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Three New Manufacturing R&D Networks Launched

Three manufacturing R&D groups are among 11 new NSERC Strategic Networks that were recently awarded a total of $56 million over the next five years. The manufacturing networks, which connect businesses to leading university researchers, will focus on new technologies for plastic systems, machining processes for manufacturing automation and large-scale production of monoclonal antibodies. The new Strategic Networks were officially announced on February 2, 2010, by Industry Minister Tony Clement at the Manufacturing our Future Summit organized by Canadian Manufacturers and Exporters.

McMaster Workshop Ignites New Partnerships

A January 2010 workshop, arranged by NSERC's regional office in Ontario, has led to the formation of at least four new R&D partnerships between businesses and researchers in materials science and manufacturing technologies at McMaster University.

Organized in collaboration with the University-Industry Liaison Office and the Hamilton Economic Development Department, the workshop attracted 13 companies and 10 researchers. The four new relationships are among more than 72 partnerships that have applied for NSERC's new $25,000 Engage Grants since the initiative was launched in November 2009. As of March 15, 2010, NSERC has approved 57 Engage proposals for funding.

Propelling Vantrix to World Leadership in Mobile Communications

A highly productive partnership with researchers at École de technologie supérieure (ETS) has helped Montreal's Vantrix Corporation emerge as a global leader in optimizing the vast and exploding array of multimedia content in mobile communications networks.

Led by Dr. Stéphane Coulombe, the ETS researchers have successfully developed algorithms and innovations for adapting and transcoding the many different codecs (coding/decoding schemes) that enable multimedia content. These technologies ensure that images and videos, transmitted among an increasingly diverse range of mobile terminals, are processed at the lowest possible cost to the network operator and displayed at the highest possible quality to the end user.

The ETS innovations are already helping Vantrix win new business, including a major contract with an undisclosed Tier One network operator in North America. The five-year deal, announced in February 2009, will enable the network operator to deliver mobile video, web TV, user-generated content and video on demand.

Transcoding enables interoperability between terminals, ranging from smart phones to portable computers, whose capabilities and features differ markedly. But since transcoding consumes a lot of computer power, it's challenging for network operators to offer the service at an affordable price. Moreover, the quality of the adapted content is often unsatisfactory to the end user.

To address these issues, the ETS researchers have engineered higher performance image and video transcoding algorithms. For example, they have developed an MPEG-4 to H.264 transcoding algorithm that is two to three times faster than existing methods. They have also devised techniques for determining the best adaptation strategies, in terms of quality and complexity, when multiple transcoding alternatives meet an end terminal's requirements.

"The contributions of Stéphane's team are a very important part of our intellectual property creation chain," remarks Jean Mayrand, Chief Technology Officer at Vantrix. Indeed, the ETS researchers have generated more than half of the 30-plus, global patent filings in the company's intellectual property war chest.

"The goal in our business is to generate the best possible user experience on every mobile terminal at the lowest cost to the network operator," explains Mayrand. "With the ETS innovations, we have differentiated ourselves in the market because we can transcode faster and with superior quality than our competitors."

He adds that the relationship with ETS is synergistic because the university provides a window on long-term technology development so that the company can remain focused on immediate customer concerns and market requirements. Now in its fourth year, Vantrix's partnership with ETS is buttressed by a four-year, $420,000 NSERC Collaborative R&D grant.

Given its genesis, Vantrix's solid ties to university researchers should not be surprising. Vantrix is a spinoff of VoiceAge Corporation, itself a University of Sherbrooke spinoff company that is a world leader in audio compression algorithms for mobile phones. Since its formation in 2004, Vantrix has grown to a staff of 80–a number which is expected to reach 120 by the end of this year.

Creating Value from Sewage

Dr. Donald Mavinic's industry partners are racking up impressive business wins with a technology that enables wastewater treatment operations to reduce operating costs, increase plant capacity and minimize the release of nutrients that can wreak ecological havoc on nearby lakes and rivers.

