



COORDINATING RESEARCH COUNCIL, INC.

3650 MANSELL ROAD, SUITE 140
ALPHARETTA, GA 30022
TEL: 678/795-0506 FAX: 678/795-0509
WWW.CRCAO.ORG

February 8, 2012

In reply, refer to:
CRC Project No. E-98

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal to provide services for "Exhaust Emissions of Average Fuel Composition " (CRC Project No. E-98). A description of the project is presented in Exhibit A, "Statement of Work."

Please indicate by letter, fax, or email by **February 22, 2012** if you or your organization intends to submit a written proposal for this research program. CRC will answer technical questions regarding the Request for Proposal if they are submitted in writing. CRC will then return written answers to all of the bidders, along with a copy of the original questions.

A CRC technical group composed of industry representatives will evaluate your proposal. CRC reserves the right to accept or reject any or all proposals.

The reporting requirements will be monthly progress reports and a summary technical report at the end of the contractual period. The reporting requirements are described in more detail in the attachment entitled "Reports" (Exhibit B).

The proposal must be submitted as two separate documents. The technical approach to the problem will be described in part one, and a cost breakdown that is priced by task will be described in part two. The cost proposal document should include all costs associated with conducting the proposed program. The technical proposal shall not be longer than 10 pages in length.

CRC expects to negotiate a cost-plus fixed fee or cost reimbursement contract for the research program.

Contract language for intellectual property and liability clauses is presented in Exhibit C and in Exhibit D, respectively.

Important selection factors to be taken into account are listed in Exhibit E. CRC evaluation procedures require the technical group to complete a thorough technical evaluation before considering costs. After developing a recommendation based on technical considerations, the costs are revealed and the recommendation is modified as needed.

Electronic copies of the technical and cost proposals should be submitted to:

Dr. Chris Tennant
Coordinating Research Council
3650 Mansell Road, Suite 140
Alpharetta, GA 30022

Phone: 678-795-0506
Fax: 678-795-0509
E-mail: ctennant@crcao.org

The deadline for receipt of your proposal is **March 8, 2012**.

Yours truly,

Chris Tennant
Deputy Director

EXHIBIT A

Statement of Work

CRC Project E-98

Exhaust Emissions of Average Fuel Composition

Background

Recent model gasoline vehicles have continued to show improved performance in their ability to meet ever lower exhaust and evaporative emission standards. A recent program by EPA, NREL and CRC evaluated effects of T₅₀, T₉₀, ethanol content, aromatics content and RVP. However, that program only tested extreme combinations of fuel properties.

Current federal and California regulations for reformulated gasolines include sets of equations (i.e., the Complex Model (EPA) and the Predictive Model (CARB)) which describe the impact of fuel properties and composition on emissions. The coefficients in these models are based largely on the Auto/Oil Air Quality Improvement Research Program studies. The Energy Policy Act of 2005 requires that EPA update the Complex Model to reflect the latest information on fuel and vehicle effects. CARB staff periodically revises their Predictive Model, so they too will be interested in more recent information on fuel effects for use in the next model update.

This project intends to generate data that will both significantly improve our ability to validate models to predict exhaust emissions for the newest technology vehicles that were developed using the data from the previous program and contribute to the development of new models.

Objective

The objective of this project is to measure exhaust emissions from a range of recent model light-duty gasoline vehicles operating on two or three fuels. One fuel will be a re-blend of one of the fuels from the previous program; the other fuel(s) will occupy the space defined by the properties of all of the fuels tested in the previous program. Regulated emissions as well as speciated emissions will be measured using standard exhaust emission tests. The contractor should prepare a bid based on testing two fuels, and include the additional cost for testing a third fuel as an option.

Approach

The contractor should provide a technical work plan and schedule for the project. The contractor should also present their experience with measuring vehicle emissions at extremely low levels, along with estimates of precision and accuracy expected in this program. Elements of the program are described below.

Fuels

Two or three fuels will be provided to the contractor for the testing. Thirty drums of each fuel will be shipped for storage at the contractor's facility.

Vehicles

Fifteen vehicles will be tested, all of which will be provided by CRC. The contractor should check each vehicle to make sure it is in sound mechanical condition and that its emissions are acceptable for that class of vehicle.

Testing

Vehicle pre-conditioning will follow the procedure specified in Attachments A and B. Each vehicle fuel combination will be tested twice using the LA-92 emissions test cycle, with the fuel order randomized for each vehicle. The contractor will prepare a randomized design for review with the CRC Program Panel. Results of replicate tests will be compared to criteria to be provided by CRC to determine whether a third test must be performed. The contractor should allow for a third test to be required approximately 15% of the time.

To the extent possible, the testing for each vehicle will be carried out in as short a total elapsed time as possible. If any vehicle is not tested for more than three days, the contractor will run an additional LA-4 cycle on that vehicle.

