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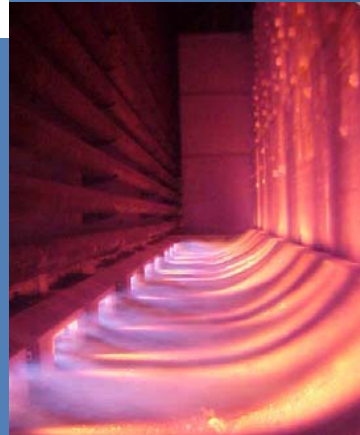
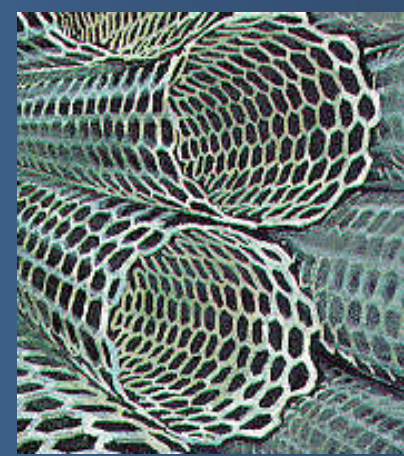
## Energy Efficiency and Renewable Energy

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# Save ENERGY Now

### Energy Assessments: What are the Benefits to Small and Medium Facilities?

**Bill Prymak, US Department of Energy  
Golden Field Office  
November 6, 2008**



# Energy Assessments: What are the Benefits to Small and Medium Facilities?

## Webcast Agenda

- Overview of Industrial Assessment Center (IAC) Program
  - Bill Prymak, US Department of Energy
- Facility Assessment Process
  - Don Kasten, Rutgers University
- Demonstration of IAC Website
  - Michael B. Muller, Rutgers University
- Q&A



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# DOE Industrial Technologies

**Goal:**

Drive a 25% reduction in industrial energy intensity by 2017.

**Save**  
**ENERGY**  
**Now**



# ITP Directly Supports DOE Strategic Goals

## DOE Goals include

- Promote America's energy security
- Increase energy diversity
- Reduce environmental impacts of energy
- Increase energy productivity



## EERE Goals include

- Dramatically reduce, or even end, dependence on foreign oil (Goal 1)
- Increase the efficiency/ reduce the energy intensity of industry (Goal 6)



## ITP Goal

Drive a 25% reduction in U.S. industrial energy intensity by 2017 in support of the Energy Policy Act of 2005 (EPAct 2005)

## *Technology Delivery Program supports ITP Goal*

**Help plants save energy today by assessing opportunities and facilitating adoption of best energy management practices and efficient new technologies**



# Industrial Technologies: Save Energy Now

Save  
**ENERGY**  
Now



Technology  
Research &  
Development



Technology Delivery

- Energy Management
- **Plant Assessments**
- Software Tools
- Training
- Plant Certification
- Info & Resources



Best Practices



# Technology Delivery Products and Services

## Tools

- Baselineing
- Software Decision Tools
- Energy Management

## Facilitation

- Visions & Roadmaps
- Supply Chain Partnerships
- Utility Services to Industrial Customers
- State/Regional Partnerships

## Training

- Tool Awareness
- End-user
- Qualified Specialist
- Special Topics

## Information

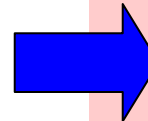
- Website
- Information Center
- Tech. Info.
- On-Line Databases

## Standards

- ISO 50001
- ANSI/Plant Certification

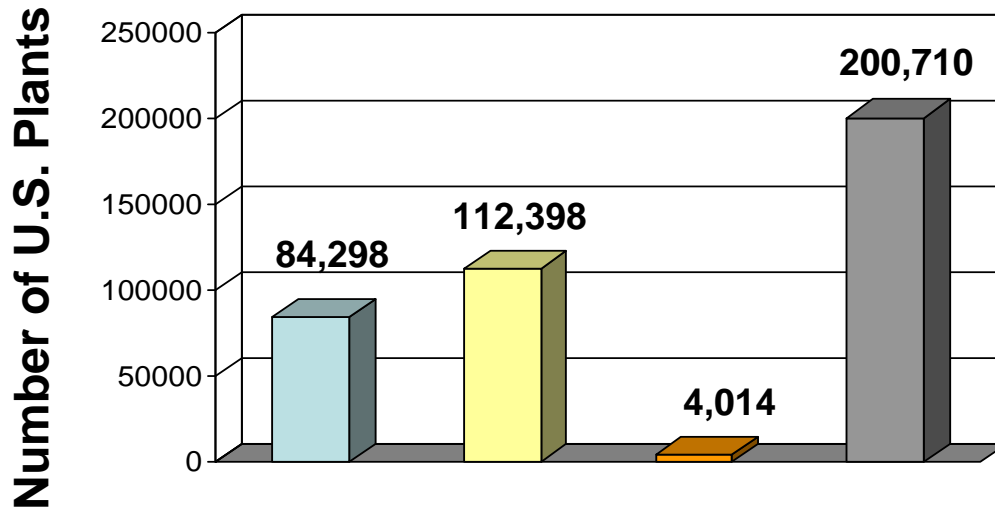
## Assessments

- Large Plant Energy Savings Assessments
- **Industrial Assessment Center 1-day audits**
- Partner-led Assessments States, Utilities, etc.



