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## PROJECT SUMMARY

### Seeking High Value Products from Asphaltenes

<b>PROJECT SPONSOR:</b>	
Marc Godin	
<b>PROJECT PROCESS:</b>	
<input checked="" type="checkbox"/> RFP Draft Initiated	5/3/2012
<input checked="" type="checkbox"/> RFP Approval from Sponsor	7/3/2012
<input checked="" type="checkbox"/> RFP Campaign Launch	7/11/2012
<input checked="" type="checkbox"/> Submission Deadline	8/24/2012
<input checked="" type="checkbox"/> Extension Deadline	8/31/2012
<input checked="" type="checkbox"/> Report Delivery	9/21/2012

#### REQUEST DESCRIPTION

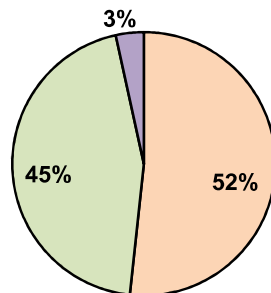
**Petroleum Technology Alliance Canada (PTAC)** seeks technology that will enable the development of high value products derived from asphaltenes. PTAC is interested in technologies that are novel, yield valuable end materials, and will consume significant quantities of asphaltenes.

#### OVERVIEW OF RESPONSES

**A total of 29 formal responses were submitted** from variously-sized companies within the technical marketplace, as well as reputable research groups from academia and others.

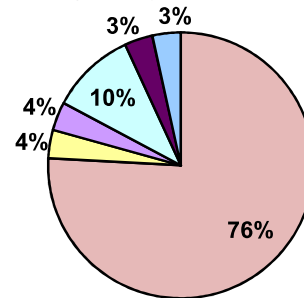
Responses are most often from teams within a single entity, or consortia of small companies, but a few are industry/academia partnerships or "spinoff" companies from universities.

Type of Entity



- Industry
- Academia
- Consultant

Geography



- North America
- Central America
- Asia
- Europe
- South America
- Middle East

Of interest:

- Three approaches to produce high value carbon products from asphaltenes.
- Conversion of asphaltenes to structural masonry blocks.
- Using asphaltenes in microbial fuel cells to simultaneously break down asphaltenes and generate power.

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**SUMMARY OF RESPONSES**

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No attempts have been made to rate or otherwise qualify the responses to this RFP.

Responses to this request were evenly divided between conceptual approaches and ones that have been demonstrated at laboratory scales. Several proposals suggest modifications of existing processes designed for other substrates. Common themes include degradation (oxidative or reductive) of asphaltenes into more tractable compounds, conversion into building or paving materials, conversion into light fuels, and microbial degradation. Several submissions were for enabling technologies that could assist in the transport or reduce the content of asphaltenes.

Highlighted responses:

Asphaltenes could be used as precursors to three different carbon products: carbon fiber, pitch, and mesocarbon microbeads. This significantly different approach takes advantage of asphaltenes' high carbon content.

Existing technology to produce structural masonry blocks from waste materials like fly ash, waste roof shingles, and foundry sands can be modified to incorporate asphaltenes. Asphaltenes would be milled and incorporate a polymeric binder, before compression forming – either with or without other waste materials.

Asphaltenes could be used as substrate for microbial fuel cells (MFCs). MFCs are currently used for waste remediation in addition to power generation. This research project would include the development and scale up of a MFC specifically designed for asphaltenes degradation and concomitant power generation.

A proprietary dispersion technology could be used to turn asphaltenes into a liquid fuel through formation of colloidal dispersion in water. This technology has already been demonstrated with bituminous coal, petroleum coke, and asphaltite at lab and pilot scales.

A patented, continuous, supercritical water reactor could be used to convert asphaltenes into low molecular weight, distillable hydrocarbons. This process also has the potential to serve as a desulfurization procedure.

**ACKNOWLEDGEMENT:**

This summary was prepared from information and analysis provided by NineSigma: [www.ninesigma.com](http://www.ninesigma.com)

## REQUEST # 68373

### Seeking High Value Products from Asphaltenes

**RESPONSE DUE DATE:** August 10, 2012

**MANAGER:** Eloise C. Young, Ph.D.

**SOLUTION PROVIDER HELP DESK**

**EMAIL:** [PhD@ninesigma.com](mailto:PhD@ninesigma.com) **PHONE:** +1-216-283-3901

#### Opportunity

Licensing, contract research, proof of concept leading to scale-up to manufacturing, joint development, supplier agreement

Opportunity to process up to 40 million metric tons of asphaltenes per year.

