

INNOVATING

THROUGH PARTNERSHIPS



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Le texte intégral des articles qui se trouvent à la présente section est disponible en français dans le site Web du CRSNG à www.crsng.gc.ca.

Investing in R&D can be highly rewarding. But as every business manager knows, it carries significant risk and expense.

To balance the cost, more and more companies are partnering with Canadian universities and the Natural Sciences and Engineering Research Council (NSERC), Canada's largest science and engineering research granting agency. Since 1994, the number of businesses involved in NSERC co-funded research projects and training initiatives has more than doubled to some 800 companies.

"NSERC has been an absolutely outstanding partner," says John Mann, Director of Engineering, DaimlerChrysler

Canada. "They help us buy down the risk, especially for longer-term fundamental research that might not otherwise make sense from a strict business perspective."

Mann's view is echoed by John Wood, Senior Engineering Advisor, Research, Development and Technology at General Motors of Canada, NSERC's largest corporate partner (see table). Wood says the granting agency's support allows GM to undertake more collaborative R&D projects with universities.

"By doing more projects, we're better able to balance the risks in much the same way that investors strive to balance their financial portfolios."





INNOVATING THROUGH PARTNERSHIPS

Additionally, he says, NSERC's matching cash for in-kind contributions – including the time spent by company researchers working with their university counterparts – is critical to ensuring genuine R&D collaboration. "It's important that NSERC recognizes the value of our in-kind support. This is what distinguishes collaborative R&D from fee-for-service contract research."

Canada is a terrific haven for R&D, according to Paul Clark, Vice-President of Research and Technology at NOVA Chemicals, one of the country's largest industrial research performers. The company also conducts research in the United States and Europe, and Clark says NOVA regularly compares government support for university-industry partnerships in the various advanced economies. Each time, he says, Canada comes out "a clear winner."

"The leveraging with NSERC, together with SR&ED (scientific

research & experimental development) tax credits, means that Canada provides the biggest bang for our buck." NOVA invests up to \$1.5 million annually in targeted research at nine Canadian universities.

The combined leverage of NSERC funding and R&D tax benefits is even greater for small, Canadian-controlled private corporations. For these businesses, the after-tax cost of sponsoring an NSERC-funded university-industry research project can be as little as 17 cents on the dollar.

Even more important than the financial leverage for NOVA, says Clark, is the exposure to student researchers. "By building relationships through NSERC and having successful partnerships with the universities, we're getting access to many of the top graduates. That's a real edge for us."

The projects, along with the granting agency's industrial scholarships and fellowships,

provide NOVA an unparalleled opportunity to assess the students as potential future employees, says Clark. "It really helps to mitigate the risk of bringing in the right people and training them."

Mann says that working with NSERC, the universities and students raises his comfort level when hiring.

"You can never underestimate the importance of good decisions when you are hiring people. The chance to look at someone and try them out is always a good thing."

Like NOVA, DaimlerChrysler Canada is getting access to top graduates. In fact, the company created Canada's first automotive engineering program through an NSERC-funded Industrial Research Chair at the University of Windsor.

"That chair was a resounding success," observes Mann. "The graduates coming out of that program are just incredible. They are

in great demand by our company, not just in Canada, but globally."

Clark, meanwhile, remains puzzled why more Canadian companies don't take advantage of NSERC's risk-sharing support. "I really have trouble understanding how they can pass up such a good deal."

An ABC of NSERC Partnership Programs With Industry

Given that business needs are often very different, NSERC has designed a variety of support mechanisms to serve many types and sizes of companies in virtually every industry sector.

The programs are divided into two broad categories: grants for collaborative research projects led by uni-

Top 50 Companies in Research Partnerships Programs

Fiscal Year 2004-05 *Based on cash and in-kind contributions through NSERC's Research Partnerships Programs in 2004-05

1	General Motors of Canada Ltd.
2	Hydro-Québec
3	Bell Canada
4	Syncrude Canada Ltd.
5	Ontario Power Generation Inc.
6	MDS SCIEX
7	Nuclear Industry Consortium (UNENE)
8	Alcan International Limited
9	Manitoba Hydro
10	Nortel Networks

11	DaimlerChrysler Canada Inc.
12	Inco Limited
13	IBM Canada Ltd.
14	Research in Motion Limited
15	Bioniche Life Sciences Inc.
16	Husky Energy Inc.
17	Schering Canada Inc.
18	Merck Frosst Canada & Co.
19	Imperial Oil Ltd.
20	QLT Inc.

