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HEALTH INDUSTRY ECONOMICS ENVIRONMENT 8 YEARS

Measuring, Monitoring and Metrics: Saving Electricity With Smart Choices

March 11, 2009

The Shocking Truth About Electricity

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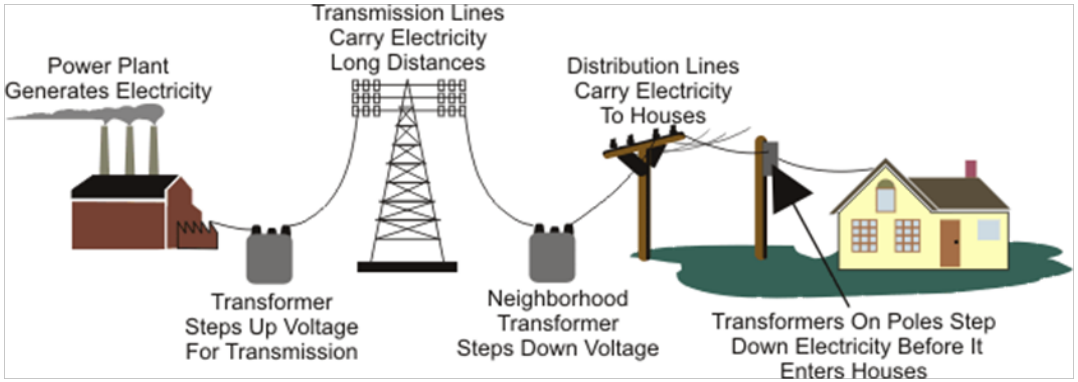
- Over the next 25 years, the world will become increasingly dependent on electricity to meet its energy needs
- Each of the world's three largest coal-consuming nations (China, the United States, and India) is projected to expand nuclear capacity significantly over the next 25 years
- The United States is the largest consumer of electricity in North America
- In 2005, electricity generation in North America totaled 4.9 trillion kilowatthours and accounted for 28 percent of the world's total generation

Source: http://www.eia.doe.gov/oiaf/ieo/electricity.html



Smart Choice # 1:

Know How Much….

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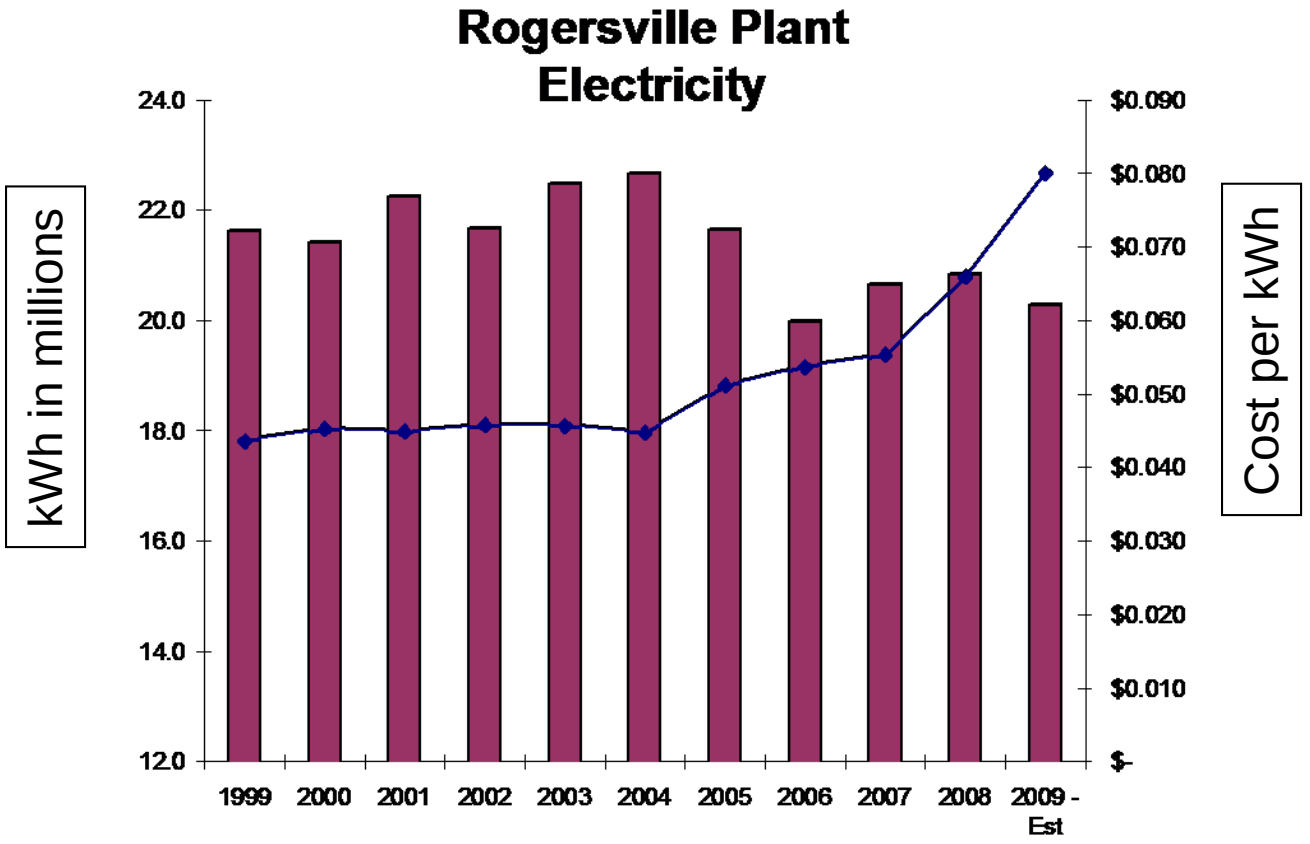
- How much electricity do you use?
- How much does it cost?



