ADVANTAGES OF USING SMARTWAY TECHNOLOGIES

Energy Center Workshop
Tarrant County Community College
April 28, 2016

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North Central Texas Council of Governments
Structure of Presentation

Introduction to NCTCOG

Overview of Trucking Industry

Energy Consumption and Emissions of Heavy-Duty Trucks

Projected Challenges

Mandates

SmartWay Technologies

SMARTE Program
North Central Texas Council of Governments

Council of Governments (COG)

Metropolitan Planning Organization (MPO)

230 member governments

Goals

• Planning for common needs
• Cooperating for mutual benefit
• Coordinating for sound regional development
Ground level ozone ($O_3$) formation: Nitrogen Oxides (NOx) and Volatile Organic Compounds (VOCs) along with sunlight

10 counties are designated in nonattainment of the 2008 8-hour ozone standards

Expanding to include Hood county (2015 revised standard)

Pollutants harmful to public health and environment

Figure 2: 8-Hour Ozone Historical Trends
Mobile Source Air Quality Programs

http://www.nctcog.org/trans/air/programs/
Trucking Industry

Overview (2013)

- Trucks moved around 13.7 billion tons of freight shipments
- Value of shipment was approximately $10.8 billion
- Employed 30.5% of all transportation and warehousing sector employment
- Account 4.1%, but heavy duty trucks (HDTs) account approximately 1% of all highway vehicles
- Account roughly 9.2% of all highway vehicle miles traveled (VMT) – (HDTs) account for 5.6%


**Figure 3: 2013 U.S. Freight Shipment by Mode**

- Medium and HD Trucks
- Rail
- Water
- Air
- Multiple Modes
- Pipeline
- Other & Unknown

76%

2%

3%

8%

9%

2%
Transportation Sector Petroleum Consumption

- Consumed, on average, approximately 13.64 million barrels of petroleum per day
- Trucking industry, medium and heavy-duty trucks, account for approximately 26%

**Figure 4: Consumption by Sector (percent)**

- Residential: 1%
- Commercial: 3%
- Industrial: 2%
- Transportation: 24%
- Electric Power: 70%

**Figure 5: Consumption by Mode (percent)**

- Light Vehicles: 63%
- Buses: 8%
- Medium-Duty Trucks (Class 3-6): 4%
- Heavy-Duty Trucks (Class 7-8): 18%
- Air: 4%
- Water: 1%
- Rail: 2%

Source: U.S. DOE. *March 2016 Monthly Energy Review*. Figure 3.7 (barrels, Dec 2015).

Source: U. S. DOE. *Transportation Energy Data Book*, Table 1.16 (gallons, 2013). Classification: Class 7 (26,000 to 33,000 pounds) and Class 8 (33,000 pounds or more).
• HDT registrations jumped by 173% from 905K to 2.5M
• VMT increased by around 380% from 35B to 168B

Figure 6: 1970 – 2013 Vehicle Miles Traveled and Number of Registration

Source: U. S. DOE. Transportation Energy Data Book, Table 5.2 (2013).
Historical Fuel Consumption

- Consumed, on average, about 28.5 billion gallons of fuel; roughly 290% increase from 1970
- 4.8 mpg (1970) to 5.8 mpg (2013); increase of 21%

Figure 7: 1970 – 2013 Fuel Consumption and Economy

Source: U. S. DOE. Transportation Energy Data Book, Table 5.2 (2013).
Greenhouse Gas Emissions

- Percent share: 15% (1990) vs. 21% (2013)
- 67% increase (230 MMT to 393 MMT)
- Gallon gasoline (19.64 pounds) vs. diesel (22.38 pounds)

Regional Nitrogen Oxides Emissions

- On-Road NOx emissions 130.77 tons per day (tpd) or approximately 44%
- HDTs NOx emissions 50.8 tpd or approximately 39% (on-road) 17% (total)

Sources: Texas Commission on Environmental Quality. 2017 Dallas-Fort Worth 8-Hour Attainment Demonstration State Implementation Plan. EPA. Average In-Use Emissions from Heavy-Duty Trucks.
Reducing Fossil Fuel Consumption

STRATEGIES

Vehicle Miles Traveled

Alternative Energy

Vehicle Efficiency
- On average, in 2013, a HDT traveled about 68,165 miles
- Shipment by truck projected to increase by approximately 4%, increase in energy consumption by 7%

**Figure 11: Projected Goods Movement by Mode**

<table>
<thead>
<tr>
<th>Mode</th>
<th>2012</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>74%</td>
<td>78%</td>
</tr>
<tr>
<td>Air</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pipeline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rail</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Percent Share by Mode**

