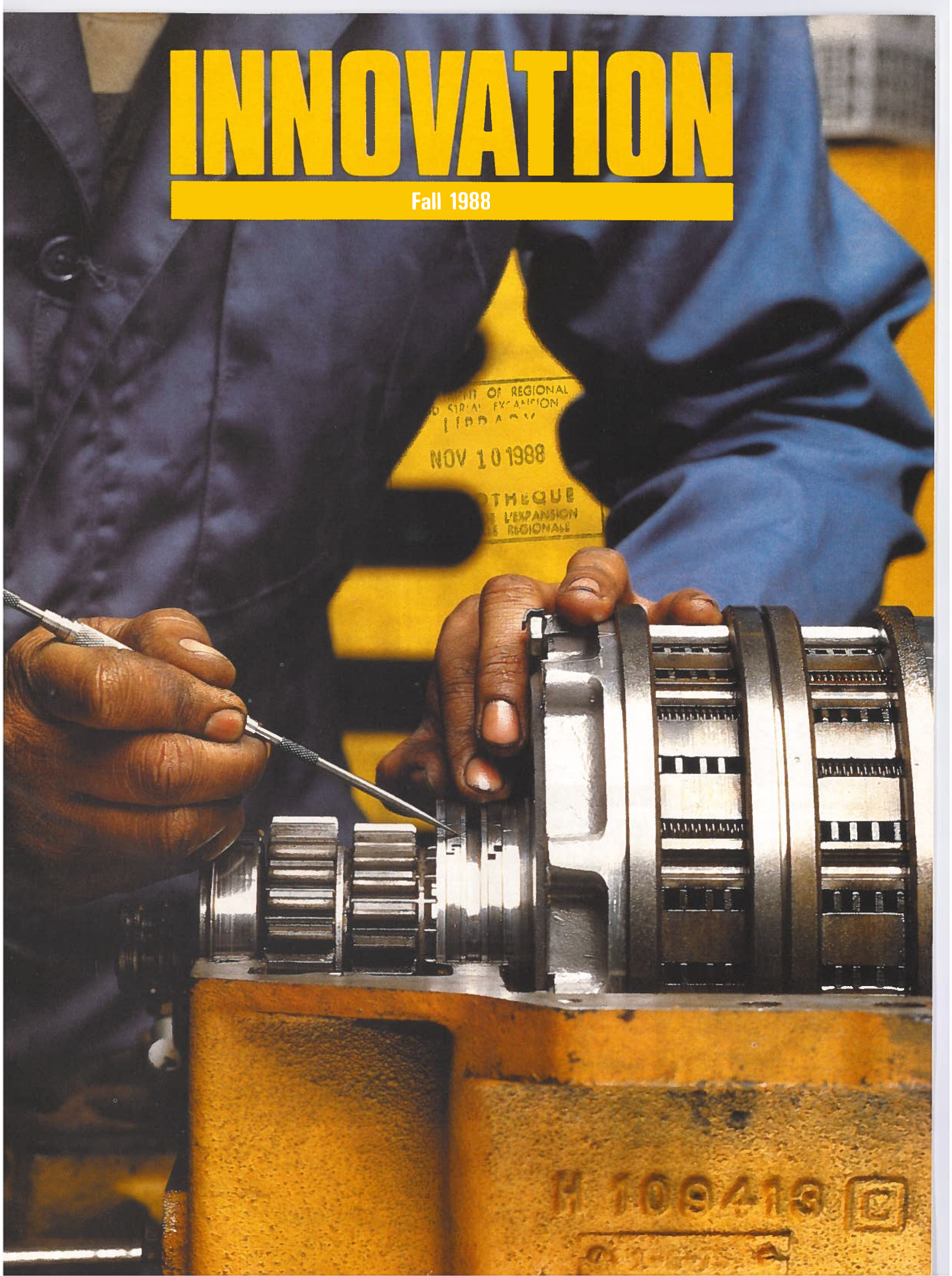


INNOVATION

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INNOVATION

Table of Contents



2 Transporting Ideas into Reality

Discovering the Transportation Development Centre opens a new appreciation of the many faceted opportunities in this sector of the economy.



6 Vadeko - Making its Mark in Space

Small Canadian company develops robot arm for space projects.



8 Amphibico - It's a Case of Encasement

Assisting underwater eyes is the aim of Montréal area firm which produces precision cases for video cameras.

10 Transtech International '87

Montréal hi-tech show points way for future.



11 Innovative Enterprise Brings its Rewards

Basics important in developing Business Excellence as the awards of excellence program proves through its annual acknowledgement of business successes.



13 Small Ottawa Firm Develops Innovative Printed Circuit Board Tester

Assuring quality the main function of Elma product.

14 Technology Transfers

15 Special Events.

Inside back cover
Regional Offices

INNOVATION

This is a reader's magazine, open to ideas and information from its readers. Offers and requests of technology transfers must come from our readers in Canada to match those supplied from abroad.

You can contact us at:

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(Également publié en français)



Over the past few months, senior management of the Department of Regional Industrial Expansion (DRIE) and the Ministry of State for Science and Technology (MOSST) have been working on the myriad of details required to establish the new Department of Industry, Science and Technology (ISTC).

A complex undertaking at the best of times, the development of a new department in the face of fiscal restraint and changing business environment is even more inherently difficult.

As a result of governmental directions, reflected in the enabling legislation tabled in the House of Commons, the new department will feature some marked changes in emphasis, and a sharpened and enhanced focus. The department will:

- place increased emphasis on policies affecting the business climate with a special emphasis on innovation and on the particular needs of specific sectors;
- develop and deliver policies, programs and services in close co-operation with industry;
- take steps to strengthen its expertise and information base in industry sectors and technology;
- take special care to address the problems and concerns of small and medium-sized business, and of developing entrepreneurs.

The new legislation reflects the many initiatives announced in recent months by the government, for example, InnovAction – a greater emphasis on leading edge technologies such as biotechnology, advanced materials and artificial intelligence. It also places renewed emphasis on assisting small and medium-sized firms develop the capability to find, adapt and apply technology.

The establishment of the Atlantic Canada Opportunities Agency (ACOA) and the Department of Western Economic Diversification (DWED) has reduced the proposed new department's role in regional development funding of programs, although under the minister and quite distinct from its main responsibilities it will be administratively involved in regional development in regions of Ontario and Quebec and among Canada's native population.

A number of Canada-wide programs will continue to be a part of the new department's mandate, including the Defence Industry Productivity Program (DIPP) and the Technology Outreach Program (TOP). The department will also continue to deliver programs, such as the Program for Export Market Development (PEMD), delivered by DRIE for External Affairs.

However, in the future there will be more emphasis on non-monetary assistance to all segments of industry, and a greater focus on co-operative efforts to meet the challenges in science and technology. This will ensure that research, development and technology application in all sectors (government, industry and academic) will be carried out to the best advantage of all Canadians.

NATIONAL RESEARCH COUNCIL SCIENTISTS have found a new method to render high levels of polychlorinated biphenyls (PCBs) safe for disposal. The method neutralizes PCBs by removing the chlorine from the toxic chemicals which were used as lubricants, insulators and cooling agents as well as additives to rubbers, paints, waxes and asphalts.