Smart Choice # 2:

Know Where It's Going

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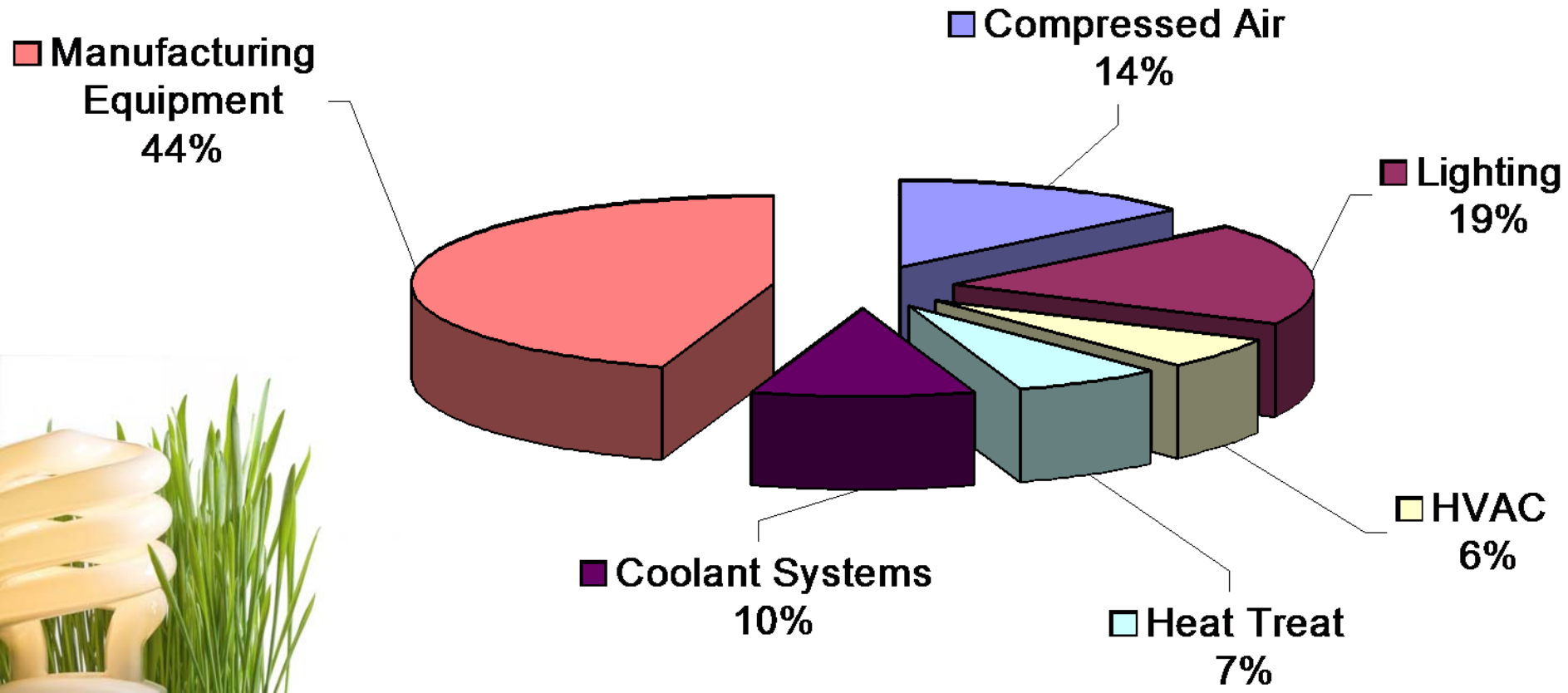
Industrial Plant Profile



