Driving Energy Efficiency

U.S. Department of Commerce
Forum on Energy Efficiency in Manufacturing
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ENERGY STAR AWARD 2009
SUSTAINED EXCELLENCE

The Case for Energy Efficiency

- Cost Savings
- Environmental Benefits
- Reduce Cost per Vehicle
- Offset Rate Increases
- Improve Reliability
- Support Sustainability Goals
- Community Outreach/Good Corporate Citizen

Drive green.

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Ford North American Manufacturing Energy Data

- 33 Manufacturing Facilities
- Annual Energy Costs
  - $600M
- Investment
  - $220M (2000–2008)
- Efficiency Improvements
  - 2000-2008: 35% normalized

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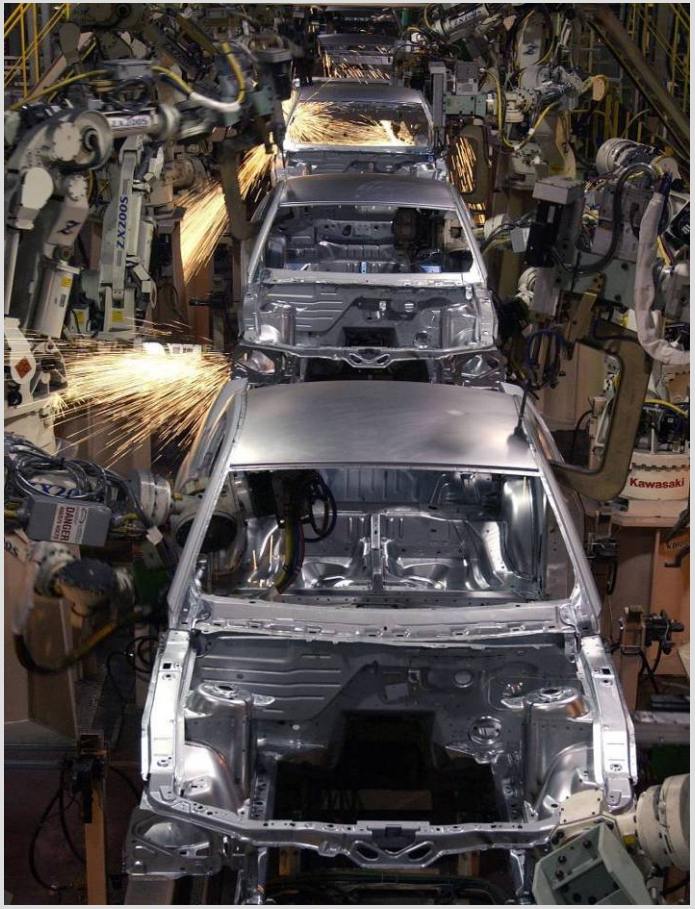
North American Manufacturing Energy Efficiency Improvements

- Process Tooling
  - Flexible Manufacturing Work Cells
  - Electric Tools
  - Painting Processes
- Operations
  - Compressed Work Schedules
  - Non-Production Shutdown Procedures
  - Compressed Air Leak Repair
- Infrastructure Upgrades
  - Lighting
  - Heating & Ventilating
  - Compressed Air Management



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Paint Application Technologies Energy Efficiency

- Reduced Booth Air Humidity
  - Natural gas consumption reduced by lowering booth temperature and humidity setpoints during winter at all applicable N.A. paint departments
  - Benefits:
    - Total Annual Energy Reduction
      - Natural Gas: 0.6M mcf (7%) $5M savings
  - No affect on paint quality

- Booth Air Handling
  - Recirculation and cascade strategies reduce the volume of air processed
  - Benefits: (AAI)
    - Annual Energy Reduction
      - Electricity 1.2MW (7%) $0.6M savings
      - Natural Gas 40Kmcf (3%) $0.3M savings
  - Strategy incorporated into Ford paint shop specifications.

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Paint Application Technologies Energy Efficiency (cont'd)

- Three Wet Paint Booth
  - Energy savings through reduced paint booth footprint & consolidated processes
  - Benefits: (OHAP)
    - Annual Energy Reduction Potential
      - Electricity: 1.0MW (5%) $0.3M savings
      - Natural Gas: 0.2M mcf (12%) $1.4M savings

- Fumes to Fuel
  - Conversion of paint booth VOCs into electricity
  - Benefits: (across N.A.)
    - Annual Energy Reduction Potential
      - Electricity: 3.4MW (5%) $1.5M savings
      - Natural Gas: 1.0M mcf (16%) $8M savings
    - Virtual elimination of NOx, SOx
    - 10-fold reduction in CO_2 emissions vs. traditional abatement
    - Net energy production
  - Compatible with Three Wet strategy

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Automated Air Compressor Controls Capital Project

- Scope:
  - Installed networked control system on existing compressors at plant powerhouses
  - 29 plants, 181 compressors

- Benefits:
  - Annual Electricity Reduction
    - 5MW (12%) $1.7M savings
  - Web-based real-time data acquisition and analysis
  - Remote troubleshooting
  - Extend equipment life
  - Reduce maintenance costs
    - Oil consumption, filter replacement, labor