The new method allows the chemicals to be transported from their storage site safely and burned at a much lower temperature with no risks to the environment.

TO ENCOURAGE SASKATCHEWAN YOUTH to take a greater interest in science and technology, the province will open Saskatchewan Science Centre at an old electrical generating plant in Regina's Wascana Centre.

THE NATURAL SCIENCES AND ENGINEERING RESEARCH COUNCIL has announced its Steacie Fellowships for 1988. The fellowships allow scientists and engineers to work full time in their field of research while they are still at a relatively early stage of their careers.

This year's winners are:

- Dr. Scott D. Tremaine, University of Toronto astrophysicist whose predictions of the existence of ring-shepherding satellites were confirmed in spectacular fashion by the Voyager satellite.
- Dr. W.G. Habashi, Concordia University, whose work has helped Canada set a world standard in aviation technology.
- Dr. Kenneth R. Davidson, University of Waterloo mathematician who is recognized as one of the world's leaders in the area of mathematics known as Operator Theory.
- Dr. Spencer C. Barrett, University of Toronto plant biologist whose work has led to a better understanding of plant mating behaviour and of the mimicry of crop plants by weeds.

IN KEEPING WITH GOVERNMENT PRIORITIES, NRC's Division of Biological Sciences has joined with industry, universities, hospitals and other government agencies to carry out major research projects including:

- improved fermentation and enzymatic processes to make useful products or eliminate wastes;
- novel techniques for the development of better diagnostic and therapeutic agents; and
- unique methodologies for the characterization and modification of proteins for enhanced utility.



Transporting Ideas into Reality



An aging population and the push for more access to services by the handicapped prompted the development of this wheel-chair elevator for inter-city busses.

Canada's little-known Transportation Development Centre, with headquarters in Montréal, was established 18 years ago and has been responsible for the implementation of hundreds of ideas for more efficient and safer methods of transport.

It's a classic problem! You've come up with a brilliant invention that could save millions of dollars — or, perhaps, thousands of lives. But where can you go to get the idea launched?

If your idea has anything to do with transportation, including marine and air technology, or with transporting the elderly and handicapped, there's one organization specifically set up to deal with such ideas — the Transportation Development Centre (TDC).

Established by Transport Canada in 1970, TDC's mandate is to study, promote and manage the application of science and technology towards a safer, more efficient and effective Canadian transportation system. It encompasses all stages of the innovation cycle — from initial concept through prototype and demonstration to final deployment.

Based in downtown Montréal, TDC was involved in 320 projects with a total value of \$16.8 million during its 1986-87 fiscal year, all under the supervision of around two dozen professional engineers.

But while the bulk of its contracts goes to bigger corporations and universities, TDC is fully prepared to deal with smaller, start-up operations, or even one-person shops.

"The road to commercialization of a product is generally long and costly," says TDC executive director Ted Rudback. "We can help at the early stages by playing a key part in the concretizing and development of ideas." However he adds a rider: "But innovators can't necessarily depend on us to carry them all the way through."

"We don't sell our services," explained senior research officer Trevor Smith. "If a university or private contractor or a provincial government or even a private individual — any member of the transport community — would like to undertake a project where the risks are too high, they can come to us directly."

Depending on the nature of the proposal, the company itself could be contracted to do the work, or TDC could issue an invitation to other parties to undertake it.

"The real work is managing contracts and making sure work paid for by the taxpayer is delivered," said Smith.

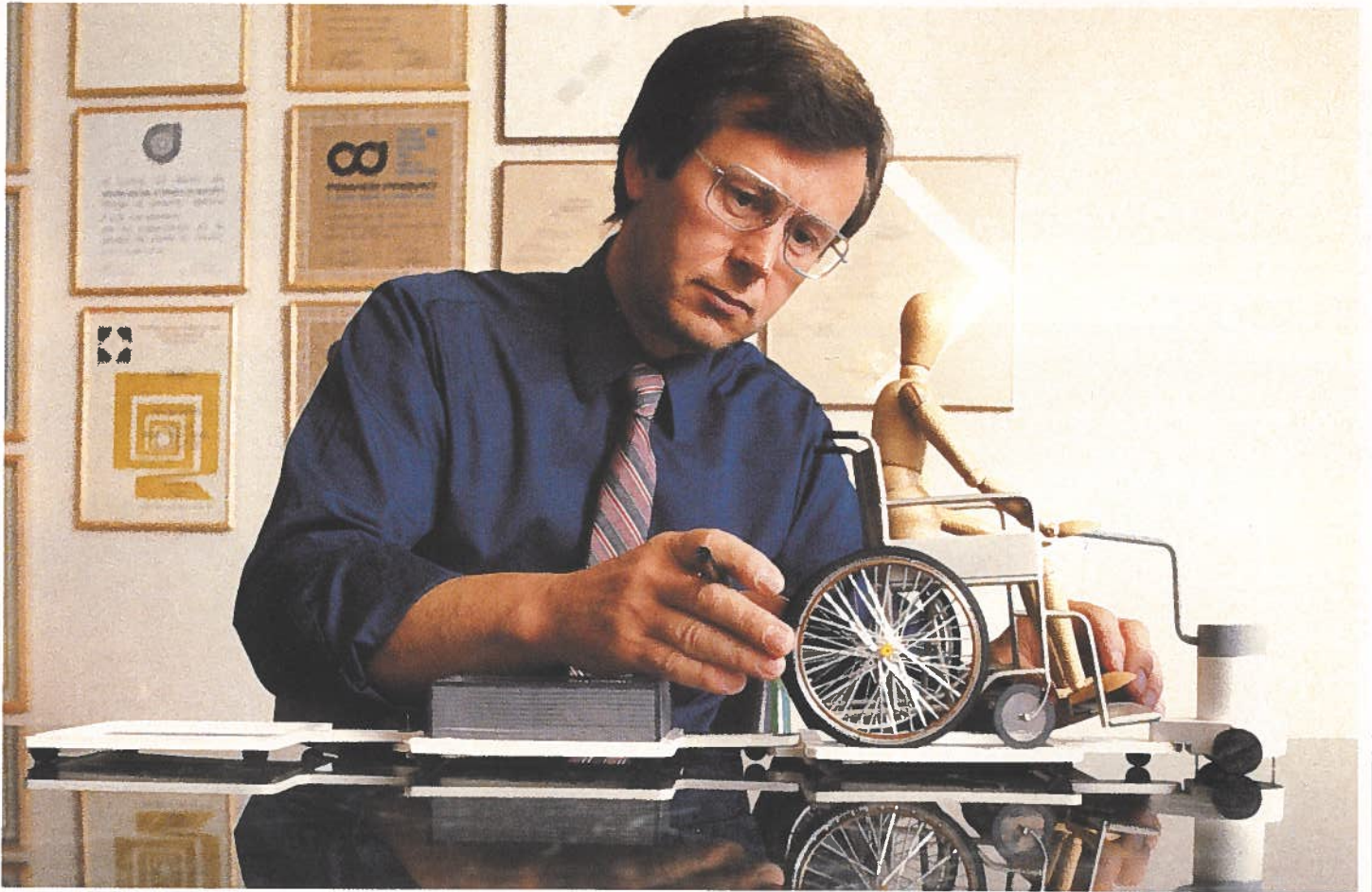
TDC's core research and development budget was recently doubled to around \$9 million. This amount is augmented by cost-sharing contributions from other federal departments, industry, the provinces and universities.