Under Mavinic's leadership, environmental engineering researchers at the University of British Columbia (UBC), in collaboration with companies, municipalities and water management utilities, have perfected a compelling pollution control process which recycles nutrient-rich sewage into high-quality fertilizer. Nurtured under a pair of NSERC-funded Collaborative R&D (CRD) projects, the innovation is based on a high-rate, up-flow, fluidized bed reactor, similar to that used in the chemical engineering industry. The reactor crystallizes magnesium, ammonia and, perhaps most importantly, phosphorous into a compound called struvite, which is sold as commercial-grade, slow release fertilizer.

Given that natural or mined sources of phosphorous (an essential element for fertilizing crops) are rapidly disappearing, the technology could also play a profound role in feeding future generations.

While the innovation is delivering value today, and promises considerably more tomorrow, the value creation process actually began more than 10 years ago when Mavinic and his partners began to scale-up the bench-level technology.

A UBC spin-off company, Ostara Nutrient Recovery Technologies Inc., was established as the commercialization vehicle in 2004 following a successful pilot-scale trial in

Penticton, B.C. That trial was spearheaded by Ahren Britton, one of Mavinic's master's students, who now serves as Ostara's Chief Technology Officer.

"The advanced training of students like Ahren is, arguably, the most important payoff for our industry partners," submits Mavinic. "Ahren's intensive field studies in Penticton really laid the groundwork for the creation of Ostara."

A key milestone occurred in 2007 when the partners successfully designed and built a 100-fold scale-up of the struvite reactor at Edmonton's Gold Bar Wastewater Treatment Plant. One of Mavinic's longest standing partners, Stantec Consulting (Edmonton's engineer-of-record), played a key part in Ostara's successful demonstration.

Stantec was rewarded for its efforts in 2009 when it was selected as the project manager by the City of Victoria for a new wastewater plant valued at more than a billion dollars. According to company officials, the struvite recovery technology, together with the ongoing relationship with Mavinic's team, was a contributing factor in winning the Victoria contract.

"Don is an outstanding partner in terms of research, technology transfer and mentoring students as potential employees for our company," remarks Ostara President, Philip Abrary. "Equally important is his skill in connecting the necessary partners. Having Stantec and the City of Edmonton as collaborators was key to our success in ushering this technology to market."

Since the Edmonton demonstration, Ostara has been on a roll. It has now sold struvite reactors to three cities in the United States and expects to generate additional orders from pilot projects in China, Europe and other U.S. municipalities.

Making Suncor Energy More Profitable and Eco-friendly

When you are operating at the scale of some of Canada's oil sands companies, small process efficiencies can pay relatively large dividends, both economically and environmentally.

To illustrate this point, consider the recent experience of Suncor Energy. Working collaboratively with an NSERC Industrial Research Chair (IRC) at the University of Alberta, and process control experts at Matrikon Inc., Suncor and its partners have engineered a new image sensor for oil sands separation cells (sepcells) that enables the recovery of hundreds of barrels of bitumen a day which previously ended up in tailings ponds.

For a typical separation cell, processing 80,000 barrels per day, the innovation delivers a one to two percent boost in bitumen recovery. Annualized, this translates into tens

of millions of dollars in additional value. It also significantly reduces Suncor's environmental footprint, as bitumen losses to tailings ponds can be significantly curtailed. "If adopted industry-wide, this technology could generate hundreds of millions of dollars in new revenues annually for operators that extract bitumen through surface mining," notes Mike Brown, Matrikon's Vice-President, Technology and Solutions.

"We're certainly pleased with the financial payback, but while the bitumen recovery is important, the driver for us here is the environmental benefit," remarks Shelley Powell, Suncor's Vice-President of Extraction. While we are still at an early stage in the implementation of this technology, the preliminary results are very promising."

Suncor and other surface mining operators recover bitumen by mixing the oil sands agglomeration with warm water in large sepcells that can tower 30 metres or higher. In the cell, the bitumen and air form a frothy layer floating on top where skimmers remove the froth for further processing. Below the froth layer is a middlings layer, and beneath that is the tailings layer. The challenge for Suncor is that the interface between the froth and the middlings layers, which is highly turbulent due to large inflows and outflows of liquid, must be held steady for optimum recovery.

For more than 35 years, the industry has been exploring techniques to measure and control the interface, but has been unable to arrive at a method that is sufficiently robust, reliable and repeatable. In the absence of measurements, sepcell operators control the interface manually by observing conditions through a sight glass on the sepcell.