Smart Choice # 2:

Know Where It's Going

- Strategy:
  - Plant electrical survey
  - Measuring and monitoring
    - Implement real time monitoring
    - Support verification of results
    - Select areas to make improvements

Scope: Lighting, Air Compressors, Manufacturing Equipment

Smart Choice # 2:

Know Where It's Going

- Measuring and Monitoring Approach and Benefits
  - Provides baseline data
  - Provides measurement after project implementation
  - Verifies results and improvements

Smart Choice # 2:

Know Where It's Going

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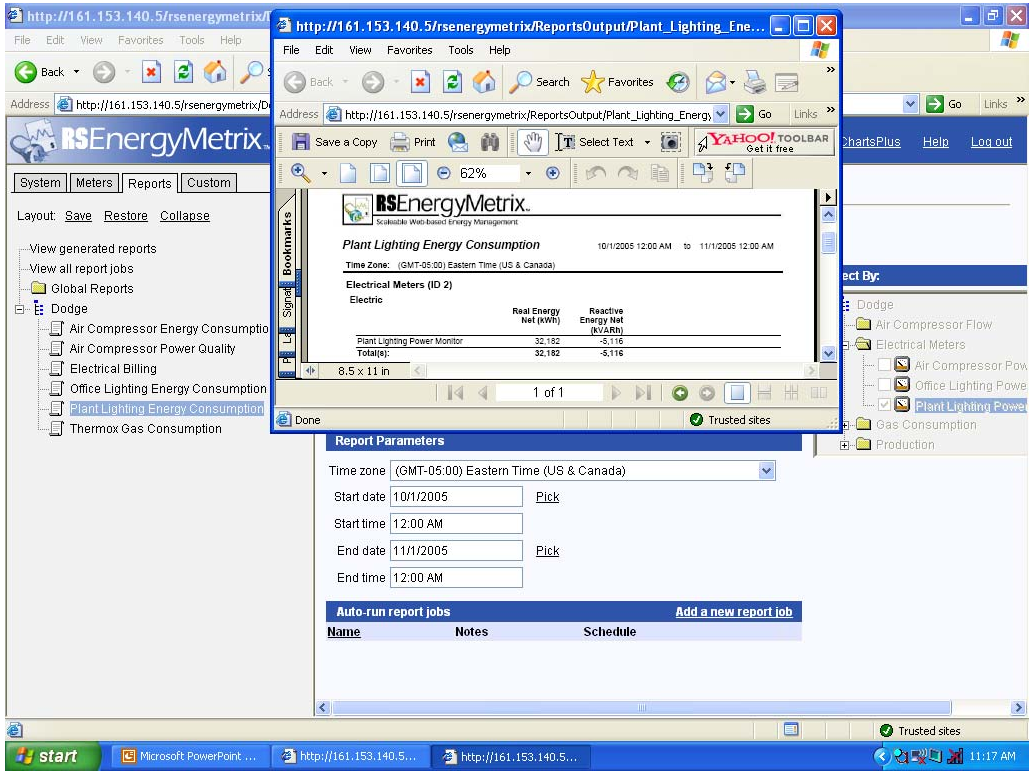
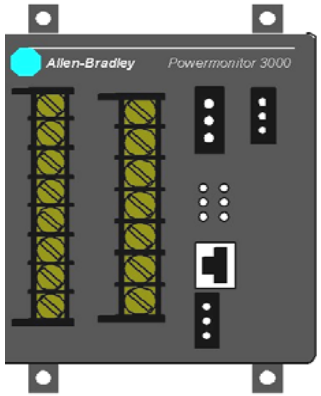
Real Time Monitoring

- Hardware & Software: Complete energy information and management solution
- Captures, analyzes, stores, and shares energy data across the entire network
- Internet Explorer is used to access and configure





Smart Choice # 3:
Turn it Off!

