Industrial Assessment Center

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

IAC Student Webcast

April, 2015

RUTGERS THE STATE UNIVERSITY OF NEW JERSEY

CAES CENTER FOR ADVANCED ENERGY SYSTEMS

Don Kasten
Manager, Technical Operations
Center for Advanced Energy Systems

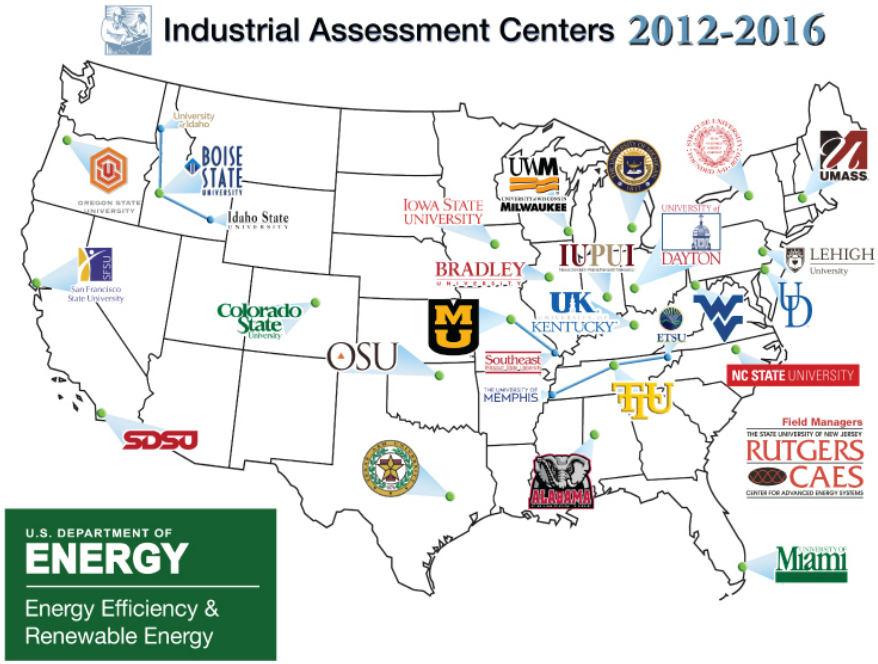
IAC Annual Directors Meeting
Field Management Review

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

RUTGERS
THE STATE UNIVERSITY OF NEW JERSEY

CAES
CENTER FOR ADVANCED ENERGY SYSTEMS

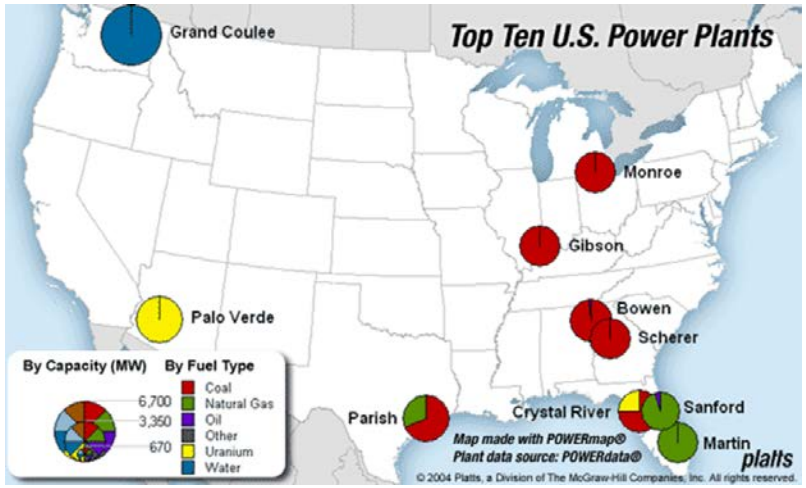
AS IAC goes into its 40th year…



IACs Produce ***Power***

Merriam-Webster defines power as:
"ability to act or produce an effect"

Nega-Watts



IACs Produce **Power**

Merriam-Webster defines power as:

"ability to act or produce an effect"

We Produce Energy Engineers

We Produce Nega-watts

How?

One day assessments – With Numbers!

This is a dramatic concept

Scale of Program

- How many assessments?
- How much energy saved?
- How many $$ saved?
- How many $$ invested?

