Panel Presentation: “Unlocking Our Vehicles to Methanol”

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UPS History of Vehicle Use and Shift to Alternative Fuels

• 1907 – couriers on foot and bicycles
• 1913 – first truck, a Model T Ford
• 75 years of growing dependence on oil
• 35 years: carefully investigating truck fuels
  – domestic, cleaner, cheaper (less price volatility)
• Key: central fueling and financial incentives
• In-service use permits perfection of vehicles, fuels
• We doubt the existence of “silver bullets”
• Economics drives the focus to long-haul heavy trucks
• UPS is willing to move boldly once the case is made
UPS Major Hubs

- Redmond Hub (98291)
- Portland Hub (97287)
- Salt Lake Hub (84643)
- Sacramento Hub (95825)
- Oakland Hub (94609)
- Las Vegas Hub (89119)
- San Gabriel Hub (91779)
- Albuquerque Hub (87119)
- Phoenix Hub (85009)
- El Paso Hub (79938)
- Dallas Fort Worth Air Hub (75249)
- Fort Worth-Hub (76105)
- Mesquite Hub (75150)
- Houston Sweetwater Hub (77083)
- Stafford Hub (77494)
- New Orleans Hub (70119)
- Orlando Hub (32899)
- Hialeah Hub (33010)
- Pinellas Hub (33782)

- Denver Hub (80222)
- Omaha Hub (68118)
- Kansas City Hub (64114)
- Little Rock Hub (72296)
- Oklahoma City Hub (73119)
- Wichita Falls Hub (79407)
- Dallas Fort Worth Air Hub (75247)
- Omaha Hub (68104)
- Memphis Hub (38116)
- Columbus Air Hub (29119)
- Jacksonville Hub (32224)
- Greenville-Spartanburg Hub (29608)
- Charlotte Hub (28218)
- Greensboro Hub (27407)
- Whitehead-Maine Hub (24229)
- North Charleston Hub (29405)
- Cincinnati Hub (45211)
- Louisville Hub (40205)
- Nashville Hub (37212)
- Atlanta Hub (30309)
- Birmingham Hub (35207)
- Huntsville Hub (35801)
- Nashville Hub (37201)
- Huntsville Hub (35802)
- Columbus Hub (31909)
- Indianapolis 81st Street Hub (46229)
- Indianapolis Hub (46219)
- Cedar Rapids Hub (52218)
- Des Moines Hub (50323)
- Chicago Union Station Hub (60601)
- Palatine Hub (60074)
- Rockford Air Hub (61181)
- Elgin-Grove Hub (60007)
- Madison Hub (53706)
- Norwalk Hub (06851)
- Milwaukee Hub (53202)
- Buffalo Hub (14210)
- Rochester Hub (14620)
- White Plains Hub (10606)
- Hartford Hub (06115)
- New Britain Hub (06056)
- New Haven Hub (06511)
- Paterson Hub (07503)
- Newark Hub (07103)
- Scranton Hub (18503)
- Reading Hub (19104)
- Scranton Hub (18510)
- Trenton Hub (08618)
UPS Global Alternative Fuel and Advanced Technology Vehicles

Total Alternative Tech Vehicles (U.S. & International): 3,152
As of Jan. 15, 2014

U.S. Alternative Tech Fleet: 2,077
- Compressed Natural Gas Vehicles: 877
- Hybrid Electric Vehicles: 380
- Liquid Natural Gas Vehicles: 249
- Propane Vehicles: 28
- Electric Vehicles: 102
- Hydraulic Hybrid Vehicles: 41
- Composite Body Diesel: 400

International Alternative Tech Fleet: 1,075
- Compressed Natural Gas Vehicles: 88
- Hybrid Electric Vehicles: 6
- Propane Vehicles: 846
- Electric Vehicles: 56
- Ethanol Vehicles: 50
- Biomethane Vehicles: 29
Why is UPS Interested in Methanol?

(Given the many alternative fuel options available in UPS’s “Rolling Laboratory”?)
Heavy Trucks Are Best Opportunity for Alternative Fuels, But Options Are Limited

• The ROI math drives one quickly to long-haul, heavy tractors
• Diesel engine cycle preferable for range, efficiency, torque, longevity
• High cost of emissions after-treatment equipment and its maintenance
• The only current alternative is LNG/diesel, although CNG is improving
• LNG not widely available and has disadvantages
  — Fuel supply extends by truck perhaps only 300 miles from liquefaction facility
  — Vehicle price
  — Cryogenic tanks, storage
  — Emissions equipment and maintenance can cost $30k over truck life
• Makes sense to look at natural gas and its derivatives for alternatives
• Carbon is important, seek transition fuels that can shift to bio-sources
UPS/EPA Tested Dual-Fuel Methanol Class 6 Truck

- Reduced need for engine after-treatment of emissions – key
- Displaced up to 50% of diesel fuel under load
- On-board and depot fuel storage, and fuel transport are relatively easy
- Changes to engine appear generally straightforward, but details are tricky, retrofit seems feasible
- Improved fuel economy
- Methanol is standard industrial chemical, widely available
- Low natural gas prices make methanol promising
- Carbon: Bio-fuel resources for methanol are attractive
Next Steps?

- Pursue dual-fuel methanol/diesel injection in heavy trucks (class 8) and work with OEMs looking for possibility of early commercialization
- Congress has encouraged DOE to fund dual-fuel technologies for heavy trucks
- DOE has issued a solicitation for proposals for dual-fuel technology in heavy trucks with the hope of commercialization in 3 years