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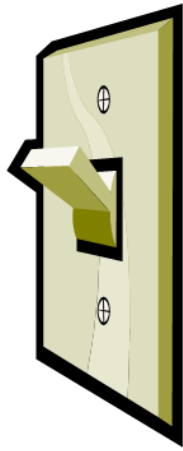
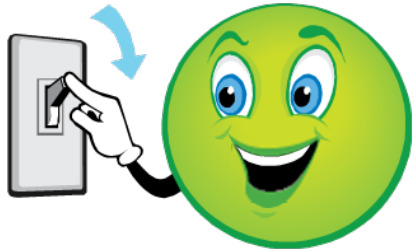


- If you don’t use it…..
- When you don’t need it
  - Unoccupied times
  - Unnecessary times
- Automate it or make a plan
  - Sensors, photocells, timers



Smart Choice # 3:

Turn it Off!

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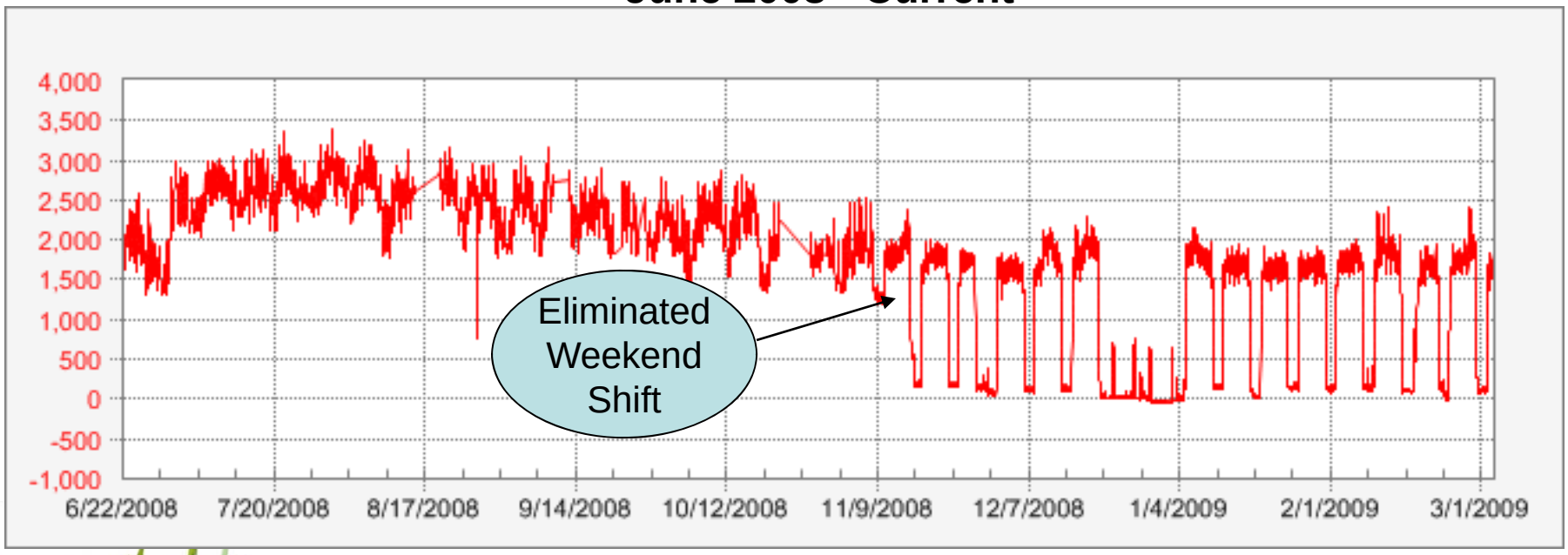
Plant Power Demand

June 2008 - Current

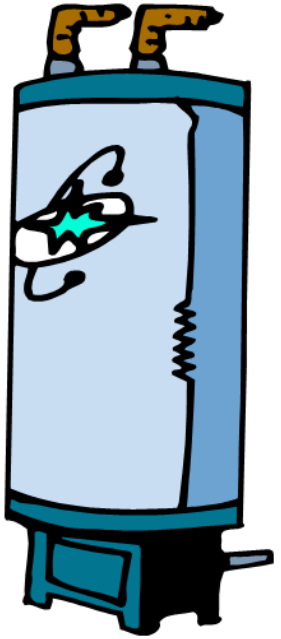


- Average weekend shutdown consumption savings of 110,000 kWh per week since November 2008
- Approximate weekly cost savings: $8k+

Smart Choice # 4:

Turn it Down!

