Dual Fuel Conversion Systems for Heavy Duty Trucks

“We cut your fuel costs”

Ira Dorfman
Senior Director – Business Development

Compressed Natural Gas: The Natural Alternative in Southeastern PA

March 20, 2012
EcoDual LLC

A new (2011) company built on 20+ years of dual fuel conversion expertise

Systems operating in the US and globally

Recently achieved EPA compliance to begin selling and installing systems

Offering complete solutions of systems, installations and fueling
Changing Fleet Owner Business Model

- In the last 4 years, the number of Fleet Owners in the U.S. have reduced from 7,000 to 5,000 due to the economy and increased competition.
- Even the largest, most successful fleet owners operate with only an 1% to 3% profit margin.
- In the last 4 years, large fleet owners are keeping their trucks longer -- from 3 years to now 5 years -- to increase payback and make a profit.
- The percentage yearly operating cost of a Class 7/8 “semi” or “18-wheeler” is now:
  - Labor 33%
  - Fuel 37%
  - Lease/Purchase, tolls, insurance, etc – 30%
Highest Density of Routes are East of the Rockies; Most Fleet Owners Operate Routes < 300 Miles/Day

- Rail continues to grow because it is lowest cost way to transport goods from East to West Coast and back – rail is 7 time less expensive to ship goods cross-country
- The rapidly increasing use of intermodal freight transfer is requiring the need for more trucks but shorter routes – “spoke and hub model”
- The further use of the Panama Canal will increase Class 7/8 truck traffic on the East Coast
- New Class 8 truck drivers are young and want to go home every night with family
- 115% yearly turn-over rate with drivers
- The average route of Swift Transportation, the largest independent Class 8 truck fleet, is now 275 miles a day
Why Dual Fuel?

- Primary advantage is low cost – payback in 1 year
- High reliability and easy maintenance
- A Dual Fuel diesel engine is fitted to utilize natural gas as a supplemental fuel. The engine is basically unchanged and continues to use compression ignition of diesel for ignition of the NG fuel.
- Class 6/7/8 heavy trucks burn nearly 25% of all the fuel used in US transportation.
- No Range Anxiety – automatically runs on 100% diesel if natural gas runs out
Our Dual Fuel Conversion System

- Compression ignition with up to 85% natural gas
- 100% diesel on start
- Runs on 100% if NG runs out
- Advanced electronic controls continuously adjust
- OEM ECU operates normally with no changes
EcoDual System Operation

- Advanced, electronically controlled fumigation
- EcoDual system ECU

- Starts on diesel
- Up to 85% NG at highest loads
EcoDual’s Patent Pending System

- Runs on up to 85% natural gas
- One-year ROI
- No power loss on hills or during acceleration
- No loss in fuel economy (MPG)
- No loss in operating range
- Can use CNG or LNG
- System is installed in 3 hours and the tank in 5 hours
- No mechanical or electrical modifications to original engine
- Does NOT void the engine warranty or reduce resale value
- Reduces all emissions
- More reliable, simpler to maintain, and lower operating cost than 100% natural gas engine
- Significantly quieter than the original engine
- Runs on 100% diesel automatically if natural gas unavailable
EcoDual’s Market – Class 6/7/8

Percentage of Classes of Commercial Vehicles in Operation

- Class 8: 49%
- Class 7: 22%
- Class 6: 21%
- Class 5: 8%

Number of Trucks in All Fleet

- Class 6: 1,562,000
- Class 7: 1,643,000
- Class 8: 3,608,000
- Total Cl. 6/7/8: 6,813,000

Private Fleets

- Over 100: 27%
- 51 to 100: 35%
- 21 to 50: 20%
- 5 and Under: 13%
- 6 to 20: 6%

Owner/Operator Fleets

- One: 63%
- 2 to 3: 21%
- 4 to 9: 7%
- 10 and Over: 9%

Commercial Carriers Fleets

- 500 and over: 10%
- 26 to 50: 17%
- 100 to 499: 27%
- Up to 25: 22%

Commercial Trucks in Operation in 2008

- Class 6: 1,562,000
- Class 7: 1,643,000
- Class 8: 3,608,000
- Total Cl. 6/7/8: 6,813,000

70% of the 5,000 fleet owners in the US are small businesses
EcoDual is Ready to Deliver

- Approved EPA OUL system for 2004-2009 Cummins ISX
- System production ongoing
- 1000 systems targeted for installation in 2012
- Full EPA/CARB certification on ISX is projected by summer 2012
- System for Cummins ISM will be available in 2012
- Detroit Diesel DD13, DD15 and Series 60 development and certification work ongoing
## EPA’s Approval List for Outside Useful Life Clean Alternative Fuel Conversion Systems