<table>
<thead>
<tr>
<th>Mode</th>
<th>2012</th>
<th>2040</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Rail</td>
<td>11%</td>
<td>9%</td>
</tr>
<tr>
<td>Pipeline</td>
<td>8%</td>
<td>5%</td>
</tr>
<tr>
<td>Marine</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Multiple</td>
<td>3%</td>
<td>3%</td>
</tr>
<tr>
<td>Air</td>
<td>0.02%</td>
<td>0.03%</td>
</tr>
<tr>
<td>Truck</td>
<td>74%</td>
<td>78%</td>
</tr>
</tbody>
</table>


**Figure 12: Projected Energy 2040 Consumption by Mode**

Source: U.S. DOE. *Annual Energy Outlook 2015 with Projections to 2040*, Figures 10. Due to independent rounding, shares may not equal 100 percent.
Regional Heavy-Duty Truck Traffic Projection

- Freight flows expected to increase by 121%
- AADTT expected to increase by 40%

### Table 1: DFW Freight Flows by Truck (tons in millions)

<table>
<thead>
<tr>
<th>Trade Corridors</th>
<th>2011</th>
<th>2040</th>
<th>Change (percent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IH-35 San Antonio - Dallas</td>
<td>26.83</td>
<td>61.52</td>
<td>129</td>
</tr>
<tr>
<td>IH-45 Houston - Dallas</td>
<td>18.48</td>
<td>35.26</td>
<td>91</td>
</tr>
<tr>
<td>IH-30 Dallas - Arkansas</td>
<td>9.82</td>
<td>24.88</td>
<td>153</td>
</tr>
<tr>
<td>IH-35 Dallas - Oklahoma</td>
<td>6.73</td>
<td>14.78</td>
<td>120</td>
</tr>
<tr>
<td>US 287 Dallas - Amarillo</td>
<td>4.50</td>
<td>9.78</td>
<td>117</td>
</tr>
<tr>
<td>IH-20 IH 10 - Dallas</td>
<td>4.31</td>
<td>11.42</td>
<td>165</td>
</tr>
<tr>
<td>US 75 Dallas - Oklahoma</td>
<td>3.18</td>
<td>6.02</td>
<td>89</td>
</tr>
<tr>
<td>IH-20 Dallas - Lousiana</td>
<td>0.94</td>
<td>1.46</td>
<td>55</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74.79</strong></td>
<td><strong>165.12</strong></td>
<td><strong>121</strong></td>
</tr>
</tbody>
</table>

Source: TxDOT. 2012 International Trade Corridor Plan, pg. 22.

### Table 2: AADTT IN DFW

<table>
<thead>
<tr>
<th>Route</th>
<th>From</th>
<th>To</th>
<th>Length (mile)</th>
<th>AADTT (2013)</th>
<th>AADTT (2033)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IH-20</td>
<td>US-377</td>
<td>US-175</td>
<td>52</td>
<td>15,769</td>
<td>22,114</td>
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<tr>
<td>IH-30</td>
<td>IH-35W</td>
<td>IH-635</td>
<td>42</td>
<td>11,458</td>
<td>16,040</td>
</tr>
<tr>
<td>IH-35E</td>
<td>IH-20</td>
<td>US-380</td>
<td>50</td>
<td>12,198</td>
<td>17,078</td>
</tr>
<tr>
<td>IH-35W</td>
<td>IH-20</td>
<td>US-380</td>
<td>45</td>
<td>10,501</td>
<td>14,701</td>
</tr>
<tr>
<td>IH-635</td>
<td>SH-121</td>
<td>IH-20</td>
<td>38</td>
<td>17,655</td>
<td>24,716</td>
</tr>
<tr>
<td>US-75</td>
<td>IH-30</td>
<td>US-380</td>
<td>32</td>
<td>13,635</td>
<td>19,088</td>
</tr>
</tbody>
</table>

Source: Dr. Mohammad Najafi. Presentation on Integrating Underground Freight Transportation (UFT) Into Existing Intermodal System, slide 17. AADTT: Average annual daily truck traffic.
Alternative Energy

- Range of 62 miles, takes 3 to 4 hours to fully charge (BMW)
- Natural gas around 2%

Source: Google image library.