- If you can't turn it off, turn it down
  - Thermostats for heating and cooling
    - Turn down during unoccupied times (or "up" in the summer)
    - Automate with a programmable thermostat
  - Water heaters
    - Lower hot water temperature from 140° to 120°
    - Programmable timer for non-use times
    - Use cold water when possible



Smart Choice # 5:
Reduce It!

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- Lighting
  - Use fluorescent lighting
  - Convert incandescent lighting to CFL
  - LED lighting on the way
  - Use motion sensors and photocells
  - Use timers and automatic controls

Smart Choice # 5:

Reduce It!

- Plant Lighting Project
  - Metal halide fixtures, 8760 hrs operation
  - Replaced 400-watt bulb with 360-watt bulb
    - 13% savings in consumption
    - Total savings of 600,000+ KwH
  - Currently converting to T5 fluorescent lighting
  - Savings verified by meters and monitoring

Smart Choice # 5:

Reduce It!

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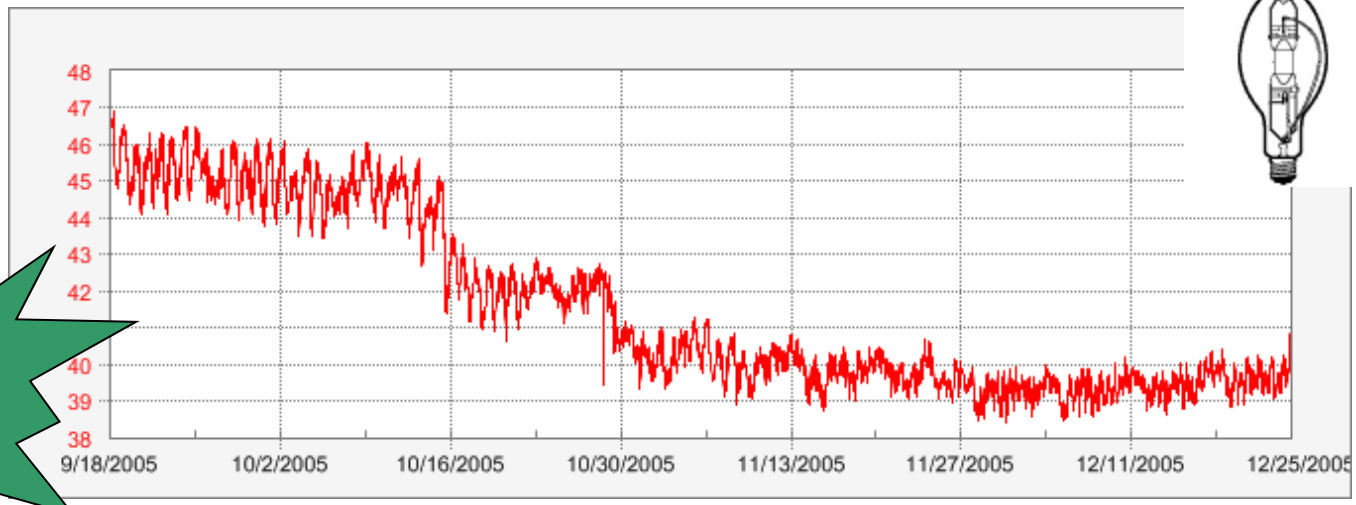
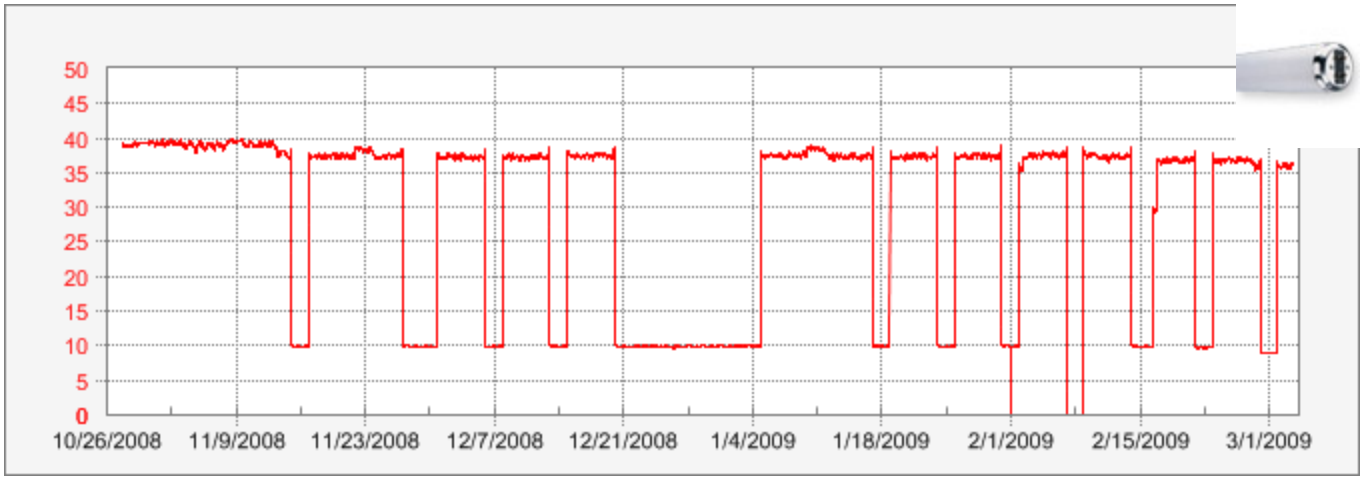
Original Project: 2005