The emissions data most pertinent to this project are normal bag, post-catalyst measurements. However, it is anticipated that most labs equipped to run such experiments will be able to provide both pre- and post-catalyst bag and second-by-second modal emissions measurements for nominally the same cost. If this is the case, pre- and post-catalyst temperatures should also be measured on a second-by-second basis. The contractor should specify any cost differential between basic post-catalyst bag measurements and the more comprehensive measurements outlined above.

Speciated emissions measurements will be carried out for the designated toxics benzene, 1,3-butadiene, formaldehyde and acetaldehyde for all tests. In addition, the contractor should provide a separate (i.e., line item) estimate for the cost to perform a complete VOC speciation of the exhaust emissions for one test of one fuel for each vehicle for each bag.

Cumulative PM mass measurements will be made for each pair of back-to-back tests.

Timing and Reports

The contractor will issue monthly progress reports, a draft final report (which includes statistical analysis) for review by the CRC Emissions Committee, and a final report that fully addresses all issues raised by the Committee review. The statistical analysis will evaluate the impact of fuel changes on the entire fleet. Results from the program will be prepared in an electronic format approved by the Emissions Committee and distributed along with the final report.

Duration

A period of 6 months will be allowed for completion of this project. This time includes preparation, review, approval and completion of all deliverables.

Quality Assurance and Quality Control

For the portion of the project that includes emissions measurements, a statement on how quality processes and products will be assured is required. This statement should address criteria for data quality in terms of precision accuracy, representativeness, completeness and comparability. The statement should also address procedures for sample handling, analytical methods, calibration procedures, procedures for data reduction and peer review plans. The individual responsible for quality assurance should be identified in the proposal statement on quality assurance and quality control.

Attachment A.
Fuel Change, Conditioning, and Test Procedure

1. Drain vehicle fuel completely via fuel rail whenever possible.
2. Turn vehicle ignition to RUN position for 30 seconds to allow controls to allow fuel level reading to stabilize. Confirm the return of fuel gauge reading to zero.
3. Turn ignition off. Fill fuel tank to 40% with next test fuel in sequence. Fill-up fuel temperature must be less than 50°F.
4. Start vehicle and execute catalyst sulfur removal procedure described in Attachment B. Apply side fan cooling to the fuel tank to alleviate the heating effect of the exhaust system. Engine oil temperature in the sump will be measured and recorded during the sulfur removal cycle.
5. Perform four vehicle coast downs from 70 to 30 mph, with the last two measured. The vehicle will be checked for any obvious and gross source of change in the vehicle's mechanical friction if the individual run fails to meet the following repeatability criteria: 1) maximum difference of 0.5 seconds between back-to-back coastdown runs from 70 to 30 mph; and 2) maximum ± 7 percent difference in average 70 to 30 mph coastdown time from the running average for a given vehicle.
6. Drain fuel and refill to 40% with test fuel. Fill-up fuel must be less than 50°F.
7. Drain fuel again and refill to 40% with test fuel. Fill-up fuel must be less than 50°F.
8. Soak vehicle for at least 12 hours to allow fuel temperature to stabilize to the test temperature.
9. Move vehicle to test area without starting engine. Start vehicle and perform three¹ 2-phase (bags 1 and 2) LA92 cycles. During these prep cycles, apply side fan cooling to the fuel tank to alleviate the heating effect of the exhaust system. Following the first two prep cycles, allow vehicle to idle in park for two minutes, then shut-down the engine for 2-5 minutes. Following the last prep cycle, allow the vehicle to idle for two minutes, then shut down the engine in preparation for the soak.
10. Move vehicle to soak area without starting the engine.
11. Park vehicle in soak area at proper temperature (75 °F) for 12-36 hours. During the soak period, maintain the nominal charge of the vehicle's battery using an appropriate charging device.
12. Move vehicle to test area without starting engine.
13. Perform LA92 cycle emissions test.
14. Move vehicle to soak area without starting the engine.
15. Park vehicle in soak area of proper temperature for 12-36 hours. During the soak period, maintain the nominal charge of the vehicle's battery using an appropriate charging device.
16. Move vehicle to test area without starting the engine.
17. Perform LA92 emissions test.
18. Determine whether third replicate is necessary, based on data variability criteria (CRC will provide).
19. If a third replicate is required, repeat steps 14, 15, 16 and 17.
20. If third replicate is not required, return to step 1 and proceed with next vehicle in test sequence.

¹ Five of the 15 vehicles (CRC will specify) will require five 2-phase LA92 cycles.

Attachment B. Catalyst Sulfur Purge Cycle

This procedure is designed to cause the vehicle to transiently run rich at high catalyst temperature, to remove accumulated sulfur from the catalyst, via hydrogen sulfide formation. The drive trace is shown below the descriptive protocol. The catalyst inlet temperature and the exhaust A/F ratio must be monitored during this procedure. It is required to demonstrate that the catalyst inlet temperature must exceed 700°C during the WOT accelerations and that rich fuel/air mixtures are achieved during WOT. If these parameters are not achieved, increased loading on the dynamometer should be added for this protocol (but not during the emissions test).

