SOCMA Webinar on Manufacturing Operations & Best Practices

*in partnership with*
U.S. Department of Energy’s Better Plant Program and Celanese Corporation

October 1, 2019
1:00 - 2:00 PM Eastern Time

[https://register.gotowebinar.com/register/892867613767576332](https://register.gotowebinar.com/register/892867613767576332)
HOW CAN I FIND BUSINESS PARTNERS AND BE IN THE KNOW ON INDUSTRY INTELLIGENCE?

SOCMA’s commercial network helps you find the right connections to develop partnerships with contract manufacturers and customers. We are your bridge to finding suppliers and customers through our lead sheet services, and we are your source of intelligence for end-market insights and product applications. Our ChemSectors network provides the industry intelligence to make key business growth decisions.

GROW YOUR BUSINESS

WHAT RESOURCES WILL HELP ME STRENGTHEN MY OPERATIONS, TRAIN MY EMPLOYEES AND IMPROVE SAFETY?

Our compliance and stewardship programs promote and guide the implementation of safe, sustainable and environmentally responsible operations across the supply chain.

DISCOVER YOUR RESOURCES

WHERE CAN I GET INTEL ON THE LATEST REGULATIONS AND POLICY SPECIFICALLY IMPACTING SPECIALTIES?

We are a powerful industry advocate. Our regulatory and legislative programs ensure you are always at the forefront of any issues or policies that may impact the way you do specialty chemistry.

FIND POLICY SOLUTIONS
Upcoming Projects

- Commercial Growth
- Lead Sheet Program
- EHS Forum
- Chemical Operations Training Tool

Contact Us

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Emylyn Noma
Manager, Compliance & Stewardship
enoma@SOCMA.org
571.348.5119
Upcoming Events

WEBINAR

October 1, 2019
Online

Manufacturing & Operations Best Practices
This webinar will highlight ways to improve plant operational efficiency through sustainable approaches to energy consumption, including resources offered through the US Department of Energy’s Better Plant Program.

EXECUTIVE FORUM

October 10, 2019
Philadelphia, PA

The Business Case for Process Intensification
Learn and discuss what process intensification (PI) means to your business and operations through case study example. The implementation of PI can strengthen production yields & advance sustainability goals while reducing operational costs & energy consumption. This Executive Forum will be held at EMD Performance Materials.

SOCMA WEEK

December 4-6, 2019
New Orleans, LA

Our inaugural event will enable professionals in the specialties value chain to trade operational best practices and discuss and identify solutions to pain points with colleagues facing the same challenges. In addition to networking opportunities, the event features educational sessions focusing on issues impacting fine and specialty chemicals industry.

COWBOYS AND CHEMICALS

February 10-11, 2020
Fort Worth, TX

Jump start your networking at Specialty & Custom Chemicals America and register to attend Cowboys & Chemicals. Join 350 friends and colleagues in Fort Worth for an Authentic Texas-style good time.
Presenters

Robert Bruce Lung  
U.S. DOE, Advanced Manufacturing Office  
Industrial Technical Assistance Fellow

David Reid  
Celanese Corporation  
Senior Manager, Global Energy and Productivity
Better Buildings, Better Plants

- **What is Better Plants?** A free, voluntary partnership program for **U.S. manufacturers** and industrial organizations that want to save on energy costs

- **Through Better Plants:**
  - Partners set long-term efficiency goals
  - Receive **technical assistance, networking platforms, national recognition and access to R&D**

- Manufacturers have two opportunities to engage in Better Plants:
  1. Broader-based **Program** level
  2. Higher-level **Challenge**

Better Plants Overview

Energy savings and program footprint continue to grow

Better Plants Snapshot

<table>
<thead>
<tr>
<th>Accomplishments</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Partners</td>
<td>224</td>
</tr>
<tr>
<td>Approximate Number of Plants</td>
<td>3,200</td>
</tr>
<tr>
<td>Percent of U.S. Manufacturing Energy Footprint</td>
<td>12%</td>
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<table>
<thead>
<tr>
<th>Reported Savings</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Energy Savings (TBtu)</td>
<td>1.35</td>
</tr>
<tr>
<td>Cumulative Cost Savings (Billions)</td>
<td>$6.7</td>
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<tr>
<td>Cumulative Avoided CO$_2$ Emissions (Million Metric Ton)</td>
<td>77.8</td>
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<tr>
<td>Average Annual Energy Intensity Improvement Rate</td>
<td>2.6%</td>
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</table>

60 goal achievers total, 7 this year
# Better Plants: Chemical Sector Participation