Verify Results

Current Project: 2009



Smart Choice # 5:

Reduce It!

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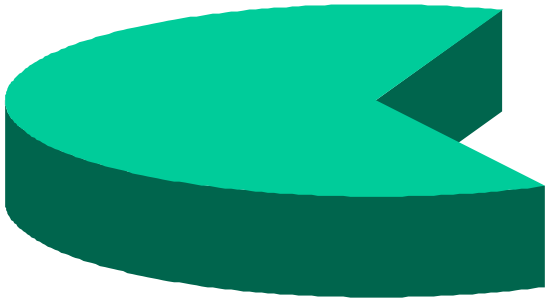
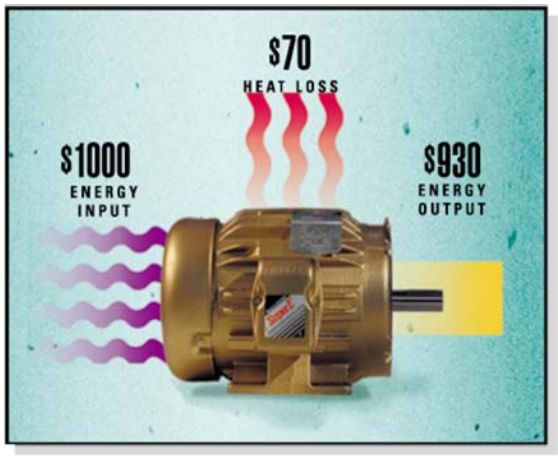
- **Inductive Loads – Electric Motors**
  - About 60% of a manufacturing company's electricity cost comes from operating electric motors
  - Electric motors consume about 25% of all the electricity sold in the United States



60%



Smart Choice # 5:

Reduce It!

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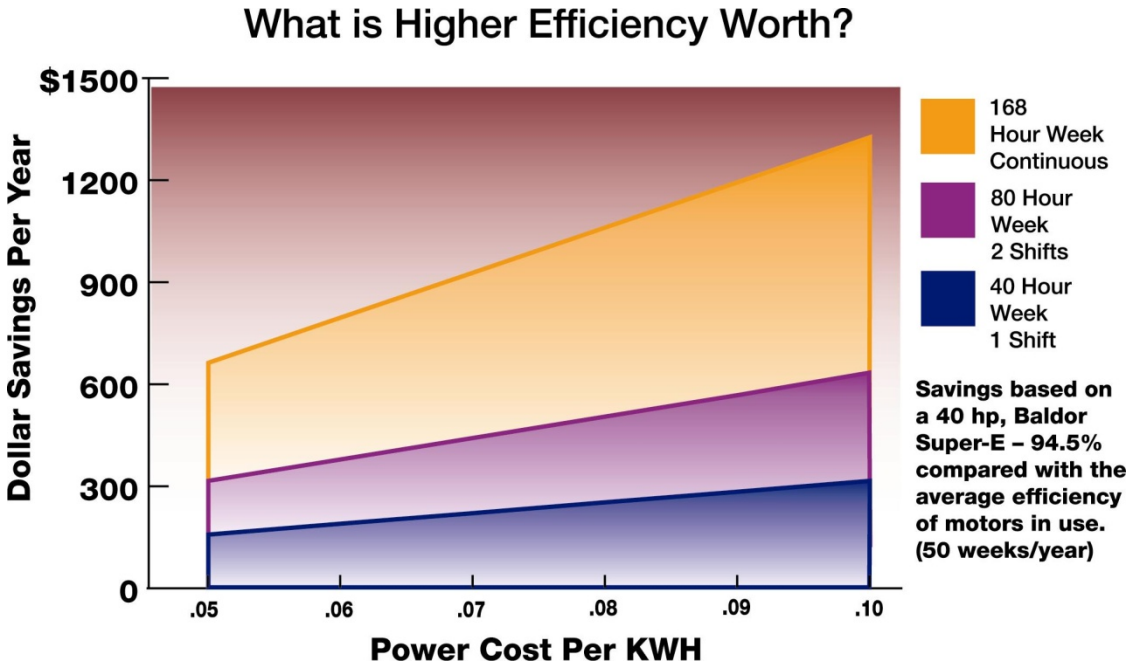
- Ways to reduce electric motor costs
  - Premium efficient motors
  - Variable speed drives

