Greening Denver’s Fleet

Public Works Fleet Division

Denver, Colorado
Greening Denver’s Fleet

- Presentation Overview
  - The hybrid experience
  - Alternative fuels
  - Emissions control
  - Fuel conservation
  - Hazardous waste reduction
  - New initiatives underway
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- Support from the Top
  - Denver’s Green Fleet Program
    - Established in 1993 by Mayor Webb
    - Called for emissions reductions
    - Warranted consideration of alternative fuels and alternative fuel vehicles
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- Support from the Top
  - Greenprint Denver Office
    - Launched in 2005 by Mayor Hickenlooper
    - Provides action agenda for sustainability
    - Calls for use of hybrids and B20 biodiesel
    - Michelle Weingarden, Director

- PW Manager/Deputy Mayor Bill Vidal
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Additional Support
- Nancy Kuhn, Fleet Administrator
- Sabrina Williams, Environmental Engineer, Denver’s Department of Environmental Health
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The Hybrid Experience

- Began purchasing Toyota Prius hybrids in 2001
- At that time, Denver’s fleet of 39 Priuses was believed to be the largest municipal hybrid fleet in the world.
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- The Toyota Prius
  - Economical
    - Low maintenance
    - Avg. 42 miles per gallon
  - 8-year warranty on hybrid technology
  - Great resale value
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- Surplused 23 Toyota Priuses in 2008
  - Most were model year 2001
  - Utilized in City Motor Center
  - Low mileage
  - Warranty on hybrid technology still in place
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### Prius Auction Results

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Prius purchase price</td>
<td>$20,003</td>
</tr>
<tr>
<td>Less rebate</td>
<td>-$3,900</td>
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<tr>
<td>Cost per unit</td>
<td>$16,103</td>
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<tr>
<td>Residual value (avg.)</td>
<td>-$11,783</td>
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<tr>
<td>End cost per unit (comparable to $55-$65 monthly payment)</td>
<td>$4,320</td>
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</tbody>
</table>
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- The Ford Escape Hybrid
  - Denver secured one of the first Ford Escape hybrids
  - Mayor’s vehicle
  - Viable replacement for SUVs
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- Newer Hybrid Purchases
  - Toyota Camry Hybrid (2008)
  - Ford Fusion Hybrid (2009)
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- Newer hybrid purchases
  - Hybrid-electric bucket truck
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- Hybrid-Hydraulic Trash Truck
  - Arrived in 2008
  - Hydraulics help launch and brake the unit
  - Fuel savings at 25%
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Hybrids
- Today, 124 hybrids in City fleet (or 4% to 5% of total fleet)
- Purchasing hybrids when passenger vehicles and SUVs are due for replacement
- Continue capitalizing on State Alternative Fuel Rebate. Last application netted $47,000 or an average of $3,100 per vehicle
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- **Alternative Fuels**
  - Propane
  - **City began using alt fuels in the 1990’s**
  - **Converted some vehicles to propane**
  - **Still have 29 propane units in fleet**
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- Alternative Fuels
  - CNG
    - Utilized at Denver International Airport (closed campus environment)

- About 125 CNG units at the airport
- 738,000 gallons of CNG used in 2007
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- Alternative Fuels
  - Biodiesel
    - City started using B20 in 2004
    - About 60 diesel units involved in pilot
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◆ Biodiesel
  – In 2006, we expanded use of B20 to all fueling locations
  – 1.4 million gallons of biodiesel purchased in 2008 (B10 and B20)
  – Paid $0.15 cents more per gallon for biodiesel in ’08. Pursuing more grant money to offset cost.
  – “Cutting” fuel on coldest days if need be
  – Fuel quality is essential
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- **Biodiesel**
  - Environmental Benefits
  - Denver purchased 2,448,935 gallons of B20 from 2004 through 2007
  - Associated emissions reductions:
    - 3,136 pounds of particulate matter
    - 4,110 pounds of hydrocarbons
    - 7.9 million pounds of carbon dioxide. Estimated to be equivalent to 785 vehicles not being driven for one year
    - Source: National Biodiesel Board website
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- Alternative Fuels
  - E85
    - In 2008, City began dispensing E85 fuel for the first time in its history
    - 242 flex-fuel vehicles in fleet
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Emissions Control

