



COORDINATING RESEARCH COUNCIL, INC.

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ALPHARETTA, GA 30022
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WWW.CRCAO.ORG

August 12, 2016

In reply, refer to:

CRC Project No. E-117

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal to provide services for “Combustion and Emissions Characteristics of a Medium Duty Vehicle Operating on a Hydrogenated Vegetable Oil Renewable Diesel,” (CRC Project No. E-117). A description of the project is presented in Exhibit A, “Statement of Work.”

Please indicate by letter, fax, or email by **August 26, 2016** 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. Christopher J. Tennant
Coordinating Research Council
5755 North Point Parkway, Suite 265
Alpharetta, GA 30022

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

The deadline for receipt of your proposal is **September 8, 2016**.

Yours truly,

Christopher J. Tennant
Deputy Director

EXHIBIT A

Statement of Work

Combustion and Emissions Characteristics of a Medium Duty Vehicle Operating on a Hydrogenated Vegetable Oil Renewable Diesel

Background

Recently, renewable diesel fuel has been offered at 32 stations within California. This fuel has a much higher cetane number of 70-95 compared to the average ULSD cetane number of 40-45. In addition, the fuel has a different energy density, distillation, hydrocarbon content, and viscosity compared to the average ULSD fuel in the U.S. market. Hydrogenated vegetable oil (HVO) renewable diesel has been introduced into the market in response to RFS and LCFS requirements for more renewable fuels. There isn't a good understanding of how this particular type of renewable fuel may influence a change in either the combustion process or the emissions from an engine relative to operation on a conventional petroleum-based ULSD fuel. This study aims to determine the effects of a commercially available renewable diesel fuel on the engine-out gaseous and PM emissions of a medium-duty vehicle. In addition, the study will measure and analyze the engine combustion characteristics associated with the use of this renewable diesel fuel.

Objective

Quantify how the use of HVO fuel property (cetane number, distillation, viscosity, and hydrocarbon composition) affects the combustion characteristics and engine out emissions in a medium duty diesel vehicle.

Approach

One vehicle will be tested on one baseline fuel and an HVO renewable diesel that has been obtained from the California market or the fuel manufacturer that supplies the market. The vehicle will be tested over the California unified cycle (LA-92). Details on the fuels, vehicles, and emissions measured are described below.

Fuels

The contractor will be required to obtain a base fuel and a renewable diesel fuel. The program will include a total of 2 fuels. The base fuel will be federal Ultra Low Sulfur Diesel (ULSD) fuel that meets ASTM D975 specifications and has a 0% biodiesel level. An HVO renewable diesel fuel will also be acquired by contractor which should be obtained from a retail station in the U.S. market or the manufacturer that sells the fuel in the U.S. market and is representative of what is being sold in California. The contractor will be responsible for measuring and reporting the main fuel properties (cetane number, distillation, density, CFPP, CP, sulfur, viscosity, energy content, acid number, oxygen content, olefins, saturates, aromatics, and metals) of each fuel. The fuels should be kept in a cool and dry storage area where they will not be exposed to sunlight.

Vehicles

The contractor will be provided with a medium duty truck from the CRC project panel. The make and model of this vehicle and particular information chosen by the CRC project panel will be blinded in the final report.

Test Procedure

After the necessary vehicle and fuels have been obtained, the contractor will conduct the vehicle testing according to the CFR Part 1066 procedures preferably in a facility that is in compliance with these regulations. This testing will be conducted in a temperature controlled light duty dynamometer test cell equipped with a constant volume sampler (CVS).

Figure 1 shows a detailed flow chart of the test procedure. Each vehicle should go through an oil break in procedure before the start of the testing. This would include replacing the oil in each vehicle at the start of testing with oil that has been analyzed to verify its properties and performing an oil conditioning procedure. The oil conditioning procedure includes performing 2 US06 test cycles followed by an LA-4 and then a US06 test cycle repeated twice on the ULSD fuel.

Before testing each fuel subset, a catalyst sulfur purge cycle should be performed: one drain and fills at 40%, then preconditioning driving on an LA-4 cycle, and two additional drain and fills at 40%. This procedure should be performed before each fuel. The ULSD fuel will be tested, then the renewable diesel fuel.

The vehicle testing will consist of a LA-92 driving cycle performed twice with a third test, if necessary, with fuel economy determined through chemical analysis. The vehicle should be held in a cold soak for at least 12 hours before each test. If any vehicle is not tested for more than 72 hours, the contractor will perform an additional LA-92.

After each fuel, the contractor would be instructed to conduct steady-state and idle testing while measuring the cylinder pressure trace with a pressure transducer to better study the quality of combustion characteristics. The steady-state testing should be done at 25 and 50 mph with each speed tested at 0, 25%, 50%, 75%, and 100% load. Once both of the ULSD and renewable fuels are tested, the project panel would like the ULSD and renewable diesel fuel tested again through the same procedure to verify with the results of the testing after a sulfur purge is performed.

Emissions and Combustion Measurements

The emissions data collected will include particulate and gaseous emissions. The contractor will collect and report engine out (before the aftertreatment system) modal gaseous and particulate emissions which include THC and NMHC, CO, CO₂, NO_x, Particle Number (PN) and PM mass. The contractor will also replace the glow plugs with pressure transducers to better characterize the combustion effects from the fuels.

