Top 3 Energy Projects

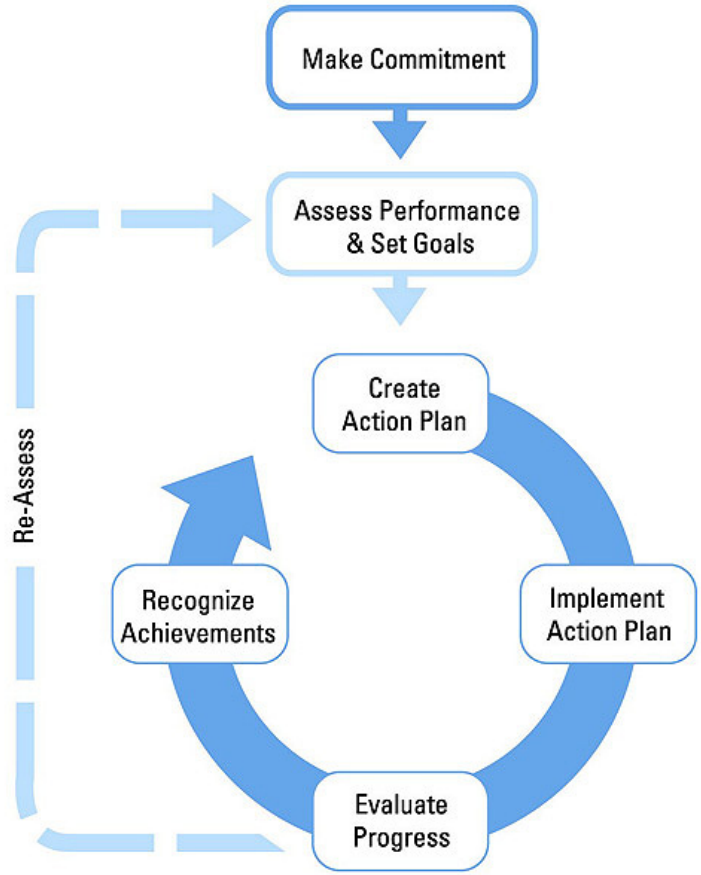
June 20, 2007

Call-in Number: 1-866-299-3188

Conference Code: 202 343 9965

About The Web Conferences

- **Monthly**
- **Topics are structured on a strategic approach to energy management**
- **Opportunity to share ideas with others**
- **Slides are a starting point for discussion**
- **Open & Interactive**



Web Conference Tips

- Mute phone when listening! Improves sound quality for everyone.

  Use * 6 – to mute and # 6 to un-mute

- Hold & Music – If your phone system has music-on-hold, please don't put the web conference on hold!

- Presentation slides will be sent by email to all participants following the web conference.

Today's Web Conference

- Welcome
- Andrew Kitchens - Hines
- Bill Allemon & Kim Humes - Ford
- Announcements

Our Top Three Energy Projects

Energy Star Energy Management
Networking Web Conference

June, 2007

Andrew Kitchens

Senior Manager

Corporate Engineering

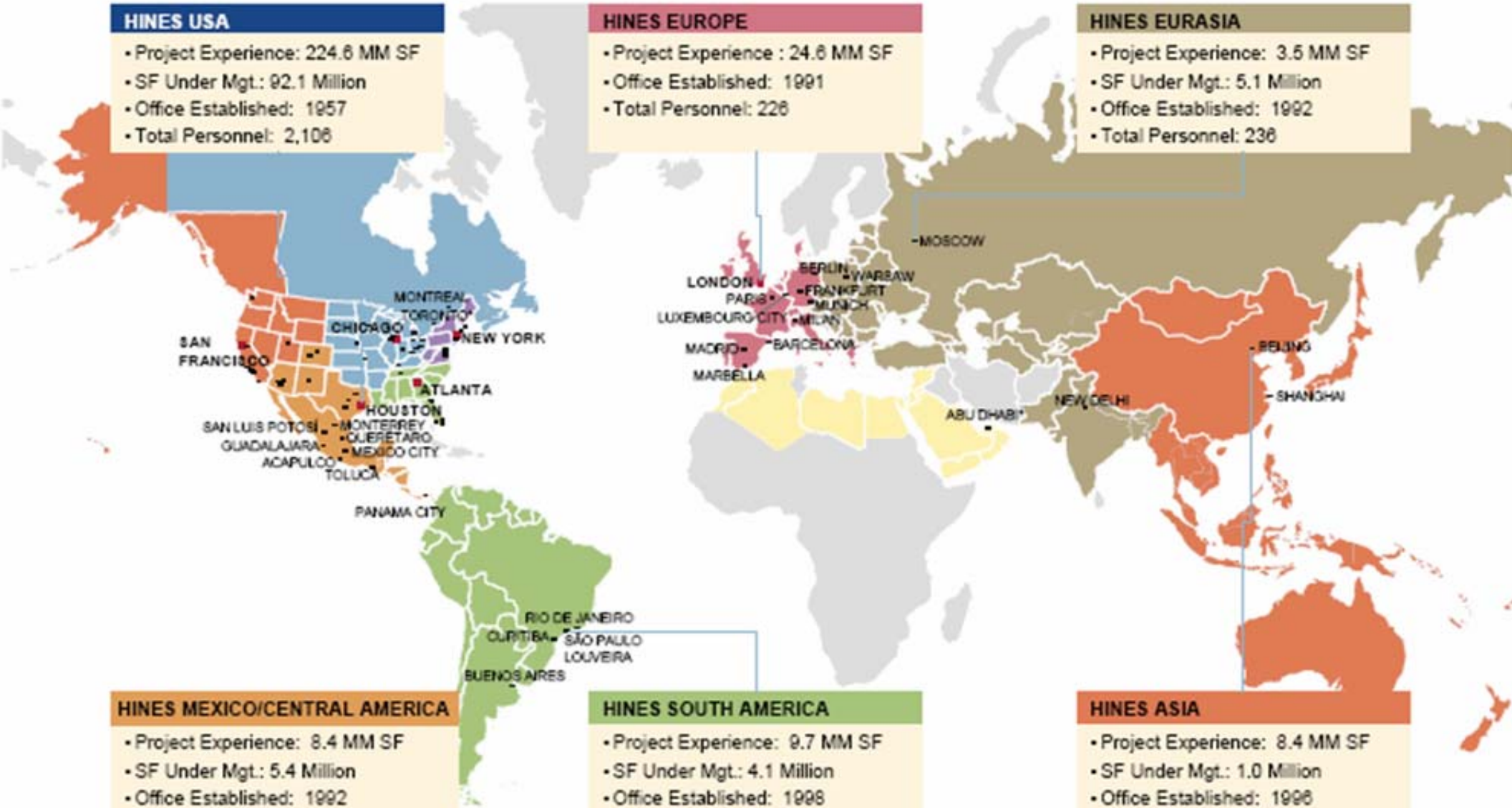
Hines

Hines Today

- Privately-owned, entrepreneurial firm
- Regional Offices - Houston, San Francisco, Chicago, New York, Atlanta, London
- 3,150 employees worldwide - 2,100 in U.S. and 1,150 outside U.S.
- Offices in 96 cities - 67 in U.S. and 29 cities outside U.S. and 15 foreign countries
- Over 730 projects developed or acquired globally
- Over US $16 Bn of assets under management with Hines equity
- Operate more than 250 properties, over 107 MM square feet
  - 50.8 MM square feet with Hines equity ownership
  - 56.9 MM square feet managed by Hines for third parties

Hines

Hines Worldwide Presence



HINES USA

- Project Experience: 224.6 MM SF
- SF Under Mgt.: 92.1 Million
- Office Established: 1957
- Total Personnel: 2,106

HINES EUROPE

- Project Experience : 24.6 MM SF
- Office Established: 1991
- Total Personnel: 226

HINES EURASIA

- Project Experience: 3.5 MM SF
- SF Under Mgt.: 5.1 Million
- Office Established: 1992
- Total Personnel: 236

HINES MEXICO/CENTRAL AMERICA

- Project Experience: 8.4 MM SF
- SF Under Mgt.: 5.4 Million
- Office Established: 1992
- Total Personnel: 168

HINES SOUTH AMERICA

- Project Experience: 9.7 MM SF
- SF Under Mgt.: 4.1 Million
- Office Established: 1998
- Total Personnel: 127

HINES ASIA

- Project Experience: 8.4 MM SF
- SF Under Mgt.: 1.0 Million
- Office Established: 1996
- Total Personnel: 285

Hines

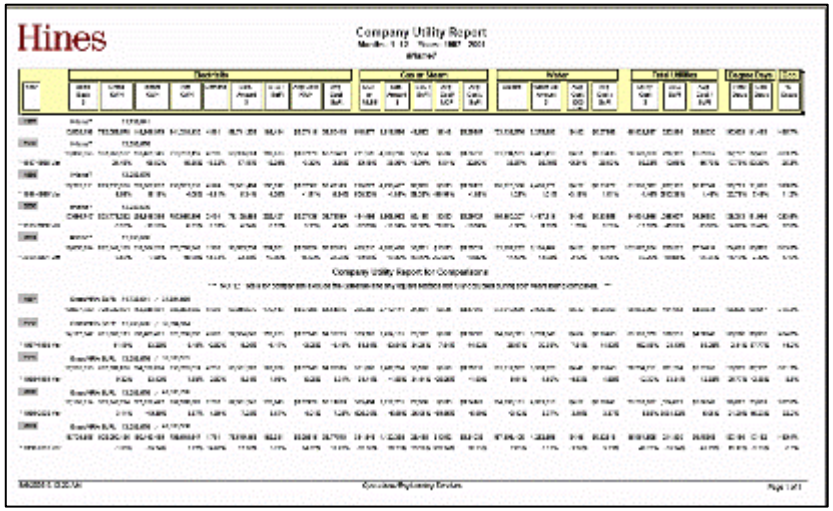
Our Top Three Energy Projects

What are Hines Top Three Energy Projects?