Motion Family



Smart Choice # 5:

Reduce It!

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- Establish a Motor Management Program
  - Survey all motors in facilities
  - Decide on motor disposition before failure and tag each motor with action:
    - Replace immediately with premium efficient motor
    - Replace on failure with premium efficient motor
    - Rewind on failure
  - Use replacement as an opportunity to upgrade motor

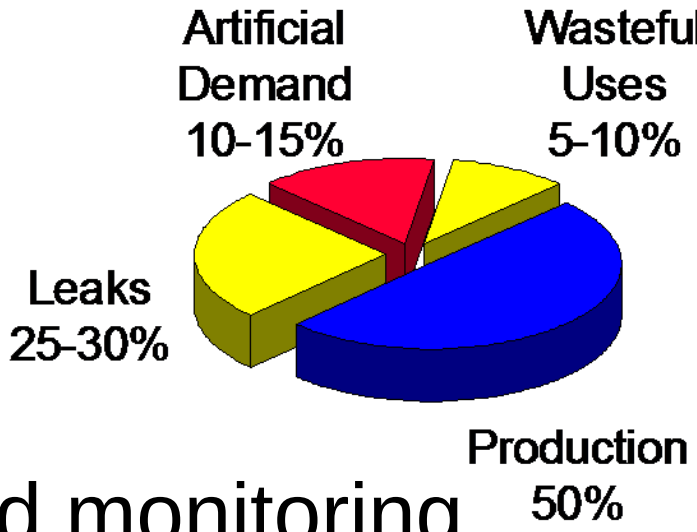
Smart Choice # 5:

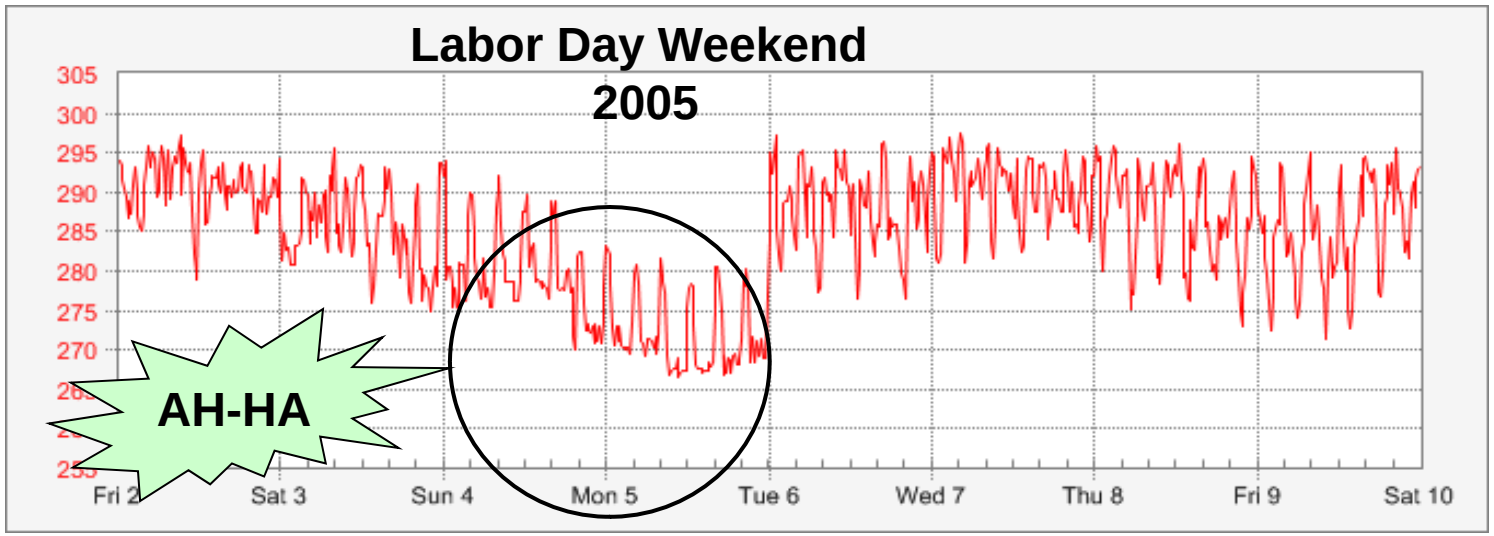
Reduce It!