"Once a major commercial potential is seen," said Rudback, "we ask the company to put up part of the required financing — generally 50 percent. If it is not commercial but Transport Canada needs it, we will do it without the question of cost. So very often it's a judgment call.

"Also, if your project is of sufficient interest to the transport industry, you could get 100 percent. But we think we are pretty fair negotiators."

While the public may become aware of some major projects that TDC has been involved in — such as the *MV Arctic's* operations, the B.C. Rail electrification program or the UTDC light rail company (now owned by Lavalin) — there are literally hundreds of other innovations initiated through the centre that are eventually implemented with little or no fanfare.

"We're a small high-tech company now just on the verge of selling our products in Canada and elsewhere," says Gerald Bachmeyer, of Oracle Communications Inc., in Burnaby, B.C. "Without TDC, we would be a lot further behind."



The development of scale models and prototypes are necessary prerequisites to the development of new products in the transportation field.

Those products include a multi-media integrated transportation information system, now being used experimentally in Vancouver; a parking advisory system that has been sold to Seattle Tacoma Airport; and a speech synthesis device that enables up-to-the-minute weather information for pilots to be composed for broadcast direct from teletype.

"The difficulty of so many products geared towards the transportation area is that at some point they have to go before some government authority or other before a sale can be made," says Bachmeyer.

"I believe TDC really takes its mandate seriously. It was instrumental in providing us with seed funding, in some cases up to the prototype stage. In other cases, TDC actually helped demonstrate and implement our products in transit or air traffic control.

"All these steps are critical for a small company. It's different if you're IBM, with its own R&D resources, but if you're small, each stage is really critical in getting a product ready that the community would buy. After demonstrating a product, TDC can take the position that if it works, a transit agency should buy it. That's happening for us now as a result."

Someone with similar sentiments is designer Uwe Rutenberg of Dorval, Quebec. He has conceived a variety of equipment to help disabled and elderly people board transit vehicles, as well as a communication system to help impaired persons obtain information on transportation facilities.

"We are working in a very specific area — dealing with the handicapped — and for us it is a tremendous advantage to have an outfit like TDC," he says. "Because of the limited market, few companies have the resources to take their products to the market stage. Therefore a concern like the TDC is very helpful."

A company currently installing one of Rutenberg's designs — a wheelchair lift integrated into an inner-city bus — is TES Ltd. of Ottawa, a major TDC contractor for many years. Says Laurin Garland, TES president: "There are many concepts we have come up with that TDC worked on to make marketable.

"Our mandate is to do research and development in transportation, so obviously there is a very close match in our aims and objectives and it's natural that we end up doing a lot of work with them. To a large extent we have focused on the elderly and disabled because, as changing demographics show, we are getting more and more elderly and government agencies are becoming more interested." TES, which is 13 years old, now employs 60 people and has a turnover of \$6 million.

TDC's initial work on the design of high-capacity intercity buses at first met with little success, as often happens. "When we first came up with the idea in 1978, the Canadian companies didn't see any need for it," says senior TDC development officer Brian Marshall.

"So, in co-operation with Voyageur, we brought in a German-built articulated bus for testing. Although this bus turned out to be unsuited

to the Canadian environment, the seed was planted. Prévost Car Inc. of Ste-Claire, Quebec, picked up on the idea and, with the help of funding from the Department of Regional Industrial Expansion, developed a new, technically advanced design. The first production units are just starting to come off the line now.

"Our involvement has come full circle. We are again working with Voyageur on an articulated bus demonstration — but this time it is an all-new Canadian technology," Marshall continued. "Twelve of the new Prévost 'artics' will be operating on the Québec-Montréal run from October, in a two-year demonstration."

TDC is also working with Canada's other inter-city bus manufacturer, Motor Coach Industries (MCI) of Winnipeg. Under negotiation is a project to build the prototype of a "stretched" version of current 14.5-m (40-ft.) designs, incorporating results of previous TDC work on accessibility.

"This could become the new industry standard," claims Marshall. "If MCI undertakes this development in Canada rather than at its U.S. plant, it should ensure the future of Winnipeg as a major design centre and production facility for the North American market."

In a different line of work is software engineer Archie Bowen, president and chief executive officer of Ottawa-based CompEngServ Ltd. With TDC aid, he has devised a computer-based expert system to help air traffic controllers resolve conflicts in sparsely used air space. Another expert system will be used to locate electro-magnetic radio frequency interference.

"I've been pushing this technology for some time," says Bowen, who is also a professor at Carleton University. "When I started, about five years ago, this type of work in Canada was almost unknown — a wasteland." Through Transport Canada, he was put in touch with TDC, where "what they do always has an element of risk".

From "a nice little shop", CompEngServ has grown to eight employees, with another seven to be hired by the summer, he reports.

Another inventor who, through TDC aid, has seen his initial concept go through to a product now being marketed is Dick Neumann, of Pointe Claire, Quebec. His Chameleon is a convertible flatbed/dry bulk trailer that permits trucks carrying such products as grain, sugar and cement in one direction to make their return with a general cargo payload.

"He put in an Unsolicited Proposal to the Department of Supply and Services — which is a very useful way of approaching us," says TDC's Rudback. "The idea itself was not new. What made it possible is new materials technology."

The TDC project manager, Lewis Sabounghi, says Neumann has entered into an agreement with Westank, of Regina, to manufacture the product for the Canadian market and the first unit is to run with Trimac Corp., a major Canadian trucking company.

"The Chameleon has turned out to be the most famous project of TDC across the world, and hundreds of requests for information come weekly from as far as Australia, Europe, Zimbabwe and Brazil," claims Sabounghi.

Ling Suen, TDC chief of research analysis and special programs, says that, in the contractual process at the TDC, "we're conscious of the regional distribution. We do not discriminate — contractors are chosen on the basis of merit. Some projects, which require only brain work and not facilities, do give a lead to small contractors since scientific expertise sometimes depends on only one individual. Knowledgeable individuals can set themselves up as a one-person firm and be able to win some TDC R&D contracts on a competitive basis."



It's test, adjust, change — test, adjust, change at every stage of the development of new ideas.



Computer simulation is an important tool in visualizing the steps required to bring ideas from conception to final implementation.

Specially prepared for Innovation by Brian Ostroff and Huguette Guilhaumon, Ottawa-based freelance writers concentrating on the fields of new business applications and high technology.

Canadians Score With Robotics

Vadeko — Making its Mark in Space

A Canadian high-tech firm that specializes in system engineering is making a name for itself in space. Vadeko International, Inc., of Mississauga, Ontario, has been awarded a contract by Morton Thiokol, a major U.S. space project contractor, to design and build the software and control system for a robotic arm used to inspect and trim the solid fuel in a rocket.

Vadeko has built its reputation in the design and development of electro-mechanical systems and is actively involved in space programs. Now, with the software contract for the Morton Thiokol robotic arm already awarded, the company is bidding on a further contract to build the actual arm, to Morton Thiokol design.