Hines

Energy Project #1 TRAIN

Train engineering teams in energy management



- Understand utility reporting techniques and the utility rate structure

- Understand how energy is used to support the efficient operation of the building within the rate structure

Hines

Energy Project #1 TRAIN

Train engineering teams in energy management

- Explore and evaluate new energy savings technologies ☞

  Those that make sense for the property are presented in a professional manner to management and ownership for evaluation

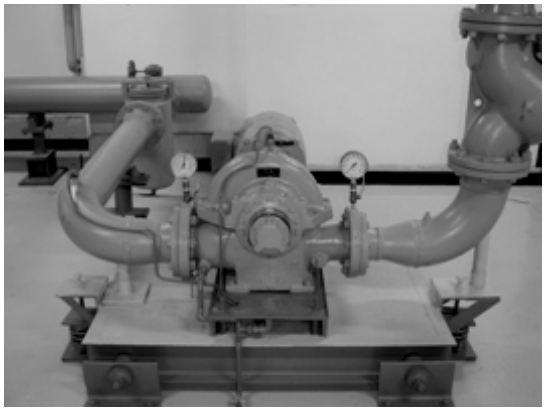
  Feasible energy reduction programs that have been approved are implemented

Hines

Energy Project #2 TRAIN - OPERATE

Operate the HVAC system proficiently

- Understand the HVAC design intent for the building
- Understand the HVAC plant's capabilities
- Understand the building's unique HVAC characteristics
- Understand the building's limitations relative to providing HVAC



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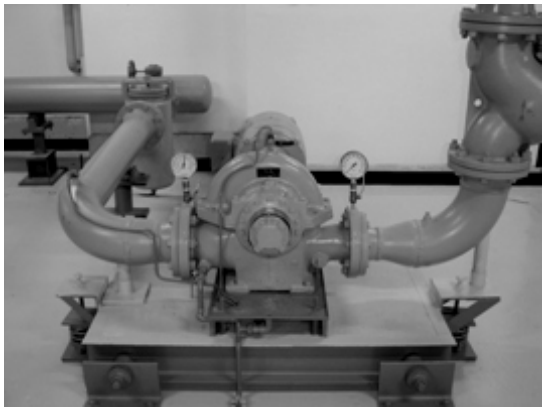
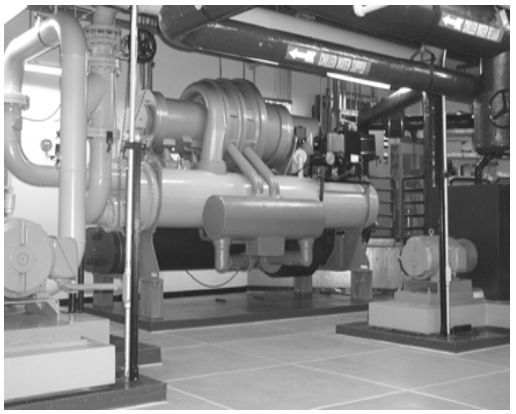
Energy Project #2 TRAIN - OPERATE

Operate the HVAC system proficiently

- Utilize economizers
- Utilize optimal start-up / free-wheeling / duty-cycling
- Properly sequence equipment



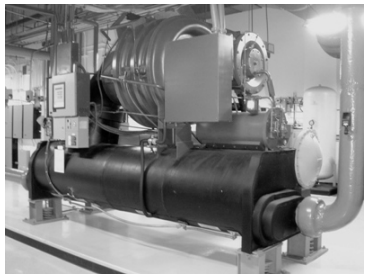


Hines

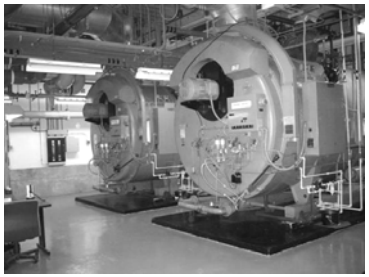
Energy Project #2 TRAIN - OPERATE

Operate the HVAC system proficiently

- Operating schedules optimized for efficient operation (occupancy, seasons, etc.)
- Routine physical verification of on/off functions

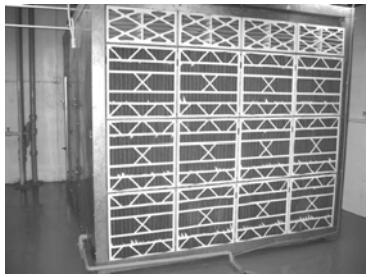


Chillers

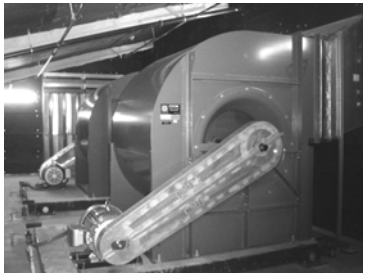


Boilers

Pumps



Air Handlers



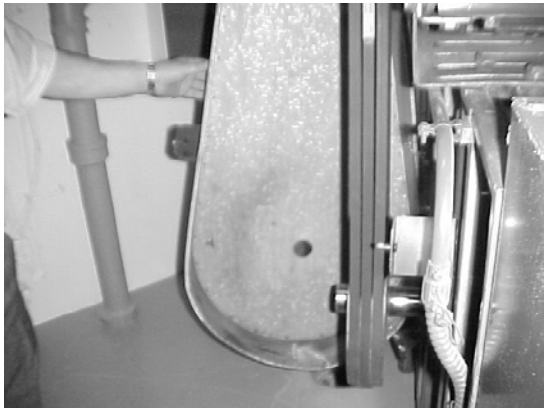
Fans

Cooling Towers

Hines

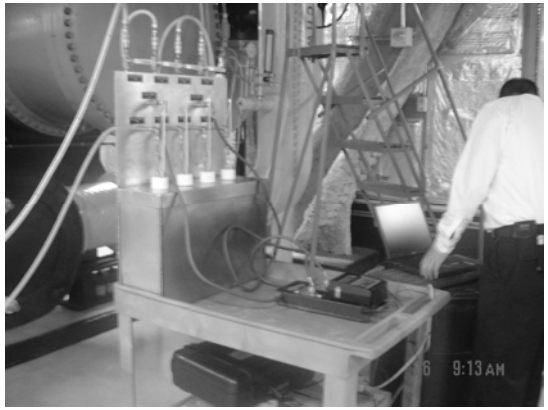
Maintain the HVAC system thoroughly

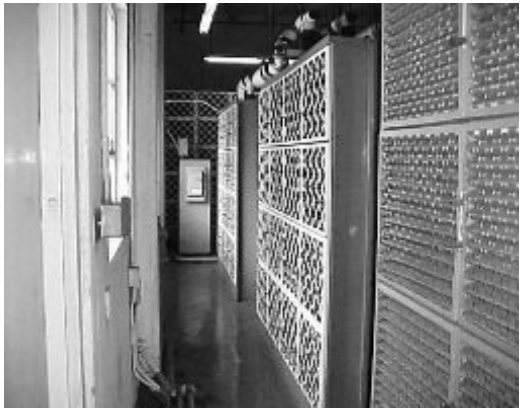
- Solid water treatment for heat transfer (chillers, air handlers, exchangers)
- Air handlers (filters, oil/lubrication, condensate control)
- Pumping systems (strainers, alignments)



Commission the HVAC system and equipment

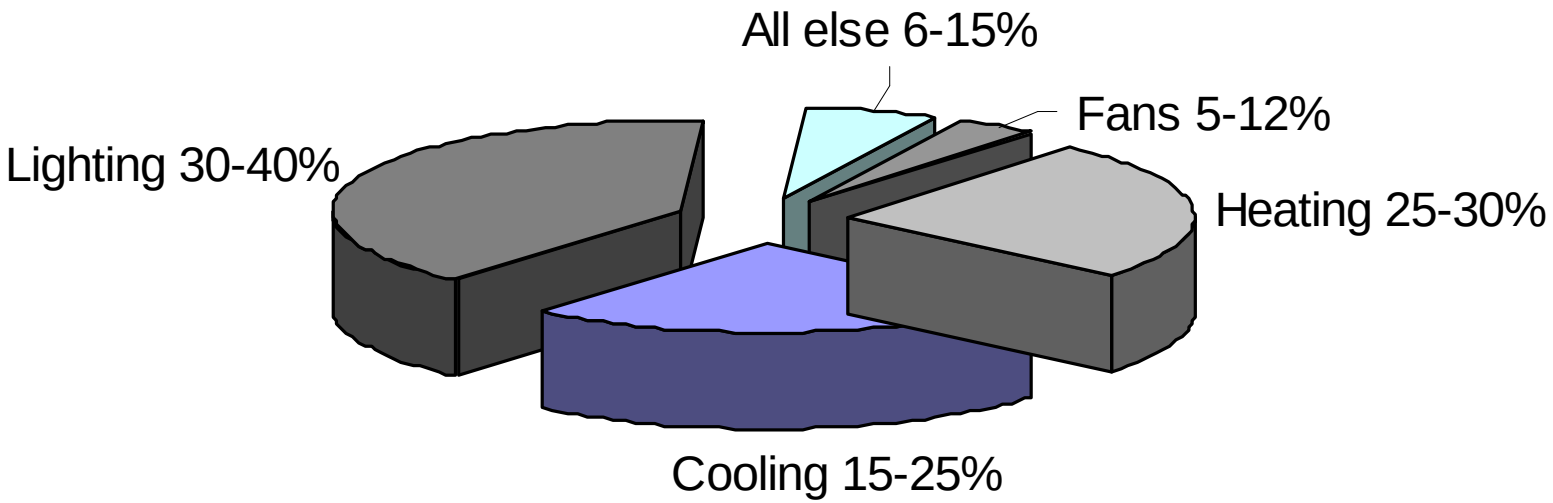
- Chiller performance
- Air handlers (dampers, control valves, sensors, controllers)
- Terminal boxes (dampers, control valves, sensors, controllers)
- Water volume performance (pumps, control valves, sensors, controllers)