#### Timeline

Phase 1 – Proof of concept (12-36 months)  
Phase 2 – Development and/or commercialization dependent on scope of business impact

#### Financials

Phase 1 – Proof of concept funding up to \$400,000, depending on the nature and scope of work proposed.  
Phase 2 – Funding would be negotiated based on outcome of first phase and level of activity or licensing required for further development or commercialization

[DOWNLOAD PROPOSAL TEMPLATE](#)

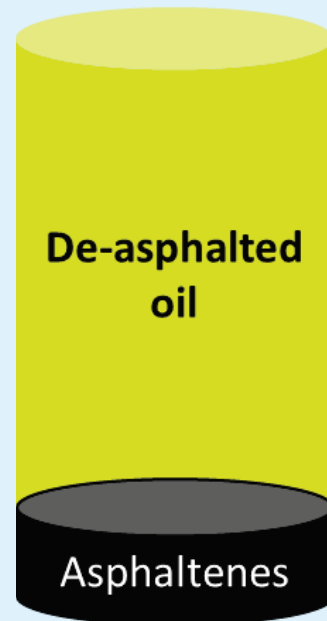
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(click buttons above)

#### Bitumen



#### REQUEST FOR PROPOSAL DESCRIPTION

NineSigma, representing the [Petroleum Technology Alliance Canada \(PTAC\)](#), invites proposals for enabling technologies to produce high value products from asphaltenes.

The successful technology will:

- Provide high net value products derived from asphaltenes
- Be suitable for use with C5-insoluble asphaltenes derived from Athabasca bitumen (click [here](#) for properties)
- Be environmentally benign with regard to process and/or footprint

#### BACKGROUND

Asphaltenes are the heaviest and most polar component of carbonaceous materials such as crude oil, bitumen, or coal. In bitumen, asphaltenes content can be as high as 15%v. This will translate to up to 500,000 barrels of asphaltenes being produced *per day*. Currently, such materials, or the conventionally derived products thereof like petcoke, are burned for fuel and/or landfilled.

NineSigma's client PTAC seeks to identify and develop novel technologies that will allow high value to be derived from this by-product. More extensive background on the asphaltenes issue is available [here](#).

## POSSIBLE APPROACHES

Possible approaches might include, but are not limited to:

- Any process that yields a high value product from asphaltenes
- Transformation to transportation fuels
- Conversion to high value chemicals or materials
- Direct use of asphaltenes that does not involve combustion

## APPROACHES NOT OF INTEREST

The following approaches are not of interest:

- Conventional combustion of asphaltenes
- Conversion to gaseous products, such as syngas, methane, etc.
- Conversion to common heavy and sour fuels, such as petcoke, fuel oil, etc.
- Conversion to common chemicals, such as monomers (C5 or lower) or fertilizers
- Any approach that uses traditional refining processes, such as coking, hydroprocessing, gasification, etc.

## ANTICIPATED PROJECT PHASES OR PROJECT PLAN

Phase 1 – Proof of concept: practical demonstration of process to produce high value product from asphaltenes, preliminary business case.

Phase 2 – Process development and commercialization: technology refinement, pilot scale trials, technology transfer to manufacturing.

## CRITERIA FOR MOVING FROM PHASE 1 TO PHASE 2

Successful demonstration of high value products derived from asphaltenes, supported by a business case that provides acceptable return on investment.

## APPROPRIATE RESPONSES TO THIS REQUEST

Responses from companies (small to large), academic researchers, other research institutes, consultants, venture capitalists, entrepreneurs, or inventors are welcome.

Appropriate responses will use the [proposal template](#) and address the following:

- High level description of proposed technology including:
  - Discussion of how this approach will use asphaltenes
  - Preliminary analysis of value of product and its marketability
  - Technical maturity of approach
  - Estimate of resultant annual asphaltenes usage and supporting evidence for this estimate
  - Environmental impact of proposed approach
  - By-products or significant waste streams produced by proposed approach
- Expertise and capabilities of responder (include any relevant prior projects or experiences)
- Intellectual property status

Examples of appropriate responders include:

I am an **academic researcher** with expertise in polyaromatic hydrocarbons and have technology that could be modified to use asphaltenes.

I am a **company** that manufactures high value chemicals or high performance materials with high carbon content and have a process that could be modified to use asphaltenes as feedstock.

I am a **small company** specializing in the development of novel materials from refinery by-products and have technology that requires further development to be used at industrial scales.

I am a **company or academic person** with technology which should provide a solution ready for testing and transfer to commercial use.

I am a **company or academic person** with technology which should provide a solution but that requires further research and development to ready it for transfer to commercial use.

## RESPONDING TO THIS REQUEST

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### NON-CONFIDENTIAL DISCLOSURE

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By submitting a Response you represent that the Response does not and will not be deemed to contain any confidential information of any kind whatsoever.

Your Response should be an executive summary (about 3 pages). The Response should briefly describe the technical approach and provide information on technology performance, background, and description of the responding team and their related experience.

By submitting a Response, you acknowledge that NineSigma's client reserves the sole and absolute right and discretion to select for award all, some, or none of the Responses received for this announcement.

NineSigma's client also may choose to select only specific tasks within a proposal for award. NineSigma's client has the sole and absolute discretion to determine all award amounts.

### RESPONSE EVALUATION

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NineSigma's client will evaluate the **Response** using the following criteria:

- Overall scientific and technical merit of the proposed approach
- Approach to proof of concept or performance
- Potential for proprietary position (i.e., is the technology novel or protectable)
- Economic potential of concept
- Respondent's capabilities and related experience
- Realism of the proposed plan and cost estimates

The client will contact respondents with highly responsive proposals for next steps.