Problem Solvers

"We go where the problems are," is the way Eric Chinn, Ottawa-based director of planning and development for Vadeko, describes his company's work.

Vadeko staff reflect this dedication. For example, H. J. Taylor, a senior partner, is a prominent space pioneer who recently received a Ministry of State for Science and Technology commendation for his participation in the development and launch of Canada's first space satellite, Allouette 1. He was active in the development of extension antennae and the Canadarm produced by Spar Aerospace.

Other Vadeko members, including president G. D. Whitehead and Z. Hershtal, were also part of Spar's space design team.

Robotic Arm

The software system designed by Vadeko for the Morton Thiokol project is similar to the system in a robotic arm built and being installed by Vadeko for Hercules Aerospace at Salt Lake City, Utah. Hercules is the builder of McDonnell Douglas multiple launch vehicles, Titan rocket motors and Trident submarine missile motors.

Vadeko's robotic arm for Hercules is the world's largest. The 15.6-metre (50-foot) long arm weighs almost 16 tonnes (35 000 pounds) and was designed to apply specialized coatings to large-scale rocket motors such as those on the U.S. Space Shuttle. The arm components are stainless steel and capable of operating in an explosive environment.

In spite of the complexity of the project, the robot arm was designed, constructed, tested and delivered to Hercules within seven months of the contract signing. This type of performance has assisted in obtaining many new contracts for the firm.

Proprietary Contract

Another recent proprietary contract being undertaken by Vadeko for a major U.S. firm involves automating the surface coating process for the interiors of vessels. This six-month project is expected to expand the firm's considerable expertise in surface coating technology.

The project involves the development of an automated, three-axis system — two servo controlled, one manually pre-set. Vadeko's design challenge is to develop a multi-pass, multi-service swivel to deliver the coating elements through a rotating joint.

Other less exotic uses for Vadeko's robotic arm expertise include a study for the Toronto Transit Commission to determine the feasibility of cleaning the underside of subway rail cars. Another is the automatic painting of rail car and tank car interiors by robot — a task that carries risks for human operators of spray equipment in confined quarters.





Further Developments

Yet another Vadeko process involves high-vacuum roll coating of thin film which is built to the client's requirements and materials patented by the National Research Council (NRC). Using dielectrics, a new optical monitor is also being developed in conjunction with the NRC which will measure thickness down to one angstrom at three hertz frequency (a wavelength of light equal to one 10-billionth of a metre at a frequency of three cycles per second).

Vadeko's clients have included Ontario Hydro which commissioned the company to solve a problem of creep in the Candu nuclear reactors at Bruce Nuclear Power Units 1, 2 and 3. The macroscopic changes in tube dimensions were such that there was not enough latitude to accommodate the creep during the lifetime of the reactors. Vadeko's solution included tool development, operational procedures, system design strategies and the integration of other tooling.

Vadeko Expands

Although less than a decade old, Vadeko has been strengthened by the purchase of 50 percent of its stock by the AGRA Industries of Saskatoon.

This industrial conglomerate also includes AGRA Consulting Engineering Group which has some 300 professional staff (engineers, scientists, geologists), 500 technical staff (draftpersons, computer programmers, technicians, laboratory staff) and 100 office support staff working in 39 offices throughout Canada and the United States.

The balance of Vadeko stock has been retained by the company's founders, all members of the Vadeko team which has grown to over 75.

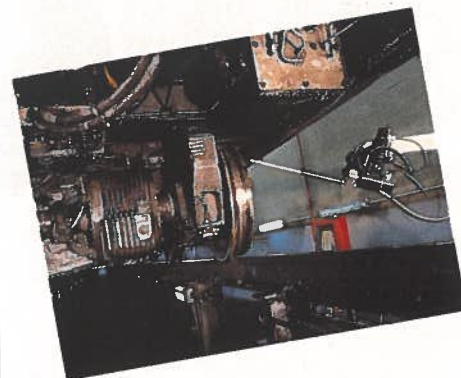
In addition to its offices, labs and machine shops at Mississauga, Vadeko maintains an Ottawa engineering design and development office.

Vadeko is one of a number of highly competent engineering, research and development enterprises that are developing world-class capabilities in specialized niches — firms that enhance Canada's reputation for expertise that was established by giants such as Monenco, Lavalin and SNC.

For further information, contact:

Vadeko International, Inc.
6535 Mill Creek Drive, Unit 62
Mississauga, Ontario L5N 2M2
Tel: (416) 821-3222/3
Telex: 065-28106

Vadeko robotic arm is designed to apply coatings to rocket motors.



A mphibico — It's a Case of Encasement

Whether its product is probing deep water or aiding research into deep space, a small dynamic firm in Dorval, on Montréal's western fringes, Amphibico Inc. has developed a hi-tech video camera housing that is rapidly becoming a world standard.

Although Amphibico is less than two years old, equipment designed and tested by Amphibico principals, Val Ranetkins and James Moore, is now in use by two adventurers in the Arctic; by National Geographic photographer, Peter Jennings, to probe a newly discovered meteorite crater; and by NASA for several space-related projects.

The company's latest product, the Amphibian V9-N housing, was specifically designed for the Sony CCD-V9, an 8mm video camera featuring superior image resolution and increased low-light sensitivity which make it ideal for underwater photography.

High Arctic Adventure

In late July, Jeff MacInnis, of Ottawa, and his partner in adventure, Torontonion Mike Beedell, left for the high Arctic to try to complete a 4000-kilometre (2500-mile) sailing trip in a catamaran and into the record books that the pair started two years ago.

With them they took a Sony CCD-V9 video camera and Amphibian V9-N housing. It was a gift from Jeff's dad, who in 1983 located the wreck of the *HMS Breadalbane*, which went down in 1853 while searching for the lost Franklin expedition.

For the younger MacInnis, the Amphibian V9-N housing encasing the camera would not only protect its valuable records in the case of a mishap such as capsizing but would also allow the adventurers to take underwater films of Arctic aquatic life.

In the case of NASA, the camera with its protective Amphibian V9-N housing is used in the space agency's high-pressure water tank to record the effects of weightlessness on the human body.

Innovative Features

The Amphibian V9-N housing has a number of innovative features, which include:



Amphibico's housing in action underwater.



- a visual recording signal which, through a flashing light, indicates to the operator and other divers that the camera is working;
- a bayonet mount lens allows the diver to present a wide angle or flat port lens assembly;
- an enlarged electronic viewfinder with X8 magnification;
- a highly sensitive and noise-free amphibious microphone;
- electronic zoom-control slowed down for macro focusing;
- convenient cassette and battery change without camera removal from the housing;
- an additional port for attaching an underwater communications receiver

High Quality

The Amphibico unit is manufactured from high quality aluminum. It has an operating depth of 105 metres (350 feet), with precision optics corrected for use both above and below water.

Although primarily designed for divers, it is also possible to mount the camera and its housing on a remote-controlled submersible. Other uses include damage assessment underwater where the diver follows instructions of inspectors on land or shipboard.

While concentrating largely on developing worldwide sales for its unique product, Amphibico's ambition is to develop a wide range of new underwater products to assist video photography.

For further information, please contact:
 AMPHIBICO INC.
 9563 Côte de Liesse
 Dorval, Quebec
 H9P 1A3
 Tel: (514) 636-9910



Distortion free lenses improve quality.