Heavy-Duty Truck Emission and Fuel Standards

Phase 1

- First GHG emission and fuel standards for medium and heavy-duty trucks
- Applies to model years (MYs) 2014 – 2018
- 7 to 20% reduction in CO₂ (EPA) and fuel consumption (NHTSA) by MY 2017
- Reduce approximately 250 MT of CO₂
- Average 6.9 mpg

Phase 2

- Applies to MYs 2021 – 2027
- Achieve 24% lower CO₂ emissions and fuel consumption relative to Phase 1 standards
- Approximately cuts GHG emissions by approximately 1 billion MT, saves 1.8 billion barrels of oil, and reduce fuel cost by $170 billion
- Average 8.5 mpg

SmartWay Program

Goals

• Develop public and private partnership
• Improve freight efficiency
• Reduce emissions

Results

• Over 3,000 partners
• Saved 170.3 million barrels of oil
• Reduce emissions: 72M metric tons (MT) of CO$_2$, 1.4M MT NOx, and 72K MT of Particulate Matter

SmartWay Strategies

Technologies

• Aerodynamics
• Idling Reduction
• Low Rolling Resistance Tires
• SmartWay Tractors
• SmartWay Trailers

Other Fuel Saving Strategies

• Alternative Fuels
• Engine Repower
• Speed Management Practices
• Weight Reduction Strategies
Cab Roof
• 4 to 8%
• Saves, on average, around 700 fuel gallons
• Equivalent to $1,400 savings in fuel cost
• 7.2 MT CO₂ reduction

Side Extender
• 1 to 2%
• 175 fuel gallons
• Saves $350 in fuel cost
• 1.8 MT CO₂ reduction

Trailer Side Skirts and Tails

Side Skirts
• 4 to 7%
• Saves 645 gallons
• Reduces fuel cost by around $1,300
• 13.1 MT CO₂

Tails
• 1 to 2%
• 175 fuel gallons
• Saves $350 in fuel cost
• 1.8 MT CO₂ reduction

Idling Reduction Devices

Auxiliary Power Unit

Heavy-duty trucks, on average, spend 2,400 idling hrs/year, burning 0.6 gal/hr

Use
- Heating
- Air conditioning
- Electrical accessories

Benefits
- 1,440 gallons saved
- $2,880 fuel savings
- 14.6 MT CO₂

Low Rolling Resistance Tires

Single Wide Tires or Dual Tires

- 3% reduction in fuel consumption (6.19 mpg)
- Fuel reduction equivalent to 500 gallons
- Fuel cost savings $1,000
- 14.6 MT CO$_2$

List of SmartWay tires is available online at [https://www.epa.gov/verified-diesel-tech/smartway-verified-list-low-rolling-resistance-lrr-tires-and-retread](https://www.epa.gov/verified-diesel-tech/smartway-verified-list-low-rolling-resistance-lrr-tires-and-retread)
Benefits

- 0.60% increase in fuel economy
- Fuel reduction equivalent to 100 gallons
- Fuel cost savings $200
- 1.12 MT CO₂

Reduce flexing and bending of tires

SmartWay Certified Tractors and Trailers

Benefits

• Reduce fuel consumption by up to 20%
• Equivalent to 2,000 to 4,000 gallons of diesel per year
• Fuel savings between $4,000 to $8,000 per year
• Reduces CO₂ between 20.3 MT to 40.7 MT

Sources: EPA, SmartWay Designated Tractors and Trailers and U.S. DOE, Transportation Energy Data Book, Table 5.2 (2013).
SuperTruck Program (2010)

Goal
Increase overall fuel economy to 9.75 mpg

Partners
• Daimler Truck North America
• Cummins & Peterbilt
• Volvo
• Navistar

Annual Projections
• Spend nearly $30B less on fuel
• Consumer nearly 300M fewer barrels of oil

Saving Money and Reducing Truck Emissions (SMARTE)

Reduce fuel consumption and fuel-related emissions from the trucking industry

Program Objective

Conduct outreach in order to provide awareness owner-operators and small-to-medium size trucking companies

- Regulations
- Funding opportunities
- Technological and operational solutions

Program Resources

- Driver, Fleet Manager, and Vendor information folders
- Informational brochure
- Application assistance

www.nctcog.org/SMARTE
# SMARTE Program Results

## Number of Technology Upgrades
- 74 idle reduction devices
- 25 aerodynamic devices
- 2 low rolling resistance tires

## Annual Fuel Consumption and Cost Reduced
- 90,229 gallons
- $180,458

## Annual Pollutants Reduced (tons)
- 1,001 ton of CO$_2$
- 15.93 ton of NOx
Concluding Remarks

Impact on Environment

• Despite just around 5% of on-road vehicles, HDTs account for nearly 18% and 21% of, respectively, fuel consumption and CO₂ emissions
• Roughly 36% of NOx emissions in DFW is attributed to heavy-duty diesel trucks

Challenges

• HDTs will continue to play a significant role in the movement of goods
• Energy demand from HDTs is expected to increase by roughly 33% by 2040
• Average annual daily truck traffic in DFW is projected to rise 40% by 2033

Improving Fuel Economy

• SmartWay technologies expected to increase fuel efficiency up to 20% (saves 2,000 to 4,000 gallons)
• SuperTruck Program: achieve 9.5 mpg or above (10.7 and 12.2)
Contact Information

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www.nctcog.org/smartway
www.nctcog.org/smarte

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