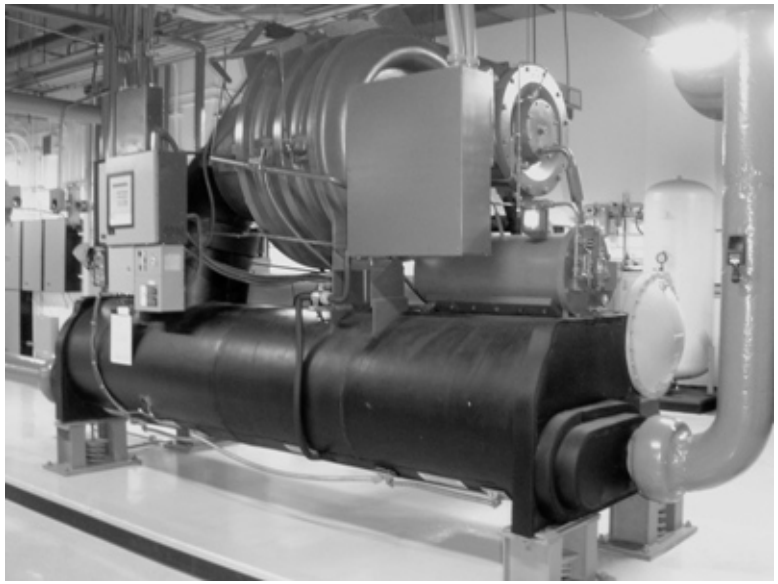




Energy Project #3 TRAIN - OPERATE - MAINTAIN

Energy-Usage in Office Buildings





A chiller can consume
20% of a building's total electricity

50% inefficiency factor in a chiller can equate to **10% increase in the building's electrical consumption**

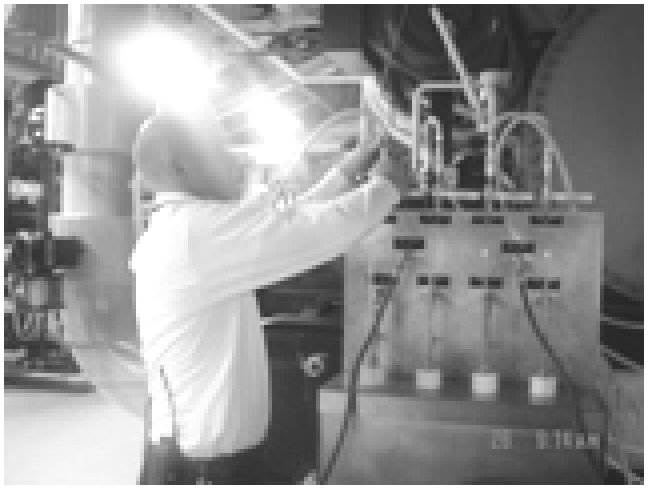
Hines

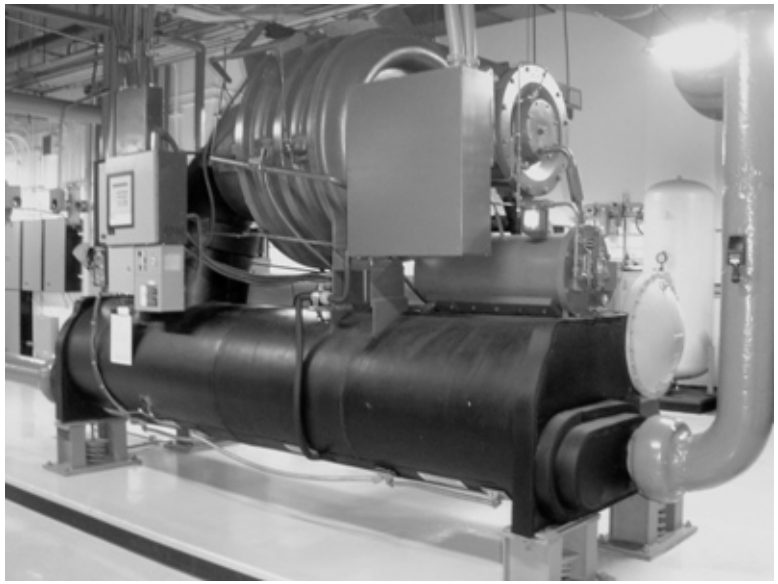
Energy Project #3 TRAIN - OPERATE - MAINTAIN

Hines conducts chiller performance tests on a regular basis

Performance is calculated based on real-time conditions, measuring;

- Water temperatures
- Water volumes
- Electrical voltages and amps





Each test takes about 45-minutes to complete and provides prompt indications of declining chiller performance

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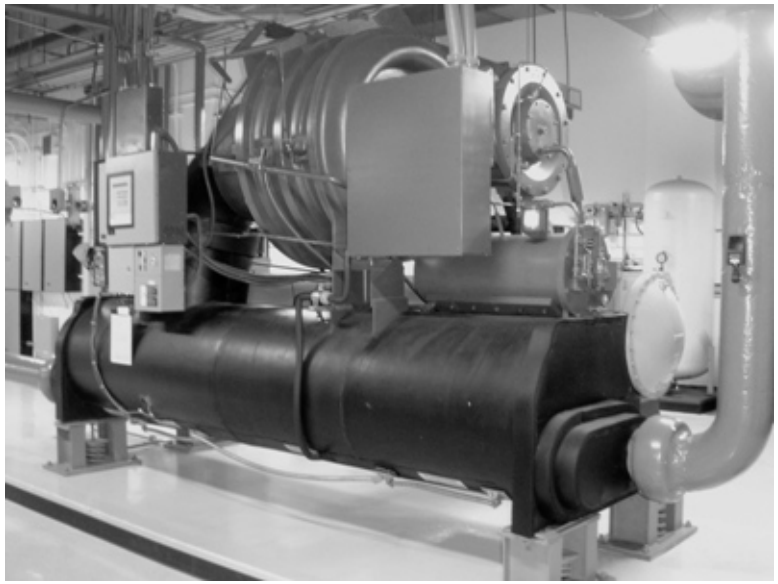
Energy Project #3 TRAIN - OPERATE - MAINTAIN

Common causes of decreased chiller efficiency:

- Poor heat transfer
- Lubricant contamination of the refrigerant
- Improper refrigerant charge



Measures to increase chiller efficiency include:

- Cleaning water tubes
- Adjusting / changing refrigerant charge
- Adjusting water volumes

Hines

An 800-ton Chiller operating at 550 tons (partial load)

Rated at .64 kilowatts per ton

0.64 kilowatts per ton x 550 tons =
352 kilowatts per hour

352 kilowatts per hour x 12 hours =
4,224 kilowatt hours (kWhs)

$0.10 per kWh electric rate

$0.10 x 4,224 kWhs = **$422 / day**

Operating at .83 kilowatts per ton
(about a 30% inefficiency)

0.83 kilowatts per ton x 550 tons =
456 kilowatts per hour

456 kilowatts x 12 hours =
5,478 kilowatt hours (kWhs)

$0.10 per kWh electric rate

$0.10 x 5,478 kWhs = **$548 / day**

$548 - $422 = **$126 / operating day**

$126 x 248 operating days / year

$31,248 Annual Savings

Hines

Our Top Three Energy Projects

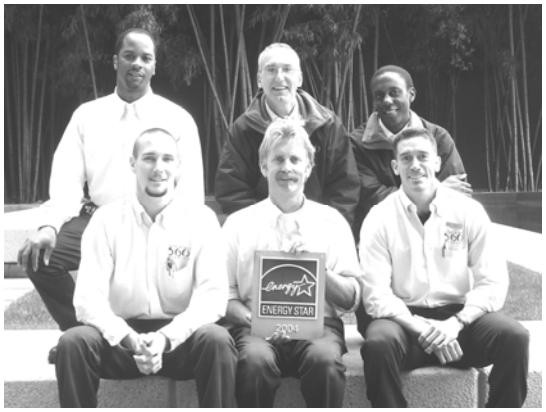
Partnering with the EPA

100+ Buildings with the ES Label

Representing over 64-million sq ft

Keeping Hines energy managers informed

Over 50 energy-related Best Practices

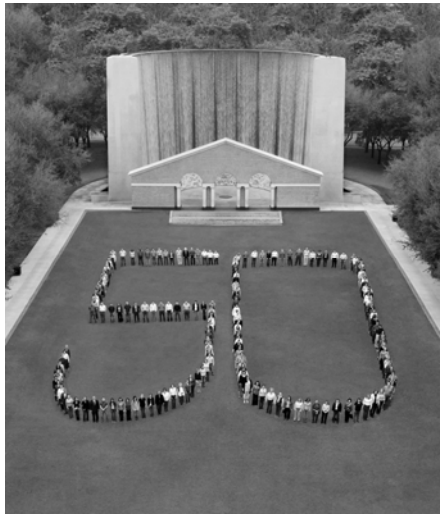


myHines.com – **the** Hines resource for energy management material

Hines

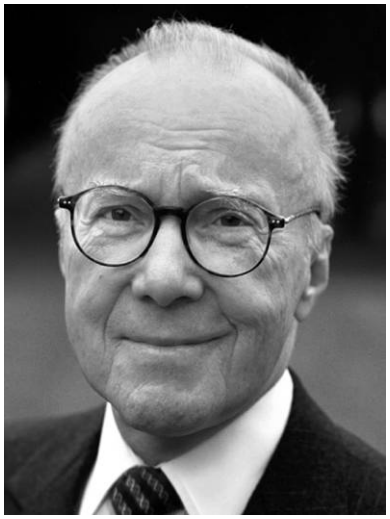
Gerald D. Hines' Vision

Buildings of superior quality and architectural merit backed by responsive, professional management attract better tenants, command higher rents and retain their value, despite the ups and downs of real estate cycles



2007
50th Anniversary

Gerald Hines
Founder of Hines



Hines

Ford Motor Company

Energy Efficiency Project Highlights

Bill Allemon CEM, Manager, Energy Efficiency
Kim Humes PE, Energy Program Manager