**Light-Duty and Heavy-Duty Outside Useful Life Clean Alternative Fuel Conversions**

[http://www.epa.gov/otaq/consumer/fuels/altfuels/altfuels.htm](http://www.epa.gov/otaq/consumer/fuels/altfuels/altfuels.htm)

<table>
<thead>
<tr>
<th>Fuel Information</th>
<th>Conversion Manufacturer</th>
<th>Original Vehicle Information</th>
<th>Conversion Vehicle Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conversion Fuel</td>
<td>Original Fuel</td>
<td>Model Year</td>
<td>OEM</td>
</tr>
<tr>
<td>Diesel or Diesel/CNG</td>
<td>Diesel</td>
<td>American Power Group, Inc.</td>
<td>2004</td>
</tr>
<tr>
<td>Diesel/CNG</td>
<td>Diesel</td>
<td>Clean Air Power, Inc.</td>
<td>1998, 1999, 2000, 2001, 2002</td>
</tr>
<tr>
<td>Diesel/CNG/LNG</td>
<td>Diesel</td>
<td>EcoDual LLC</td>
<td>2009, 2008, 2007, 2006, 2005, 2004</td>
</tr>
<tr>
<td>Gasoline/LPG</td>
<td>Gasoline</td>
<td>Parnell USA</td>
<td>2002</td>
</tr>
</tbody>
</table>
Cummins and Detroit Diesel Engine Families Represent 3 Million Trucks

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cummins – Approx. 31% of our market – mostly ISXs</td>
<td>ISL/ISL9</td>
<td>8.9L</td>
<td>345 - 365</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>ISM/ISX12</td>
<td>10.8L/11.9L</td>
<td>280 - 500</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>ISX/ISX15</td>
<td>14.9L</td>
<td>385 - 600</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CAT – Approx. 19% of our market</td>
<td>C13</td>
<td>12.5L</td>
<td>350 - 525</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C15</td>
<td>15.2L</td>
<td>435 - 550</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Detroit Diesel – Approx. 25% of our market</td>
<td>MBE 4000</td>
<td>12.8L</td>
<td>350 - 450</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Series 60</td>
<td>12.7L</td>
<td>380 - 515</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Series 60</td>
<td>14L)</td>
<td>470- 515</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DD 13</td>
<td>12.8 L</td>
<td>350 - 470</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>DD 15</td>
<td>14.8L</td>
<td>455 - 560</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MACK/Volvo – Approx. 17% of our market</td>
<td>Maxidyne 370</td>
<td>12.1L</td>
<td>370 /405</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MP7/D11</td>
<td>10.8 L</td>
<td>325 - 405</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MP8/D13</td>
<td>12.8 L</td>
<td>415 - 505</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>MP10/D16</td>
<td>16.1 L</td>
<td>515 - 605</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EcoDual & CU-ICAR Development

- EcoDual headquarters and development center will be located at CU-ICAR in Greenville, SC
- EcoDual development center will initially focus on building out the Detroit Diesel product line
- EcoDual & ICAR will also pursue longer term major R&D projects for locomotives and novel 100% natural gas engines
- Full testing and fabrication facilities including two AC dynamometer cells
Near-Term Opportunity for EcoDual System Deployment in Southeastern Pennsylvania

2012 Competitive CMAQ Program
DVRPC has set aside funds to support a Competitive CMAQ Program. Beginning in Fiscal Year 2013, DVRPC will make a total $8,000,000 in CMAQ funds available for Bucks, Chester, Delaware, Montgomery, and Philadelphia counties in Pennsylvania. A total of $2,600,000 will be available for projects in Burlington, Camden, Gloucester, and Mercer counties in New Jersey. Examples of eligible CMAQ projects include pedestrian and bicycle projects, transit improvement programs, congestion reduction and traffic flow improvements, diesel retrofit projects, and funding of transportation demand management programs, among others. Public agencies and public – private partnerships with a public agency sponsor are eligible to apply for the Competitive CMAQ Program funds.
Why EcoDual System is Good Match for DVRPC Congestion Mitigation Program

EcoDual will score very well in the DVRPC program evaluation because:

- The low cost of the fuel system
- Sizeable reduction in NOx and PM
- The high mileage/high fuel consumption of the targeted Class 8 trucks

EcoDual is actively recruiting fleets with which to work on proposal submittals through Philadelphia Clean Cities