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AutoAlliance Energy Upgrade Performance Contract

- Scope:
  - Plant infrastructure and production equipment upgrades
  - Replacement of 12,000 light fixtures
  - Paint booth air management
  - Automated building and process equipment controls

- Benefits:
  - Annual Energy Reduction
    - Electricity: 2MW (10%) $1M savings
    - Nat. Gas: 0.6M mcf (34%) $4.5M savings
    - Water: 54kGal (20%) $0.3M savings
  - Enable improved vehicle quality
    - Improved lighting levels
    - 30% less paint booth air flow = reduced dirt contamination

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Chicago Stamping Plant Performance Contract

- Lighting Fixture Replacement
  - Installing 6,000 fixtures with integral motion sensors
  - Estimated Annual Electricity Reduction
    - 1.2MW (11%) $0.7M savings
- Powerhouse Automation & Controls
  - Installing modern controls on all powerhouse systems
  - Remote alarm and paging function will enable unmanned operation
  - Integrating existing systems
    - BigFoot H&V System
    - Air Compressor Controls

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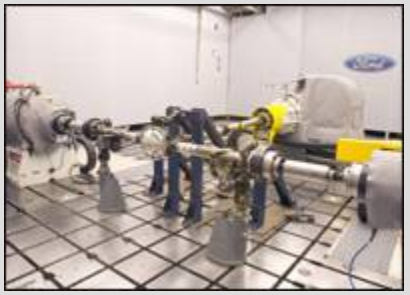
Ford Research & Innovation Center
Energy Performance Contract

SIEMENS

- Scope
  - Demand Controlled Ventilation
  - Retrofitted 5,000 light fixtures
  - Upgraded energy management system
  - Lab exhaust fan, fume hood controls
    - Occupancy sensors
    - Static pressure monitoring
  - Upgraded chiller controls



- Financials
  - Six year term
  - $1.47M savings

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Energy Metering & Monitoring System (Schneider Electric)

- 200+ Electricity and Natural Gas Meters
- 43 Sites
- Near Real-Time Monitoring
- Externally Hosted
- Power Quality Monitoring at 12 Sites

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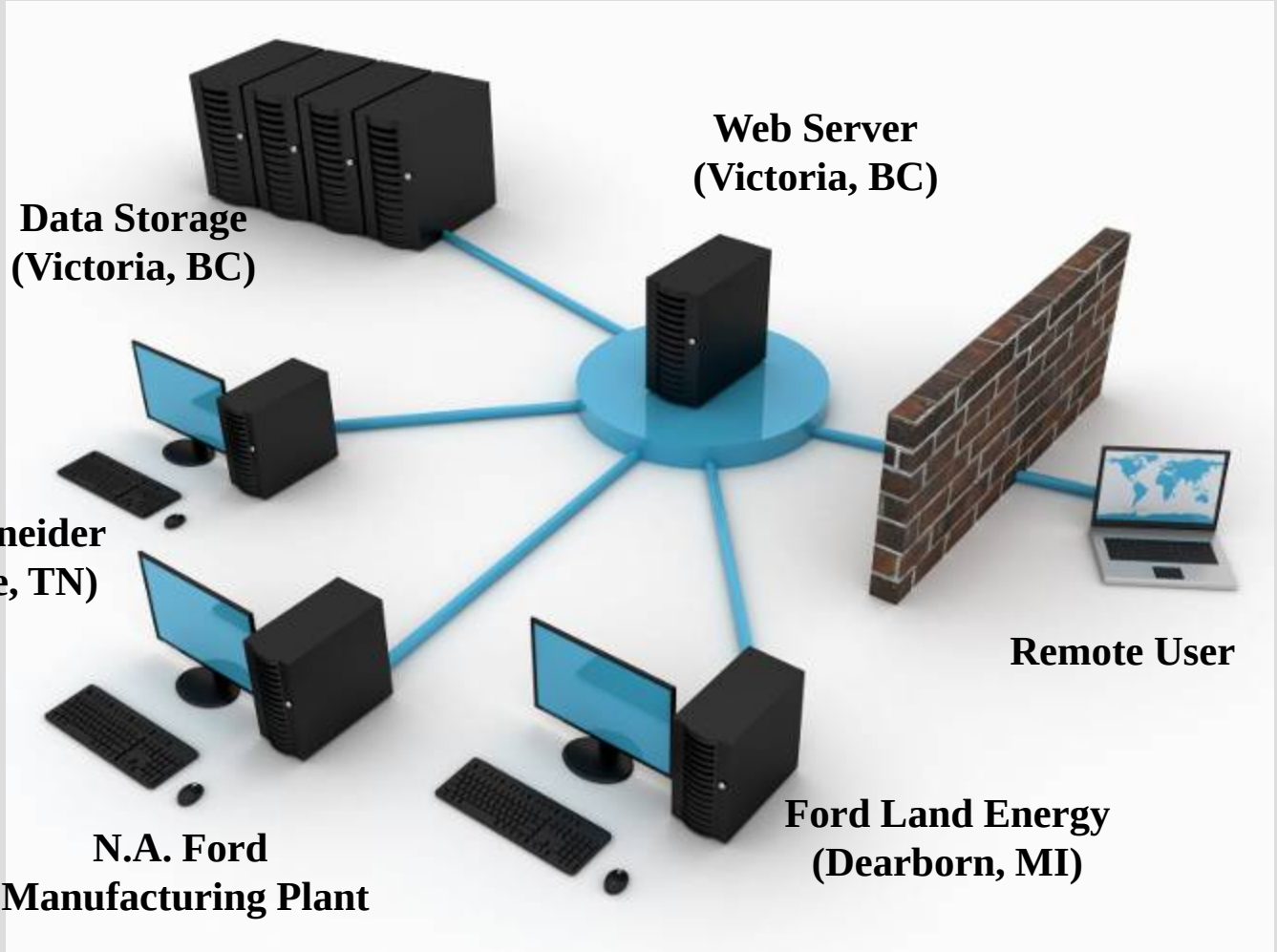
Energy Metering & Monitoring System Network Diagram