Scale of Program

- How many assessments? ***15,000+***
- How much energy saved? **70 tBtu**
- How many $$ saved? **$675M**
- How many $$ invested? **$545M**

- Persistent Savings
  - Savings fade out over 10 years

- 20 tBtu worth $200 Million
- These savings have saved gas, oil, and are displacing power plants. RIGHT NOW!

Scale of the Program

- **Enough energy reduction right now to take 10 average utility sized gas turbines off the grid**

Tips on Assessments

- **The IAC Assessment is the "Gold Standard"**
- What is unique is the one-day assessment
  - We have tried other formats
- In reality, its an exercise in efficient and effective use of time
  - Much prep work
  - A good plan on site
- Assign one person to be the "timer"
  - Learned this from U. of Kentucky

Tips on Introductions

- **"This is a free program – There are no obligations"**
  - This is a program offered at no cost to the clients
  - Client is obligated to answer the implementation call
  - Bring a sample implementation survey, put it In the appendix of the report
  - Question. Sign a contract?

What Do We Do?

- Manage
  - Technical support
    - Promote
      - Database

Manage

Make sure the work gets done each year (boring!)

Act as interpreter

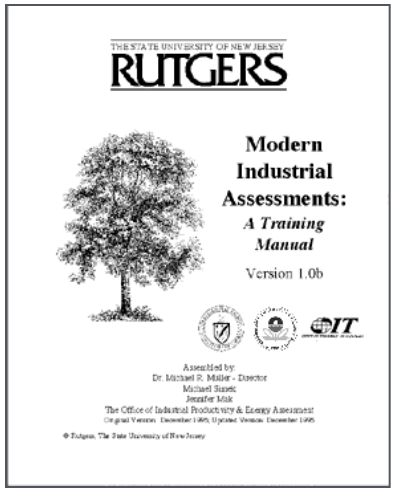
- Top down - Focus of DoE –
- Bottom up - Voice of your concerns to DC

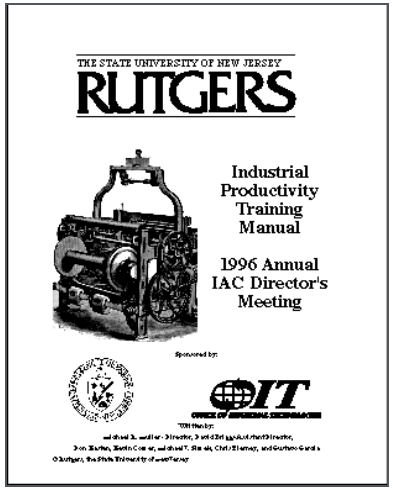
  We are multi-lingual

  English, Engineering, and even Administration

Technical Support

- Training – IAC , Manuals, Webcast
- Directors meeting
- Review of reports (Critiques)
- Research new technologies
- Advise new programs, BP tools





Database – don't touch that dial!

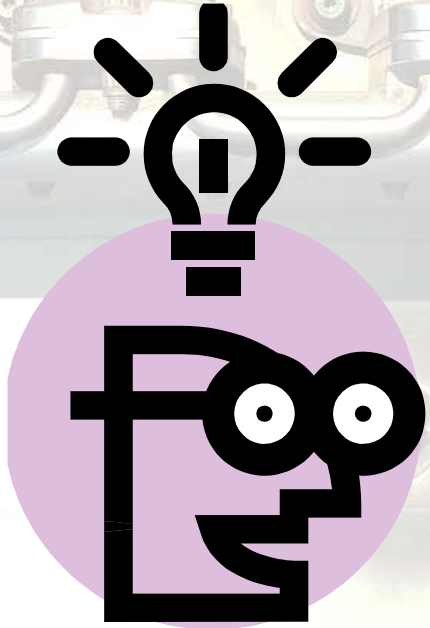
If You Want to Know More About the Database…

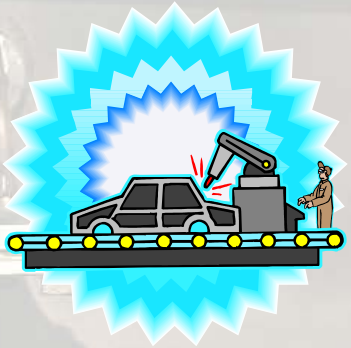
Call MikeB

- Mike will tell you more than you want to know

Two Skills not usually taught in school

Group Writing
Estimation





Tips from the Field Management

- I won't pretend to be an expert

  But here are some tips we have learned from critiques for writing IAC reports

IAC Report Critique Points

- **Present the Recommendations in some order in Executive Summary**

  ARs presented in a random order do not inspire confidence by executive.