June 20, 2007

ENERGY STAR AWARD 2006

ENERGY STAR AWARD 2007

FORDLAND

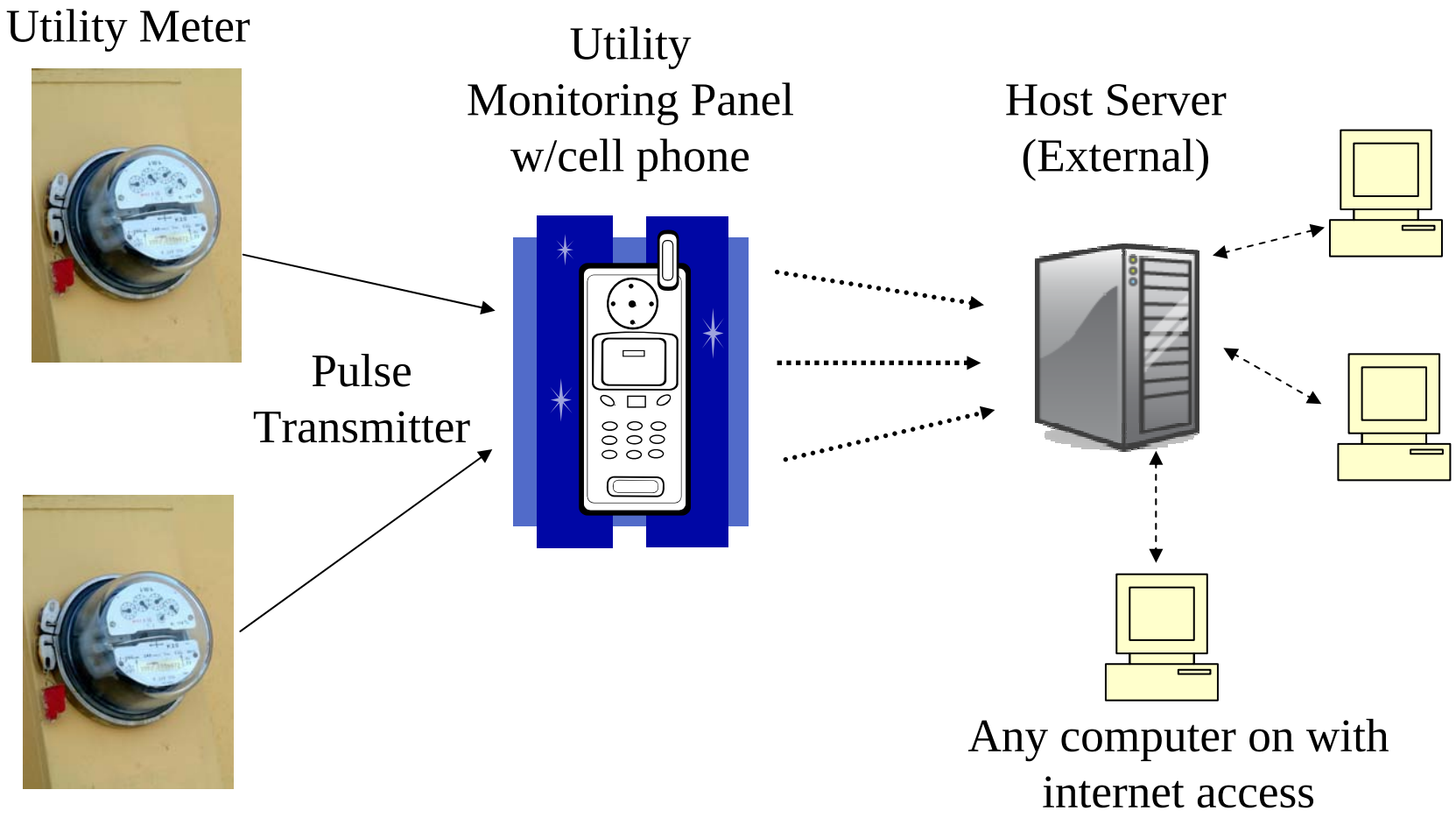
Agenda

- Ford Utility Monitoring System
- Commercial Facility Energy Saving Upgrades
- Fumes to Fuel Project

Ford Utility Monitoring System (UMMS)

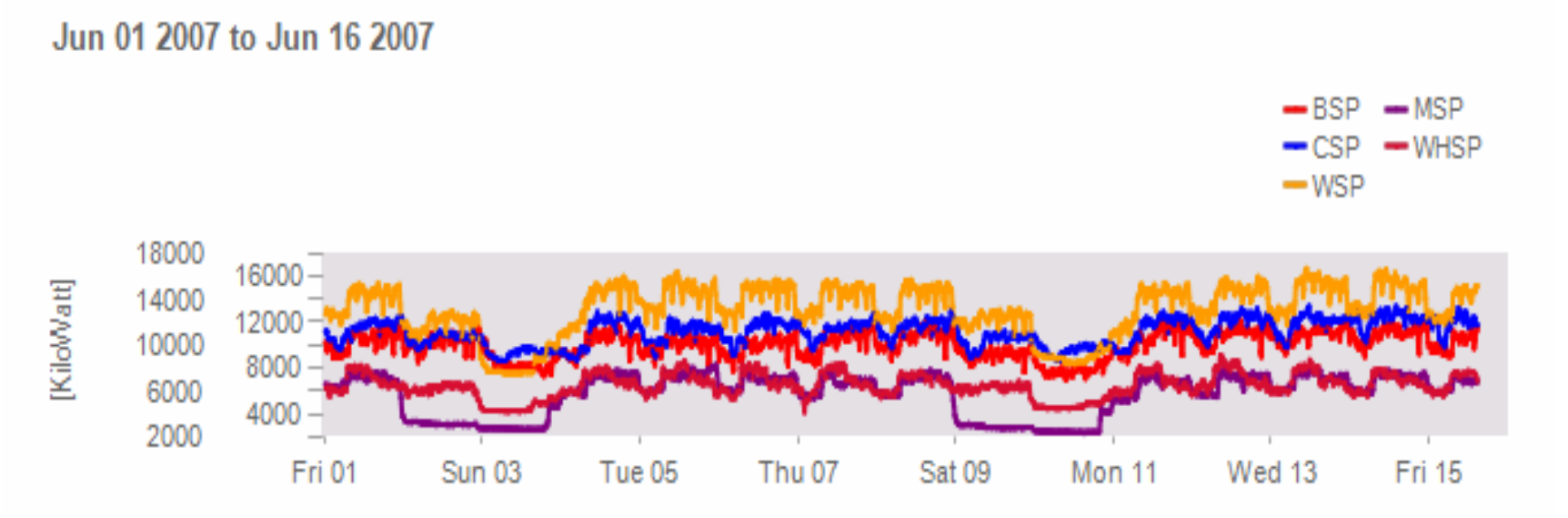
- Near real time monitoring incoming utility meters
  - Electricity: 15 minute
  - Natural Gas: hourly/daily
- System Overview
  - 43 Assembly & Manufacturing Sites in North America
  - 200+ meters
  - Power Quality monitoring at 12 key sites
- Access via password protected external webpage

Data Flow


Utility Meter
Utility
Monitoring Panel
w/cell phone
Host Server
(External)
Pulse
Transmitter
Any computer on with
internet access

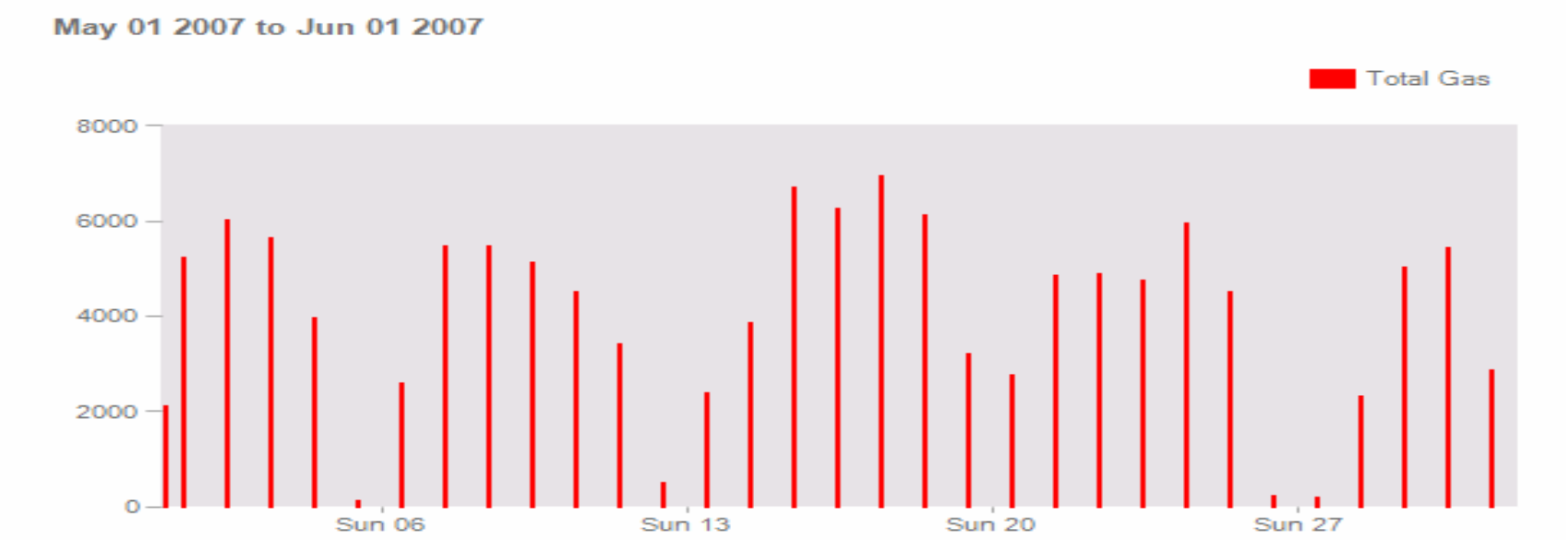
Benefits of the Utility Monitoring System

- Effective tool in reducing kw demand during non-production periods
  - Like facility (Assembly, Stamping, Manufacturing) kw demand comparisons monitored to identify BIC plants and transfer best practices to other similar plants
  - VPN access used to develop customized reporting by plant for weekly review