1. Drive the vehicle from idle to 55 mph and hold speed for 5 minutes (to bring catalyst to full working temperature).
2. Reduce vehicle speed to 30 mph and hold speed for one minute.
3. Accelerate at WOT (wide-open throttle) for a minimum of 5 seconds, to achieve a speed in excess of 70 mph. Continue WOT above 70 mph, if necessary to achieve 5-second acceleration duration. Hold the peak speed for 15 seconds and then decelerate to 30 mph.
4. Maintain 30 mph for one minute.
5. Repeat steps 3 and 4 to achieve 5 WOT excursions.
6. One sulfur removal cycle has been completed.
7. Repeat steps 1 to 5 for the second sulfur removal cycle.
8. The protocol is complete if the necessary parameters have been achieved.

EXHIBIT B

REPORTS

MONTHLY TECHNICAL PROGRESS REPORTS

The contractor shall submit a monthly technical progress report covering work accomplished during each calendar month of the contract performance. An electronic Microsoft® Word compatible file (<1 MB) of the monthly technical progress report shall be distributed by the contractor within ten (10) calendar days after the end of each reporting period. The report shall contain a description of overall progress, plus a separate description for each task or other logical segment of work on which effort was expended during the reporting period.

FINAL REPORT

The contractor shall submit to or distribute for CRC an electronic pdf-compatible copy transmittable via email) of a rough draft of a final report within thirty (30) days after completion of the technical effort specified in the contract. The report shall document, in detail, the test program and all of the work performed under the contract. The report shall include tables, graphs, diagrams, curves, sketches, photographs and drawings in sufficient detail to comprehensively explain the test program and results achieved under the contract. The report shall be complete in itself and contain no reference, directly or indirectly, to the monthly report(s).

Within thirty (30) days after receipt of the approved draft copy of the final report, the contractor shall make the requested changes and deliver to CRC thirty (30) hardcopies including a reproducible master copy of the final report. The final report shall also be submitted as an electronic copy in a pdf or pdf-convertible file format. The final report may be prepared using the contractor's standard format, acknowledging author and sponsors. An outside CRC cover page will be provided by CRC. The electronic copy will be made available for posting on the CRC website.

EXHIBIT C

INTELLECTUAL PROPERTY RIGHTS

Title to all inventions, improvements, and data, hereinafter, collectively referred to as (“Inventions”), whether or not patentable, resulting from the performance of work under this Agreement shall be assigned to CRC. Contractor X shall promptly disclose to CRC any Invention which is made or conceived by Contractor X, its employees, agents, or representatives, either alone or jointly with others, during the term of this agreement, which result from the performance of work under this agreement, or are a result of confidential information provided to Contractor X by CRC or its Participants. Contractor X agrees to assign to CRC the entire right, title, and interest in and to any and all such Inventions, and to execute and cause its employees or representatives to execute such documents as may be required to file applications and to obtain patents covering such Inventions in CRC’s name or in the name of CRC’s Participants or nominees. At CRC’s expense, Contractor X shall provide reasonable assistance to CRC or its designee in obtaining patents on such Inventions.

To the extent that a CRC member makes available any of its intellectual property (including but not limited to patents, patent applications, copyrighted material, trade secrets, or trademarks) to Contractor X, Contractor X shall have only a limited license to such intellectual property for the sole purpose of performing work pursuant to this Agreement and shall have no other right or license, express or implied, or by estoppel. To the extent a CRC member contributes materials, tangible items, or information for use in the project, Contractor X acknowledges that it obtains only the right to use the materials, items, or information supplied for the purposes of performing the work provided for in this Agreement, and obtains no rights to copy, distribute, disclose, make, use, sell or offer to sell such materials or items outside of the performance of this Agreement.

EXHIBIT D

LIABILITY

It is agreed and understood that _____ is acting as an independent contractor in the performance of any and all work hereunder and, as such, has control over the performance of such work. _____ agrees to indemnify and defend CRC from and against any and all liabilities, claims, and expenses incident thereto (including, for example, reasonable attorneys' fees) which CRC may hereafter incur, become responsible for or pay out as a result of death or bodily injury to any person or destruction or damage to any property, caused, in whole or in part, by _____'s performance of, or failure to perform, the work hereunder or any other act of omission of Contractor in connection therewith.

Attachment B. Catalyst Sulfur Purge Cycle

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EXHIBIT E

PROPOSAL EVALUATION CRITERIA

- 1) Merits of proposed technical approach.
- 2) Previous performance on related research studies.
- 3) Personnel available for proposed study – related experience.
- 4) Timeliness of study completion.
- 5) Cost.