21	DuPont Canada Inc.
22	Ericsson Canada Inc.
23	3M Canada Company
24	Tembec Inc.
25	Medtronic Inc.
26	Domtar Inc.
27	Alberta-Pacific Forest Industries Inc.
28	CAMECO Corp.
29	Petroleum Research Atlantic Canada
30	Atomic Energy of Canada Ltd.

31	Micalyne Inc.
32	Albian Sands Energy Inc.
33	Anglo American Exploration (Canada) Ltd.
34	Xerox Research Centre of Canada
35	Diavik Diamond Mines Inc.
36	Millar Western Forest Products Ltd.
37	NOVA Chemicals Corporation
38	Abitibi-Consolidated Inc.
39	Syngenta Crop Protection (Canada) Inc.
40	Ad Opt Technologies Inc.



versity professors; and support for companies hiring new researchers, or sending employees for university training. Here are some key NSERC initiatives for manufacturers.

Collaborative R&D (CRD) Project Grants

Because they target market-driven research, CRD grants are among the most popular forms of assistance with industry sponsors. The company works with a professor or group of professors to frame the nature of the problem and the needs of the project. The professor then submits the proposal to

NSERC, along with the company's endorsement. For successful proposals, NSERC matches industry cash and in-kind contributions of equipment and personnel. Client satisfaction surveys reveal that more than 95 per cent of industry respondents rate their CRD projects as worthwhile and successful. Moreover, almost 90 per cent of CRD relationships continued after the projects ended – proof positive of their value.

Good Vibrations

Cooper-Standard Automotive of Mitchell, Ontario, designs and manufactures body mounts that optimize cabin comfort in vehicles. Made from butyl rubber, these mounts sit between the vehicle frame and body, reducing the noise and vibration from acceleration and bumpy road conditions.

Until recently, the process for determining how rigid the devices needed to be and where they should be placed – known as body mount vehicle tuning – was based on trial and error, according to Bernie Rice, Manager of Product Development. But thanks to a CRD project with the University of Waterloo, Rice says the company now has a new set of modeling and simulation tools that deliver reliable answers.

The first demonstration of the modeling tools allowed company designers to reduce vehicle vibrations at the driver's seat by more than 50 per cent, simply by altering the position of off-the-shelf mounts.

"This project has been much more successful than we ever thought possible. It gives us a distinct edge over our competitors."

Rice says senior management was skeptical about the research project before it began, such that it would not have materialized without NSERC. "NSERC gave us the confidence to take a little higher risk, and that gamble is paying off handsomely."



NSERC Strategic Project Grants

Strategic Project Grants fund research and training that has the potential to generate jobs and create economic benefits for Canadians. One of the areas targeted is "competitive manufacturing and value-added products and processes" (and within that area, a set of very specific topics or research avenues listed on NSERC's Web site). Generally speaking, this program supports activities that are further removed from the market than those funded under the CRD program. For this reason,

a Strategic project can be an interesting play for a company willing to take a longer-term perspective, and have the government share more of the risk. Although the call on industry funding and in-kind support may be reduced, close industry participation at all stages of the project is essential. The proposals are submitted to NSERC by professors in an annual competition cycle with a spring deadline.

One-of-a-Kind Manufacturing

Gienow Building Products of Calgary is a world-leading manufacturer of custom windows and doors, with over 500 employees in nine Canadian branches. Gienow's business involves mass customization, producing more than 2,000 windows a day, no two identical.

"With customers demanding ever-shorter delivery times, our challenge is to design and manufacture one-of-a-kind products with the same speed and quality you would expect from mass production," explains Paul Dean, Vice-President of Information Systems.

To meet the challenge, Gienow teamed up with the University of Calgary in a Strategic project to find out if complex algorithms and computer programs can speed up design and optimize resource planning.

Dean says the fact that Gienow's cash and in-kind contribution amounts to less than a third of the NSERC grant made it an attractive proposition to senior management.