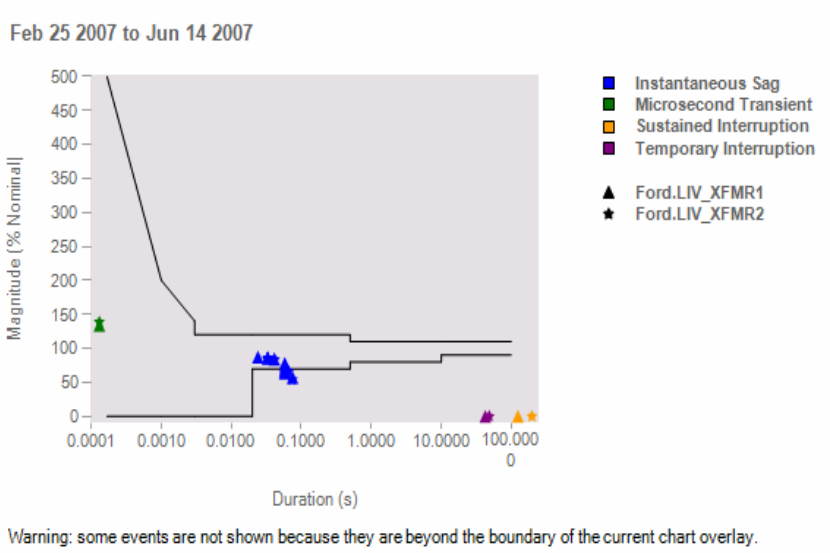
Benefits of the Utility Monitoring System

- Provides access to electricity and natural gas usage data to better manage and reduce energy costs/consumption
  - Significantly reduces timing for energy data collection and reporting
  - Reduces purchasing cost of natural gas via access to accurate/timely consumption data for daily balancing
  - Improves benchmarking and identification of BIC practices
  - Identifies peak shaving opportunities for electricity



Benefits of the Utility Monitoring System

- Web-based Real Time Power Quality monitoring
  - Ability to view/monitor power quality events at key sites
  - Easy to view multiple-plant data simultaneously
  - Historical data availability of PQ events
  - Eliminates need for unique software at each plant
  - Provides documentation for potential lost-cost sharing with utility company

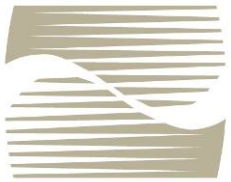


System Highlights

- User-friendly software
  - User customized dashboard allows quick access to data
  - Data trends and analysis are easy to create and share
  - Excel download allows limitless data analysis
  - Graphs can be cut and pasted into emails for distribution

ION Enterprise

Energy Management



POWER MEASUREMENT

owned by Schneider Electric

System Highlights

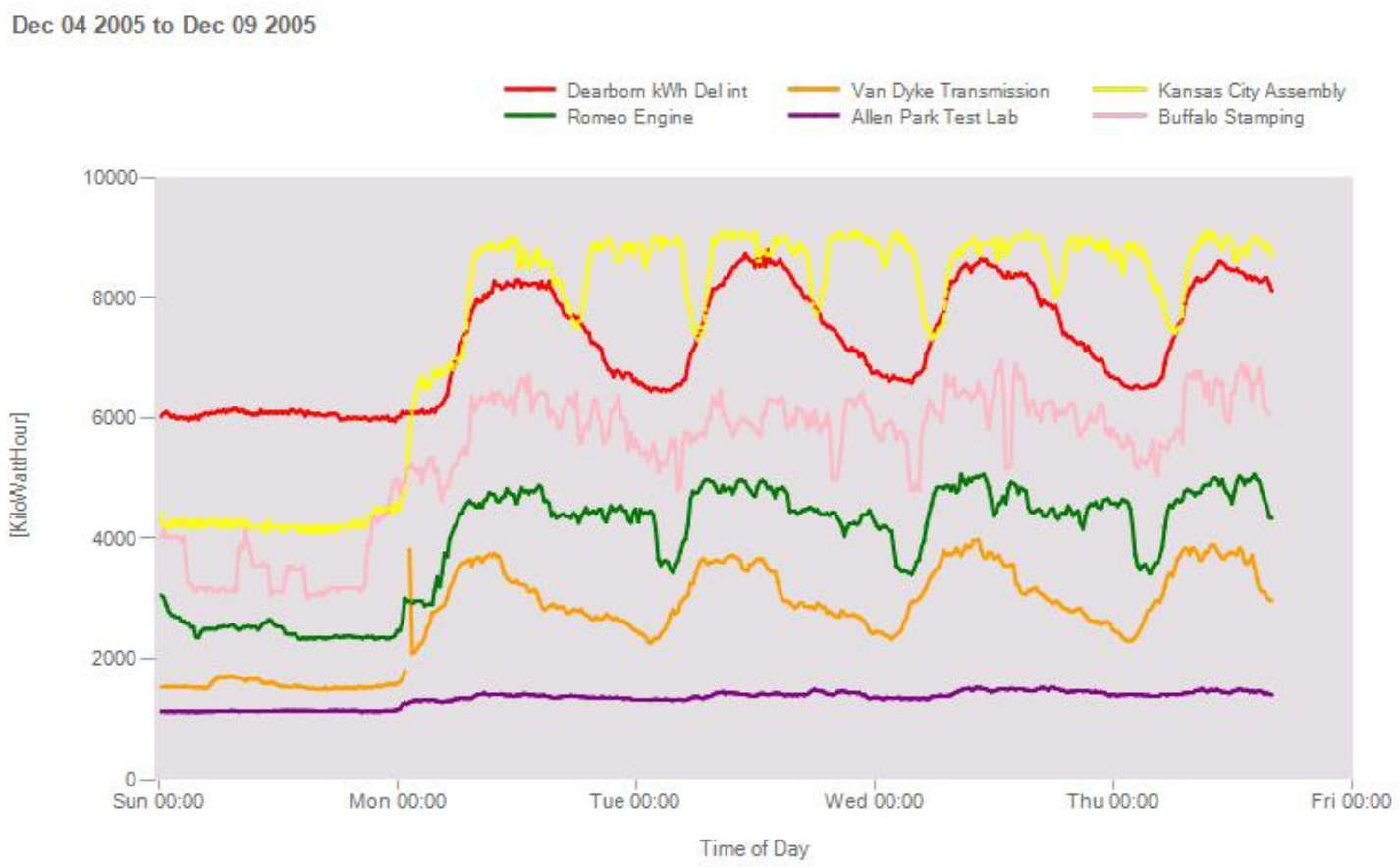
- Accessible from work and home
  - Software accessible via password protected website
- Externally Hosted Software
  - Schneider server hosts application
  - Internal IT hosting barriers eliminated
  - Lower installation cost (hard wired and wireless)
  - Software upgrades included in maintenance agreement
- Wireless Data Transfer
  - Wireless modems and modhoppers reduced infrastructure cost

Pages

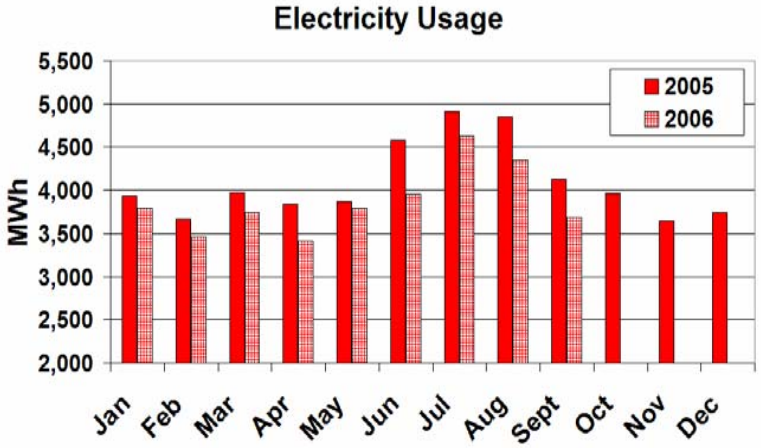
- Wkly Dmd Prfl
- Daily Loading
- Lima XFMRs
- Lima PQ
- Real Time
- Ford Home
- Wayne electric
- NG Consumption
- Allen Park Plan
- Wayne Plot
- Romeo Plot
- Lima PQ

Weekly Demand Profile

WeeklyDemandProfile — Static Chart



Ford World Headquarters
Energy Performance Contract



Annual Savings

- - 9% overall energy reduction
- *$ 369,200*
- *1,354,777 kWh electricity*
- *46,138 MMBtu natural gas*
- *12,555,170 gallons water*
- *1,370 tons of CO_2 greenhouse gas emissions*

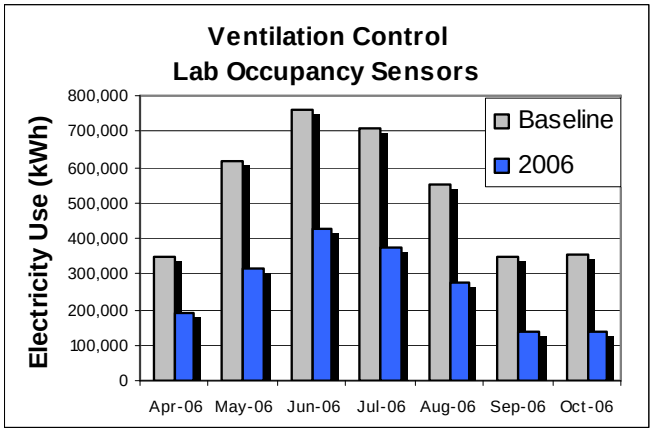
Other Benefits

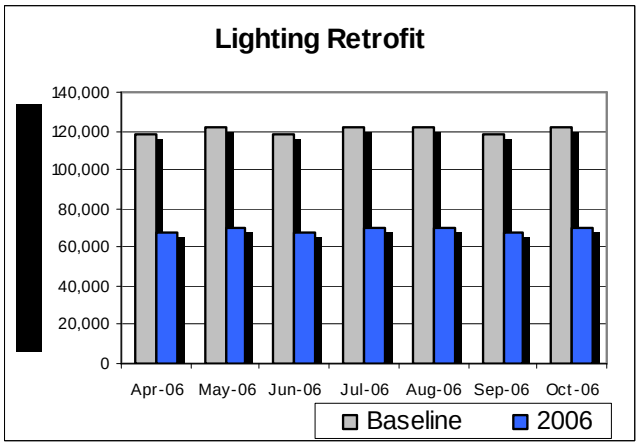
- Reduced environmental impact of cooling tower wastewater
- Reduced chemical consumption for cooling tower water treatment

