



Energy Assessments for the Boiler and Process Heater MACT

Frederick P. Fendt, P.E.

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Technical Career (35 Years)

- Global Energy Eff Manager – Dow Chemical Company
- Technical Fellow – Rohm and Haas Company
- Senior Engineer – Carolina Power and Light Company
- Utility Project Engineer – Federal Paperboard, Inc.

External Influence

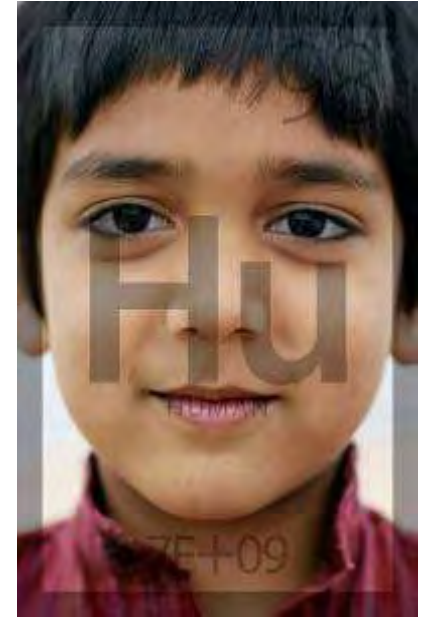
- Chairman – Energy Committee – Council of Industrial Boiler Owners
- Chairman – US Council for Energy Efficient Manufacturing
- Chairman – U.S. D.O.E.'s Steam BestPractices Program
- ASME Energy Assessment Standards Committees

Agenda

- Dow at a Glance
- Energy Assessments (EAs)
- EAs for the Boiler and Process Heater MACT
- Questions?

About Dow

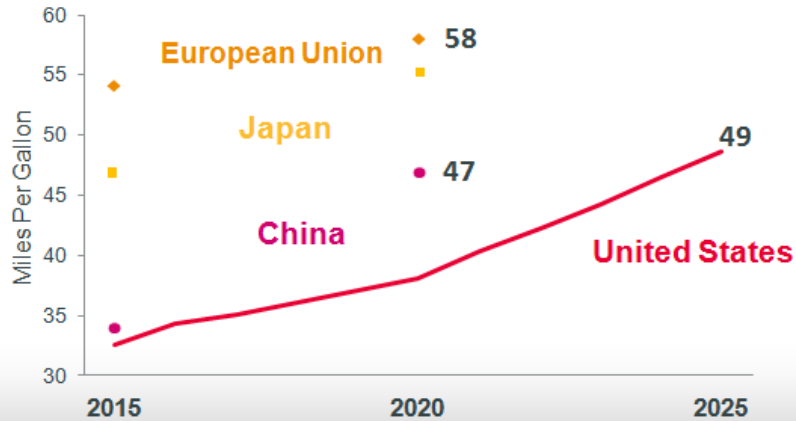
- Largest diversified chemical company
- Founded in Midland, Michigan in **1897**
- **Manufacture more than 6,000 products at 200 sites in 36 countries across the globe**
- Annual sales of **\$58 billion**
- **53,000 employees** worldwide
- One of the world's largest industrial **energy** consumers
- Committed to **Sustainability**



Rapidly Evolving Trends Enabled By Dow

Automotive

Corporate Average Fuel Economy (CAFE) MPG Regulations



- Dow structural bonding key enabler of lightweighting via dissimilar materials assembly (aluminum usage +50% 2015 - 2025)

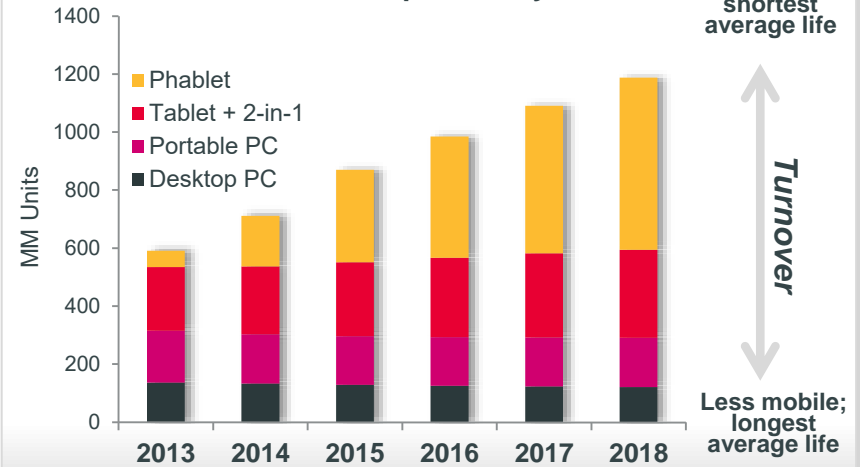
- Lightweighting is the most sustainable and affordable way to meet global tailpipe emission legal requirement (e.g. CAFE)
- Low gas prices drive large/premium vehicle demand (larger share of wallet), accelerating light weighting implementation