- **Present a short description of ARs immediately after this list. It is an Executive Summary**

  Assume execs won't read past page 5…

Report Riting Tips

Use variables consistently throughout report –

- **Operating Hours (OH)**

  Ensure that students are working together.

  Use Utilization Factor (UF) to adjust for different run times.

- **Use consistent energy cost**

  Determine the cost of the “last” Kwh or mmbtu

Report Riting Tips

Differentiate Between "Best Practices" and a recommendation

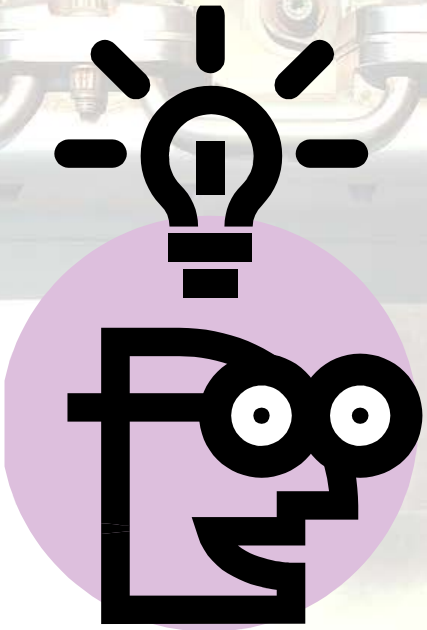
What is the Application to <u>THIS</u> plant?

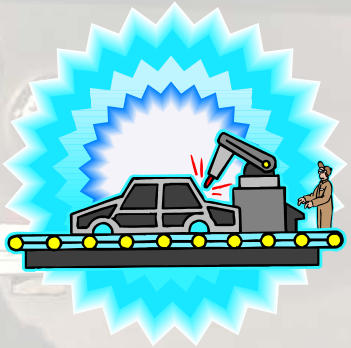
Best practice manuals tell plant mangers what a "typical" plant can save.

You are on the plant floor to tell him/her how THIS plant is affected.

One Skill not usually taught in school

Estimation





Estimating

- **This is the ONE ITEM we are asking you to change**
- Show the cost of operating a piece of equipment, don't bury it. Eg. Cog belts, 3% improvement.
- For Example: Energy Savings =

10 HP x .74kw/hp x .8 LF x 6000 hr./.92 eff. x $.10/kwh –
10 HP x .74kw/hp x .8 LF x 6000 hr./.95 eff. x $.10/kwh =
$ 625.40

Sound Reasonable?

Estimating

- Current to Operate

10 HP x .74kw/hp x .8 LF x 6000 hr./.92 eff. x $.10/kwh = $3860.89

- Recommended Cost to operate

10 HP x .74kw/hp x .8 LF x 6000 hr./.95 eff. x $.10/kwh= $3798.35

Savings = $62.54

- From previous equation Savings = $ 625.40
- Still sound reasonable?

Estimating

- **Request for ideas about the art/science of estimating**
  - Exercises
  - Quiz Questions
  - Rules of Thumb

Misplaced Precision

1 lb. fresh tomatoes

½ lb. pasta

¼ lb. chopped green peppers

4 oz. ground parsley

1 cup olive oil

1 oz. eye of newt

AND

A Pinch of Salt

Misplaced Precision

- Energy Savings =

  10 HP x .74kw/hp x .8 LF x 6000 hr./.92 eff. x $.10/kwh

- **Times 2**

- Misplaced Precision
  - ***The 20,000,006 year old dinosaur***

Issues - Lighting

- Production of Lower Efficiency Lighting Banned

- This means lots of opportunity
- But we must be cautious

Issues - Lighting

- **Most common is 400w MH to T5**
- We have seen too many errors – this is very dangerous
- Calculation can very complicated – but not necessary.
- Clients are going to use lighting expert (usually)

- We have seen calculations using Coefficient of Utilization, for example
- If you don't understand what that is – don't use it

