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## **ARB LPG Fuel Blends Evaluation Project July 1999 Progress Report**

submitted to:

### **LPG Fuel Blends Evaluation Project Task Group and Co-Sponsors**

*American Automobile Manufacturers Association, ARCO Products Co., California Air Resources Board, Cummins Engine Co., Engine Manufacturers Association, Equilon, Ford Motor Co., GFI, IMPCO, National Propane Gas Association, National Renewable Energy Laboratory, Natural Resources Canada, Propane Education and Research Council, Railroad Commission of Texas Alternative Fuels Research & Education Division, South Coast Air Quality Management District, Tosco Refining Co., and Western Propane Gas Association*

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### **I. Executive Summary**

Medium and Light-duty emissions tests were completed in 1998. Performance/Combustion tests were completed in January 1999 at Southwest Research Institute (SwRI). Durability tests at Bodycote ORTECH (Bodycote) continued to be on hold. Project fundraising and management continued.

### **II. Test Program Work Performed**

#### **A. Fuel Composition Tests**

No fuel blend composition tests were performed during July 1999.

Fuel composition data from the Emissions, Performance/Combustion, and Durability tests can be accessed in prior monthly reports at ARB's website:

<http://www.arb.ca.gov/altfuels/lpg/mvlpge/mvlpge.htm>

#### **B. Medium-Duty Engine (Cummins B5.9LPG) Emissions Tests at Bodycote**

Tests were completed in August 1998. Final Report was submitted in November 1998. Prior monthly reports and the Final Report can be accessed on ARB's website:  
<http://www.arb.ca.gov/altfuels/lpg/mvlpge/mvlpge.htm>.

***C. Light-Duty Truck (F150 Bi-Fuel) Emissions Tests at ARB Haagen Smit Laboratory***

Tests were completed in September 1998. ARB's Final Report was posted on ARB's website in mid-July 1999. Prior monthly reports can also be accessed at ARB's website: <http://www.arb.ca.gov/altfuels/lpg/mvlpge/mvlpge.htm>.

***D. Performance/Combustion Tests at SwRI***

Tests were completed in January 1999. The Final Report was submitted in February 1999. Test program protocol and previous reports can be accessed at ARB's website: <http://www.arb.ca.gov/altfuels/lpg/mvlpge/mvlpge.htm>.

***E. Durability Tests at Bodycote***

Issues regarding the test engine's starter motor, flywheel, and flywheel housing remain unresolved (between Bodycote and Cummins Engine Company).

Hertz Engineering (Hertz) sent the results from the analyses of the -10 to 0-hour engine oil sample and the new and used oil filter. The used filter analysis indicated typical contamination levels for a rebuilt engine. Oil and new filter analysis indicated acceptable results (see attached Hertz detailed analysis). This reinforces the value of doing this new system flush prior to commencing Durability tests.

Due to budgetary constraints caused by AFRED funding delays, ADEPT requested Bodycote to further suspend Durability tests until August 21, 1999. Bodycote agreed to do so for a test cell rental fee.

**III. Project Management Support and Administrative Work Performed**

***A. Project Fundraising***

The Task Group was requested to release all or part of the holdback payments to meet existing project obligations.

California Energy Commission (CEC) informed ADEPT in June that there was no money available for this project due to lower than expected funding given to CEC in the recently passed 2000 California State budget. The expected CEC contribution was \$10,000.

The Texas Alternative Fuels Committee (TAFC) budget is under negotiation in the Appropriations Committee of the Texas legislature. This grant may be at risk during this process. Mr. Alex Spataru, President of ADEPT, will be traveling to Austin, Texas to make a presentation at the TAFC meeting on August 18, 1999.

ADEPT was informed that the State Energy Conservation Office is being transferred to the State Comptrollers Office. This may cause eventual funding delays for up to two (2) months. More information will be available after the TAFC meeting.

ADEPT received an additional \$15,000 from ARB's Ultramar account.

