate actions to go back to the norm	8	PE2.03	The Plant Energetic Performance Indicators are calculated by the Operation Team, discussed with the Utilities Technician and with the Utilities Manager every day at the time of an MGP meeting and displayed in the information points. The deviations are the object of immediate actions to go back to the norm.	1
BP2.07	The evolution of the monthly Plant Energetic Performance Indicators is charted on the period of the last 12 months	1			
BP2.08	The fixed and variable costs of the plant are known	1	PE2.04	The fixed and variable costs of the plant and the shops are known and annualy updated (linear regression on the couples consumption and production)	1
Budget : Establishment of a budget					
BP2.09	The budget is established with physical values for the different primary energies	10			
BP2.10	The projected need in energy is calculated in relation to the production forecasts	8	PE2.05	The projected need in energy is calculated in relation to : - the production forecasts - the fixed and variable consumption defined by analysis of daily ratios (linear regression on the couples consumption and production) - the commitment of progress on consumption	1
BP2.11	The project need for space heating steam is calculated in relation to the commitment of progress on space heating steam consumption	1	PE2.06	The project need for space heating steam is calculated in relation to: - the local climatic rigour known on the basis of thirty-year values - the plant space heating steam need per Degree Day - the commitment of progress on space heating steam consumption	1
BP2.12	The quantities obtained will be valued in local currency in relation to the forecasts energy price supplied by Purchasing	10			
BP2.13	The energy budgets are validated with the Plant Management	10			
BP2.14	Each Shop Manager has in his budget the energy part of his shop. He analyzes the variances and manages the correct actions of resuming to the norm with the help of the Utilities Manager of the site	1			
Budget : Follow-up in relation to budget					
BP2.15	Production, consumption and costs are follow-up monthly and compared to the budget. The variances are analyzed for determining the cause of it	10			

MICHELIN
A better way forward

Central Energy Management Database

- Tracks energy consumption and cost data for all plants.
- Pulls in production data to trend specific consumptions
- Allows for trending of critical KOIs and benchmarking between plants.



MICHELIN
A better way forward

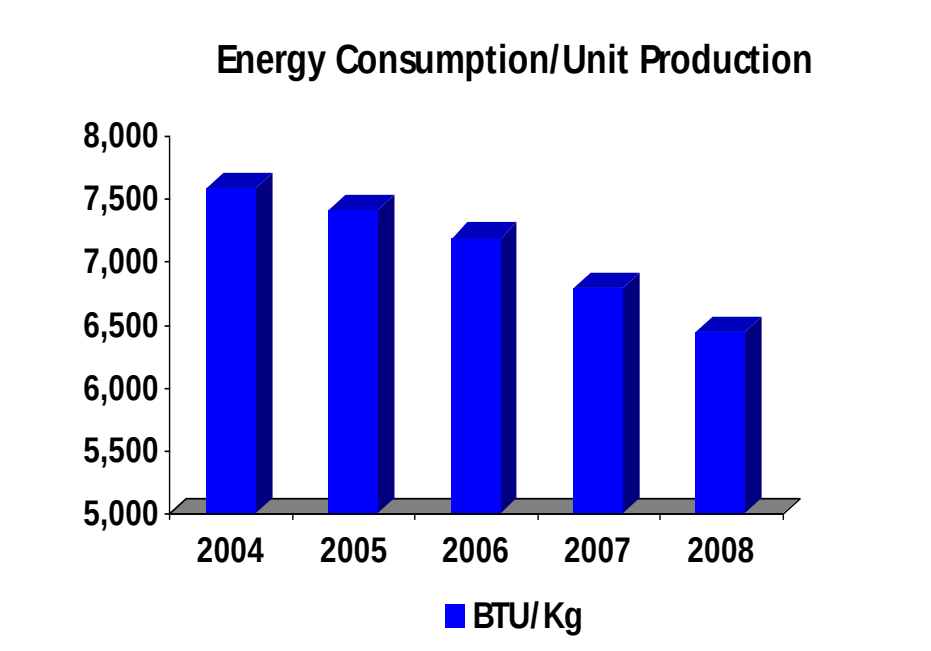
Specific Plant Projects

- **Energy Consumption Projects**
  - STA – Electric boiler installation
  - GRE – Curing steam vent heat recovery
  - AND – Boiler blowdown heat recovery
  - FTW – RO system for boiler feedwater
  - BAL – Air compressor system controls
  - AND – Electric reheat for humidity control
  - SPA – High bay lighting retrofit
  - ARD- Energy shutdown procedures
  - TUS – HP condensate heat recovery
  - DTH – Curing condensate heat recovery
  - PPC – Comp air artificial load reduction
- **Renewable Energy Projects**
  - ARD – Landfill Gas
  - TUS – Landfill Gas
  - DTH – Biomass Boiler
  - PPC – Wind Energy
  - BAL – Wind Energy
  - WAT – Solar wall
  - FTW – Geothermal HP

MICHELIN
A better way forward

Results

- Energy Diagnostics group wide have highlighted potential savings amounting to 10% of the sites energy cost.
- MNA Energy Consumption per Unit of Production has decreased 15% since 2004.

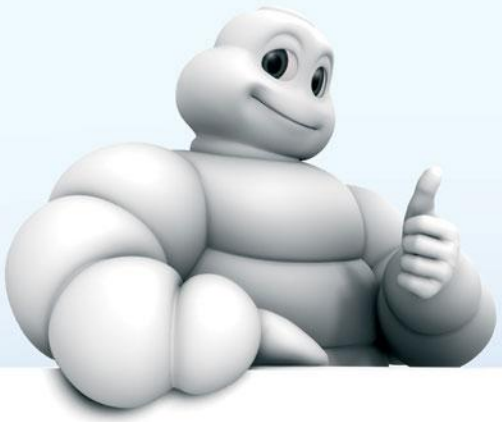


MICHELIN
A better way forward

Keys to Success

- Leadership support
- Committed team on the ground at each site
- Energy users are engaged in the process
- Energy reduction goals are built into the annual site financial plans

MICHELIN
A better way forward



Questions ?

MICHELIN
A better way forward