# U.S. Manufacturing Sector Energy Use

## U.S. Manufacturing Plants: By Size



**Small Plants**    **Mid-Size Plants**    **Large Plants**    **All Plants**

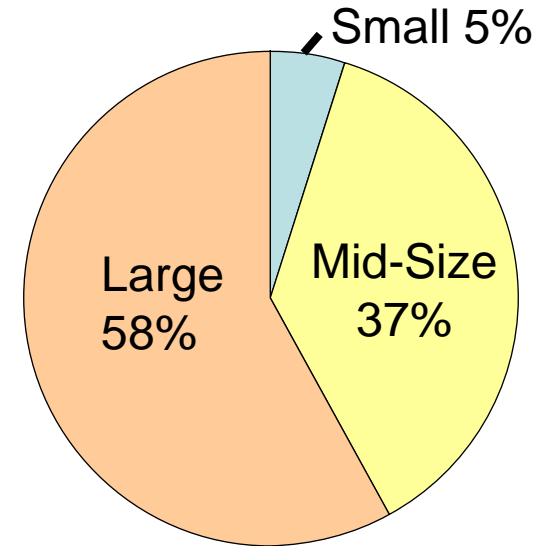
Annual Energy Consumption (Billion Btu/yr)

<25    26-500    >500

Annual Energy Consumption (\$/yr est.)

<\$100K    \$100K-\$3M    >\$3M

## Percent of Total Manufacturing Energy



2002 EIA MECS

**Over 196,000 plants use 42% of U.S. manufacturing energy**



# Plant Energy Assessments

## Industrial Assessment Centers

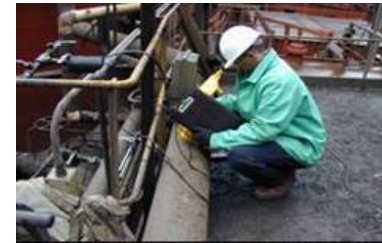
### ➤ *Small/Medium Plant Assessments*



- *Plants with energy consumption \$100,000 to \$2 million; < 0.3 TBtu*
- *Over 14,000 assessments completed*
- *Conducted by Industrial Assessment Centers at 26 universities*
- *150+ students trained each year; ~ 60% of graduates make careers in energy field*
- ***New savings identified – 25.5 TBtu/yr, \$185M/yr (2006 - 2008)***

## Energy Savings Assessments

### ➤ *Large Plant Assessments*



- *Plants with energy consumption > 0.3 TBtu*
- *Over 625 ESAs completed since 2006*
- *Targeted single system assessments in 5 areas*
- *Average identified energy savings per plant: 8%*
- *Contract with over 70 energy experts*
- ***New savings identified – 100 TBtu/yr, \$827M/yr (2006 – 2008)*** 8





# Large Plant Energy Savings Assessments

- **FREE** 3-day assessment focused on large plants (>0.3 TBtus annual total energy consumption) - complement to the IAC program, which focuses on small to medium sized plants
- Conducted by DOE Energy Experts and plant personnel
- Help plants quantify immediate opportunities for energy and cost savings through targeted system assessments (steam, process heat, compressed air, pumps, fans)
- Provide valuable hands-on learning that can help plant staff gain knowledge to multiply the benefits of the assessment
- Learn more and apply online at:

<http://www1.eere.energy.gov/industry/saveenergynow/index.html>





WAUSAUPAPER



ArcelorMittal



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# SEN Participants

# Industrial Assessment Centers

IACs are ITP's nationwide network of energy savings teams

- **Core activities:**
  - Perform **FREE** energy, waste and productivity assessments; and
  - Train next generation of energy savvy engineers
- **Unique program:**
  - university-based;
  - internationally recognized experts;
  - motivated student workforce; and
  - continued energy service to industry through IAC alumni
- **Results (average identified savings per assessment per year):**
  - **\$135K energy savings + \$85K productivity improvements = \$220K**
  - **23.5 BBtu Energy (or about 10%)**
  - **1.3 K metric tons CO<sub>2</sub>**

