Energy Management in Dow Chemical

26 May 2010, Beijing
Ningke Peng
About Dow

A diversified chemical company, harnessing the power of science and technology to improve living daily

- founded in Midland, Michigan in 1897
- annual sales of $58 billion
- 52,000 employees
  - 3,900+ in China and growing daily
- supplies more than 5,000 products
- serve customers in 160 countries
- a company committed to sustainability
- 24 sites and offices in China
Dow’s Energy Use

Dow is among the largest Industrial Energy Consumers

- Annual Energy Consumption Globally ≈ 600 Trillion Btu’s (22 million tons of coal equivalent)
- The Cost of Energy in 2009 Approached US $2.5 Billion Globally (~17 billion RMB)
Dow’s Energy Performance

Energy Intensity Performance

EH&S Goal: 20% Improvement in Btu/lb.
Actual: 22% Improvement through 2005

$ 4.3 Billion  Cumulative Savings (B$)  Total Actual Energy
(~33 billion RMB)
Driving Energy Efficiency at Dow

Key Elements for an Effective Energy Efficiency & Conservation Management Program

- Corporate Commitment
- Senior Leadership Support
- Organizational Structure
- Energy Reporting
- Implementation Methodology
- Employee Communications
- Goals & Compensation

Energy Efficiency & Conservation
Driving Energy Efficiency at Dow

**Corporate Commitment:**

- Provides the Overall Commitment to EE&C
- Establishes Energy Efficiency & Conservation as a Corporate Objective
- Defines Company Values to Stakeholders
- Dow Corporate Environmental Advisory Council
- Establishes Expectations for Leaders
Enhanced Public Reporting

Public Commitment:
In 1995 Dow Committed:

• To Reduce Energy Intensity
• By 20% by the year 2005
• From Base Year 1994
Corporate Commitment to 2015 Goals

We will further reduce our global energy intensity by 25% from 2005-2015.

We will reduce our GHG emissions intensity by 2.5% per year thru 2015.

“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

Liveris Launches 2015 Sustainability Goals
Driving Energy Efficiency at Dow

**Senior Leadership Support:**
- Sets Overall Long Range Goals
- Establishes Priority
- Provides Resourcing and Funding
- Establishes Performance Accountabilities
- Visibly Models Action
- Leads Advocacy and Champions EE&C
Driving Energy Efficiency at Dow

Organizational Structure:
- Implementation Leader(s)
- Implementation Teams
- Energy Teams Networks

Roles & Responsibilities

Implementation:
- Develops Management Systems
- Establishes Implementation Model
- Develops Specific Plans to Achieve Goals
- Identify Energy Saving Opportunities
- Implement EE&C Projects
- Monitor and Report Progress
- Promotes EE&C Culture Locally
- Leverages Success
### Driving Energy Efficiency at Dow

#### Organizational Structure:

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<td>EE Leader</td>
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- Charter
- Leadership
- Membership
- Plans
- Roles

**Business Teams**

**Site Teams**
Driving Energy Efficiency at Dow

Energy Measurement & Reporting Systems:

Robust Energy Accounting System
- Metering Program
- Sub-metering
- Energy Conversion to Common Btu’s; Btu’s/lb

Drill Down Capabilities:
- Business / Site / Plant / Facility / Equipment

Converting Data to Useful Information

Available to all Leaders and Employees

Basis for Monitoring and Reporting Progress

Global Asset Utilization Reporting System
## Example: Fuel Gas Cost and Consumption

<table>
<thead>
<tr>
<th>Site</th>
<th>Yr 2001</th>
<th>Yr 2002</th>
<th>1H 2003</th>
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<tr>
<td>Cost ($/ lb)</td>
<td>Fuel Gas</td>
<td>Fuel Gas</td>
<td>Fuel Gas</td>
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<tr>
<td>Usage (BTU/lbProduced)</td>
<td>Yr 2001</td>
<td>Yr 2002</td>
<td>1Q 02</td>
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<tr>
<td>Site</td>
<td>Site</td>
<td>Site</td>
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**Graphs:**
- **Cost ($/ lb)**: Graph showing cost trend for each site.
- **Usage (BTU/lb)**: Graph showing usage trend for each quarter and year.
Example: Energy Intensity Reporting System