**B. Project Expenditures**

Table 2 shows July expenditures and total expenditures to date.<sup>1</sup>

**Table 2: July Expenditures and Total Expenditures to Date**

Item	Funds Expended In July	Funds Expended to Date
Fuel (Air Liquide, Phillips)	\$764.29	\$30,981.72
Emissions Tests (Bodycote)	\$0.00	\$176,351.07 <sup>2</sup>
Perf./Comb. Tests (SwRI)	\$0.00	\$83,794.97
Fuel Properties (Dixie)	\$335.00	\$13,293.46
Engine	\$0.00	\$17,063.47
Raw Durability Tests (Bodycote, Hertz)	\$0.00	\$19,000.00
Project Management	\$4,436.08	\$89,160.40
Attorney Fees	\$0.00	\$2,250.00
Subcontractor	\$0.00	\$4,374.29
Miscellaneous	\$0.00	\$702.93
<b>TOTAL</b>	<b>\$5,535.37</b>	<b>\$436,972.31</b>

Table 3 shows total funds received to date, by respective funder.

**Table 3: Total Funds Received to Date**

Funder	Amount
ARB (ULTRAMAR)	\$100,000.00
ARCO	\$45,000.00
EMA	\$1,000.00
NPGA	\$8,920.00
NRCan	\$119,500.95 <sup>3</sup>
PERC	\$25,000.00 <sup>4</sup>
SCAQMD	\$82,876.64
Shell/Equilon	\$36,000.00
Tosco	\$22,500.00
WPGA	\$12,000.00
<b>TOTAL</b>	<b>\$452,797.59</b>

Project Account Balance at month's end: **\$15,825.28**

<sup>1</sup> All outlays above \$1,000 are pre-approved by the LPG Task Group and/or the TAC.

<sup>2</sup> Total includes \$23,422.55 (CAN\$35,931.02), paid directly to Bodycote by PGAC.

<sup>3</sup> Total of three payments: one at US\$61,356.48 (conversion ratio of 0.6817), one at US\$34,721.92 (conversion ratio of 0.6518), and one at US\$23,422.55 (conversion ratio of 0.6519). This figure was incorrectly reported in prior monthly reports due to an ADEPT accounting error.

<sup>4</sup> Total PERC award was \$30,000. \$5,000 was allotted to PVC for its project costs.

Table 4 summarizes the in-kind services received to date, by respective funder.

**Table 4: In-Kind Services Received to Date**

<b>Funder</b>	<b>Item</b>	<b>Estimated Value</b>
ARB	ARB-El Monte Light-Duty Emissions Tests	\$90,000
Cummins	Test Support	\$8,000
Ford	Vehicle and Test Support	\$23,500
NREL	Cummins B5.9LPG Engine	\$15,000
<b>TOTAL</b>		<b>\$136,500</b>

**C. Project Contracts and Other Documents**

The final May 1999 Progress Report was distributed to the Task Group.

**Travel associated with effort described:**

No travel was conducted in July.

**IV. Work planned for the next reporting period (August 1-31, 1999)**

**Project Management-ADEPT**

1. Continue general project management.
2. Prepare and complete funding contracts for co-sponsors.
3. Attend TAFC meeting to support approval of AFRED funding.
4. Reinstate Durability tests.

**Test Program**

Bodycote will continue Durability tests.

**V. Attachments:**

Hertz Run-in Oil and Filter Analyses.

**VI. Disclaimer**

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## VII. Glossary of Acronyms

AFRED	Alternative Fuels Research and Education Division
ARB	California Air Resources Board
ARB-El Monte	ARB Haagen Smit Laboratory in El Monte, CA
ARCO	ARCO Products Co.
CEC	California Energy Commission
Cummins	Cummins Engine Co.
Dixie	Dixie Services Inc.
EMA	Engine Manufacturers Association
Ford	Ford Motor Co.
Hertz	Hertz Engineering Inc.
LPG	liquefied petroleum gases
NPGA	National Propane Gas Association
NRCan	Natural Resources Canada
NREL	National Renewable Energy Laboratory
Bodycote	Bodycote ORTECH
PGAC	Propane Gas Association of Canada
PERC	Propane Education and Research Council
Phillips	Phillips 66 Propane Co.
PVC	Propane Vehicle Council
SCAQMD	South Coast Air Quality Management District
SwRI	Southwest Research Institute
TAC	Technical Assessment Committee
TAFC	Texas Alternative Fuels Commission
Tosco	Tosco Refining Co.
USWG	U.S. water gallons
WPGA	Western Propane Gas Association