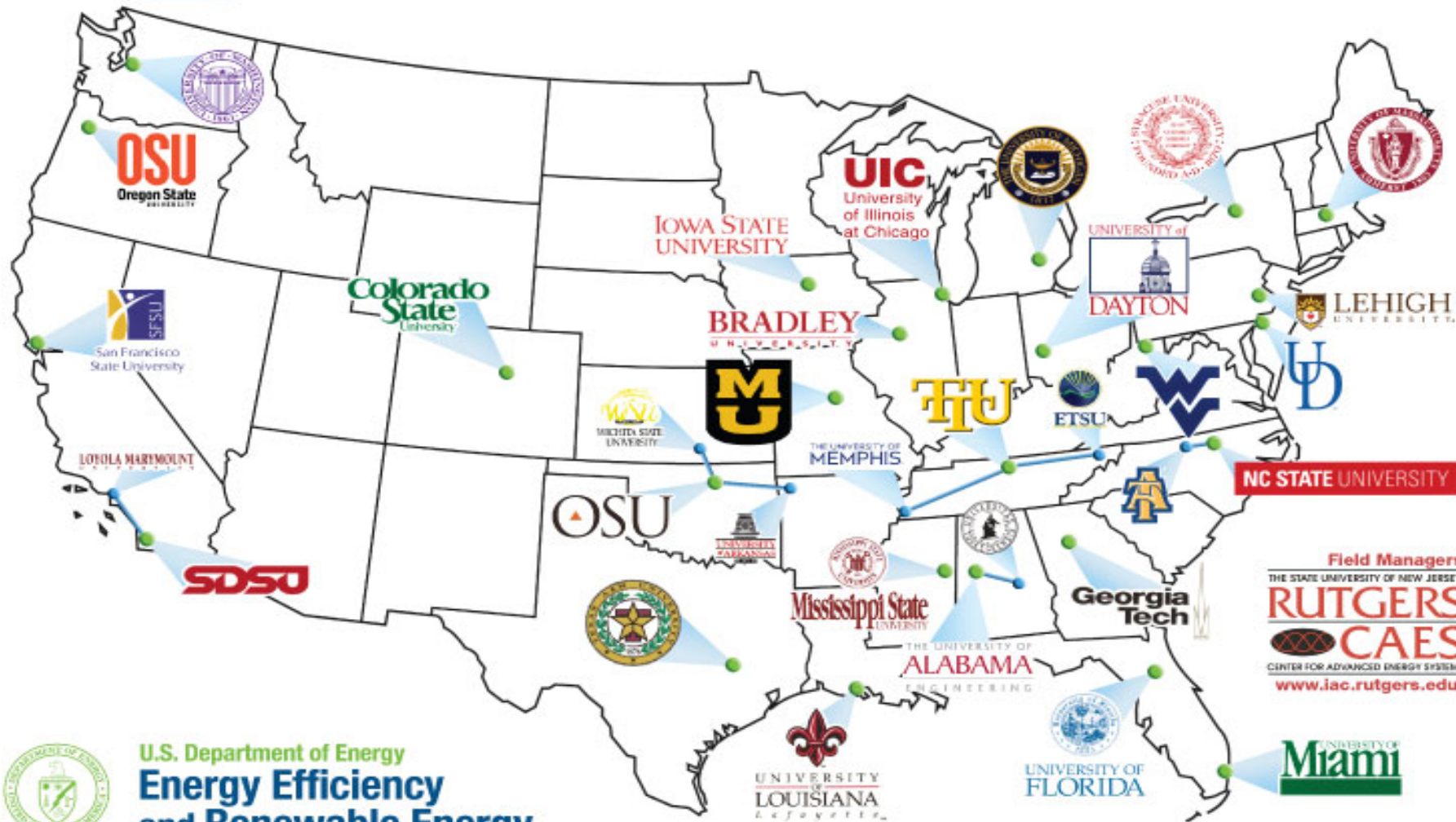


**Bottom line:** wealth of knowledge and experience – motivated people with diverse capabilities that can provide ongoing to support





# Industrial Assessment Centers 2006-2011



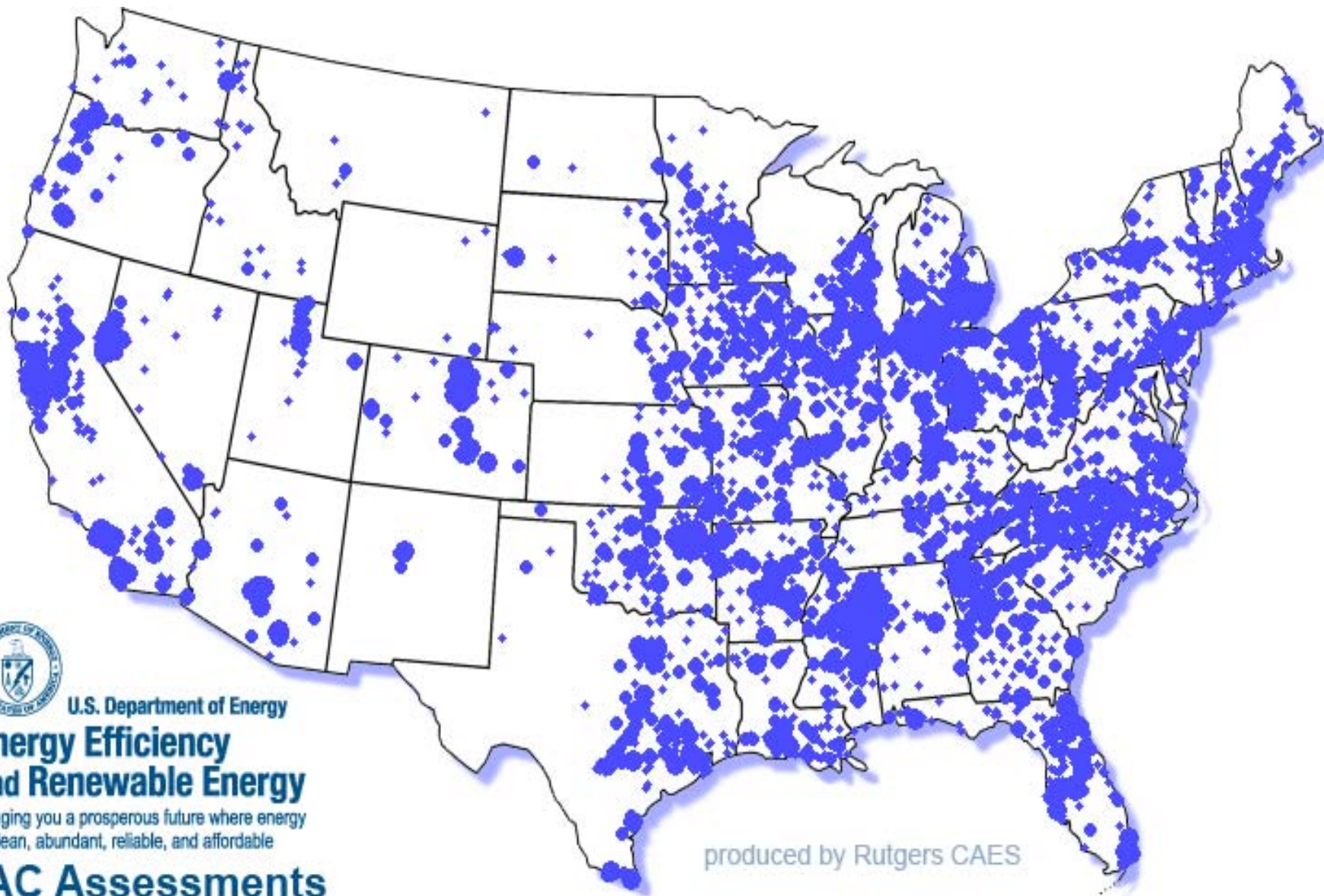
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## IAC Assessments

produced by Rutgers CAES



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# Current IAC “Structure”