- Retrofitted 26 refuse units with crank case ventilation systems
- Retrofitted 34 dump trucks with diesel oxidation catalysts and crank case ventilation systems
  - DOCs break down pollutants (CO, HC, PM) into harmless gases.
  - Crank case ventilation systems virtually eliminate crank case emissions.
  - The two systems working in tandem are claimed to reduce pollutants by 90%
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- Off-Road Paving Equipment Grant
  - 21 pieces of off-road paving equipment are getting DOCs.
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- Another Emissions Control Initiative
  - Installed pre-heaters on 16 refuse trucks
  - The heaters heat the unit’s hydraulic oil and engine coolant
  - Reduces idling time
  - Reduces emissions produced when vehicles start up on cold days
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- Funding for Retrofits
  - Made possible with EPA grant money
  - Also applying for DOE grant $$ for plug-in conversion kits, charging stations, medium duty hybrids
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- **New Idling Ordinance**
  - Effective 2009
  - No person shall allow a vehicle to idle for more than five (5) minutes in any one-hour period
  - Doesn’t apply to emergency vehicles
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- Reducing Greenhouse Gases
  - Denver is monitoring the impact of driving behavior on fuel consumption and greenhouse gas emissions.
  - 168 units piloting “Driving Change” product developed by Enviance, Inc. and Cartasite, Inc.
  - It educates operators on how their driving patterns can impact their carbon footprints
  - Participants have access to their vehicle’s emissions info and can monitor their progress.
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- Controlling particulate matter
  - In 2001, Fleet Maintenance began purchasing “combo units” – 50 snow trucks able to carry and apply liquid and solid de-icers.
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- Fuel conservation efforts
  - Established Fuel Conservation Committee in June 2008
  - Reprogramming transmissions on refuse trucks (lowering shift points for fuel economy increase averaging 18%)
  - Setting maximum idle time and speed
  - Tracking and expanding successful initiatives
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Fuel Conservation Efforts

- Incorporating LEDs (light-emitting diodes)
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- Gaining efficiencies through GPS
  - Denver has installed GPS units on approximately 70 Wastewater trucks
  - Piloting ZONAR on 20 refuse units
  - Using GPS to improve routing and save fuel!
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◆ Proactive Tire Program
  – Fleet Maintenance regularly checks vehicle tires
  – Being down 7.5 pounds of pressure reduces fuel economy by 2.8%
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- Reducing Hazardous Waste
  - Targeted parts cleaning processes
  - Purchased environmentally-friendly parts washers
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- New parts washers
  - Self-cleaning units
  - Produce less waste
  - Reduced hazardous waste generation by 2,000 pounds (or one ton).
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Body Shop Improvements

- Installed a new air makeup unit in the paint booth. It filters air coming in and out of the paint booth (intake and exhaust filters). Fewer harmful emissions released into the atmosphere.
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“Green” Paint
- Using Martin Senour water-based automotive paint (new to our region)
- Estimates 96% reduction in volatile organic compound (VOC) emissions compared to solvent-borne basecoats
- No hazardous air pollutants (HAPs)
- Reduces hazardous waste generation = saves $$
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- Receiving Recognition
  - 9th Greenest Fleet in North America - 100 Best Fleets Organization
  - 2009 Colorado APWA Chapter Award for Fuel Savings and Conservation Program
  - City and County of Denver 5281 Team Award for supporting the City’s sustainability action agenda
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- Denver’s Environmental Management System (EMS) receives ISO 14001 certification
  - Management system to improve environmental and sustainable development performance
  - Uses a continuous improvement cycle of Plan-Do-Check-Act
  - Denver is now one of the first major US cities with a ISO 14001-certified EMS
  - Shows commitment to continuously improving our environmental stewardship.
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- Eco-Partnership with China
  - Co-chair of eco-partnership between Denver, CO, and Chongqing, China
  - Partnership arranged by U.S. Treasury Dept.
  - The two cities have agreed to jointly confront the challenge of advancing the electrification of the automobile
  - Partners include Ford, Changan Motor, National Renewable Energy Lab, and American and Chinese Battery Consortiums, among others.
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Looking to the Future

– New fleet facility in 2010 to accommodate maintenance of alternative fuel vehicles

– Pursuing grant money for L/CNG fueling station and to offset incremental cost of purchasing LNG refuse units.
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Looking to the Future

- Receiving CNG trash truck this year
- Methane project – converting methane from the dump into LNG fuel
- Right-hand drive hybrids for parking enforcement employees
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What It’s All About!