Precision machining the key to Amphibico's success.



Each camera housing is tested to meet required pressures.

Transtech International 87

Hundreds of high-technology exhibitors displayed their products, services and expertise at the first-ever Transtech International Conference for Innovation and New Technologies — Transtech International 87.

Sponsored by the Centre for Industrial Innovation/Montréal, the exhibition filled the Montréal Convention Centre when it opened late last autumn.

Speakers at the conference covered a broad range of topics including the rapid transfer of technologies from university to industry; sub-contracting to provide access to high-tech markets; and the transfer of technologies both within Canada and internationally.

But it was the displays of both Canadian and international high-tech expertise that highlighted the exhibition. The show had something for everyone — a smorgasbord of offerings ranging from the gimmicky to developments on the frontier of science and technology.

Triumf Cyclotron

For example, on display was the Vancouver firm, Triumf, operator of the world's largest cyclotron, a world-class facility for experiments in sub-atomic research and probing the structure of matter. Triumf was promoting co-operation in the upgrading of its cyclotron to expand the limits of knowledge and keep Canada in the forefront of sub-atomic research and application.

Triumf's successes have included the development of such new biomedical research tools as: new methods to take pictures of the living brain painlessly; therapy beams aimed at killing cancerous tumours; advanced heart diagnostic techniques; and new medical radioisotopes for diagnosis and treatment.

Triumf is a joint venture of four western universities (Alberta, Simon Fraser, Victoria and British Columbia) with assistance from the National Research Council.

Other universities are expected to take part shortly in the facility's latest development — a Kaon factory — which will roughly double Canada's investment in Triumf (about \$200 000 000).

At Transtech International 87, Triumf was looking for two things: scientific development projects and funds; and Canadian manufacturers capable of providing and/or developing specialized hardware and machinery.

Wide Range of Products and Opportunities

At the other end of the scale were innovative gadgets such as a frypan attachment designed to prevent eggs from spilling on the stove when they are cracked open on the frypan's edge.

Between these two extremes, there were literally hundreds of developments and offerings from Canada, Europe and Asia. Most of the foreign entries were promoted in national displays and covered a wide range of trade goods and technology-transfer opportunities.

Transtech Awards

In collaboration with various co-sponsors, Transtech presented awards to six entries in several categories of inventions and achievements in innovation.

The organizers of Transtech 87 considered that this, their first effort, has provided a good testing ground for future shows. The Centre for Industrial Innovation/Montréal, sponsor of the show, plans to continue holding the conference and exhibition on an annual basis, anticipating that it will develop into a world-class event.

Triumph's Positron Emission Tomography (PET) Scanner capable of diagramming brain in horizontal slices.



Canada Awards

Innovative Enterprise Brings its Rewards

Locating a market niche and finding innovative ways to fill it seems to be the answer for many of the firms competing for the 1988 Canada Awards for Business Excellence. This was certainly true in the case of two winners of the 1987 Gold Award — Medionics International Inc. of Markham, Ontario, and Clay-Mill Technical Systems Inc. of Windsor, Ontario.

In each case, the founders used initiative, nerve and a keen eye for opportunities to bring their firms to their current state of excellence.

Medionics International Inc.

Medionics topped a record number of entrants in the Small Business category, which was open to Canadian businesses with sales of less than \$2 million.

The firm designs and manufactures peritoneal dialysis equipment and related products which remove toxic substances from blood. This equip-

ment is used primarily for patients with kidney failure and other medical disorders.

Through an improved design which decreases the risk of infection during treatment and built-in early warning systems which detect infections that can lead to complications or death, Medionics has improved the safety of peritoneal dialysis treatment.


Other Medionics improvements include equipment which is simple and portable enough to be used at home by dialysis patients, reduced dialysis equipment operating costs and improved efficiency.

To date, Medionics has installed approximately 1000 units in hospitals around the world. About 75 percent of the firm's products are exported to the United States where they are marketed by major suppliers of dialysis solutions.

In Canada, Medionics markets its own products and trains hospital nursing staff in their operation, according to company president Mahesh Agarwal.

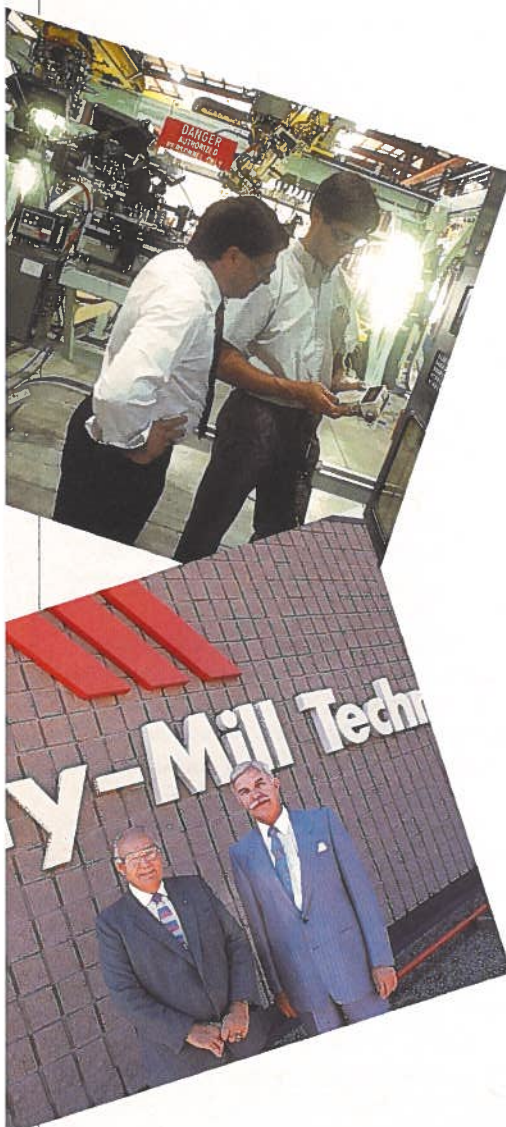
Management's objective since incorporation has been to be a world leader in the development, design and manufacture of dialysis equipment. And, since some of the world's best peritoneal dialysis centres and clinicians are located in Canada, the company has maintained a close working relationship with them to remain aware of their priorities, problems and medical advances.

Employing a management style that encourages creativity and innovation, Medionics has developed a number of breakthrough products.



Peritoneal dialyses machine cleanses blood.

Robotic automation a winner for Windsor's Clay Mill, according to President Clayton Pearce and Vice-President Keith Arner.



These include a unique clamping valve design that provides better heating of the dialysis fluids; operating modes that shorten the dialysis cycle; modified tubing to reduce infection; and simplified operation combined with a comprehensive set of safety valves which allow for home care treatment.

With new developments entering their final stage, it is expected that 1988 is the year that the true market potential of Medionics will be realized.

Clay-Mill Technical Systems Inc.

Robotics is not considered to be a field in which Canadians excel but it would be difficult to convince Clayton Pearce of that fact. As president of Clay-Mill Technical Systems Inc., he has put Windsor, Ontario, on the map for high technology as the world's only manufacturer of heavy-duty overhead gantry robots. And it uses another Windsor firm's vision sensors on its robots — these from Diffracto, a runner-up to Clay-Mill in the Innovation category at the 1987 Canada Awards for Business Excellence.

