



**COORDINATING RESEARCH COUNCIL, INC.**

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**December 4, 2015**

In reply, refer to:

CRC Project No. CM-136-15-1

Dear Prospective Bidder:

The Coordinating Research Council (CRC) invites you to submit a written proposal to provide services for “Investigation into Filter Plugging Due to Sulfate Salt Contamination of Ethanol, Gasoline, and Gasoline-Ethanol Blends,” (CRC Project No. CM-136-15-1). A description of the project is presented in Exhibit A, “Statement of Work.”

Please indicate by letter, fax, or email by **December 18, 2015** 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](mailto:ctennant@crcao.org)

The deadline for receipt of your proposal is **January 7, 2016**.

Yours truly,

Christopher J. Tennant  
Deputy Director

## **EXHIBIT A**

### **Statement of Work**

#### **Investigation into Filter Plugging Due to Sulfate Salt Contamination of Ethanol, Gasoline, and Gasoline-Ethanol Blends**

##### **Background**

In the mid-2000s there were instances of sulfate salts that clogged dispenser filters and turbine pumps and also caused vehicle fuel injectors to stick. High sulfate anion levels were identified in some batches of denatured fuel ethanol and were linked to the contamination issue. The sources of cations were not determined during these incidents. As a result of this issue ASTM imposed limits on sulfate contamination in denatured fuel ethanol (ASTM D4806). Since this limit, and the process changes that resulted, were implemented field problems with sulfate salts have not recurred in the United States. An investigation of all possible sources of cations and sulfate anions involved was not conducted. As well a formal research program was not conducted to determine an acceptable concentration of cations or sulfate anions. Recently, increases in the ethanol content of gasoline-ethanol blends has renewed interest in sulfate salts and constituent ions in the finished fuels and components including ethanol.

##### **Objective**

Develop a thorough understanding of the formation of particulate sulfate salts in ethanol, gasoline, and fuels containing ethanol, including the impacts of water and ethanol concentration, the level of sulfates and cations, and the influence of temperature, gasoline aromatic content and detergent additives on particulate formation and filterability. Based on filterability experiments, determine the relative maximum levels of cations and sulfate anions in ethanol and fuel blends containing ethanol with current levels of detergent additives that will result in filter plugging and vehicle performance problems.

##### **Program**

The program will consist of two phases. The first phase will be a literature search of the published and publically presented information on the possible sources of the cations and sulfate anions, the solubility of various sulfate salts in alcohols, hydrocarbons, and their blends, filter plugging due to sulfate salts, potential interactions between fuel additives and sulfate salts and automotive performance problems associated with sulfate salts in gasoline and gasoline-ethanol blends. This information will be categorized and summarized to guide the next phases. The second phase consists of laboratory work to determine the solubility and filterability of sulfate salts in ethanol, gasoline and gasoline-ethanol blends with LAC and higher amounts of gasoline detergent additives. This is the foundation for understanding the chemistry of the formation of sulfate salts and their ability to plug filters and vehicle fuel handling equipment. In the laboratory experiments phase the variables will be determined based on the literature search. The first set of lab experiments will look at the solubility of sulfate salts in denatured fuel

ethanol. The variables are likely to include temperature, water content, cation (ammonium or sodium), and sulfate anion level. The second set of lab experiments will look at the solubility of sulfate salts in gasoline. The variables are likely to include temperature, water content, cation (ammonium or sodium), aromatic content, detergent level and sulfate anion level. A partial factorial approach should be taken in designing these experiments to minimize the number of experiments required. The third phase will look at the solubility of sulfate salts in gasoline-ethanol blends and focus on the variables that were determined to be important in sets 1 and 2. It is envisioned that the testing will involve preparing the required solutions and heating or cooling them to test temperature. The solutions would then be filtered using an appropriate ASTM test procedure and the amount, and, potentially, composition, of precipitate determined and compared with the initial dosage.

### **Reporting**

After CRC reviews proposals, and awards the project, the successful bidder will participate in a kick-off meeting with the CRC project team and CRC management. Weekly teleconferences with the CRC project team with brief status reports will be planned and scheduled at mutually convenient dates and times. After each phase is complete an interim report will be prepared by the contractor and reviewed for comment by the project team. This report will be used to determine any changes to the testing. At the conclusion of the program a final report will be prepared by the contractor and reviewed for comment by the project team. The contractor will make reasonable changes to the document per the comments of the project team.

## **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).

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.