Concepts Implemented

- CO_2 Demand controlled ventilation
- Electrostatic cooling tower water treatment system
- Retrofitted existing lighting with energy efficient components
- Water saving faucets, toilets and urinals
- Variable frequency drives on chilled water system

Ford Research and Innovation Center Energy Performance Contract





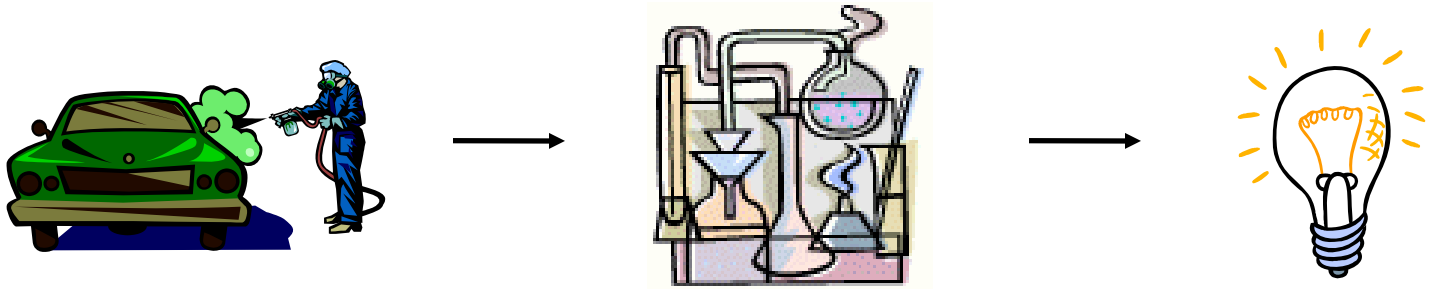
Annual Savings

- *-10%+ overall energy reduction*
- *$245,300*
- *2,654,000 kWh electricity*
- *18,279 MMBtu natural gas*
- *3,100 tons of CO_2 greenhouse gas emissions*

Concepts Implemented

- CO_2 Demand controlled ventilation
- Retrofitted existing lighting with energy efficient components
- Added set back and occupancy control for laboratory exhaust and fume hoods
- Optimized scheduling of building air handling units.

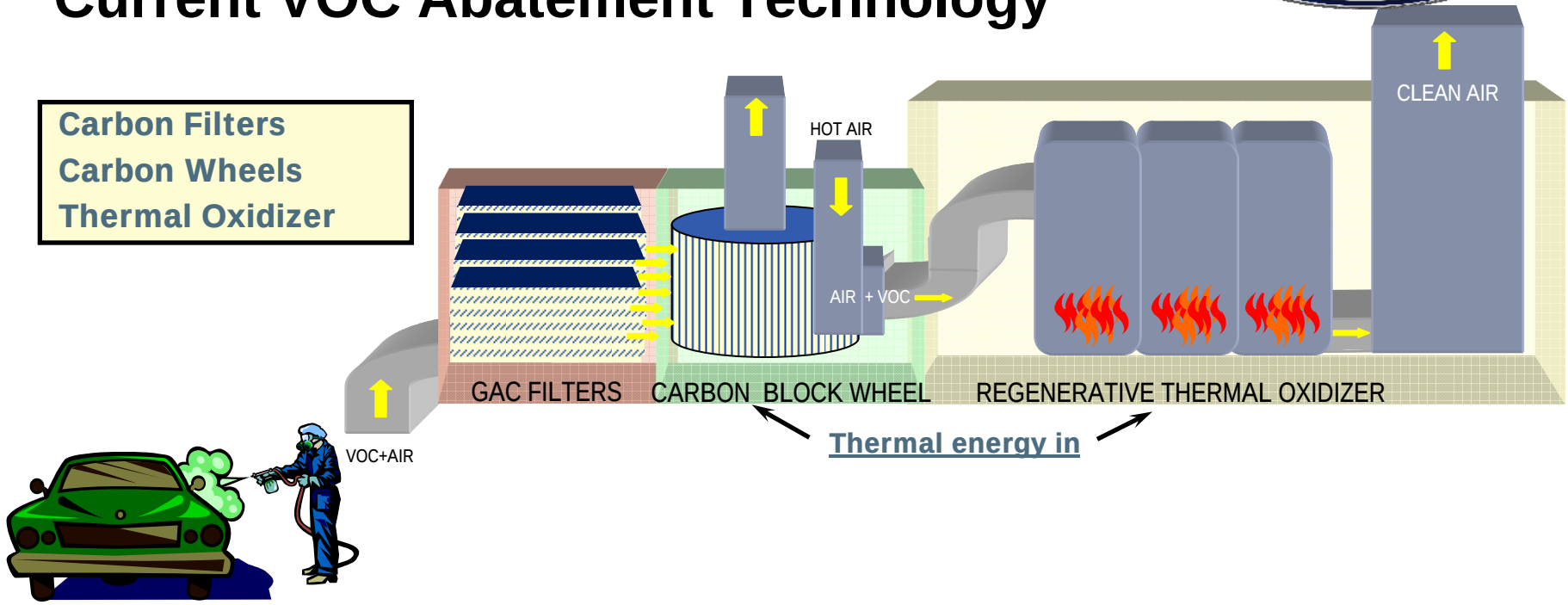
Ford Motor Company
Paint Fumes-to-Fuel System



DTE Energy

Fumes to Fuel Project
Current VOC Abatement Technology

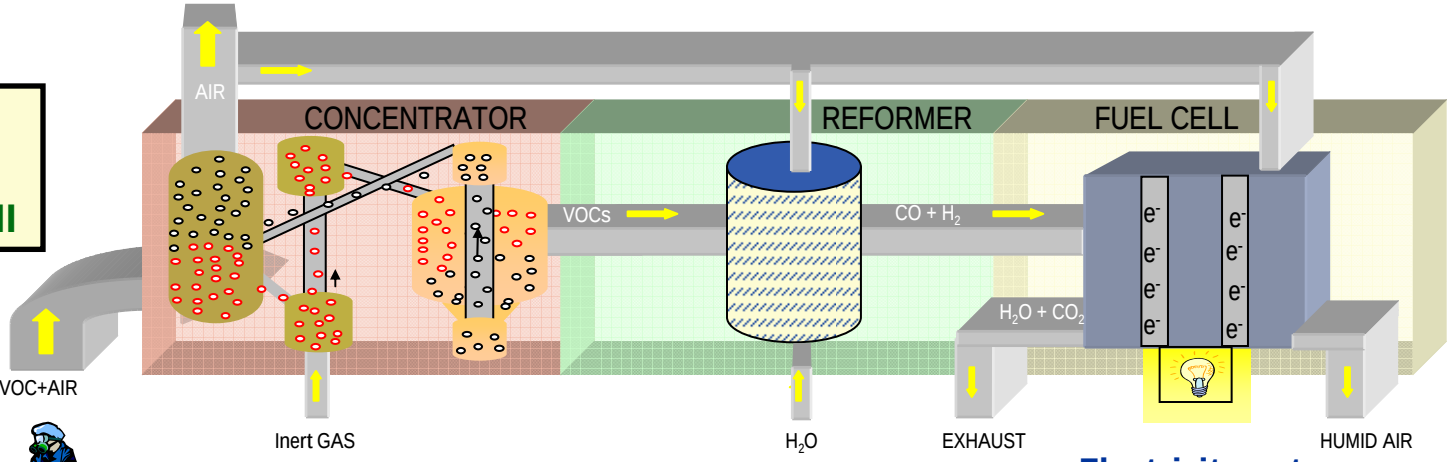
Carbon Filters
Carbon Wheels
Thermal Oxidizer



- Tenfold concentration of VOC's + incineration using natural gas
- Meets environmental regulations
- However…
  - High energy demand
  - Produces significant amount of NO_x, SO_x, CO_2 emissions
  - Maintenance issues

Fumes to Fuel Project
New VOC abatement technology

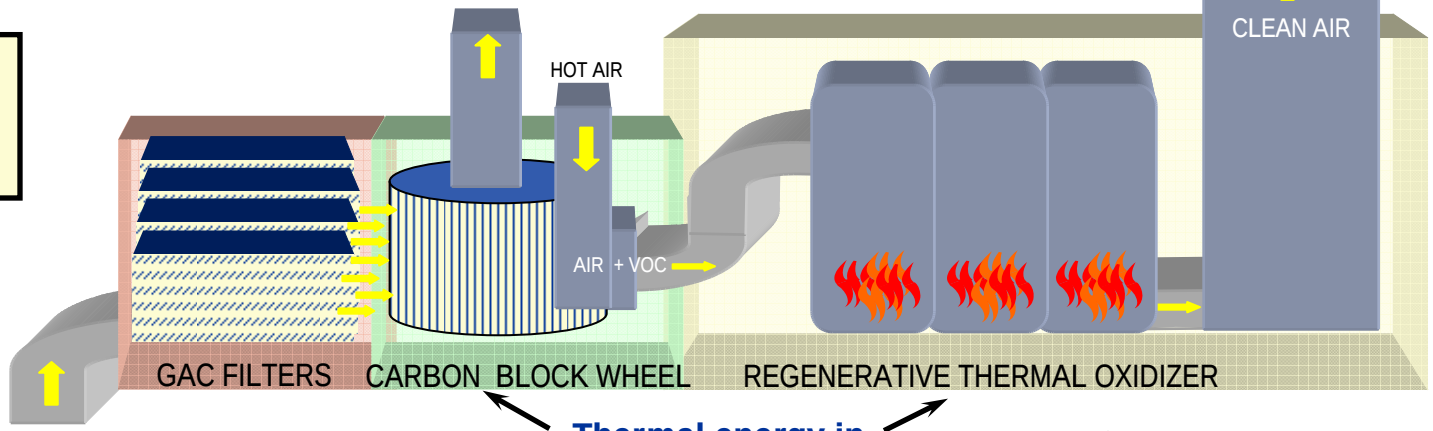
Concentrator
Reformer
Solid Oxide Fuel Cell



- >2000-fold concentration + conversion into electricity
  - Virtual elimination of NO_x, SO_x; 10-fold reduction in CO_2 emissions
  - Net energy production
  - Can run on natural gas in off-hours to produce cheap electricity