Source: Deutsche Bank

Electronics

Global Annual Shipments by Device



- ~95% of mobile devices enabled by Dow materials
- Higher Semiconductor content driven by consumer desire for more powerful devices
- Smartphones and Phablets have shorter lifespan as consumers replace devices more often



Source: IDC

Olympic Partnership

Dow's Olympic partnership highlights how science and chemistry can improve the Olympic Games and serve as a proof point to how Dow solutions improve everyday life.

Objectives

- Enable profitable business growth
- Accelerate establishment of government market program
- Build brand and reputation
- Enhance customer experiences and relationships
- Expand employee pride and engagement

DOW AT RIO

Rio 2016 and Dow Partner to Implement the Most Comprehensive Carbon Program in Olympic Games History

- Dow will mitigate 500,000 tons of CO₂equivalents (CO₂eq) from organizing and hosting the Games through 3rd party-verified emissions reductions.
- Dow and Rio 2016 will also work to generate an additional 1.5 million tons of CO₂eq in climate benefits by 2026, addressing other Games-related emissions.



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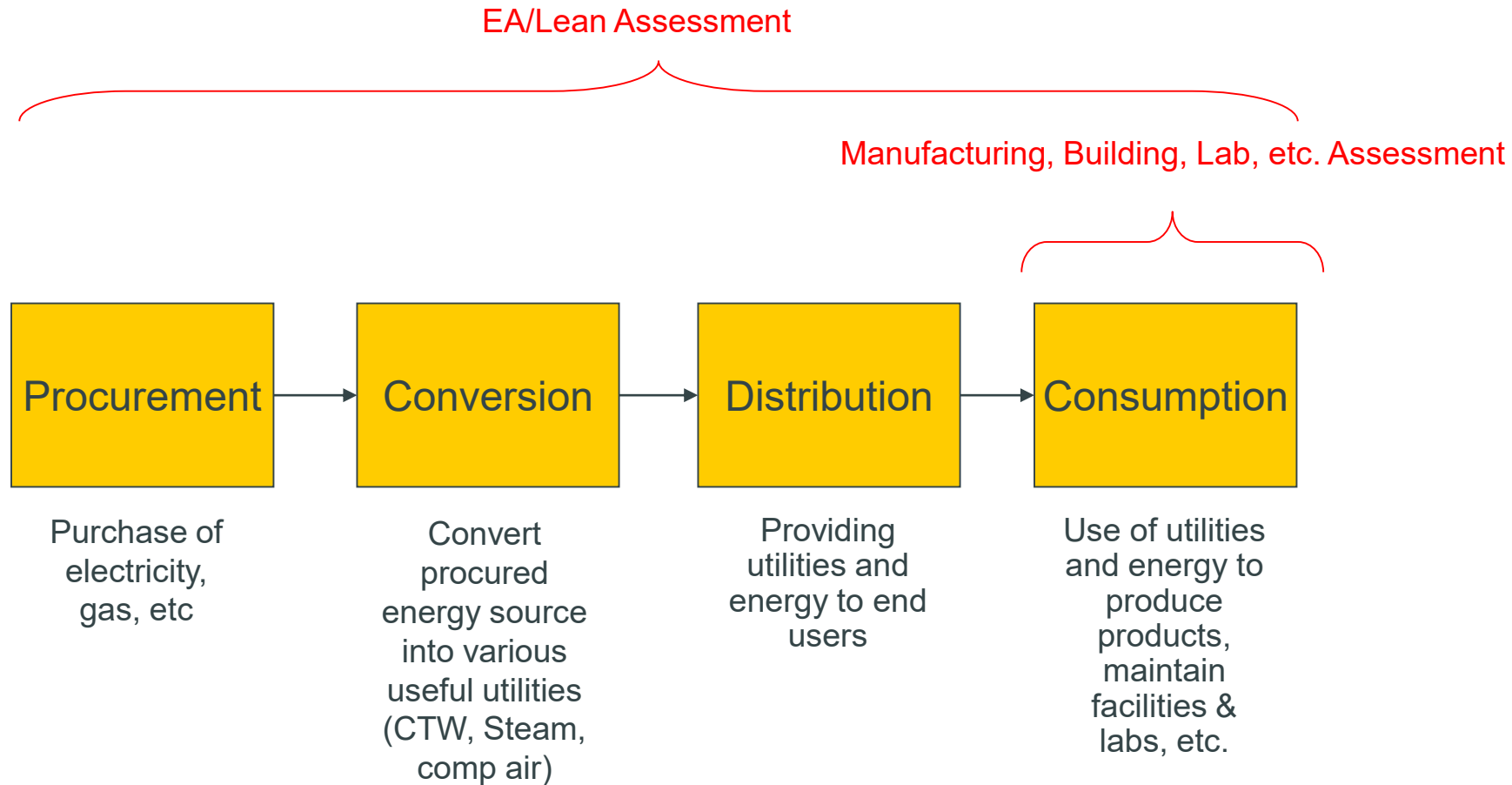
Five Distinct Types of Energy Assessments