<table>
<thead>
<tr>
<th>Accomplishments</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Partners</td>
<td>24</td>
</tr>
<tr>
<td>Approximate Number of Plants</td>
<td>303</td>
</tr>
<tr>
<td>Percent of U.S. Manufacturing Energy Footprint</td>
<td>2.9%</td>
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</table>

<table>
<thead>
<tr>
<th>Reported Savings</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Cumulative Energy Savings (TBtu)</td>
<td>140</td>
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<tr>
<td>Cumulative Cost Savings (Millions)</td>
<td>$521</td>
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<tr>
<td>Cumulative Avoided CO₂ Emissions (Million Metric Ton)</td>
<td>4.3</td>
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<tr>
<td>Average Annual Energy Intensity Improvement Rate</td>
<td>2.9%</td>
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Better Plants Challenge Partners
Why Partner with Better Plants?

- Technical Assistance
- National Recognition
- Peer-to-Peer Networking
- Connection to Innovation and R&D
Technical Support: Technical Account Manager (TAM)

- Help with energy baselines and data tracking/reporting
  - EnPI regression-based tool

- Helps partners leverage DOE and external resources

- Helps partners develop a roadmap for achieving their goal(s)

“Like having a free consultant on retainer”
Andy Terrey, City of Phoenix Water Services
TAM Support for Baseline/Data Analysis

- Help with energy baselines and data tracking/reporting
  - Regression-Based Approach
  - Facility-Level Approach
  - Corporate-Level Approach
- DOE's EnPI tool includes GHG and cost savings calculations
- Free guidance document
In Plant Training Topics:

- Compressed Air
- Pumping
- Steam
- Process heating
- Fans
- Energy Treasure Hunt Exchanges
- Water/Wastewater treatment
- Industrial Refrigeration
- 50001 Ready
- Industrial Water Efficiency (coming soon)

- Teach participants how to conduct assessments, use DOE tools, and implement projects
- Open to employees from host plant, peer companies, suppliers
- > 110 INPLTs, 1800 participants since 2011
- Identified > 5 TBTU and $37 million in energy savings between 2011 and 2016
- Pre-INPLT webinars available on program website
Helping Better Plants Partners measure operating data to evaluate equipment performance and quantify energy performance improvement.

Field data is best for evaluating system performance.

- Free of charge, including shipping
- Use equipment for up to four weeks
- TAM technical assistance with usage and interpreting results
- First come, first serve application
Technical Assistance: MEASUR Tools

Industrial System Software Platforms:

- User friendly
- Open source
- Developed by subject matter experts

Available at: [www.energy.gov/eere/amo/measur](http://www.energy.gov/eere/amo/measur)

Steam System Modeler

Pump System Assessment Tool (PSAT)

Fan System Assessment Tool (FSAT)

MotorMaster+

AIRMaster+

Process Heating Modeler Tool (PHMT)
## Technical Assistance: Supply Chain Initiative

<table>
<thead>
<tr>
<th>Legrand</th>
<th>UTC</th>
<th>Lockheed Martin</th>
<th>Honda NA</th>
<th>Volvo Group</th>
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<tr>
<td>Chapco</td>
<td>GKN Aerospace</td>
<td>Cascade Engineering Technologies, Inc.</td>
<td>KYB Americas</td>
<td>TitanX</td>
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<td>Coilplus</td>
<td>Hitchiner</td>
<td>Clearwater Engineering, Inc.</td>
<td>Newman Technologies</td>
<td>GB Manufacturing</td>
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<td>Complete Design &amp; Packaging</td>
<td>MB Aerospace</td>
<td>Cooperative Industries Aerospace &amp; Defense</td>
<td>Asama Coldwater Manufacturing</td>
<td>Durable Products</td>
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<td>Durex</td>
<td>RTI International Metals, Inc.</td>
<td>The Harva Company, Inc.</td>
<td>American Mitsuba</td>
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<td>Research Electro-Optics</td>
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<td>Savage Precision Fabrication</td>
<td>Mahle Engine Components</td>
<td>Allumaloy</td>
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<td>Rowley Spring &amp; Stamping</td>
<td>Jedco, Inc.</td>
<td>Vanguard Space Technologies</td>
<td>Cardington Yutaka</td>
<td>Bendix</td>
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<tr>
<td>Stanley Spring &amp; Stamping</td>
<td></td>
<td>Tri-State Plastics, Inc.</td>
<td></td>
<td>Mekra Lang</td>
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</tbody>
</table>
Technical Assistance: Water Efficiency