Deliverables

The contractor will be responsible for the testing, data analysis, and reporting. A “kick-off” meeting will be conducted at the beginning of the testing phase by the project panel to facilitate further technical guidance to the contractor. A monthly progress report will be written by the contractor on the status and accomplishments of the month. The contractor should seek guidance from the panel on unforeseen problem areas or concerns with the program. Once testing and data analysis is complete, the contractor will submit a draft final report to CRC. This draft final report will be reviewed by the panel and feedback will be given. A final report should be submitted and approved within a timely manner of the submission of the draft report.

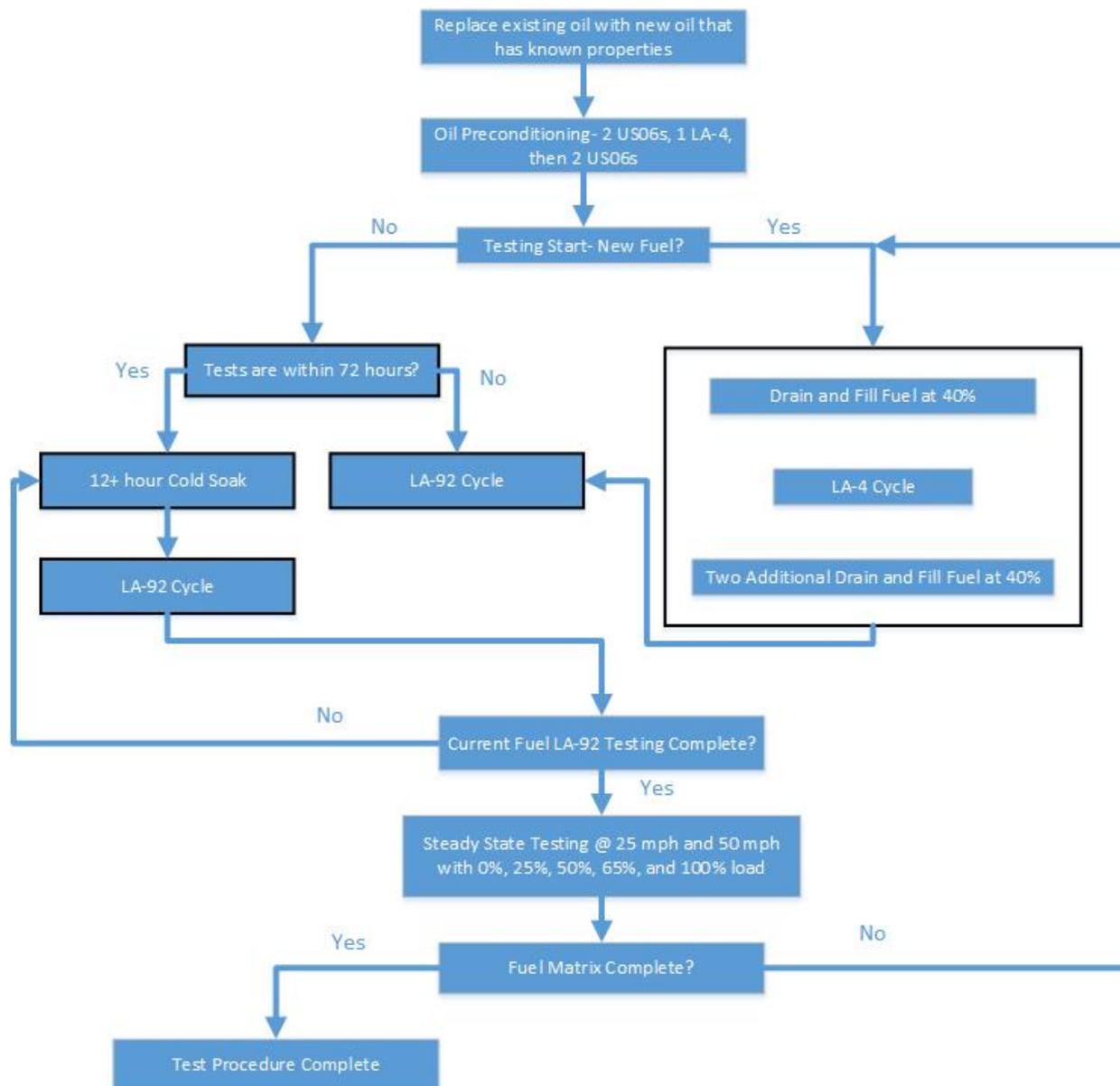


Figure 1. Flow chart of test procedure.

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 (Microsoft Word) 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).

The draft report must have appropriate editorial review corrections made by the contractor prior to submission to CRC to avoid obvious formatting, grammar, and spelling errors. The report should be written in a formal technical style employing a format that best communicates the work conducted, results observed, and conclusions derived. Standard practice typically calls for a CRC Title Page, Disclaimer Statement, Foreword/Preface, Table of Contents, List of Figures, List of Tables, List of Acronyms and Abbreviations, Executive Summary, Background, Approach (including a full description of all experimental materials and methods), Results, Conclusions, List of References, and Appendices as appropriate for the scope of the study. Reports submitted to CRC shall be written with a degree of skill and care customarily required by professionals engaged in the same trade and /or profession.

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 electronic copies in a pdf and Microsoft Word 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 in connection therewith.

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.