Dow Superior Energy Performance Certification

Tom Wood
Dow Chemical Co.

Superior Energy Performance Certification of TCO:

- About Dow
- Dow Products
- Dow’s EE & Climate Commitment
- SEP program and The Texas Pilot
- TCO Pilot Effort and Certification Results
- Dow overall EE&C Achievements
About Dow

• Largest diversified chemical company in the world
• Founded in Midland, Michigan in 1897
• Supplies more than 5,000 products to customers in 160 countries
• Annual sales of $45 billion
• 52,000 employees worldwide
• One of the world’s largest industrial energy consumers
• Committed to Sustainability
Oil & Gas = Energy & Feedstock

Feedstock
Ethane, Propane, Butane, Naphtha

Energy
Steam, Heat, Power, Water

850,000 Barrels/day
Corporate Commitment & Accountability

Corporate Commitment to 2015 Goals

• Further reduce global energy intensity by 25% from 2005 to 2015
• Reduce GHG emissions intensity by 2.5 % per year thru 2015
• Aspire to reduce absolute emissions within the company by 2025

“No one in the world is more intensely aware of the need, ultimately, to reinvent our dependency on oil and natural gas than we are... We will lead the way on energy transformation because we have to. And we have taken important steps already.”

-- Andrew Liveris
Chairman, CEO & President
The Dow Chemical Company
Since 1994 through 2010
Energy Intensity Reduction Savings $ 9.4 Billion
Over 1,800 Trillion BTUs

Cumulative $ Billions

$ 9.4 Billion

Cumulative Savings ($)  Energy Intensity(BTU/lb)
What is Superior Energy Performance?

A market-based, ANSI/ANAB-accredited certification program that provides industrial and commercial facilities with a roadmap for achieving continual improvement in energy efficiency while boosting competitiveness.

Goals:

• Drive continual improvement in energy performance
• Develop a transparent system to validate energy performance improvements and management practices
• Encourage broad participation throughout industry
• Support and build the energy efficiency market and workforce
U.S. Council for Energy-Efficient Manufacturing

• Acts as champion of U.S. industry in pursuing national energy efficiency goals
• Seeks to improve the energy intensity of U.S. manufacturing through a series of initiatives
• Guides development of Superior Energy Performance
Certification Requirements:

An ANSI/ANAB-accredited Verification body will conduct a third-party audit to verify that the following requirements are met:

2. Energy Performance Improvement

ISO 50001 is a foundational tool that any organization can use to manage energy.

Superior Energy Performance
Single facility ISO 50001 conformance with validated energy performance improvement
Benefits to Companies

• Recognition
  – Publicly recognized as leader in sustainable use of energy resources (local and financial community)
  – Customers may grant preferred supplier status

• External financial incentives
  – Energy efficiency credits (electric utility & others)
  – Potential carbon credits (state, regional, and national)

• Systematic framework for continuous improvement
  – Consistent with ISO 50001 energy management and ASME system assessment standards
  – Provides tools and resources to assist implementation and validation of sustained energy performance improvement
Dow TCO joins Texas Pilot

Why

• Help Develop SEP though US CEEM
• Improve Site Energy Management System
• Pilot as first step in broader implementation
• Also testing at our Institute WV Site and a Brazil Site

How

• Installed or enhanced elements of Management System for Energy (ANSI/MSE 2000-2008)
• Incorporated requirements into existing ISO Standard documents at the Site
• Defined “In-Scope” plants at the site: Isopropanol Plant and Energy Systems
Dow TCO joins Texas Pilot

Challenges

• Initially takes additional work, short on resource
• Electrical Sub-Metering lacking
• Requirements of “Mature Pathway”

Synergies

• Built on Dow’s Energy Management System and requirements incorporated into our existing ISO 9001 system
• Use of existing energy measurement and reporting system
• SEP offered plenty of flexibility in implementation
Energy Performance Improvements

Isopropanol Plant

• The Isopropanol unit underwent a multi-year renewal and improvement project resulting in a 17.1% EI reduction

• A number of energy efficiency improvements were included in the design:
  • A new control system
  • An air compressor replacement
  • Consolidation of two distillation columns
  • Heat integration and condensate recovery
  • Focused optimization of new facilities using Six Sigma methodology
Energy Performance Improvements

Energy Systems Plant

- Several large energy saving projects were implemented resulting in an 8.1% improvement in energy use
- Improvements included optimization of assets, improvements in maintenance strategies and control systems improvements
- Specific focus areas included:
  - A Gas Turbine water washing system
  - Reconditioning of a large steam turbine generator
  - Efficiency improvements to a steam power boiler
# SEP Performance Criteria for Certification Levels