• FREE Water management guidance document – topics:
  ➢ Making the business case for water efficiency
  ➢ Prioritizing facilities to focus initial efforts
  ➢ Establishing water baselines and targets
  ➢ Industrial water efficiency examples
  ➢ NEW: Plant Water Profiler tool

• Additional resource:
  ➢ Webinar on starting a corporate water efficiency program
Technical Assistance: Access to Other AMO Programs:

**Industrial Assessment Centers:**
- No-cost energy assessments
- IACs provide training and recommendations
- Average IAC client saves $47K energy costs

**Combined Heat and Power Technical Assistance Partnerships**
- Identify CHP opportunities
- Vendor, fuel, and technology neutral assessments.
- Additional technical assistance for end-users considering CHP
Access to other Programs: 50001 Ready

**DOE’s Energy Management Program**

1. Implement ISO 50001 principles

Complete 25 Tasks in US DOE's 50001 Ready Navigator free, self-guided online tool

2. Present energy performance

Submit energy performance data. May use EPA’s Portfolio Manager, DOE’s EnPI Lite or FEMP/OMB energy reporting data

3. Self-attest to 50001 Ready

Sign-off by management of 50001 Ready implementation and commitment

**energy.gov/50001Ready**
Connections to Innovation and R&D

Better Plants hosts Technology Days at National Laboratories to:

**Tour** World-class research facilities

**View** Demonstrations of innovative technologies

**Hear** from lab experts and industry peers

**Learn** how to partner and leverage technology

**Network** with BP partners and lab technologists

New: National Lab Innovation Portal:

[https://betterbuildingssolutioncenter.energy.gov/better-plants/special-initiatives/national-lab-innovation-portal](https://betterbuildingssolutioncenter.energy.gov/better-plants/special-initiatives/national-lab-innovation-portal)
Events & Networking

- **Annual events:**
  - Better Buildings summit
  - Industrial Energy Technologies Conference
  - AEE World (formerly World Energy Engineering Congress)
  - ACEEE Summer Study on Industry

- **Networking:**
  - Regional events
  - Technology-based working groups
Networking

- Technology-based working groups
- Conferences: IETC, AEE World, Better Buildings Summit
- Regional events: IIEG
- Technology Days: 2017, 2018, 2019

Discussion: AEE World

Partners Networking: AEE World

Steam Working Group: IETC
National Recognition: Examples

Better Project/Practice Awards

Social Media

DOE Visits
National Recognition: Examples

Goal Achievers

Trade Press Articles

Industry Week

Electrolux, TE Connectivity Partner with DOE to Improve Energy Performance

The U.S. Department of Energy’s Better Buildings, Better Plants Program and Challenge has cultivated a community of nearly 200 partners to reduce energy costs, increase productivity, create jobs and improve resiliency.

Eli Levine, Bruce Lung | Feb 13, 2018
Better Buildings Solution Center

- More than 200 industrial solutions tested and proven by Partners
- Find solutions by topic, building type, solution type, building size, sector, technology, location, and more.
- Technology Focus area: https://betterbuildingssolutioncenter.energy.gov/better-plants/technology-focus-areas

energy.gov/bbsc
Why Partner with Better Plants?

Better Plants is for you if:

- **Controlling** operating costs is important
- **You want unbiased Technical Assistance** with energy efficiency
- **Networking** with industry-sector peers & independent experts is helpful
- **Recognition/Validation** for energy efficiency/sustainability accomplishments is desired
Joining is Easy!

- Simple 2-page agreement
- Should be signed by CEO or a senior executive
- Fill out and email back to: robert.lung@ee.doe.gov
For more Information

Eli Levine, Program Manager, eli.levine@ee.doe.gov, 202-586-9929

Bruce Lung, robert.lung@ee.doe.gov, 202-586-4411

Clifton Yin, clifton.yin@ee.doe.gov, 202-586-6151

TAM info

BetterPlants@ee.doe.gov

Better Plants Website:
http://betterbuildingssolutioncenter.energy.gov/
Partner Example: Volvo Trucks

• Better Plants
  • $2 million energy savings by implementing opportunities found in three In-Plant Trainings
  • Eight IAC assessments: $560,000 in energy cost savings
  • Met Better Plants program goal 2014, re-pledged and expanded scope
  • Received corporate award at IETC 2015
  • Established supplier cohort 2019

• Energy Management
  • Three plants certified to ISO 50001/Superior Energy Performance
  • Reinvests energy savings into other energy reduction projects to improve continuously

$15 million energy savings between 2009 and 2017
Partner Example: Celanese

Narrows, VA, plant

Case study on major boiler replacement project

• Validated energy dashboards energy savings = $4.5 million/year
• Cumulative energy intensity improvement of >20% (goal achieved twice)
• Received 1 In-Plant Training (Steam)
• Awarded 1 In-Plant Training (compressed air)
• DOE developed two case studies

IETC Award, spring 2016

DOE AMO Director visit, December 2016
Celanese – DOE Better Plants Partnership
Celanese Corporation

We are a global technology and specialty materials company that engineers and manufactures a variety of products essential to everyday living.