As one of Canada's major auto manufacturing centres, Windsor also provides a market for the Clay-Mill robots. Both Chrysler and General Motors use them to mount doors, fenders and trunk lids to cars. And the robots have been exported to new plants in the U.S.

For example, Chevrolet's new Corsica and Beretta plant in Wilmington, Delaware, has 12 Clay-Mill cells which cost from \$250 000 to \$1 million each, depending on the type of controls.

According to Pearce, "It's been a long, hard row."

In the beginning, he had to design and build his own lift tables because no one made them with the capabilities required for the fast, accurate and flexible computerized robot system which he invented with three colleagues.

Building on the company's amazing growth since 1984 (when there were 17 employees and sales of \$600 000 compared to today's work force of 140 and sales of more than \$23 million), Pearce is moving Clay-Mill in new directions.

The first generation robot could pick up car doors and fasten them to the frame in a pre-fixed position. The second generation, now in production, measures the door opening using Diffracto

vision sensors and adjusts the door for the best possible fit. And, for the future, the company's highly skilled technical staff are working on a third generation.

"The controls will be more sophisticated," says corporate development vice-president, Keith Arner. "I thought we had reached the limit two years ago, but we're still finding new and better ways to do things."

Pearce has expanded his planning staff to keep ahead of a changing world market. Plans call for moves into aerospace and defence work in North America and he sees major opportunities in Europe. While Pearce agrees European technology is good, he feels Europeans are behind in multiple application. Automatic mounting of car doors has become commonplace in North America, but it is just being examined in Europe.

"In England," says Arner, "they were flabbergasted to learn we were putting doors on cars in 34 seconds."

The company recently sold a robot to Imperial Tobacco in Montréal to palletize products and cut labour costs. Clay-Mill claims the robot also lends itself to hazardous applications and conditions.

Speed, accuracy and heavy load capacity are the big advantages of Clay-Mill's gantry. It can move a 900-kg payload a distance of one metre in one second to an accuracy of 0.005 cm. In the auto industry, no other system can match this, although Pearce admits that other firms are in the planning stages with competitive machines.

In spite of all the advantages of robotics, there is still resistance to the new technology in industry, even in the automotive field, now the most advanced of the heavy industries.

Much of this stems from industry reluctance to hire and train the more sophisticated technicians required to operate the robots.

For this reason, Clay-Mill offers a complete "turnkey" service, including engineering, design, assembly, installation and training services for the customer's staff.

Indications of Excellence

While these two firms were the gold medal winners in the Innovation and Small Business categories of the Canada Awards for Business Excellence, they are but an indication of the competence of the over 650 firms which entered the 1987 awards.

For further information on the two award-winning companies, contact:
Medionics International Inc.
Markham, Ontario L3R 4B5
Tel: (416) 475-8431

Clay-Mill Technical Systems Inc.
2855 Deziel Drive
Windsor, Ontario N8W 5A5
Tel: (519) 944-7902

Small Ottawa firm develops innovative Printed Circuit Board Tester

For Miguel Fombellida, the development of his patented printed circuit board (PCB) tester has been a continuing commitment for the last four years.

While his production model has been tested and found to do the designed functions in a satisfactory manner, a full order book or a joint-venture agreement is needed to bring the tester into full-scale production. With selling price running at \$35 000 for the master unit and \$5 000 to \$10 000 for each testing module, the task has switched from development to sales promotion.

The Spanish-born and -educated engineer has devoted most of his efforts to the development of his PCB tester since he left Northern Telecom to form ELMA Engineering Services Ltd. in 1981.

Miguel Fombellida, left, and Jean Bouchard are two partners in ELMA



Government Assistance

Development has been assisted by grants from the Department of Regional Industrial Expansion under its Industrial and Regional Development Program and from the Program for Export Market Development (PEMD) of External Affairs.

To support R&D, Fombellida has allocated revenue from sales of precision equipment developed for clients such as Northern Telecom, Bell Northern Research and the National Research Council.

For example, the ELMA design team has developed a machine to assist in the crystal growth of gallium arsenide while another patented development is a method of splicing fibre optic cables.

Three-Second Testing

In operation, ELMA's printed circuit board tester can test a complex printed circuit board in about three seconds and an efficient operator should be able to maintain a test speed of about 10 boards a minute and even greater if a mechanical arm is used for loading and unloading.

Because the master unit is complex and test modules must be designed to accommodate specific circuit board configurations, the tester is best suited to large-scale operations or where reliability is an overriding consideration to cost.

It was for this reason that ELMA requested and received PEMD assistance to attend high-technology shows in the New England states where a large high-tech manufacturing base has been established.

For more information on the PCB tester or to discuss technology transfer, joint-venture or licensing arrangements, contact:

Miguel Fombellida
 President
 ELMA Engineering Services Ltd.
 2540 Delzotto Avenue
 P.O. Box 930 R.5
 Ottawa, Ontario
 K1G 3N3
 Tel: (613) 822-7866

Technology Transfers

Offered

Canada

- Powder Pump for Inductively Coupled Plasma (ICP) or Flame Spectrometers
- Chemorepellant Compound
- Ceramic Materials with Enhanced and Predictable Resistance to Fracture
- Elevator for Harvesting Delicate Agricultural Products
- Controlled Pattern Sprinkler
- Self-Cleaning Reversible Lava Rock Barbeque Grill
- Self-Cleaning Eavestrough
- Longline Fishing System
- Liquid Barrier Filter and Method of Operation
- Coin holder
- Automatic Damper for Chimney Flue

Federal Republic of Germany

- Process for Recycling Waste Plastic
- Hexagonal Pixels for Better Visibility

France

- Pyromechanics for Aeronautics and Space, Armament and Defence Applications

Great Britain

- Alcohol Production Technology
- Polymer Electrolytes
- Polymeric Liquid Crystal Storage Devices
- Anthralin Compounds
- Laser Strain Rate Meter
- Automated Vision System and Operation Software
- Multiple Strain Gauge Monitor
- Identification of Cancerous Cells
- Non-Invasive Measurement of Cutaneous Blood Flow
- Improved Spermicidal Contraceptives
- Low-Cost Cervical Smear Pre-Screening System
- Asbestos Fibre Detection and Monitoring System

- High Efficiency Earmould
- Determination of Two-Dimensional Fluid Flow Around Structures
- Multiwire Dispenser

Italy

- Water Heater Devices
- Reinforced Nylon Rotors
- Furniture

Sweden

- Metal Roofing System

Switzerland

- New Generation of Displacement Compressors, Pumps and Motors

U.S.A.

- Device for Application of Herbicides

Requested

Canada

- Over-the-Counter Pharmaceutical Products

Federal Republic of Germany

- Rubber-Related Technologies and Products
- Devices and Tools for Industrial and Craft Workshops
- Chemical Specialties and Additives

Gabon

- Consumer Goods Sought

Italy

- Acquaculture Technology

Offered

Canada

Powder Pump for Inductively Coupled Plasma (ICP) or Flame Spectrometers

(Case No. 8175)

This "powder pump" is designed to introduce a particulate solid material in dry powder form for analysis in an ICP or flame spectrometer. It is claimed to offer relatively uniform, continuous and controlled delivery of the sample and permits the changing of samples without disrupting the operation of the analyzing device.