Faced with this challenge, the IRC partners developed an intelligent vision system that peers through the sight glass and automates the entire process. The system is composed of a digital camera and a series of sophisticated digital signal processing algorithms, pioneered by Dr. Sirish Shah, Industrial Research Chairholder, and his PhD student, Phanindra Jampana. Rounding out the system is an additional set of algorithms, developed by Matrikon and Suncor engineers, for controlling enormous inflows and outflows of oils sands and water.

"We've worked passionately with our partners at the University of Alberta and Suncor to deliver value to this project," says Brown. "We're very excited by the results and look forward to applying this technology for the benefit of the entire industry."

Small Cutting Tool Company Eyes Big Payoff

Wilmot Ramitt is a small business entrepreneur eyeing a big payoff from a research partnership with mechanical engineers at the University of Waterloo. The President and owner of Industrial Tooling Solutions (ITS), an 11-person metal grinding operation, is confident that the outcomes of the partnership will not only boost the competitiveness of his core business, but also enable ITS to diversify and expand into promising new markets.

The company, which recently completed its first NSERC-funded Collaborative R&D (CRD) project, is now following through with a second CRD project on a manufacturing technology that cuts production costs for making specialized tools and extends the life of those tools by making them more repairable. Cost savings will in turn make ITS's industrial customers more profitable.

Ramitt says the technology could provide ITS with a decisive edge in the fiercely competitive business for industrial cutting tools—a worldwide market estimated at $85 billion annually.

Known as automated laser cladding, the technology can allow ITS to deposit very thin coatings (from 0.1 to 3 mm) of exotic materials—specifically tungsten-based alloys—on cutting tools, dies and machining parts. These tools and parts are costly because they are normally made from pure tungsten. By using a steel base that is tungsten coated, the cost of the manufacturing components can be reduced by as much as 30 percent.

In automated laser cladding, a laser beam melts powder particles and a thin layer of the substrate to create a coating that is directly bonded to the substrate. Through a sensor system, the quality and geometry of the clad is measured in real time. Using an intelligent controller, the laser power and cladding speed is adjusted to achieve the desired quality and geometry in the deposited layers.

"Our work on the intelligent controller, for which a patent was filed under the first CRD is key to ensuring the process is as user friendly as possible," explains Dr. Amir Khajepour, who leads the Waterloo team. "You don't want a situation where you need a PhD to operate the process. It must be accessible to those who are non-experts in the laser cladding process."

"With this process," notes Ramitt, "we can actually repair a broken tool that would ordinarily be scrapped, and we have more than a tonne of damaged tools in our storage facility. If we could fix those tools, and have our customers realize even half the life of a new tool, then everybody wins."

In addition to refurbishing cutting tools, ITS is also exploring the possibility of tungsten alloy coatings for other production machinery, including machine drums used to shape and install heads on nails. Because pure tungsten is highly brittle, the machine drums are prone to cracking, which can lead to months of production down time, says Ramitt.

"Laser cladding could significantly extend the lifespan of these machining parts and reduce the total cost of ownership for manufacturers. From a growth perspective, this new business opportunity could be much larger than our existing cutting tool business."

How to Stretch Your R&D Dollars

Did you know that the after-tax cost to Canadian businesses of funding industry-driven, university R&D, in collaboration with NSERC, can be as little as 17 cents on the dollar? This figure applies to a company's cash contributions to a university research partnership, for which NSERC typically supplies two dollars for every dollar of business investment. Such investments are also eligible for tax relief, including refundable cash in many instances, under Canada Revenue Agency's $4 billion Scientific Research and Experimental Development (SR&ED) program.

Synergy Awards for Innovation

Nominations close on May 3, 2010 for the Synergy Awards for Innovation (awarded for outstanding examples of university-industry collaboration).

Share your story

Have an NSERC R&D Partnership success story to share? Please send a brief summary to editor@NSERCPartnerships.ca.

Contact Us

For more information about NSERC's partnerships programs and how your business can become involved and benefit, please call toll free at 1-877-767-1767. You will be connected to a representative in one of our five regional offices who can assist you.