- DOE: Program and project management
- Technical Field Manager: Currently located at Rutgers University Provides technical oversight for all 26 operating Centers, maintains the IAC database, case studies and other relevant tools
- IAC Centers: Currently 26 located at ABET accredited engineering departments in universities around the country – Competitively selected every 5 years (next in 2011)
- ORNL: Metrics, analysis and student/alumni activities



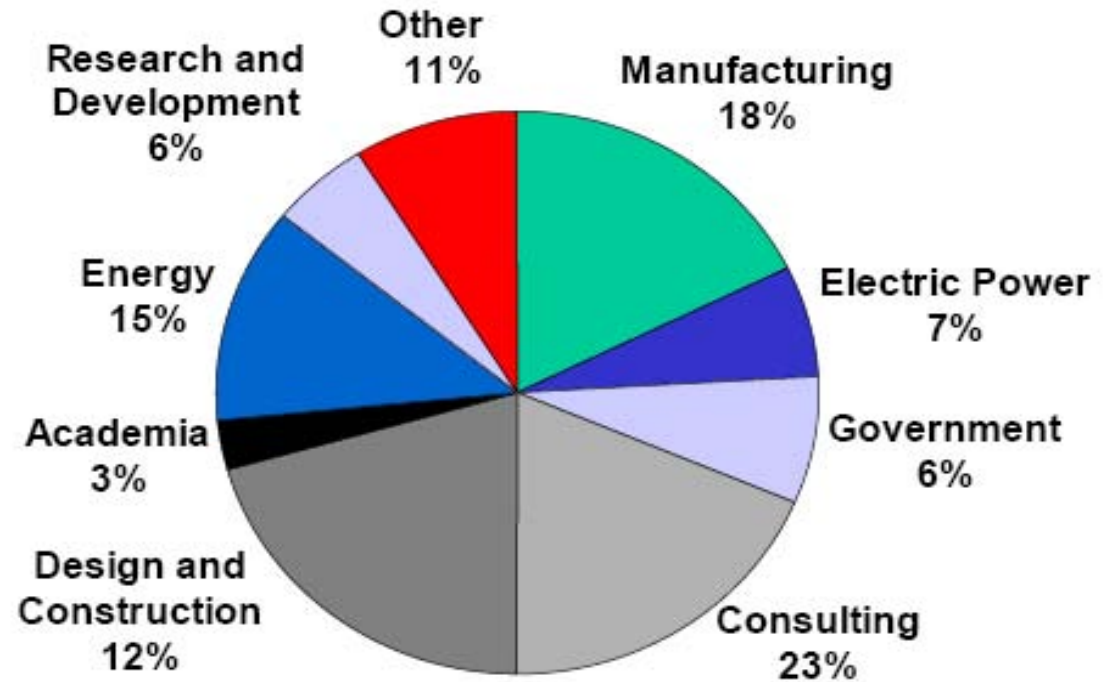
# Green Workforce

***2,500 alumni since 1977  
with 56% now working in  
energy related positions!***

## IAC Student Website

- Information on IAC Program
- Links to energy related websites
- Post job openings

## IAC Alumni Employment by Sector



# MEPs and the IACs

## Ongoing collaboration with the National Institute of Standards and Technology's Manufacturing Extension Partnership (MEP)

- Began with Memorandum of Understanding signed in February 2007
- Goal: Formally establish collaborative efforts to support energy efficiency in the U.S. manufacturing industrial base
- ITP's IAC program took the lead in these collaborative efforts:
  - 13 internships funded (IAC students at local MEPs)
  - 90 joint industrial assessments
  - All 26 Centers contacted their local MEP to provide training and DOE resources (information packet with tools and publications)
  - Ongoing collaboration efforts at several IACs due to win-win nature of the partnership
- MEPs are tracking number of “touches” with DOE resources (the latest report from NIST indicated nearly 4,000 in FY2007)





# IACs - Looking Ahead

- IAC assessment program will with focus on high quality results and student training
- Continue to provide workshops, training, software testing, and implementation of new initiatives
- Stretch goal - Expand reach of the IACs to all 50 States with additional funding and centers
- Continue to expand IAC partnerships with MEPs and industry

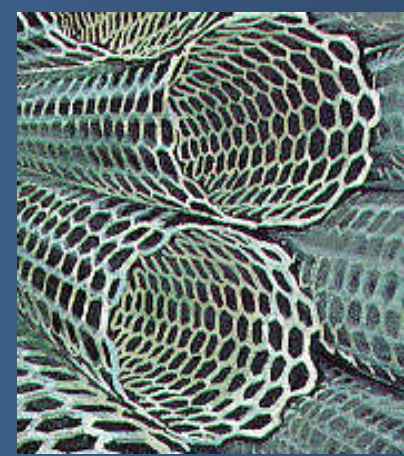




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## Energy Efficiency and Renewable Energy