Issues - Lighting

- ***"Must Haves"***
  - **Existing Lighting Levels**
  - **Recommended Lighting Levels**
    - **(Illuminating Engineering Society)**
  - **Suggested Lighting Levels**
    - **We have seen 50% reduction in lighting levels recommended**
    - **This unacceptable to any plant manager**
  - **References**
    - **Where did you data come from?**
    - **Where did the calculation come from?**
    - **Hint: U. of Dayton is <u>not</u> a reference**

Case Studies

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- **Introduce Case Studies at introduction**

- Have a case study to leave behind
- Very Important
- Allows us to continue to offer confidential assessments

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ADVANCED MANUFACTURING OFFICE:
INDUSTRIAL ASSESSMENT CENTERS

Assessment Overview:
Thermoplastics Manufacturer

A team of students & faculty from the IAC at the University of Delaware performed an industrial assessment for New Process Fiber, Inc. The assessment was sponsored by the Department of Energy and was led by Center Director Dr. Kaith Goossen, a faculty member in the Department of Electrical and Computer Engineering. In April 2011 the IAC team employed a comprehensive assessment methodology that considered energy, waste, & process related improvements. The team examined all large energy consuming equipment &systems for potential savings. They compiled a waste inventory & investigated the potential for waste reduction or improved disposal & recycling methods. The team also examined manufacturing processes for potential improvements, & emerging technologies were assessed for potential contributions to efficiency improvements.

Applications

The assessment personnel of the program identified and evaluated opportunities to conserve energy, minimize waste and improve productivity. In this case important opportunities for energy savings were found in compressed air, cooling, lighting and HVAC systems.

New Process Fiber, Inc., located in Greenwood, DE, is a 40,000 ft²facility that produces 400,000,000 thermoplastic parts each year.

Summary

Through the Department of Energy's Industrial Assessment Center (IAC) located at University of Delaware, an extruded thermoplastics manufacturer was able to realize a 16.7 % reduction in electricity, resulting in a 14.8 % overall utility cost reduction.

Company Background

New Process Fibre is a major supplier of non-metallic stamped components to many of the largest OEM companies in the world. They produce custom non-metallic components for almost every facet of everyday living from electronic, plumbing, automotive, defense, furniture and construction to name a few. At the time of the assessment, the plant consumed about 1,200,000 kWh/year and 220 MMBTU of heating oil. Existing plant Best Energy Practices included updated lighting and added extruder insulation.

Implemented Recommendations

The table on the following page summarizes specific recommendations that were made during the assessment and were implemented or will be implemented in the near future. These projections of savings & capital costs identified during the assessment have been established through engineering analyses and research. As a result,

Assessment At A Glance

-Implemented 7/11 of recommendations to save an estimated $22,318/year

-Implemented recommendations to reduce air infiltration, increase cooling tower and compressed air efficiency, and updated HVAC equipment and lighting

-Payback periods of implemented recommendations range from 0 to 48 months, averaging 15 months

Tips About Productivity

- Look for safety report, usually on the wall in plant

Tips on Productivity

- This is NOT good, indicator of a poorly manages plant, Watch where you walk!

Twelve Hours
without serious incident

- **Ask about defect rate?**

- The term “defect” is usually defined by a product that reaches the customer
- If the product can be recycled back into the process, it is called ‘internal return”. Co usually does not view this as wasteful.
- But a lot of energy can be wasted by reworking