1. Manufacturing Process Energy Assessment
2. EA/Lean Assessment
3. Office Buildings / Warehouse Assessments
4. Laboratory / Research Facility Assessments
5. BMACT Compliance Assessments



Components of Energy Use

Definition of the two types of Assessments



EA / Lean Assessments

A broad, multi-discipline look across a plant, site, or operation:

- Optimized to get biggest bang for effort invested
- Infinitely flexible to align with site and business objectives
- Focus is energy cost reduction without capital, but looks at all waste
- Approximately one person-week of prework, one week onsite, and some follow up time is required.

Typical results:

5% to > 25% Reduction
in per pound energy use



Technical Process Energy Assessments

A deep drill fairly unique process analysis using:

- Equip Manuals, Flow Diagrams / P&ID, Technical Manuals
- Heat & Mass Balances, ASPEN Models, Process economic analyzer tools
- Batch Recipes, Operating Instructions, Batch Cards

The purpose is to:

- Understand process technology to determine if potential exists
- Develop preliminary Opportunities, with potential savings, and estimated costs
- Discuss with site team members to gain buy-in and support

Typical results:

20% to > 50% Reduction
in per pound energy use



Office Building / Warehouse Assessments

Much shorter duration, much less prework

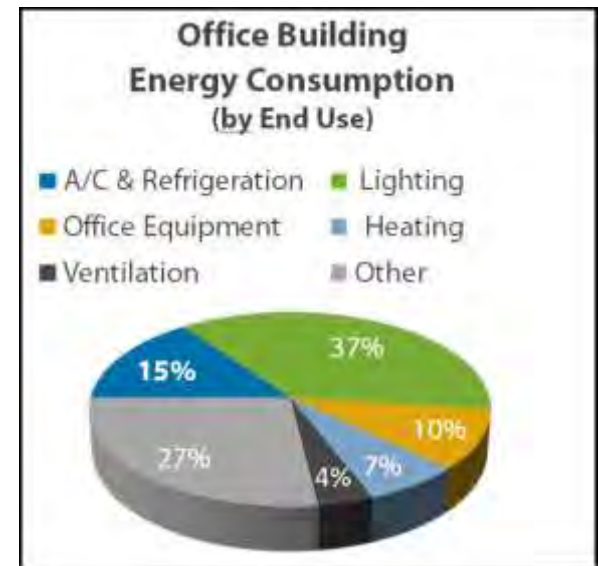
Focus is on Lighting; HVAC; Building Envelope Sealing

Turn down where work schedule allows

Seasonal management of utilities

Typical results:

5% to > 25% Reduction
in total energy use



Lab / Research Assessments

- Similar to building / office assessments
- Heavier focus on Industrial Ventilation, especially lab hood design and operation
- Clean rooms specialization
- Pay special attention to repurposed spaces, i.e., clean room now used for storage.