De-Pyramided Energy Intensity Performance
Goal 25% Reduction by 2015

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<tbody>
<tr>
<td>BTU's/lb</td>
<td>5,666</td>
<td>5,547</td>
<td>5,363</td>
<td>5,412</td>
<td>5,584</td>
<td>5,363</td>
<td>5,412</td>
<td>5,584</td>
<td>5,363</td>
<td>5,412</td>
<td>5,584</td>
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Energy Intensity (BTU's/lb) Goal Line 2015 (BTU/LB)
Site Tool for Individual Plants

BTU/lb - Current Year compared to Baseline (monthly avg for 2004)
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**Improvement Methodology:**

- To Identify Defects –
  - Energy Waste
  - Inefficiency
  - Sub-Optimized Systems
- Enables Finding Optimum Solutions
- Corrects the Defect
- Establish a Control Plan to Sustain the Gains
- Integrated into Capital Program
- Internal and/or Externally Assisted Energy Assessments
- Long Range Listing of Opportunities / Projects
- Continuous Improvement Mindset
- Consider Six Sigma Approach
Driving Energy Efficiency at Dow

Employee Communication Systems:

System(s) That Facilitate Sharing or Communication of:

- Energy Efficiency and Conservation Goals
- Performance Reporting
- Challenges & Success Stories
- EE&C Tools and Best Practices
- Benchmark Information
- Promotes Involvement & Recognizes Successes
- Messages from Leadership Team
- System that is easy to access – Consider Web based
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Goals and Compensation:

To Help Drive Accountability Throughout the Organization

Set Challenging Annual Goals
- Corporate Goals
- Business Goals
- Site Goals
- Plant Goals
- Team Goals
- Individual Goals

Link to Compensation:
- Compensation Linked to Goal Attainment & Performance
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Reaching Beyond the Fence:

- Dept of Energy – “Save Energy Now”
- Energy Star’s – Industrial Energy Star Program
- Texas Industries of the Future – Programs, Texas Show Case
- Alliance to Save Energy
- ACEEE
- American Chemistry Council
- NAM, Others
Our Results

**Dow Solutions - Impact to Dow**

- Sustained Drive to Energy Intensity Reduction Since 1990 over 38% reduction
- **Since 1994:**
  - Cumulative Energy Savings = Approx 1,700 Trillion Btu’s
    - More than enough energy to provide power to all the residential and commercial users in California for a full year
    - Equivalent to 60 million tons of coal saved.
  - Cumulative avoided GHG (CO2 equi) emissions of ~ 90 Million MT
  - Cost Savings (avoided fuel) = Over $ 9 Billion (>61 billion RMB)
  - Demonstrated Long-Term Effectiveness of our Program
  - Added Value to Corporate Reputation
  - Positions us for even further, more ambitious Goals

**Dow Solutions – Impact to the Planet**

- One square foot of Styrofoam (one inch thick) will save one ton of CO2 emissions over the average lifespan of a home
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
Thank You
Back up Slides
1995 to 2005 Results
How were the Results in Energy Efficiency Obtained?

Facility Efficiency improvement 9%
Product Mix / Merger & Acquisition Activity - not covered above 5%
Energy Power & Utility Efficiency Improvement power / steam supply 5%

Sub Total 19%

High Payback Energy Efficiency Projects --- %
Focused Engineering/Most Effective Technology Efficient Solutions + %
Focused Maintenance/Operations/Energy Teams + %

Total 22+%
Examples of Energy Efficiency Projects

Replace aging power co-generating assets with state of the art assets – going from a 9000+ HR to 6100 HR

Finding a solution, then leveraging across the company:

- GT brush seal designs
- Variable speed drives
- Site integration optimization
- New design standards for evaluating pipe size vs pump size, insulation, etc.

New technologies for producing products that help others enhance their energy efficiency

Six sigma tools to optimize asset operations.

- Six sigma is a process improvement methodology using data and statistical analysis to identify, fix or improve opportunity areas

Recovering by-product hydrogen and using as fuel