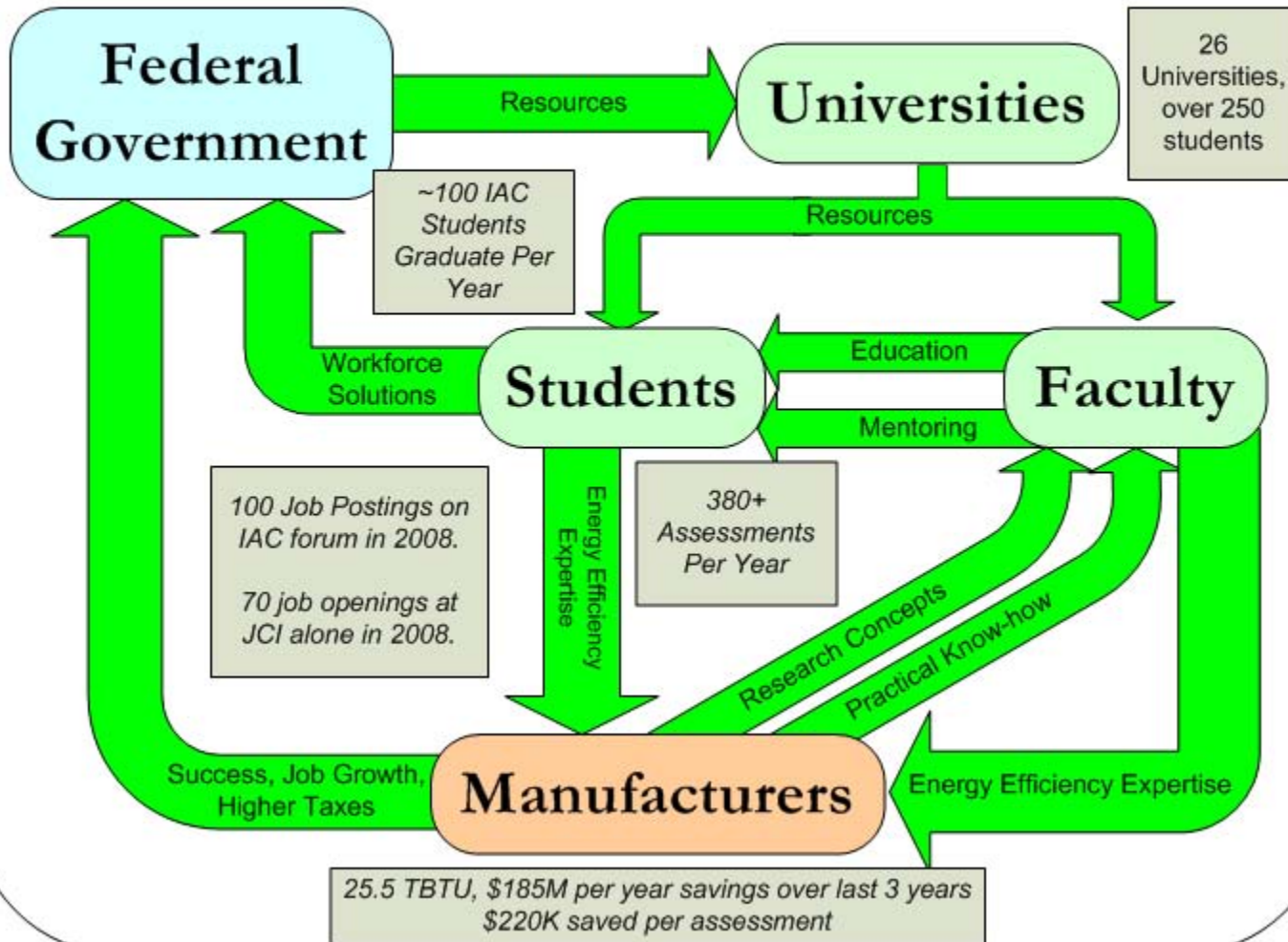
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## Industrial Assessment Centers

Don Kasten  
Rutgers University

# IAC Program... Who Wins?



# *The DOE IACs (cont.)*

- Major function is to perform industrial assessments at nearby manufacturing centers.
  - Performed by teams made up of faculty and students
    - **This is NOT a student project**
  - Normally consists of a one day site visit at an industrial plant
  - Must be integrated to include waste and productivity
    - Fundamentally a multiple-system assessment
    - When resources are limited teams can focus on a subset of important systems
- An “energy audit” grown up



## ***A History of Success As ITP's Foundation for Delivering Efficiency to US Industry***

- 15 of the 26 centers have been in the program for more than 10 years
  - This experience has led to:
    - Creative development and implementation of ITP tools
    - Mentoring relationships with MEPs
    - Establish important cogs in the ITP technical delivery infrastructure
- 25% percent of Directors and Assistant Directors have conducted more than 100 assessments



# ***What Does a Small Manufacturer Need?***

- Why don't energy projects get done?
- Money? Yes
- Skills? Yes
- Knowledge? Yes
- **TIME!** An assessment forces you to review your bills and spend one day looking at energy as a resource.



# What does an IAC Do For You?

## Energy

Analyze your energy bills  
Investigate and recommend energy saving opportunities in your facility

## Waste

Investigate and recommend waste minimization opportunities

## Productivity

Investigate and recommend opportunities that will decrease energy input per unit of production



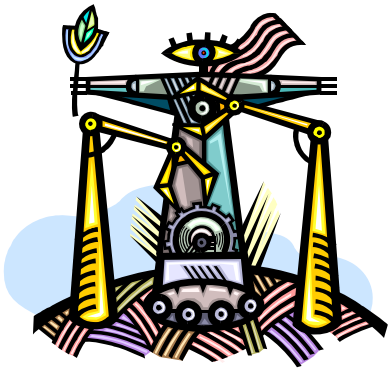
# *Energy (and cost)*

- **Energy Bill Analysis**

- We can look to see if there is a better rate structure
- Many costs are not for energy use (peak demand)
  - Example: One company saved by testing a fire suppression pump off peak
- Patterns in usage – day, night, summer winter
- TAXES – most of you should not be paying taxes for manufacturing usage. One utility takes the IAC word for how much...
- Rebates and financing – We know what is available in your area. Some utilities will fund an energy saving opportunity, if the IAC endorses it.