41	IBEX Technologies Inc.
42	Bunge Canada
43	Bowater Canadian Forest Products Inc.
44	AstraZeneca (Canada)
45	Loblaw Companies Limited
46	Bayer Inc.
47	Arise Technologies Corporation
48	Wyeth-Ayerst Canada Inc.
49	PMC-Sierra Inc.
50	Boeing Company

“Without NSERC support, it’s difficult to get access to front-line research and technology in manufacturing. Now, we’re in a position to get advanced notification of important mathematical tools that will help solve our problems and give us a competitive advantage.”

Industrial Research Chairs (IRCs)

NSERC’s Industrial Research Chairs program was conceived with one overriding objective – to assist Canadian universities develop expertise in areas of major interest to industry. NSERC currently sponsors more than 140 of these long-term research programs. Many involve multiple companies, each attracted by components of a chair’s research program or training that the companies consider strategic to their interests. The Chair programs are among NSERC’s largest and most prestigious initiatives, with the chairholders senior members of Canada’s science and engineering research community, recognized for their accomplishments as well as for their ability to network with industry.

Move Over Steel

Pultrall, Thetford Mines, Québec, is a small manufacturer of polymer products using pultrusion techniques. (These are automated, continuous processes for manufacturing composite rods, tubes and other structural components



with a constant cross-section.) The company’s most promising products are fibre-reinforced polymer (FRP) rods for concrete reinforcement.

As a non-conductive, corrosion-proof material that is four times lighter than steel, FRP rods could someday displace steel reinforcing bars (commonly called rebars) in concrete structures, including buildings and bridges.

In pursuing this vast opportunity, Pultrall is one of seven companies and two government organizations that have been collaborating for more than a decade with the Université de Sherbrooke’s Dr. Brahim Benmokrane, holder of an IRC in innovative FRP composite materials.

“Brahim has been of great technical help to us, particularly in expanding our understanding of how the FRP rods behave in concrete,” remarks Pultrall General Manager Bernard Drouin. “The independence of his research gives us credibility with civil engineering regulators that we could never have achieved on our own.”

Drouin says Dr. Benmokrane’s work has elevated Pultrall’s FRP products to commercial accep-

tance in a market that’s governed by strict design and material property rules. “It’s been a long and expensive R&D process, but we are now on the verge of becoming profitable with our FRP rebars.”

Chairs in Design Engineering

Design engineering is an enabler of innovation, but in Canada there is an acute shortage of people with this skill set. To address this gap, NSERC is creating 11 Chairs in Design Engineering, and a further five specializing in environmental design engineering. Besides developing new curricula and training programs for university students at all levels, the Chairs engage in design and development of market-ready products, processes and technologies, the creation of design partnerships, teams and networks, and the promotion of state-of-the-art practices and processes.

Water Vs. Water

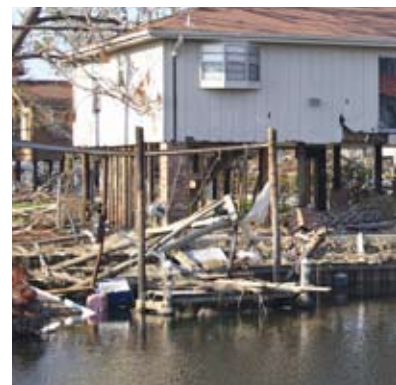
POL-E-MAR manufactures industrial-strength plastic fabrics and products for pollu-

tion containment in Dartmouth, Nova Scotia. In a bid to diversify its product line, the 10-person company developed the idea of a portable flood control system involving water-filled, flexible bags that would be easier and quicker to deploy than sand bags, the most common barriers used against floods.

For the next step, POL-E-MAR enlisted the aid of engineering students from Dalhousie University’s Innovation in Design Lab, an initiative led by Dr. Peter Gregson and funded through the NSERC Chairs in Design Engineering program. After examining the idea and identifying potential weaknesses of all types of flood barriers, the students arrived at a design that was successfully demonstrated in field tests.

“Having that resource was critical to us,” remarks POL-E-MAR General Manager Dave McKechnie. “My initial concern was that we would get bogged down in engineering detail, but the students looked at the big picture, including how to design to our manufacturing and marketing strategies.

