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ARB LPG Fuel Blends Evaluation Project August 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

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) were reinstated. Alternative Fuels Research and Education Division (AFRED) funding was approved at the Texas Alternative Fuels Council (TAFC) meeting. Project fundraising and management continued.

II. Test Program Work Performed

A. Fuel Composition Tests

Two (2) LPG blend composition tests were ordered from Dixie Services, Inc. (Dixie).

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

Tests were further delayed due to test cell computer malfunctions and needed recalibration of thermocouples, pressure transducers, and related instrumentation.

Issues regarding the test engine's starter motor, flywheel, and flywheel housing remain unresolved (between Bodycote and Cummins Engine Company). ADEPT is reviewing this matter with both parties. Resolution is expected by the end of September.

GFI Control Systems, Inc. (GFI) approved the return of the defective vaporizer from the test engine. The defective vaporizer was covered under warranty.

The Task Group approved and ADEPT signed four (4) contract amendment authorizations (AA) for Durability tests at Bodycote (see attached). Total contract value with Bodycote is now at \$74,825.

1. AA#3 (8/26/99) provides an additional fixed price of \$950 to cover test cell charges during the suspended Durability tests period from 6/24/99 to 7/7/99.
2. AA#4 (8/26/99) provides an additional fixed price of \$950 to cover test cell charges during the suspended Durability tests period from 7/8/99 to 7/21/99.
3. AA#5 (8/26/99) provides an additional fixed price of \$950 to cover test cell charges during the suspended Durability tests period from 8/5/99 to 8/20/99.
4. AA#6 (8/30/99) provides an additional fixed price of \$975 for needed recalibration of thermocouples, pressure transducers, and related instrumentation.

AA#'s 1 and 2 are still under review and negotiation.

III. Project Management Support and Administrative Work Performed

A. Project Fundraising

Holdback payments were received from several project partners to help meet existing project obligations.

AFRED funding was approved at the TAFC meeting on August 18, 1999.

B. Project Expenditures

Table 2 shows August expenditures and total expenditures to date.¹ Table 3 shows total funds received to date, by respective funder.

Table 2: August Expenditures and Total Expenditures to Date

Item	Funds Expended In August	Funds Expended to Date
Fuel (Air Liquide, Phillips)	\$7,626.00	\$38,607.72
Emissions Tests (Bodycote)	\$0.00	\$176,351.07 ²
Perf./Comb. Tests (SwRI)	\$0.00	\$83,794.97
Fuel Properties (Dixie)	\$0.00	\$13,293.46
Engine	\$0.00	\$17,063.47
Raw Durability Tests (Bodycote, Hertz)	\$0.00	\$19,000.00
Project Management	\$15,296.37	\$104,456.77
Attorney Fees	\$0.00	\$2,250.00
Subcontractor	\$0.00	\$4,374.29
Miscellaneous	\$0.00	\$702.93
TOTAL	\$22,922.37	\$457,894.68

Table 3: Total Funds Received to Date

Funder	Amount
ARB (ULTRAMAR)	\$100,000.00
ARCO	\$50,000.00
EMA	\$1,000.00
NPGA	\$8,920.00
NRCan	\$126,033.95 ³
PERC	\$25,000.00 ⁴
SCAQMD	\$82,876.64
Shell/Equilon	\$40,000.00
Tosco	\$22,500.00
WPGA	\$12,000.00
TOTAL	\$452,797.59

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

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

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

³ 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.

⁴ 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

Funder	Item	Estimated Value
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
TOTAL		\$136,500

C. Project Contracts and Other Documents

A revised project timeline was distributed to the Task Group (see attached).
 The final June and July 1999 Progress Reports were distributed to the Task Group.

Travel associated with effort described:

No travel was conducted in August.

IV. Work planned for the next reporting period (September 1-30, 1999)

Project Management-ADEPT

1. Continue general project management.
2. Prepare and complete funding contracts for co-sponsors.
3. Continue Durability tests.
4. Visit Bodycote to settle test engine mismatched parts issues and to deal with other outstanding matters.
5. Visit NRCAN to seek additional project funding and for status reporting purposes.
6. Visit NPGA in Providence, RI to request additional funds.
7. Untangle missing starter motor test engine related issues.

Test Program

Bodycote to continue Durability tests.

V. Attachments:

Bodycote AA#'s 3, 4, 5, and 6;
 Project Timeline (GANTT Chart).

VI. Disclaimer

This report was prepared by ADEPT as result of work co-sponsored by the SCAQMD and Task Group members. Opinions, findings, conclusions, and recommendations within are those of the author and do not necessarily represent SCAQMD's views. SCAQMD, their officers, employees, contractors, and subcontractors make no warranty, expressed or implied, and assumes no legal liability for the information in this report. SCAQMD has not approved or disapproved this report, nor have they passed upon the accuracy or

adequacy of the information contained herein.

VII. Glossary of Acronyms

AA	amendment authorization
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.
Bodycote	Bodycote ORTECH
Cummins	Cummins Engine Co.
Dixie	Dixie Services Inc.
EMA	Engine Manufacturers Association
Ford	Ford Motor Co.
GFI	GFI Control Systems, Inc.
Hertz	Hertz Engineering
LPG	liquefied petroleum gases
NPGA	National Propane Gas Association
NRCan	Natural Resources Canada
NREL	National Renewable Energy Laboratory
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.
WPGA	Western Propane Gas Association