# *Equipment*

- We like machines – we understand the manager who loves his old compressor.
- We know that you are adverse to risk – medium sized manufacturers are not early adopters
- Our directors have seen it all – there is no substitute for experience.
- We understand that long paybacks are not acceptable
- We know the value of reliability, the cost of down-time



# ***Not Just a 1 Day Assessment***

## ***IAC Industrial Assessment Protocol***

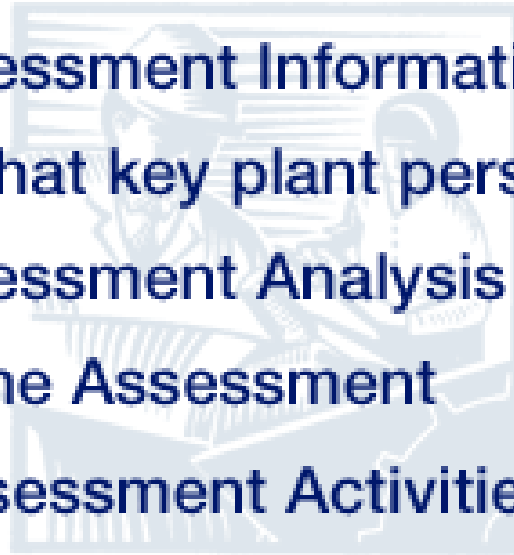
**STEP 1: Pre-Assessment Information Gathering**

**STEP 2: Ensure that key plant personnel are involved**

**STEP 3: Pre-Assessment Analysis**

**STEP 4: Day of the Assessment**

**STEP 5: Post Assessment Activities**



# *The IAC Assessment*

## **Industrial Triage**

- *“a system of priorities designed to maximize success when confronted with limited time and resources”*
- *Ideally, this is a comprehensive approach – but it can evolve to become a systems approach...*
- *At clients request, or by discovery*



# *The DOE IACs (cont.)*

- Results in a formal report being sent to the client firm
  - Each report has several recommendations which provide:
    - Sufficient engineering design to explain the recommendation
    - Anticipated savings
    - Implementation costs
    - Simple payback
- Students Fully Involved
  - Pre-Assessment prep
  - Onsite data and measurement
  - Post-assessment analysis
  - Report writing
  - Presentation of results