<table>
<thead>
<tr>
<th>Performance Characteristics</th>
<th>Silver</th>
<th>Gold</th>
<th>Platinum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Performance Pathway</td>
<td>Meets 5% energy performance improvement threshold over the last 3 years</td>
<td>Meets 10% energy performance improvement threshold over the last 3 years</td>
<td>Meets 15% energy performance improvement threshold over the last 3 years</td>
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<tr>
<td>Energy Performance Improvement</td>
<td>Demonstrates an energy performance improvement of 15% or more over the last 10 years.</td>
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<tr>
<td>Mature Energy Pathway</td>
<td>Score on Best Practice Scorecard</td>
<td></td>
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<tr>
<td></td>
<td>Includes credits for energy management best practices and energy performance improvements beyond 15% over the last 10 years.</td>
<td>• Meets a score of at least 35 and up to 60 out of 100 total points for Best Practice Scorecard</td>
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<tr>
<td></td>
<td></td>
<td>• Minimum of 25 points required for the energy management best practices</td>
<td>• Minimum of 25 points required for the energy management best practices and 10 for energy performance</td>
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<tr>
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<td></td>
<td>• Meets a score of at least 61 and up to 80 out of 100 total points for Best Practice Scorecard</td>
<td>• Meets a score of at least 81 out of 100 total points for Best Practice Scorecard</td>
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The SEP Industrial Measurement and Verification (M&V) Protocol is a methodology to:

1. Verify results and impact from implementation of energy management
2. Track energy performance changes over time
3. Document energy performance normalized to production
# Energy Performance Improvement Results

<table>
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<tr>
<th>Project</th>
<th>Start-Up Date</th>
<th>2010 vs. 2007</th>
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<th>Annualized Energy Saved in 2010 (MMBtu/Yr.)</th>
<th>Annualized Net CO₂ And Other GHG Emissions Reduction (Tons CO₂ or CO₂ Equiv)</th>
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<tr>
<td>Isopropanol Unit Energy Intensity Improvement</td>
<td></td>
<td>2010 vs. 2007</td>
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<tr>
<td>Project</td>
<td>Start-Up Date</td>
<td>% Energy Savings Per Unit of Production</td>
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<td>Annualized Energy Saved in 2010 (MMBtu/Yr.)</td>
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<tr>
<td>See Note</td>
<td></td>
<td>17.1%</td>
<td>192,000</td>
<td>11,136</td>
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<td>192,000</td>
<td>11,136</td>
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<tr>
<td>Energy Systems Energy Intensity Improvement</td>
<td></td>
<td>8.1%</td>
<td>396,200</td>
<td>22,980</td>
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<td>22,980</td>
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</table>
DOW worked with the University of Texas at Austin to pilot Superior Energy Performance at its Texas City Operations* facilities:

- Field tested elements of Superior Energy Performance
- Conducted audits using ANSI, MSE and M&V Protocol
- Established the first ANSI/ANAB-accredited Verification Body for Superior Energy Performance
- Certified the first plants to Superior Energy Performance

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<th>First facilities certified to Superior Energy Performance</th>
<th>Performance Level</th>
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<tr>
<td>Cook Composites and Polymers Co. Houston, Texas</td>
<td>Gold</td>
</tr>
<tr>
<td>Freescale Semiconductor, Inc. West Austin, Texas</td>
<td>Silver</td>
</tr>
<tr>
<td>Owens Corning Waxahachie, Texas</td>
<td>Silver</td>
</tr>
<tr>
<td>Union Carbide, subsidiary of the Dow Chemical Co.</td>
<td>Platinum</td>
</tr>
<tr>
<td>Texas City, Texas (Isopropanol Plant)</td>
<td></td>
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<td>Silver</td>
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<td>Texas City, Texas (Energy Systems facility)</td>
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* Texas City Operations is owned and operated by Union Carbide Corporation, a wholly owned subsidiary of The Dow Chemical Company.
Dow’s Overall EE Results

• Sustained drive in energy intensity reduction
  – Over 25% reduction in EI worldwide since 1994
  – Cumulative Energy Savings = Approx 1,800 Trillion Btu’s
  – Cost Savings (avoided fuel) = Over $ 9.4 Billion
  – Cumulative avoided CO2 emissions of ~ 95 Million MT

• Demonstrated long-term effectiveness of our program

• Enhanced corporate reputation
Efficiency and The Triple Bottom Line

**Good for Business:**
- Saves Money
- Enhances Global Competitiveness
- Preserves Jobs
- Creates Prosperity for Shareholders

**Good for the Environment:**
- Fewer GHG Emissions
- Part of the solution to global climate change

**Good for Society:**
- Reduces Demand
- Lowers Energy Bills
- Promotes Energy Security