Typical results:
5% to > 50% Reduction
in energy use



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Boiler & Process Heater MACT

Energy Assessment Requirements

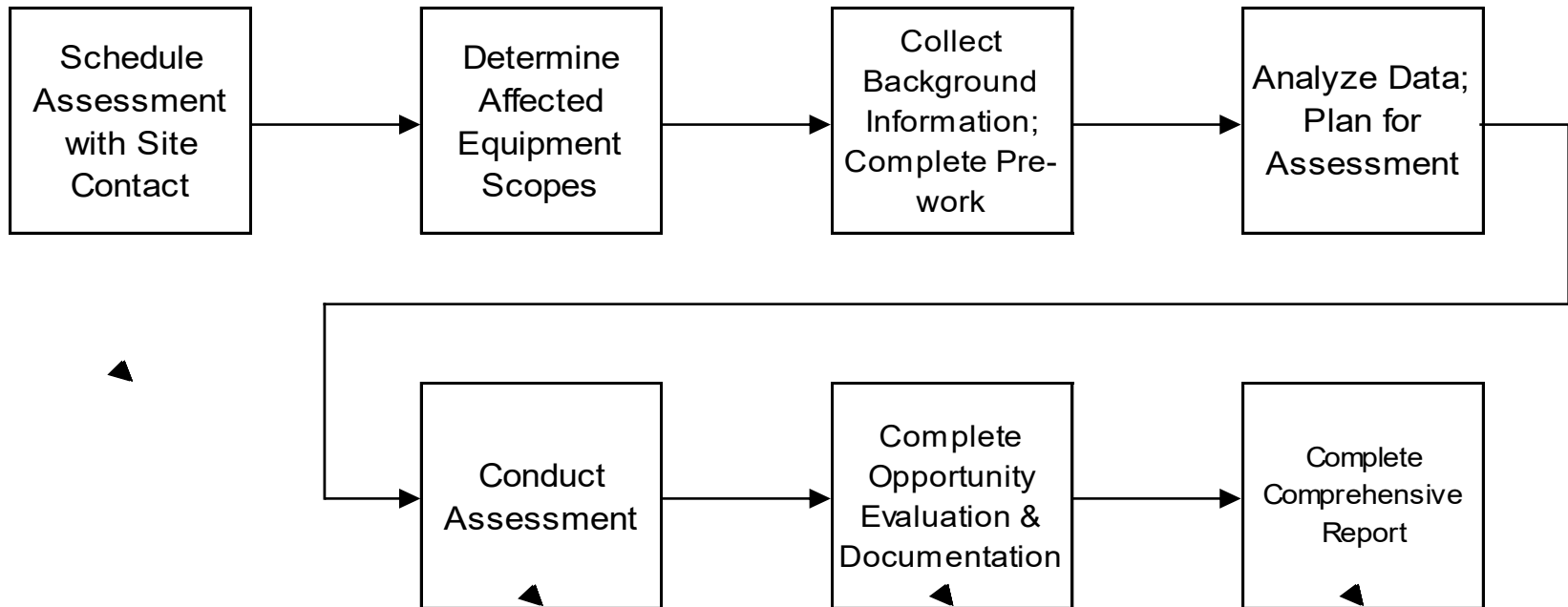
One-time energy assessment

- Visual inspection of boiler or process heater
- Evaluate Boiler/PH operating characteristics, specs of energy using systems, O&M procedures and unusual operating constraints.
- Inventory major energy use systems consuming energy from affected source under control of Boiler/PH owner / operator.
- Review architectural & engineering plans, facility O&M procedures and logs and fuel usage.
- Review of facility's Energy Management practices and provide recommendations for improvements consistent with definition of Energy Management practices, if identified.
- List of cost-effective energy conservation measures within facility's control.
- List of energy savings potential of energy conservation measures identified.
- Comprehensive report detailing ways to improve efficiency, cost of specific improvements, benefits, and time frame for recouping investments.
- Performed by a "Qualified Energy Assessor"

January 31, 2016 compliance deadline

Boiler / Process Heater MACT Energy Assessment

BMACT Energy Assessment Work Process



■ Tool Overview

The tool provides a convenient place to collect information needed for the energy assessment and to link to external documentation required by the Boiler and Process Heater MACT.

Each site will receive a copy of the tool prepopulated with preliminary information.

The tool is used to collect information throughout the process, and at the end, becomes the required final report.

Additional Documents Required

The following documents are required:

- Any documentation showing Boiler or PH operating characteristics, any systems specs, and any O&M procedures for energy systems within the scope defined in tab 3.
- Documentation of any unusual operating constraints.
- A/E plans, O&M procedures, logs, history of fuel usage.
- Documentation of the Site's Energy Management practices.

Results

- Opportunities discovered in energy efficient lighting, steam traps, insulation, and operational discipline.
- A handful of significant process related opportunities discovered.
- Net impact looks like it will result in a 1% or 2% reduction.

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