- ~7,700 employees
- 43 global manufacturing facilities, 18 countries
- $7.2 billion in net sales in 2018
- Number 455 on the 2017 Fortune 500 list
- Innovation is at the core of our business
- Strong Energy Management Program

\[ \text{El Path to 2020 Goal} \]

\[ \begin{align*}
2.900 & \quad 2.800 \\
2.700 & \quad 2.600 \\
2.500 & \quad 2.400 \\
2.400 & \quad 2.300 \\
2013 & \quad 2014 \quad 2015 \quad 2016 \quad 2017 \quad 2018 \quad 2019 \quad 2020
\end{align*} \]

Water Conservation

Celanese Corporation

Engineered Materials
$2.6 Billion Net Sales
Leverages chemistry, material science and applications based on customer relationships and insight to create unique solutions and value

Acetyl Chain
$4.0 Billion Net Sales
Leverages technology, our global production network and a deep understanding of global trade flows to create value

Cellulose Derivatives
$649 MILLION NET SALES
As a leading producer of cellulose acetate products, we are committed to delivering products, technological know-how and services that improve our customers’ competitiveness and advance their goals
Celanese – DOE Better Plants Partnership

► Better Plant Partner Status

► Committed to 25 % EI reduction for US plants
  – Achieved in 2014 and 2017

► TAM (Technical Account Manager)
  – Weekly update call with Tim Kolp
    – Resources, Advice, Networking, Validation
  – Quarterly review with Bruce Lung or Eli Levine

► Goal Setting and Achievement Recognition

► InPlant Training

► Resources

► Water Program
Celanese is committed to making a positive impact on our communities. One aspect of being sustainable is reducing our energy intensity to increase efficiency, and to serve our communities and the environment. On October 2, The U.S. Department of Energy (US DOE) recognized Celanese's leadership in energy efficiency at the 2014 Better Plants Recognition Ceremony at the Walter E. Washington Convention Center in Washington, D.C. Steve Ridge, global director of EHS and operational excellence, received the award on behalf of Celanese.

Leading manufacturers in the Better Plants Program take on bold commitments to reduce energy intensity. The U.S. Department of Energy works with manufacturers to set aggressive energy reduction goals, improve report progress. Celanese partnered with the Better Plants Program to reduce energy intensity by 25% over ten years. We had until 2017 to reach this goal. However, we went ahead of our pledge date. "This accelerated our strong commitment to protect our environment," said Darren Collins, vice president, chemicals operations. Companies that sign the pledge must report and progress each year to the U.S. Department. Sites were Clear Lake, Bishop, Bay City, and Nacogdoches.

On May 16, the Department of Energy recognized Celanese Corporation for its goal achievement in the Better Buildings, Better Plants Challenge for the second time. After meeting its first energy-efficiency target in 2013, Celanese followed up with a new target and met that goal this year, reducing energy intensity within U.S. plants by an additional 21 percent.

Celanese Corporation is a global technology leader in the production of differentiated chemistry solutions and specialty materials used in most major industries and consumer applications. Celanese's highly diversified product portfolio serves a broad range of end-use applications including paints and coatings, textiles, automotive applications, consumer and medical applications, performance industrial applications, filter media, paper and packaging, chemical additives, construction, consumer and industrial adhesives and food and beverage applications.
In Plant Training

In-Plant Trainings (INPLTs) are workshops led by Better Plants experts that train participants on how to identify, implement, and replicate energy-saving projects. Better Plant partners host an on-site, three-day training at one of their facilities, and invite others to attend. Technical expertise gained through the INPLTs help companies overcome common, critical barriers to adopting energy management practices and technologies.

► Awarded Steam In Plant training in 2016
  − 33 attendees at Bishop, TX facility
  − 3 Day training and plant assessment
  − On site presentation from Dr. Mark Johnson
    − Director of the Advanced Manufacturing Office (AMO) in the Office of Energy Efficiency and Renewable Energy (EERE).