Chemorepellant Compound (Case No. 8224)

This invention concerns a chemorepellant compound for attachment to a prosthetic surface for use in human and animal cardiovascular systems to provide a biocompatible surface with reduced thrombogenicity.

Ceramic Materials with Enhanced and Predictable Resistance to Fracture

(Case No. 8381)

These ceramic materials, specifically partially stabilized zirconia employing Beta-alumina, can be made with a high Weibull Modulus, greater than 40 (steel has a Weibull Modulus of 50), with a probability of fracture of one sample in 1000. Reported to have a high resistance to fracture at low and high temperatures, these ceramics can be used for turbine components, cryogenic environments and applications where conductive heat transfer is not desired.

Elevator for Harvesting Delicate Agricultural Products (Case No. 8514)

Without damaging delicate products, particularly those with irregular size or shape such as potatoes, this device will lift the products from the digging bed of a harvester to a height suitable for loading onto a vehicle. In principle, a similar device could be used to move many other types of delicate products.

For further information on the above products, write to: F. K. Crowe, Canadian Patents and Development Limited, 275 Slater Street, Ottawa, Ontario K1A 0R3; Tel: (613) 990-6100. Please quote the appropriate Case No.

Controlled Pattern Sprinkler

According to the inventor, this rotating sprinkler contains a plastic disk that can be altered to control the irrigation in a range of large square or other configurations of areas to be irrigated, at differing water volumes and high pressure, concentrating the water supply into a single nozzle for even spray.

Self-Cleaning Reversible Lava Rock Barbeque Grill

The barbeque grill consists of two grills with a layer of lava rock between them and has a pair of insulated handles for handling when hot. The grill requires only minor wire brushing to keep clean and is claimed to reduce flames, cook quickly and can be kept odour-free by simply reversing it a few minutes after cooking. It works well with gas, electric or charcoal barbeques.

Self-Cleaning Eavestrough

The eavestrough has a snap-on filtering cover and an inclined bottom wall to form a sharp angle with a vertical suspending wall. The inventor states that this arrangement concentrates the water flow into an increasingly smaller area for rapid flow and self cleaning, and prevents ice from sticking to the inclined bottom. The system can be made from a variety of standard materials at competitive cost.

The technology for the above three products is available through licensing or joint-venture arrangements from the inventor. Write to: Florencio N. Palma, 263 Keele Street, Toronto, Ontario M6P 2K1; Tel: (416) 763-1429.

Longline Fishing System

A Canadian company is offering, through a licensing arrangement, the exclusive manufacturing and worldwide marketing rights to the technology it has developed for an automatic longline fishing system. The offer includes consultation and the expertise needed to set up a production line. The system consists of four major components — first line hauler and hook debaiter; main hauler with automatic hook pickup; revolutionary storage magazines; and automated baiter and cutter combination.

Write to: George or Leith Jollimore, Jollimore Longline Systems, P.O. Box 335, Kensington, Prince Edward Island C0B 1M0; Tel: (902) 836-3549 or 836-3509.

Liquid Barrier Filter and Method of Operation

The technology is offered for this invention which provides a process for removing, by a liquid barrier, pollutant particles from a contaminated gas. According to the developer, the barrier can remove such contaminants as organic and inorganic fumes, dusts (in particular, insecticides or herbicides), suspended pigments, pollen, bacteria, viruses, radioactive fallout. Laboratory tests show the system to have a 99 to 100 percent efficiency.

Write to: Sylvain Desjardins, Bureau Liaison Université-Industrie, Université de Sherbrooke, Sherbrooke, Quebec J1K 2R1; Tel: (819) 821-7840; Telex: 05-836149.

Coin holder

A Canadian inventor wishes to enter into a licensing arrangement for the manufacturing and marketing of his one-piece plastic coin holder. The inventor claims as advantages, it is easy to fill and empty, inexpensive to produce (around two cents per unit), can be used as publicity tool (i.e., messages can be printed on it) and can be filled either manually or mechanically. Its small openings on the sides permit verification of authenticity of coins and finally, this type of coin holder is designed to eliminate the need to count the number of pieces.

Automatic Damper for Chimney Flue

A Canadian inventor wishes to enter into a licensing arrangement for the manufacturing and marketing of his automatic damper for chimney flue. Among the advantages claimed by the inventor is an appreciable fuel economy. This damper can be used in all kinds of heating systems and can be applied commercially or in residences.

For further information on the two above inventions, write to: P. A. Chabot, President, PARECOM Ltd., 736 Baker Avenue, Ville de Vanier, Quebec G1M 2T9; Tel: (418) 527-3979 (evenings).

Federal Republic of Germany

Process for Recycling Waste Plastic

A German company is offering, under a licensing arrangement, its technology for a process to recycle waste plastic material and is in a position to build turnkey plants for full-scale production. The process uses scrap plastic of all sorts. It requires only 80 percent purity of one specific plastic (e.g., PVC, PE, PPE) and the rest may be other plastic, dirt, paper, etc. The range of products varies from outdoor benches, fence posts, etc., to stands for road signs.

Hexagonal Pixels for Better Visibility

A German company is offering, under a licensing arrangement, the manufacturing and marketing rights to its technology for displays with hexagonal pixels, claimed to give a visibility three times better than with round or square pixels. All letters or figures can be presented. Applications include cash registers, dashboard displays, computer screens, destination panels for public transport, watches.

For further information on the above, write to: Götz Schaudé, Innovationsberatung, Finkenstrasse 14, D-7534 Birkenfeld, Federal Republic of Germany; Tel: (0 72 31) 48 07 23; Telex: 17 7231 113.

France

Pyromechanics for Aeronautics and Space, Armament and Defence Applications

A French company, with extensive expertise in the use of pyrotechnics in a wide range of applications, wishes to discuss the transfer of its technology with a Canadian company. Applications of its technology range from cutting steel or composite cables up to 50 mm diameter under water, explosive bolts, flexible linear cutting charges, etc., to automatic release of air bags in cars, and sprinkler actuators.

Write to: Götz Schaudé, Innovationsberatung, Finkenstrasse 14, D-7534 Birkenfeld, Federal Republic of Germany; Tel: (0 72 31) 48 07 23; Telex: 17 7231 113.

Great Britain

Alcohol Production Technology (Ref. VC 002)

An improved method of ethanol production from biological/agricultural feedstock has been developed. The method uses a continuous fermentation system operated at high biomass concentration and very short throughput times.

Polymer Electrolytes (Ref. VC 004)

Novel polymeric materials based on modified PEO polymers have been developed, jointly with the British Ministry of Defence, which are claimed to have significantly higher ambient conductivities than conventional materials. In addition to use as battery electrolytes, the materials are said to have potential applications as elastomers and hydrophylic materials.

Polymeric Liquid Crystal Storage Devices

(Ref. VC 006)

New types of polymeric liquid crystals have been developed as information storage devices. Applications include laser writing, advertising displays, audio-visual presentations, variable optical density systems, data storage, variable light transmission windows.