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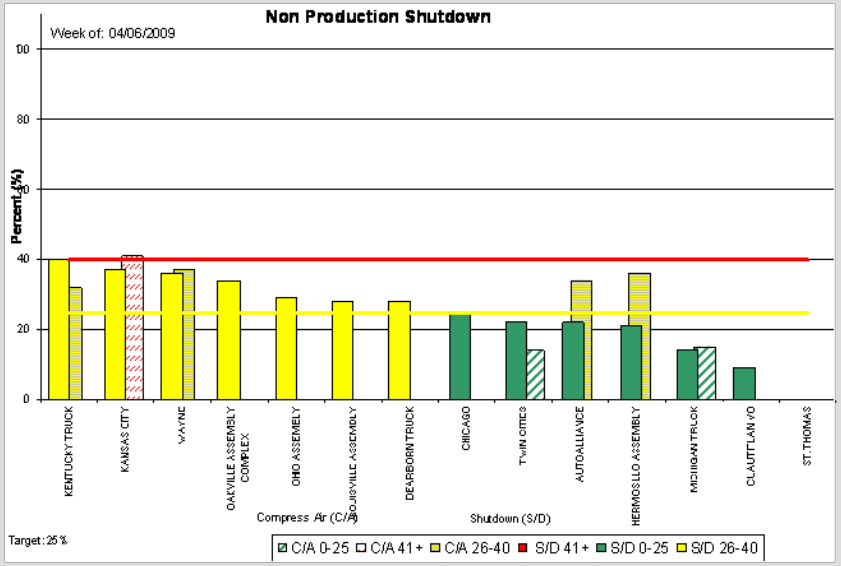
Management Practices
TVM Energy Program

- Five low-cost/no-cost actions to reduce consumption during non-production periods
  - Weekend Electrical Shutdown
    - 25% Goal
  - Compressed Air Consumption
    - 25% Goal
  - Compressed Air Pressure
    - 70psig Assembly, 55psig Stamping
  - General Building Exhaust Fans
    - Goal: Zero
  - Paint Booth Humidity
    - 70degF/50%Rh



- Consistent program since 2003 launch
- Weekly performance reports used by plants to manage non-production energy consumption
- Leverages automated data collection & use of tools

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EPA EnergyStar Program

- U.S. Government funded program to improve air quality through superior energy efficiency
- Supports all sectors of energy use and generation
- Benefits:
  - Industry focused best practices sharing and benchmarking
  - Monthly Partner Webcasts
  - Motor Vehicle Manufacturing Focus Group
  - Benchmarking Tools (EPI)
- Energy Star Partner Award

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EPA Energy Star Program
Key Elements

- Data Management & Reporting
  - Identify KPIs
  - Generate progress reports
  - Management reviews
- Projects & Actions
  - Capital Projects
  - Performance Contracting
  - Initiatives, Programs
  - Low Cost, No Cost Best Practices
- Communication & Awareness
  - Share progress with whole plant
  - Educate plant employees
  - Community Outreach

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State Programs
Michigan Energy Optimization Program

- Michigan Clean, Renewable and Efficient Energy Act of 2008
  - Renewable Portfolio Standard
  - Energy Optimization Program
    - Administered by MPSC and Service Providers

- DTE Energy “Your Energy Savings” Program
  - Efficiency Rebates
    - Prescriptive Incentives
      - Lighting, Motors, Heating & Cooling Equipment, etc
    - Custom Incentives
    - Application Process
    - Performance Contracting

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What's Next?
New Products, New Facilities

Electric? Hybrid? PHEV?
Super Efficient ICE? Hydrogen Fuel Cell?

Vehicle Electrification

- Changes to Plant Layout
- New Tooling
- Modularity
- New Vehicle Finishes & Application Technologies
- Renewable Energy with Stationary Battery Storage

EcoBoost

HYBRID

PLUG-IN HYBRID

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Thank You!