Freescale Superior Energy Performance Certification

Mark Krawczyk
Agenda

- Freescale Company overview
- Oak Hill Site
- SEP training and implementation of energy management system
- SEP audit and certification
- Barriers
- Results and key to success
- Lessons learned
Company Overview

- Semiconductor design and manufacturing company established in 1953
- Focused on the automotive, networking, industrial, consumer, and enabling technologies
- Engaged with 10,000+ customers globally; over 100 of the top electronic manufacturers
- $5 billion in revenue in 2010
- Headquartered in Austin, Texas
- 20,000 employees in over 20 countries
Technology Offerings Across Markets

- **Automotive**
  - Multimedia Processors
  - Microcontrollers
  - Embedded Processors
  - Baseband Processing and RF Transceivers
- **Consumer**
  - Communication Processors
  - Control Processors
- **Industrial**
  - RF Power and MMICs
  - Sensors
- **Networking**
  - Analog & Power Management
  - Digital Signal Processor Technologies
Freescale Energy Conservation Pathway

- <1998 – Various energy conservation projects implemented
- 1998 – Facilities Technology Center established
- 2000 – Utilities conservation goals set for Austin plants
- 2001 – Austin Utilities Conservation Team formed
- 2001 – Motorola SPS Energy Council formed
- 2001 – Corporate energy conservation goals set
- 2005 – Gross margin improvement goals drive energy conservation
- 2005 – Corporate Utilities Conservation Team formed
- 2010 – Long term resource conservation goals set
- 2010 – Oak Hill plant SEP certification achieved
Oak Hill Site Overview

- Development and manufacture of semiconductors
- Wafer Fab makes microcontrollers, power management and radio frequency products for the automotive and wireless markets
  - Built in 1990 - First 200 mm semiconductor factory in the world
  - Fab cleanroom size: 100,000 s.f.
- New Product Introduction Probe & Test
- Corporate office buildings
- Total building space: 1.5 million s.f.
- 2300 employees
- Annual electrical consumption:
  - Electrical 200 million KWH
  - Natural gas 0.2 trillion BTU
Energy Profile

Electrical Consumption

- Fab Tools: 34%
- Fab Support: 19%
- Cair: 6%
- PCW: 6%
- Chilled water: 4%
- Exhaust: 4%
- N2: 3%
- UPW/IW: 2%
- Office & Labs: 1%
- Lighting: 1%
- Misc: 1%
- Other: 4%
Energy Profile

Natural Gas Consumption

- 75% Steam
- 15% Abatement
- 10% Fab Tools
SEP Training and Energy MS Implementation

- Created cross-functional team to participate in the pilot project
- Participated in workshops, webinars and technical assistance calls
- Developed energy MS integrated into existing environmental MS (ISO 14001)
- Developed energy management policy and set energy goals
- Two system assessments: pumping (chilled water) and compressed air
- Developed energy profile
- Documented operational criteria and procedures for systems identified as significant energy uses
- Developed key performance indicators and control charts at system level
- Developed energy performance indicators to calculate SEP improvement
  - Linear regression analysis: energy vs. manufacturing turns and enthalpy
- Conducted training to increase employee awareness of the SEP program
- Included N2 plant contractor in team meetings
- Conducted internal audit and management review
Energy Management System Structure

- Integration in the existing ISO 14001 EHS MS
- All documentation electronic
- Identical folder structure
- Shared elements
# Chilled Water Pumping System Assessment

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Savings (KWH)</th>
<th>Savings ($)</th>
<th>Completed (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eliminate valve throttling loss for glycol chiller pumps. Trim impeller or install VFD.</td>
<td>292,000</td>
<td>$18K</td>
<td>Yes</td>
</tr>
<tr>
<td>Change glycol chiller differential pressure setpoint from 20 psi to 12 psi</td>
<td>60,000</td>
<td>$4K</td>
<td>Yes</td>
</tr>
<tr>
<td>Run 1 out of 2 secondary chilled water pumps for VFD/motor savings</td>
<td>19,000</td>
<td>$1K</td>
<td>No</td>
</tr>
<tr>
<td>Change secondary distribution differential pressure setpoint from 18 psi to 12 psi</td>
<td>87,000</td>
<td>$5K</td>
<td>Yes</td>
</tr>
<tr>
<td>Shutdown unneeded chiller and pumps by utilizing more flexibility on chiller startups</td>
<td>315,000</td>
<td>$20K</td>
<td>Yes</td>
</tr>
<tr>
<td>Replace condenser water pumps with more efficient pump</td>
<td>269,000</td>
<td>$17K</td>
<td>No</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,042,000</strong></td>
<td><strong>$65,000</strong></td>
<td></td>
</tr>
</tbody>
</table>
## Compressed Air System Assessment

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Savings (KWH)</th>
<th>Savings ($)</th>
<th>Completed (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce system operating pressure</td>
<td>1,384,000</td>
<td>$87K</td>
<td>No</td>
</tr>
<tr>
<td>Add a 400 HP VSD compressor to operate as trim</td>
<td>398,000</td>
<td>$25K</td>
<td>No</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,782,000</strong></td>
<td><strong>$112,000</strong></td>
<td></td>
</tr>
</tbody>
</table>
Chilled Water KPI

CUB CHILLED WATER KW VS. ENTHALPY

CUB Chilled Water System KPI Checklist

CUB Chilled Water System kW Breakdown

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SEP Audit and Certification

- Five auditors + three ANSI staff that were “auditing the auditors”
- Fifteen overall processes were audited, 0 major NCs, 5 minor NCs
- Energy performance improvement verified as 6.5%
- Oak Hill plant was recommended for certification at the Silver Level
- Corrective action plans were accepted by the auditor
- The auditor issued a certificate after ANSI accredited them as a registrar
- Certification requires surveillance audits (ANSI) for a 3 year period, and then re-certification
Demonstrating energy performance improvements

- Energy Performance Pathway vs. Mature Energy Pathway
- Explored using the SEP Mature Energy Pathway
- Gaps in data for 10-year period
- Low score on renewable energy and CHP
- Chose Energy Performance Pathway
- Challenge with correlating energy consumption to production level
- 2008 used as a mid-year and compared with the baseline year, 2006, and with 2009

Energy management integration into existing management systems

- Took a while to decide
- Shared some documents, such as Level 1 and Level 2
- Some other parts of the energy system are separate from the existing MS
- Formalized level 3 procedures
Results and Key to Success

- Oak Hill plant qualified as SEP Silver Certified Partner
- Successful incorporation of energy management into recognized company-wide management systems
- Energy management as a way of doing business, instead of making improvements on a project-by-project basis
- System KPIs driving continual improvement
- Leverage plant-level activities into a corporate-wide program
- Awareness of the certification out across the organization
- Engaging more employees in energy management and energy efficiency
- Support from senior management
Lessons Learned

- Leverage existing environmental or quality management systems and staff
- Cross-train your energy and management system staff
- Create cross-functional teams
- Establish management commitment upfront and keep communicating to management on project status
- Hold regular team meetings during the implementation phase
- Take a structured look at data using statistical methods to realize immediate benefits
Questions?