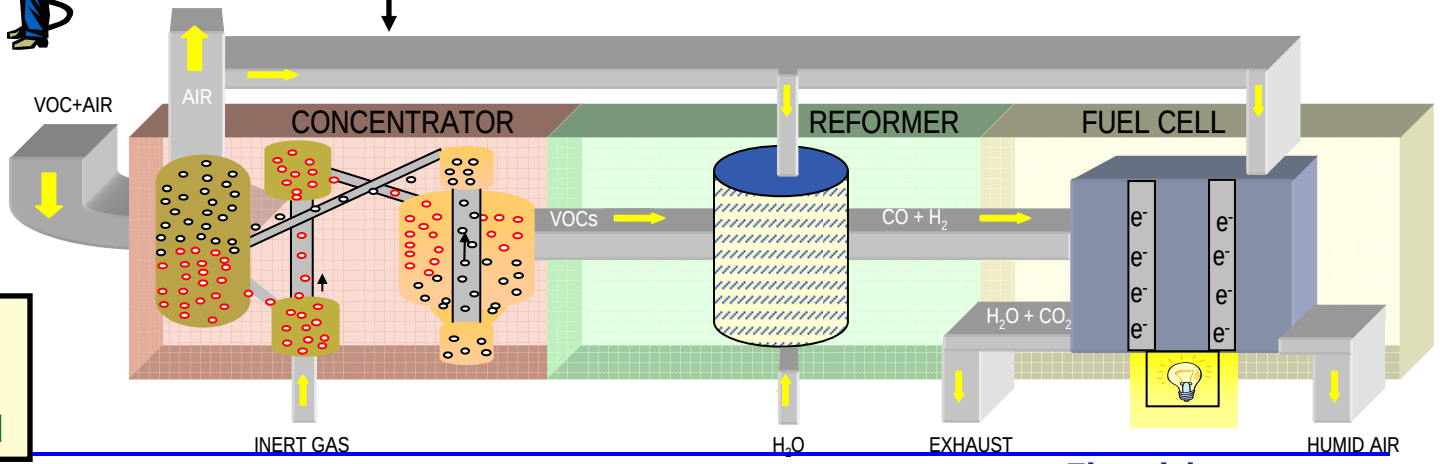
Fumes to Fuel Project
Technology Comparison

Carbon Filters
Carbon Wheels
Thermal Oxidizer



Thermal energy in

Waste-to-energy instead of energy-to-burn-waste

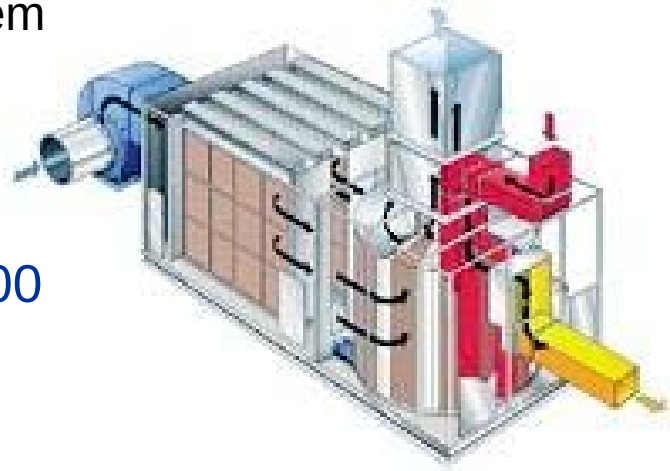


Concentrator
Reformer
Solid Oxide Fuel Cell

Electricity out

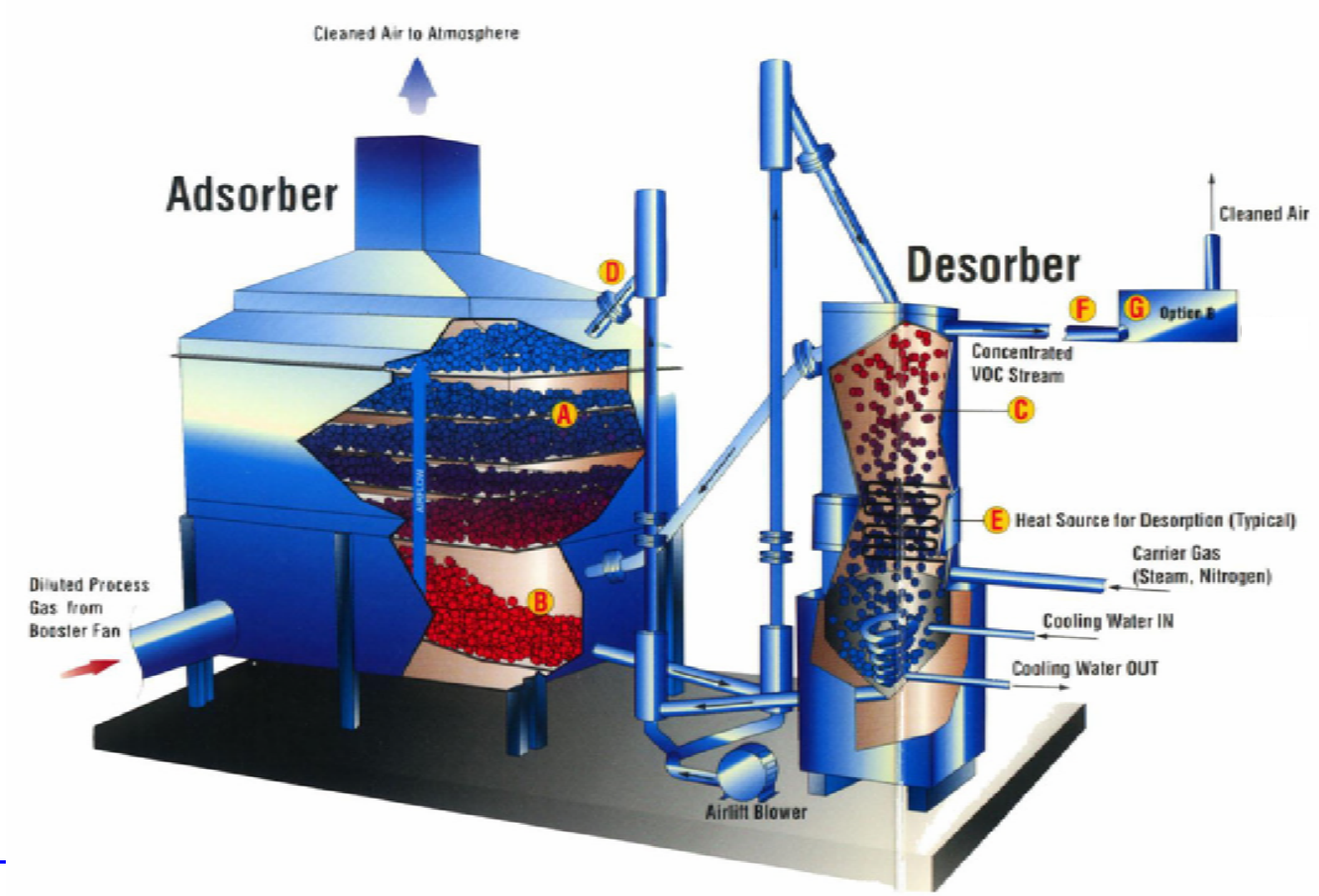
Fumes to Fuel Project Concentrator

- Carbon wheel technology yields tenfold by-volume concentration
  - Not sufficient concentration for fuel cell system or even flare
  - Safety (fire) and maintenance issues
- Fluidized bed systems achieve 1,000-10,000 fold concentration
  - Early fluidized beds had a durability problem (adsorber beads)
  - FBC's now used routinely in various industries
    - Furniture painting, semiconductor, Teflon tubing industries, printing, …
    - First automotive application

