March 20, 2012

Backgrounder

Automotive Partnership Canada

Launched in 2009, Automotive Partnership Canada (APC) is a five-year, $145million initiative that supports collaborative research and development (R&D) activities benefiting the Canadian automotive industry through partnerships between industry and academia and/or other government departments and agencies.

APC's funding partners are:

- Natural Sciences and Engineering Research Council of Canada (NSERC) ($85 million);
- National Research Council Canada (NRC) ($30 million);
- Canada Foundation for Innovation (CFI) ($15 million);
- Social Sciences and Humanities Research Council of Canada (SSHRC) ($5 million); and
- Canada Excellence Research Chairs (CERC) Program ($10 million).

Research Areas

An industry task force guided the development of APC. This included identifying research priorities, grouped under three strategic themes. To be supported, research must fall under at least one of the following themes:

- Improving the Automobile's Environmental Performance and Impact;
- The Cognitive Car; and/or
- Next Generation Manufacturing.

For more information about Automotive Partnership Canada, visit www.apc-pac.ca.

Canada

What follows are descriptions of each of the newly funded APC projects:

1) Development of a Hybrid Electrohydraulic-Hydromechanical Drawing Process for Production of Lightweight Automotive Parts

Researcher:	Daniel Green, University of Windsor
Partners:	Ford Research and Advanced Engineering, Amino North America Corporation, Novelis Global Technology Centre, ArcelorMittal Dofasco, CANMET Materials Technology Laboratory (Natural Resources Canada)
APC Investment:	$1,046,800 (through NSERC)

The use of high-strength steels and lower-density materials (aluminum, magnesium) in automotive body and chassis structures is an excellent way to reduce vehicle weight. However, higher-strength and/or lower-density materials are inevitably accompanied by a decrease in formability; leading to an increase in cost and a decrease in product design flexibility. One of the most promising forming processes that could help to overcome these limitations is electrohydraulic forming (EHF)—discharging a high-voltage current between two electrodes submerged in a fluid and using the pressure wave in the fluid to form a sheet metal blank against a die at very high strain rates. This project aims to prepare EHF technology for medium- to large-scale production of automotive parts in Canada.

2) Development of Novel Titanium-Based Powder Production, Consolidation and Shaping Processes for Low-Cost Titanium Automotive Parts Manufacturing

Researcher:	Stephen Corbin, Dalhousie University
Partners:	Kingston Process Metallurgy, Wescast Industries
APC Investment:	$2,211,530 (through NSERC)

Titanium and its alloys represent superior light-metal alternatives in the pursuit of automobile weight reduction and increased performance. Traditionally, the use of titanium in the automotive industry has been restricted to luxury vehicles, given the high costs of production. This project aims to develop a low-cost method of producing titanium parts for automotive applications through the development of new processes. Replacing steel with titanium alternatives can reduce the weight of a vehicle by 50 percent, resulting in benefits for the Canadian consumer and the environment.

3) Long-Lived, High-Energy-Density and Low-Cost Lithium-Ion Batteries for Automotive, Grid Energy and Medical

Researcher:	Jeff Dahn, Dalhousie University
Partners:	3M Canada, GM Canada, Magna E-Car Systems, Medtronic Energy and Component Center, Nova Scotia Power
APC Investment:	$4,176,005 (through NSERC and CFI)

Lithium-ion batteries for cars must meet more stringent requirements than those for portable electronics. They must last for 10 years, sustain over 3,000 charge-discharge cycles and withstand extremes of temperature. Batteries for grid energy storage and medical devices have similar requirements. A major goal of this project is to rapidly identify those cell chemistries and operating ranges that give optimum battery cycle and calendar life. Another goal of this project will be to transfer the knowledge gained through advanced diagnostic methods to partners through scientific and technical exchange.

4) Magnesium-Intensive Multi-Material Automotive Structures: Fabrication and Performance

Researcher:	Michael Worswick, University of Waterloo
Partners:	Cosma International (division of Magna), 3M Canada, Huys Industries, Meridian Lightweight Technologies, CANMET Materials Technology Laboratory (Natural Resources Canada)
APC Investment:	$3,713,044 (NSERC and CFI)

More and more, manufacturers are building automotive parts and structures out of more than one material (composites or multi-materials). This can dramatically reduce weight and improve overall vehicle performance. However, many factors affect the long-term reliability of these materials. This project will examine key corrosion, fatigue, and structural parameters, while also implementing the crashworthiness testing infrastructure required to evaluate the corrosion protection and joining technologies associated with a multi-material structure. Advanced numerical (i.e., computer) models for manufacturing and in-service performance will be developed. These will enable efficient computer-aided engineering of future vehicles. The project will position the Canadian automotive sector to manufacture competitive, next-generation lightweight structures.

5) Low Platinum PEM Fuel Cells

Researcher:	Steven Holdcroft, Simon Fraser University
Partners:	Automotive Fuel Cell Corporation, Ballard Power Systems, Hyteon Inc., BIC Inc., GM Canada, Hydrogenics,
APC Investment:	$5,500,000 (through NSERC and NRC)

Polymer electrolyte membrane fuel cells (PEMFCs) are being developed worldwide as clean energy conversion devices. Promising applications for these fuel cells include materials handling backup power, residential co-generation, fleet vehicles and portable electronics. However, the biggest impact fuel cells could have lies in the commercial automotive sector, which holds great potential to reduce greenhouse gas emissions and air pollution. A significant technical barrier to full commercialization is the high amount of platinum required for each fuel cell. This partnership brings together 17 scientists and engineers from nine universities across Canada, who will work on reducing the cost of PEMFCs through the exploration of alternative non-platinum metals and the fabrication of advanced layer structures.

6) ***In-situ*** **Studies of Electromechanical Processes in Automotive Materials**

Researcher: Gillian Goward, McMaster University
Partners: GM Canada, Bruker Ltd., Heka Electronics

APC Investment: $2,346,484 through (NSERC)

This team proposes to identify improvements to lithium batteries by looking inside operating batteries to determine what occurs at various scales including the meso (mid-level), molecular (chemical), and nano (atomic) scales. This will give the researchers a picture of the electrical and chemical state of health of the battery and will help them understand what is impacting on its performance. The goal is to develop innovations that will bring the next generation of automotive batteries to the cars of tomorrow.