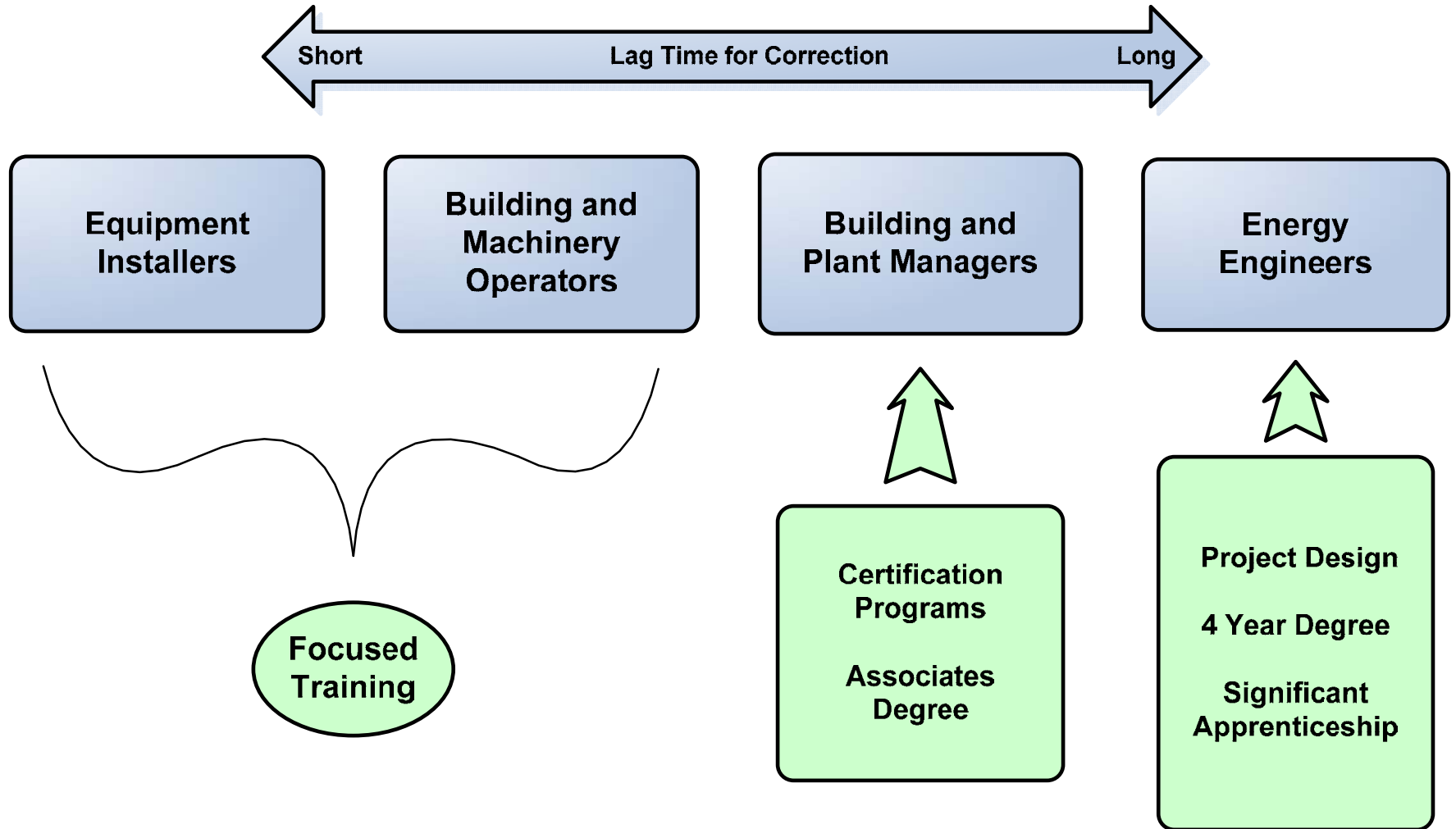


# *Results for a Sample Industry: food products*

- Since program inception in 1981, the IACs have...
  - Assessed 386 food plants
  - Identified over \$73M in potential annual savings (\$190K / plant)
  - Of which about \$21M has been implemented (\$54K / plant)
- Some of the recommendations with the greatest cost savings include:
  - Cogeneration
  - More efficient motors
  - Heat recovery
  - More efficient furnaces



# Workforce Solutions Depend on the Tasks!



# Real People – Real Solutions



Dave Abbe,  
Rutgers, 1991

Manager  
Engineering and Capital  
Projects  
Glaxo Smith Kline



Marcus Wilcox,  
Oregon State, 1989

President  
Cascade Energy Engineering  
Portland, Oregon



Ben Erpelding, PE  
San Diego State, 2002

Director of Engineering  
Optimum Energy, LLC  
Seattle, WA



Bill Eger, Dayton 2007

Energy Manager, City  
of Cleveland  
Cleveland, OH



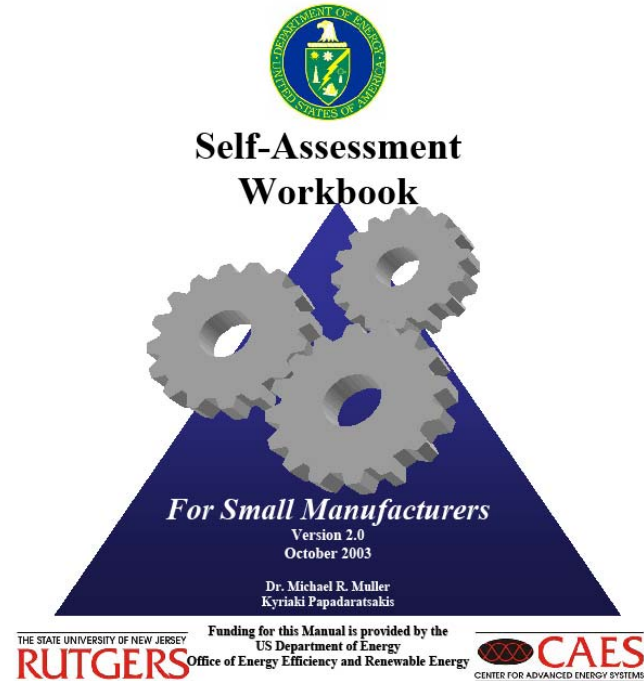
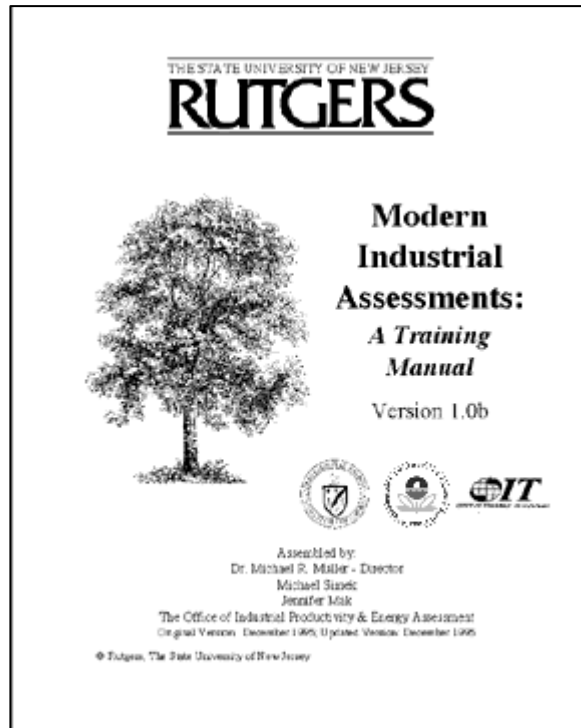
# *Bottom Line*

- The DOE's Industrial Assessment Centers are an important federal effort
  - Provides a steady stream of top young engineers into energy efficiency careers
  - Helps small and medium sized manufacturers save energy and cope with the enormous recent increases in costs
  - Carefully utilizes Federal \$\$ - the centers make their nickels scream!
  - Develops energy efficiency expertise in faculty at our top engineering schools
- Workforce issues in energy are big and getting bigger
  - Helps with the ITP goals of establishing relevant “Intellectual Capital” and developing certified practitioners





# Resources



# Case Studies

## Plastics:

### Industrial Assessment



Industrial Technologies Program

Assessment Date:  
June 09, 2008

#### Benefits:

- Report identified potential annual energy cost savings of \$246K
- Plant found additional \$100K annual savings as a result of recommendation #1
- 8 of 10 recommendations implemented within 6 months, remainder budgeted for completion within 20 months

#### Applications:

The Texas A&M University assessment team for Texas Tile Manufacturing LLC discovered 10 opportunities to decrease energy usage and waste focusing on elements of the production process and the various energy streams, including natural gas, electricity, steam and the water usage of the plant. One important recommendation for the plant was the replacement of pilot lights with spark igniters, thereby reducing natural gas usage considerably. Once implemented by the plant they discovered the additional benefit of longer lives for their conveyor belts that were no longer exposed to heat from the pilots.