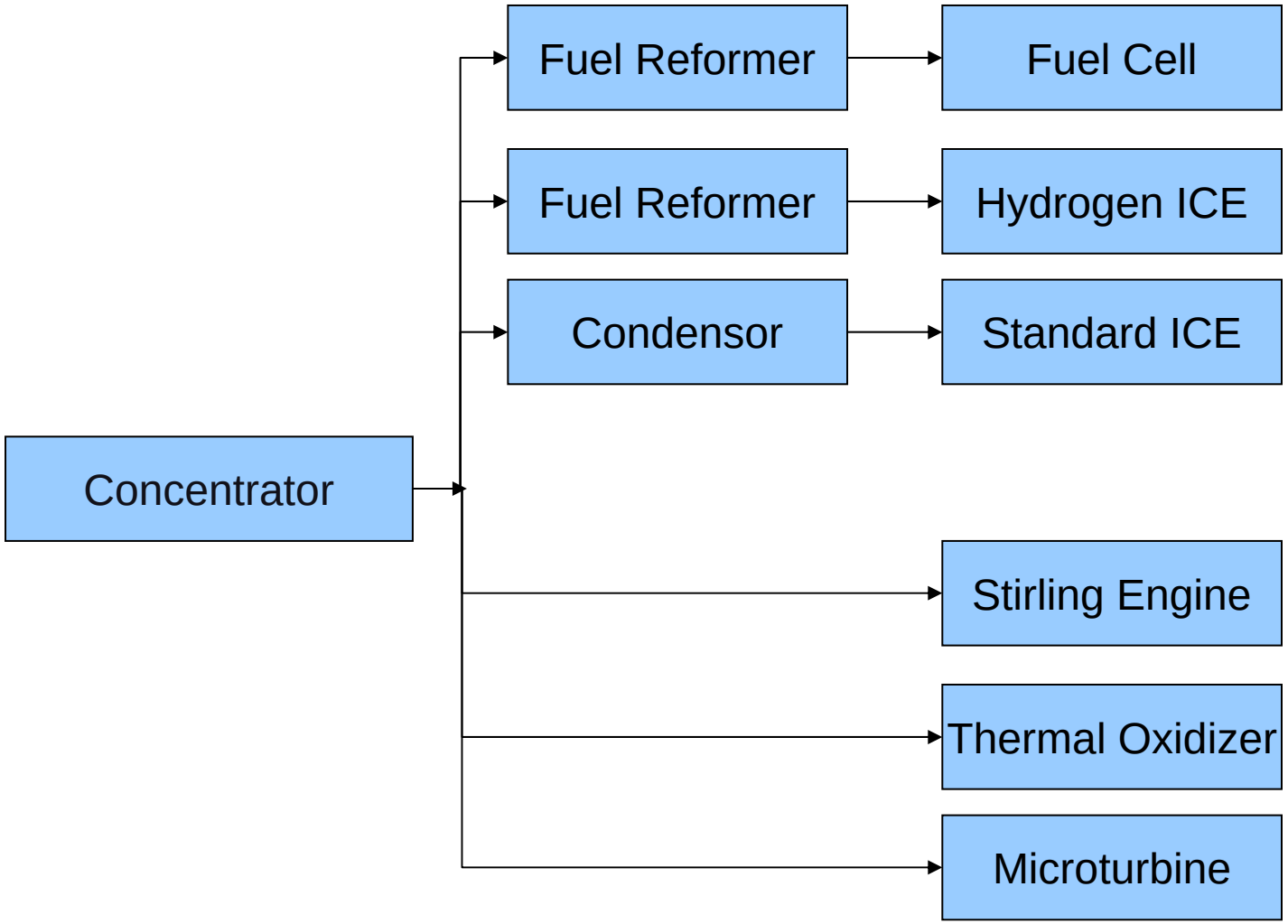


Traditional Carbon Wheel

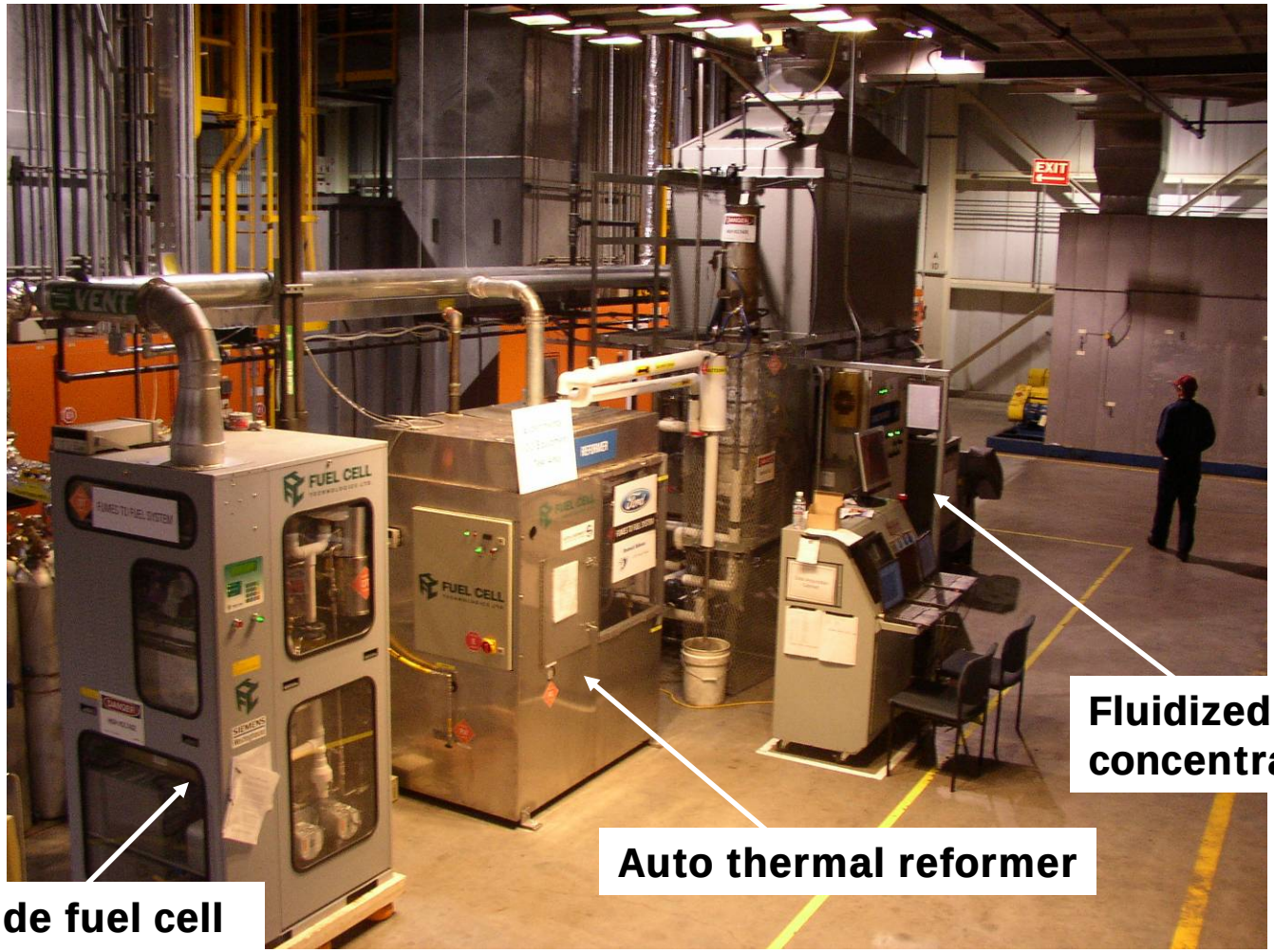
Fumes to Fuel Project
Fluidized Bed Technology



Fumes to Fuel Project Technology Options



Fumes to Fuel Project
5 kW Alpha prototype demonstration



Dearborn Assembly Plant, July 17, 2003

FORDLAND

Fumes to Fuel Project
Beta System

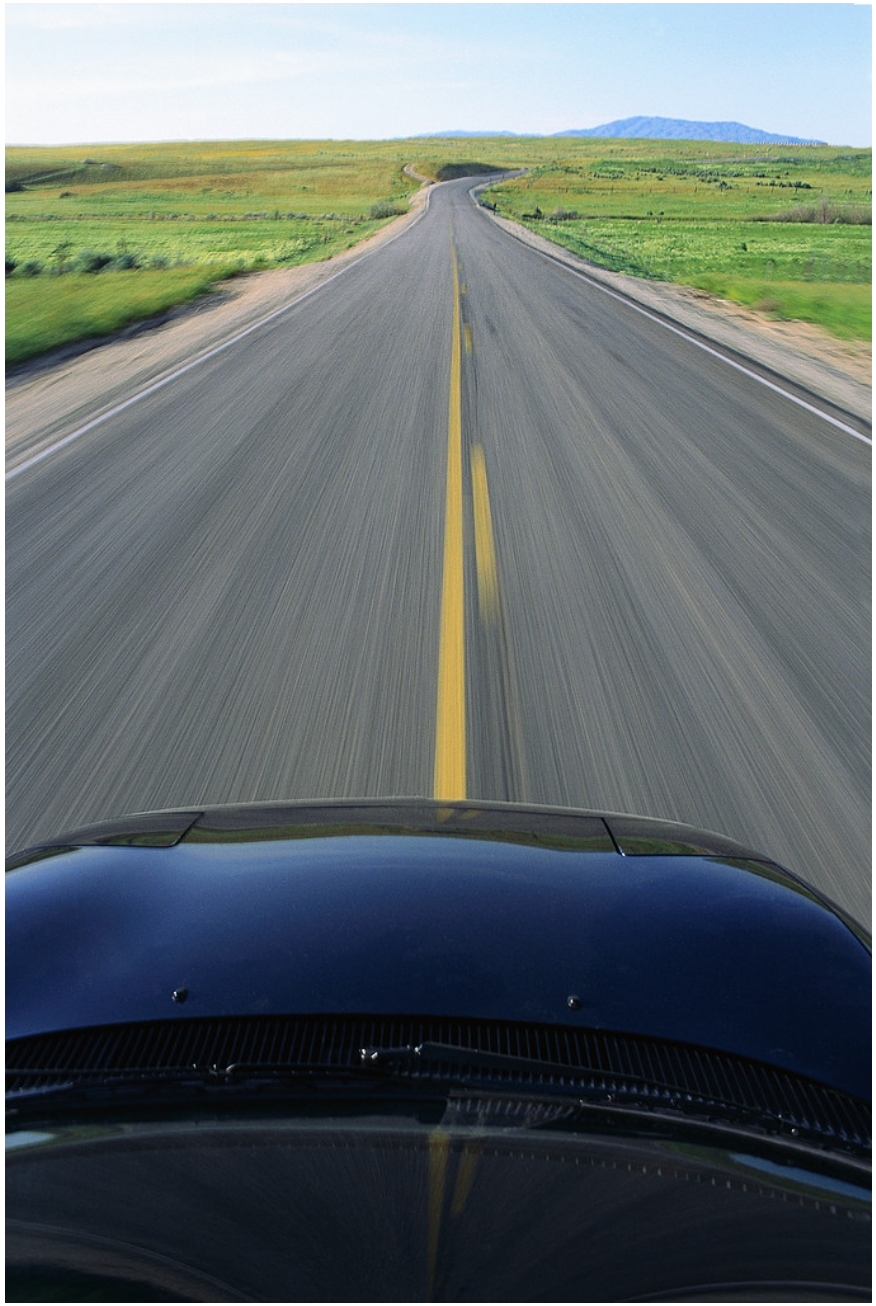
- Utilizes Stirling cycle engine for VOC control and energy generation
- Eliminates the need for fuel reformation
- Uses fuel in the vapor phase

Fumes to Fuel Project
Status to Date

- System Fluidizes and is Ready to Receive Process Air in <20 Minutes
- System Run in Automatic Mode for Days without interruption
- Stirling Engine Dual Fuel Train a Success
- Stirling Engine Run on 100% Captured Solvent, 0% Captured Solvent (ie. Natural Gas), Full Range of the Blend

Thank You
for your time
and interest!

ENERGY STAR AWARD 2007
PARTNER OF THE YEAR



Questions & Discussion

Upcoming Web Conferences

July 11 – Leveraging ENERGY STAR Change A Light

July 18 – Saving Energy with Water Efficiency

August 8 – Energy Auditing

September 19 – Retro-commissioning

Download past web conference presentations at:
www.energystar.gov/index.cfm?c=networking.bus_networking

Questions or comments? Contact: tunnessen.walt@epa.gov

Thank You!