

Energy Efficiency in the Industrial Sector

Market transformation viewed from
the trenches

National Symposium on Market Transformation
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Approach

- Frame National and Regional Programs, Activities
- Frame Local Situation
- Using Utah as a base to think about how, and how well, national and regional activities have diffused.
- Going from the anecdotal and specific to the general
- Develop some general lessons from particular experience

National Framework -Major Areas of Action

- Technology – Research and Development
- Components and Equipment
- Direct Technical Assistance
- Codes and Standards
- Training, Information, Analytical Tools

National Framework -Actors

- Feds – DOE (EERN, OIT) and EPA
- Non profits
- Regional
- Local
 - Utility DSM, Public Benefits Programs
 - State Energy Offices
 - Local non profits

Framing Utah Industrial Sector

- Service based economy
- Wide urban/rural geographic and demographic split
- Concentration of traditional, resource based, resource intensive industries
 - Mining
 - Primary metals
- Significant, growing high tech industry
- ~ 30 % of energy to produce 14 % of State GDP
- compare to ~37% energy for 24 % GDP nationally
- Very low energy costs
- Energy exporter
- Conservative political climate

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Framing Utah Energy Efficiency

- State Energy Office
 - Policy
 - Funding
 - Federal Programs
- Not part of NW or CA “region”
- Not for Profits -
- One Electrical IOU
 - IRP requirements
 - DSM Program
 - Load Challenged
- One Large Gas IOU
 - Deregulated access
 - No required efficiency programs
 - Large ratepayer owned reserves

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The trenches

- Players
 - Facility Manager/Engineer
 - Operators
 - Consultants
 - Designers
 - Vendors
- Technical Infrastructure
 - Analytical Skills
 - Analysis/Design Tools
- Market Infrastructure
 - Equipment
 - System/Performance Information

The small industrial plant

- Compressed Air
- HVAC Systems
- Lighting
- Process Cooling
- Dust Collection
- Process Heating
- Process Equipment

The DSM Energy Audit - Opportunities

- Compressed Air
 - Controls
 - Leaks/End use
 - Storage/Distribution
 - Controls
- HVAC
 - Economizer
 - Controls
- Process Cooling
 - Evaporative cooling
 - Water cooled chiller
 - Variable speed pumping
- Lighting
 - Retrofit
 - Controls
- Dust Collection
- Process Heating
- Process Equipment

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The DSM Energy Audit – What Gets Done (WO incentive \$)

- Compressed Air
 - ~20 to 50 % - only slightly related to payback
- HVAC
 - 20 to 50 % - strongly related to payback
- Process Cooling
 - 10 % - “had to do something”
- Lighting
 - 40- 80 % strongly related to payback
- Dust Collection
 - 0
- Process Heating
 - 0
- Process Equipment
 - 0

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Industrial Refrigeration

A tale of two projects

- What they had in common
 - New Processing/Warehouse/Distribution Centers
 - Design Build Project
 - Ammonia Refrigeration System
 - Temperature Controlled Storage
 - Office Areas, Shipping Docks
 - Same Refrigeration Contractor
 - Same Utility

What was different

- Project 1 – National Player
- Utah Power DSM Program
- Energy Engineer had relationship with refrigeration contractor
- Owner has experience with variable speed cooling in other plants
- Project 2 – Biggest of the Locals
- No Utility Involvement
- Design firm was local AE with experience with ammonia/glycol systems

What Got Done

- Very similar ammonia system design
 - controls,
 - compressor sizing and staging,
 - sub cooling,
 - ts oil cooling...
- Plant 1 –
 - Variable Speed Evaporator Fans
 - Warehouse Lighting Controls
 - Packaged rooftop HVAC
- Plant 2 –
 - Glycol loop for comfort cooling

Missed Opportunities

- Plant 1
 - Integrated Cooling System – Using very efficient ammonia refrigeration system for office cooling
 - Still working on commissioning/verification issues
- Plant 2
 - Variable Speed Evaporator Fans
 - Energy engineer for plant 1 doing retrofit audit (new DSM incentive program)

Compressed Air Systems

- Union Pacific Railroad
 - New and Existing
- Wire Plant
- Pipe Casting
- Printing Plant
- Hydraulic Controls Mfg
- Controls
- End Uses
- Leaks
- Drier
- System Sizing
- Distribution Piping

What got done

- Railroad (*CAC class*)
 - Leaks
 - System sizing
 - Controls
 - End uses
- Pipe casting (*CAC class*)
 - Leaks – partial
 - Dryer
 - End uses
- Controls Mfg
 - none
- Wire Plant (*BP workshop*)
 - Shut off compressor
 - Controls
 - Leaks
- Printing Plant
 - End uses?

What didn't get done

- What
 - Controls
 - End Uses
 - Leaks
 - Distribution System
 - Driers
- Why
 - Hard to understand
 - No champion
 - Human resource intensive - no time
 - Project management
 - Operators
 - Capital cost

Evidence of Change (market transformation?)

- Compressed Air
 - CASST
 - PacifiCorp DSM
 - Compressed Air Challenge
 - SavAir
- Motors
 - Motor Challenge
 - “Premium” Efficiency Motors
- Industrial Refrigeration
 - PacifiCorp DSM
- Cooling – Space/Process
 - PacifiCorp DSM
 - CoolTools
 - QuickChill
 - eQuest

Issues and Barriers

- Awareness
- Cost
- Perceived Risk
- Technical Expertise
- Tools and Information
- Components vs. Systems
- Industrial (Commercial)
 - Not “sexy”
 - Capital intensive
 - Hard to understand/market– “not new washing machine”
 - Limited human capital
 - Equipment energy performance information – not published (non existent?)

Lessons

- Component focused efforts typically lead to system issues
- System approaches have synergistic potential
- Changing and improving systems is fundamentally different from, and much more difficult than, changing equipment or components

Lessons

- Better support resources results in better, higher implementation
- Public domain tools and information increasingly valuable
- A lot to do even in a low energy cost region
- Trained vendors consultants and operators make a big difference
- There is a shortage of trained of human capital
 - Local champions
 - Project managers
 - Energy based engineering