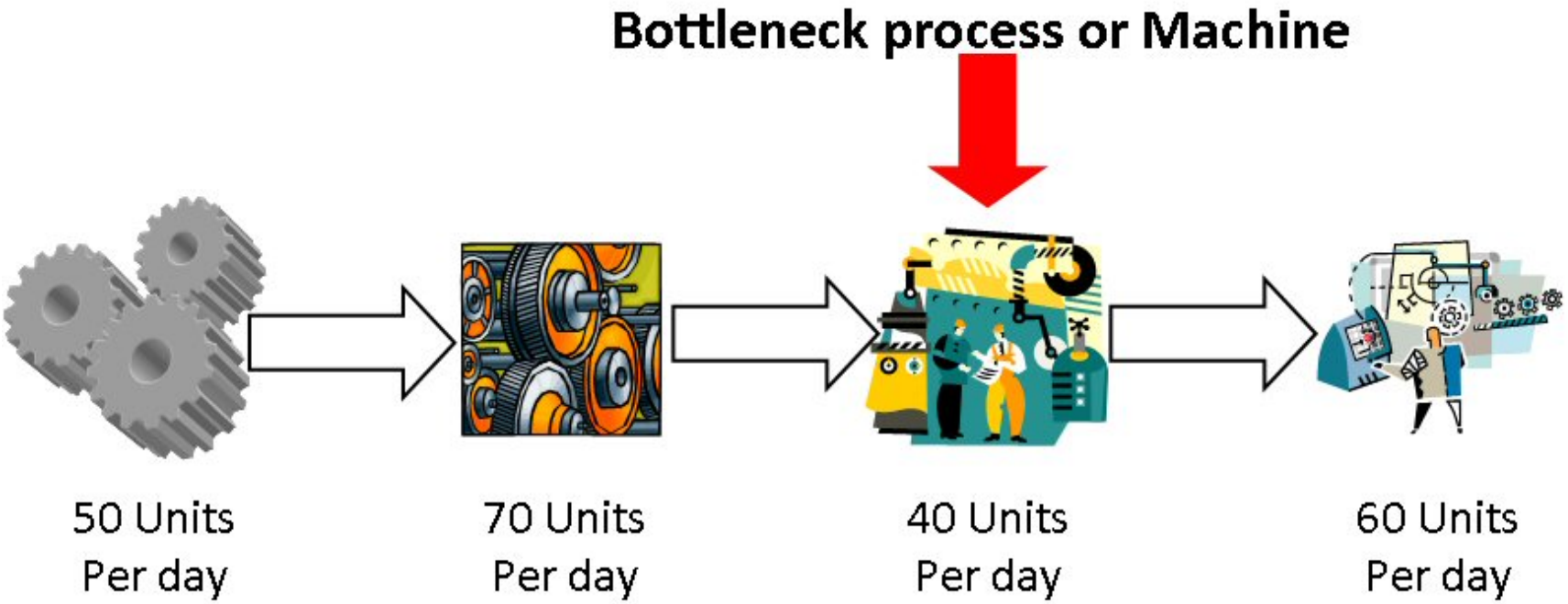
Tips on Productivity

- **Where is the bottleneck?**

- Can the Co produce more?
- Which process is the restriction?
- Bottleneck is identified by waiting…
  - people
  - machines
  - materials

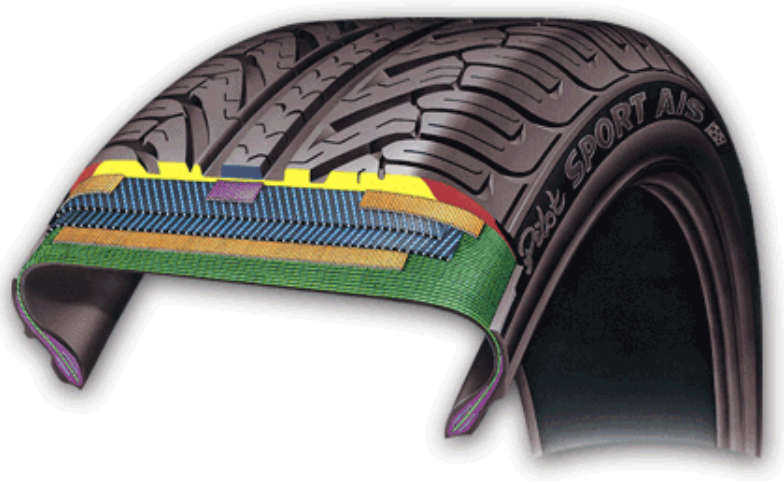
Tips on Productivity

A manufacturing unit can only produce to the bottleneck's maximum capacity



Maximum throughput is 40 units per day

Tips on Productivity



- Solution can be scheduling
- Can be new piece of equipment
- Stockpiling not a great idea
- Be creative
- E.g. A tire factory bought a new assembly machine
- Required only one operator instead of two
- Sometimes was the bottleneck

- Solution? For short periods of time, use the old machine in addition to the new machine.

Implementation Calls

- **Discussion: What Works?**
- Who Makes them?
- When?
- Any tricks?

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