► Awarded Compressed Air training in 2019
Showcase Project

- Showcases a major energy project
- Conversion of Coal to Gas fired boiler – Narrows Virginia plant

Showcase Project: Natural Gas-Fired Boilers Upgrade

Sector Type: Industrial
Location: Narrows, Virginia
Size: Site footprint 1315 acres
Financial Overview: Project Cost: $160 million

Title: Showcase Project: Large Chemical Plant Improves Energy and Environmental Performance with Boiler Upgrade
Implementation Model

- Opportunity to Contribute and share energy best practices
- Energy Dashboards
  - Led to IETC Top Project Award
  - Chemical Processing Magazine Article
Other Resources

- Motor System Assessment – Narrows Plant
- DOE Better Plants Web Page
- 50001 Ready

Celanese Corporation
Recognition

Opportunities for Recognition

► Goal Achiever
  – Two goal achievements

► Better Plant Projects Awards
  – Two top project awards (2018, 2019)

► DOE Conference Speaker
  – Multiple conference speaking opportunities
  – Plenary Session 2017 Speaker
  – IETC Conference (2X)
Program Benchmarking - Water

Need for a Water Conservation Program

- Emerging Sustainability Initiative
  - Integration of Financial Sector, Customer metrics with Sustainability

- Risk Management
  - Strategically plan for external water scarcity factors
  - Regulatory mandates – permit to operate / expand

- Cost

- Employee Engagement
Water Program Basis

- Utilized DOE and UTC Water guidance document
- Standard Principles of a water program
- Scalable to local plant need

**United Technologies**

**GLOBAL WATER CONSERVATION GUIDANCE DOCUMENT**

Water use has always been an important part of UTC’s Environment Health and Safety conservation goals. From a global perspective, population growth and shortages of renewable fresh water supply necessitates that sustainability planning include water management best practices. In addition to being inextricably linked to energy and climate change, water supply issues have the potential to significantly impact how and where manufacturing sites operate. UTC has a long and successful history of implementing water conservation projects. Since 2006 UTC has reduced annual water consumption 33%.

In addition to local water supply classification sites should be aware of other risk factors such as local water quality conditions. Water quality statistics are typically published by water suppliers or municipalities. Other risk factors include rising cost and increased regulatory requirements on water quality.

This guidance document provides details of UTC’s guidance on water conservation.

**BEST PRACTICES**

- Water balance
- Leak management
- Eliminate once-through cooling
- Cooling tower management
- Flow meters
- Low flow fixtures and flow resistors
- Rinse tank overflow
- Xeriscaping
- Recycle process wastewater
- Rain water harvesting

**REQUIRED ACTIONS**

Water reduction initiatives should be scalable to match local conditions. Sites will review the best practices listed below for applicability and will develop an implementation plan for the water management best practices that are considered practical. Project details will be tracked in the EH&S Project Tracking Module.
Principles of a Water Conservation Program

1. Water balance and knowledge of significant water users
2. Water usage and cost analysis / trending
3. Water distribution system and Leak management program
4. Cooling water systems management
5. Boiler and steam systems water management
6. Water treatment optimization
7. Eliminate once-through cooling
8. Water flow meters and submeters, analysis, calibration and process controls
9. Building water management to conserve water
10. Recycle process, and waste treatment wastewater
11. Enhance employee culture and behaviors for water conservation

<table>
<thead>
<tr>
<th>Water Balance And Knowledge Of Significant Water Users</th>
<th>Site has an up to date water balance including distribution system drawings and major input and consumption streams – 90% balance closure and list and water usage of significant water users in the site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Usage And Cost Analysis / Trending</td>
<td>Site reviews water usage and cost trends for reviewing of emerging issues and conservation project identification. Site reviews and understands billing practices from water vendors. Greater than 10% variation in usage or cost is investigated for root cause.</td>
</tr>
<tr>
<td>Water Distribution System And Leak Management Program</td>
<td>Site has an up to date water distribution system PM program including a leak management process for identification and repair of leaks</td>
</tr>
</tbody>
</table>

Detailed Descriptions For Consistent Application
Energy and Water Nexus

► Steam Generation and Cooling
  - Boilers, Chillers, Cooling Towers
► Secondary Cost Impact
  - Affinity Laws → Flow\(^3\) ~ HP
  - Waste and Incoming water treatment
► Management Systems
  - Common Principles
  - SEU → SWU Concept
► Design
  - Design for water and energy savings – often they align

Disclaimer

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THANK YOU!