- **Compressed Air**
  - In a typical industrial facility approximately 10% is consumed for generation of compressed air
  - Compressed air costs 15-30 cents per 1000 cubic feet
  - Compressed air is one of the most expensive sources of energy in a plant
  - 7-8 horsepower of electricity is required to produce 1 horsepower of compressed air
    - » *Source: U.S. DOE*

Compressed Air

- Air Compressor
  - 8760-hours of operation
  - Capacity Issues
  - Impacted by air leaks
  - Found by measuring and monitoring





Reducing Compressed Air Consumption

- Compressed Air
  - Predictive Maintenance Equipment
    - Ultrasonic Leak Detector Measures air leaks in dB
    - Spreadsheet implemented to identify and track leaks and repairs
  - Employee involvement approach
    - Kaizen event (Pit Stop)

Reducing Compressed Air Consumption

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- Process
  - Install monitoring and track usage
  - Determine usage with equipment idle
  - Set reduction goal at idle reading (usage)

Reducing Compressed Air Consumption

- Process - Continued
  - Investigate air uses and losses
  - Repair and Improve
    - Fix or replace leaking valves, cylinders and air lines
    - Reduce pressure where practical
    - Eliminate wasteful uses of air
    - Reengineer with energy saving components or reduced air requirements
    - Find a better way to do things

Pit Stop - Leaks Found in FL-1

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Equipment	System	Description	Estimated Consumption (CFM)	Leak
FL-1 OBER	Bleed off vent valve	Butterfly Actuator	42db = 1.7cfm	bad o-ring
	Inlet valve OB-3	Petcock leak	58db = 3.5cfm	
Lectroform LF-2	inline filter BLF-6	bottom of filter hsg.		o-ring in filter hsg.
	Inline regulator			
	inline lubricator			
	plastic lines		46db = 1.8cfm	
	pneumatic valve		50db = 2.0cfm	
	manifold fittings	pipe plugs in block	53db = 2.1cfm	dry threads
	conveyor actuator	fitings	47db = 1.9cfm	push-on
Model UL2	hose		75db = 5.5cfm	
	regulator	fittngs	50db = 2.0cfm	push-on
	Valve block	pipe plugs in block	58db = 3.5cfm	dry threads
	elevator valve	end caps seals	50db = 2.0cfm	tightened
#4306 IR Hone	regulator	fittngs	50db = 2.0cfm	push-on
	lubricator	fittngs	50db = 2.0cfm	push-on
Ball bearing assembly	Pedal valve	spool valve	60db = 3.6cfm	spool o-rings
	Pedal valve	3 fittings	45db ea. = 8.4cfm	push-on
	main air QD	female fitting	47db = 1.9cfm	threads
	main air QD	male fitting	46db = 1.8cfm	threads

Pit Stop – Energy Savings

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- Reading before survey = 72cfm
- Reading after repairs = 35cfm
- Savings after repairs = 37cfm

37 ft^3/m x 60 m = 2220 ft^3/hr

2220 ft^3/hr x 8760 hr/yr = 19,447,200 ft^3/yr

19,447 mft^3 x $0.14 = **$2,723 / yr savings**

Rogersville Compressed Air Cost =$0.14/1000 Cubic Feet

Keys to Success :

Measure your Progress!

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- **Measure and monitor**
  - Know where you are (baseline)
  - Know where you are going (target/goal)

- **Start small – but get started**
- **Data drives decisions and direction**
  - Collect it, even if it is with pencil and paper
  - Use it to make improvements and focus direction

Keys to Success :

Measure your Progress!

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- **Involve others**
- **Be persistent – In it for the long haul**
- **Get a 2nd set of eyes**
- **Track success and share it**
  - Builds enthusiasm
  - Let's you know you are on the right path
  - Engages employees

…and always practice safety around electricity!!!

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