### Vinyl Flooring Texas Tile Manufacturing LLC, Additional Savings are a Pleasant Surprise

#### Summary

Through the Department of Energy's Industrial Assessment Center at Texas A&M University, Texas Tile Manufacturing LLC, a vinyl floor tile manufacturer saved a significant amount of money from reductions in energy and water expenditures. Ten recommendations, all of which have been implemented, or are budgeted for implementation, will generate savings of over \$246,000/year. The implementation of one project by the plant also resulted in additional savings estimated at \$100,000/year.

#### Company Background

Texas Tile Manufacturing LLC produces vinyl composition floor tile for institutional and commercial applications. The raw materials are mixed and blended, formed into a large sheet, milled to the proper thickness, cut into tiles, then boxed and are made ready for shipment. During the process the vinyl sheet is heated by natural gas fired heaters to maintain pliability as it moves through the production process, and is then cooled prior to packaging.

#### Assessment Approach

A team consisting of 5 students and the Director and Assistant Director of the Industrial Assessment Center at Texas A&M University performed an assessment of this facility in the summer of 2006. After arriving onsite the team met with members of the plant energy committee, toured the facility, determined a number of potential conservation measures and gathered data in order to quantify the impact of the recommendations.

#### Energy Conservation Awareness

The IAC team documented many existing good practices by the plant. Included were their efforts to minimize and reduce waste of various raw material components, unnecessary lights being turned off, low NOx burners on the steam boiler, the existence of the energy management committee, lowered compressed air system pressure, and that the power factor was optimized at 99%. The IAC encourages the continuation of these practices and the implementation of the recommended projects



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## Aluminum

### Industrial Assessment



Industrial Technologies Program

Assessment Date:  
February 22, 2006

#### Benefits:

- Identified potential annual energy cost savings of \$2 million
- Many payback periods are under 20 months
- Natural gas savings of approx. 43,000 MMBtu per year

#### Applications:

The IAC team identified opportunities to increase productivity and reduce energy usage by optimizing the furnace system, using the optimum size compressors and increasing the efficiency of the motors. The high percentage implementation of recommendations at this plant will encourage the IAC team to help other similar facilities in the future.

### Aluminum Foundry: Pennex Aluminum Company, Wellsville, PA, Implements Major Recommendations

#### Summary

Lehigh University's Industrial Assessment Center performed an energy audit at Pennex Aluminum Company, Wellsville, PA, and identifying potential savings of about two million dollars through reduction in energy consumption and improvement of productivity. Assessment recommendations amounting to \$2.55K were implemented. The major cost savings resulted from a 12.5% reduction in cycle time, as a result of increased productivity and efficiency of the homogenizer furnace. Also, \$70K was saved by switching the melting furnace to low fire mode when the furnace door is open. Other savings were realized by addressing the problem of energy losses due to poor insulation of some furnaces in the plant. An \$80K insulation project helped solve this \$100K problem. A few other smaller energy saving recommendations were also implemented.

#### Company Background

The manufacturer produces various sizes of Aluminum logs, billets, and extrusions. In the process, the raw Aluminum is melted, cast, heat treated, quenched, extruded and annealed. The stress free metal is then tested, packaged, and shipped to customers. The facility has an area of approximately 150,000 ft<sup>2</sup>. It was reported during the assessment that the production area operates 50 weeks per year, 7 days per week, and 24 hours per day.

#### Assessment Approach

A team from the Lehigh University Industrial Assessment Center, lead by Dr. Alparslan Öztekin, performed the necessary tasks in order to carry out a successful energy audit. The tasks included: initiating company contact, familiarization with the basic manufacturing process and energy consuming equipment, performing a plant visit that included an in-depth discussion with plant technical engineers, gathering required information from plant equipment, writing the technical report, including energy savings recommendations and calculations, and, finally, following up on the report to determine which recommendations were implemented.

#### Energy Conservation Awareness

The assessment team identified energy conservation awareness practices for the employees at the facility as a cost-effective way to significantly reduce energy consumption. Employees are encouraged to monitor the operating conditions of furnaces and optimize the efficiency to find the best possible energy output and least energy waste from the furnaces. Also recommended were the regeneration of the furnace's exhaust heat and the use of an optimum size compressor for the plant. Future energy management projects include reduction of compressed air leaks and system insulation checks and improvements.



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# The IAC DATABASE

- Publicly Available!
- Contains:
  - Facility data
  - Recommendation data
  - Implementation data
- Searchable by
  - Size (in energy usage, employees, etc...)
  - Industry Type (NAICS or SIC)
  - Location
  - Recommendation Type
- Updated in Real-Time as the assessments are completed

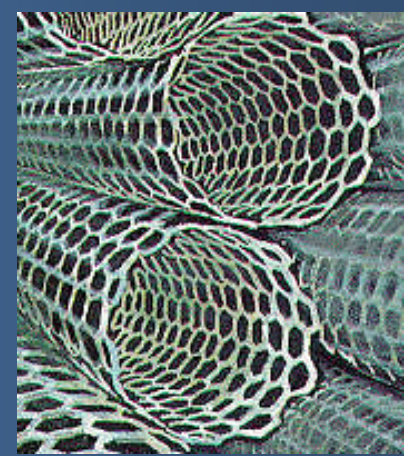




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## Industrial Assessment Centers

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