“I would recommend this design group to any small business. They are not only technically proficient, but entrepreneurial as well.”





Industrial Scholarships & Fellowships

NSERC offers three different training programs, all of which provide companies with affordable and low-risk ways to work with students or recent graduates.

The most inexpensive option is hiring a student with an Industrial Undergraduate Student Research Award. The cost can be as little as \$1,125 for a four-month term. NSERC quadruples the company contribution.

For companies requiring very specialized know-how to solve complex problems over a longer period, an NSERC Industrial R&D Fellow may be a logical choice. This program subsidizes the hiring of a recent doctoral graduate as a company employee for up to two years. A minimum business commitment of \$10,000 per year brings NSERC funding of up to \$30,000 annually. (Last year, the annual salary averaged \$54,000.)

Finally, the Industrial Post-graduate Scholarships program can be used to invest in the educational development of a current or potential employee, or simply to share

the benefits of a specific graduate research program. Businesses provide a minimum of \$6,000 per year, topped up by an annual award of up to \$15,000 from NSERC, for two to three years depending on the student's educational program. Students spend at least 20 per cent of their time working at the company.

Rejuvenating Lubricants

Montreal's Thermal-Lube is a 16-person company that develops and manufactures specialty lubricants for automobiles and many other types of machines, along with performance-enhancing additives and analytical monitoring equipment. In Thermal-Lube's business, a key challenge is to squeeze as much life as possible out of lubricants.

For that purpose, Thermal-Lube developed a Continuous Oil Analysis and Treatment System, based on Fourier Transform Infra-Red spectroscopy. The system monitors lubricant degradation and automatically replenishes depleted performance additives.

To demonstrate the value of this new form of treatment, the company recruited Dr. Robert Cocciardi as an NSERC Industrial R&D Fellow upon his graduation from McGill University.

Dr. Cocciardi designed a series of complex comparative tests that validated the superiority of this system over traditional wet chemistry and chromatographic methods for lubricant analysis. He was hired permanently by Thermal-Lube after the fellowship ended.

"Robert came to us with a tremendous amount of infrared analysis expertise," recalls Thermal-Lube President David Pinchuk.

"Because of his work, we are now re-writing the book on lubricant analysis. He's given us a new edge in the marketplace because we can now back up our claims with credible analytical data."

Wall-to-Wall Connections

Fero Corporation of Edmonton is a 16-person company that designs and manufactures masonry connectors for the construction industry. The Fero Angle Support Technology system (FAST™) provides a low-cost, rapid method of connecting exterior veneers and claddings to walls made of poured concrete, brick or block.

To boost its integrity in the marketplace, Fero has supported Cara Dawn Nash, a master's student in civil engineering at the University of Alberta, through an NSERC Industrial Postgraduate Scholarship. Ms. Nash has been working with a \$1.5-million materials testing system to analyze how well Fero's technology can transfer the load of cladding systems to interior walls.

"Cara Dawn is a very dedicated researcher who has access to facilities that we could never dream of owning," says Fero President Dr. Mike Hatzinikolas.

"Her independent evaluation of our technology is extremely important to our market credibility. I'm relying on her research as the basis for technical information that I can provide to my customers."

Hatzinikolas says the IPS award is a great deal for his company. After tax, he estimates the cost to Fero for Cara Dawn's services is less than \$4,000 per year.

Only Sponges Need Apply

Pleora Technologies, Kanata, Ontario, is a 25-person company engaged in the design and manufacture of Gigabit Ethernet connectivity solutions for high-performance machine vision, broadcast, video, and surveillance applications.

Pleora hires students through the NSERC Industrial Undergraduate Student Research Awards program to assess them as future employees. One software-engineering student from the University of Ottawa, Jason Scott Whitwill, made such a strong impression during his four-month stint that Pleora offered him a full-time job upon graduation.

"Jason was originally brought in to automate our business processes, but we quickly realized that he had the interests and skills to join our product R&D effort as well," explains Pleora President George Chamberlain.

"The best students are the ones like Jason – people who genuinely want to learn about our business. They're like sponges because they absorb as much as you can give them and then use it all to make a meaningful contribution to the company."

Canada