Anthralin Compounds (Ref. VM 1015)

Improved anthralin compounds and formulatory technology have been developed for use in the treatment of the common skin complaint, psoriasis. Increased effectiveness and the reduction of undesirable side effects are claimed.

Laser Strain Rate Meter (Ref. VE 110)

The measurement of resistance to the flow of a fluid by friction with the walls of the containment system is possible using a laser-based device. The device permits the determination of the resistance encountered by the fluid and thus the forces needed to transport it through the containment system.

Automated Vision System and Operation Software (Ref. VE 117)

An imaging system, with operating software claimed to be unique, has been developed for a wide variety of applications. Backed by a long-established R&D operation with interests in scientific, medical and industrial imaging, the system has been supplied internationally to motor manufacturers, engineering component manufacturers and for medical/scientific use.

Multiple Strain Gauge Monitor (Ref. VE 120)

A microcomputer-based system has been developed to monitor resistance changes in a multiplexed system of strain gauges. The use of a variable current source under computer control provides the same derived voltage for all gauges under no strain conditions, compensating for the spread of their nominal resistance. A very small difference between gauge voltages can be amplified before measurement in a low precision analogue-to-digital converter, providing high overall measurement precision at low cost.

Identification of Cancerous Cells

(Ref. VM 1003)

A procedure has been developed using the interaction of glyco-lipid fibronectin present on the surface of tumour cells in the presence of an enzyme. This interaction yields a series of peptides specific to the tumour cells. The procedure may be used with any tissue sample or body fluid and conventional techniques for peptide assay may be used.

Non-Invasive Measurement of Cutaneous Blood Flow (Ref. VM 1004)

A laser-doppler-based device is presented for the measurement of the flow of blood in the skin and sub-cutaneous tissue. The device measures the blood flow by comparison of the scattering effect measured with a reference base. The device is claimed to be useful in many clinical conditions such as Raynaud's disease.

Improved Spermicidal Contraceptives

(Ref. VM 1013)

A two-component spermicidal composition, using components of known spermicidal activity, has produced what is believed to be a major synergic improvement in contraceptive activity. This may result in the possibility of significant reductions in the amounts of active components used without reduction in contraceptive activity.

Low-Cost Cervical Smear Pre-Screening System (Ref. VM 1020)

A low-cost, semi-automated system for pre-screening of cervical smear tests uses proven imaging techniques, coupled with new techniques in cell dispersion and de-aggregation and fluorescent staining. The system is designed to reduce administrative work in scheduling patients in hospitals, clinics and health centres.

Asbestos Fibre Detection and Monitoring System (Ref. VM 1021)

An imaging system and operating software have been developed which automate the time-consuming process of monitoring environmental and workplace dust samples for asbestos fibres. The system is reported to be in use worldwide.

High Efficiency Earmould (Ref. VM 1016)

A new method of moulding ear inserts for hearing aids has been developed using a cold-cured composite which is moulded to the patient's ear in the clinic and immediately fitted to the hearing aid, using simple manipulations. This is said to reduce the discomfort of present moulding techniques. It also reduces delays in delivery which, when the patient is a child, can result in air leakage and poor acoustics because of the change and growth of the ear.

Determination of Two-Dimensional Fluid Flow Around Structures (Ref. VS 10008)

A software tool has been developed for the accurate prediction of the effect of fluid flow in two dimensions around cylindrical objects. The new system has applications for civil engineers, naval architects and others concerned with the design of structures subjected to fluid flow forces.

Multiwire Dispenser (Ref. VE 119)

A simple device holds, separates and dispenses a multiplicity of wires for multiwire cables and looms. It is said to be useful on devices with multiple sensors or connectors where storage wires and leads can be a problem. Applications are foreseen in a wide range of medical, industrial and instrumental environments.

The above technologies are available through licensing arrangements. Write to: Vuman Ltd., Patent and Licensing Division, Enterprise House, Manchester Science Park, Lloyd Street North, Manchester M15 4EN, England; Tel: (061) 226-8746; Telex: 265871 (attn. MMD103). Please quote the appropriate reference number.

Italy

Water Heater Devices

An Italian company is offering to Canadian firms the manufacturing and marketing rights to its devices used in water heaters, which are claimed to have energy-saving properties. The devices are — the CAL-10 kit which, applied to existing electric storage water heaters, gives energy savings up to 60 percent; the SCALDABAGNO electric storage heater, also providing savings up to 60 percent; CAL-10 HEAT PUMP which combines the advantages of the CAL-10 system with those of an air-to-water heat pump giving savings up to 80 percent.

Write to: Martin Scherer, SOLAREX S.a.s., Piazza Piccapietra 83/65, 16121 — Genova, Italy; Tel: (010) 591297.

Reinforced Nylon Rotors

An Italian firm, specializing in the design and manufacture of reinforced nylon rotors for air conditioning/purification systems, is offering to a Canadian firm the manufacturing rights to its products.

Write to: TEKNOR S.a.s., Piazza Belloni, 9, 33100 Udine, Italy; Tel. 0432/26264; Telex: 450480 TEKNOR I.

Furniture

An Italian firm wishes to enter into a joint-venture arrangement and/or licensing agreement for the transfer of technology in the manufacture of its upholstered furniture and furnishing accessories in wood, metal and marble.

Write to: GIOVANNETTI ITALIA, P.O. Box 1, Via Perucciani, 51032 Bottegone (Pistoia), Italy; Tel: 0573/544755; Telex: 572338 GICASA.

Sweden

Metal Roofing System

A Swedish firm is offering to Canadian companies, through a licensing agreement or outright sale, the manufacturing and marketing rights for its metal roofing system, the PW-Roof. The system can be applied to existing buildings or new construction and consists of rolled sheet metal panels of 600 mm or 800 mm. No end splices are necessary. Each panel is gutter-shaped so that water will flow away from the joints.

Write to: Mats Jalar, SPEKON AB, Innergatan 17, 942 00 Älvsbyn, Sweden; Tel: 46-929-12544.

Switzerland

New Generation of Displacement Compressors, Pumps and Motors

Swiss engineers are offering to Canadian companies, through a licensing agreement, the manufacturing and marketing rights to their recently designed range of pneumatic and hydraulic aggregates where the displacement bodies rotate in eccentric orbits. They can be applied to pumps for liquids, compressors for gases, and motors and meters for both liquids and gases.

Write to: Götz Schaudé, Innovationsberatung, Finkenstrasse 14, D-7534 Birkenfeld, Federal Republic of Germany; Tel: (0 72 31) 48 07 23; Telex: 17 7231 113.

U.S.A.

Device for Application of Herbicides

An American company is offering to Canadian manufacturers the manufacturing and marketing rights, through licensing or joint-venture arrangements, of its device for applying herbicides. It is claimed that the device will kill unwanted vegetation, particularly in the post-emergence stages of crop growth. The manufacturer believes that the device will lessen the amount of chemical required during post-emergence treatment; will generally eliminate the second application; and is highly cost effective.

Write to: The President, Transtech Services USA, P.O. Box 21003, Alexandria, Virginia, VA 22320-2003, U.S.A.; Tel: (703) 548-8543.

Requested

Canada

Over-the-Counter Pharmaceutical Products

A Canadian company wishes to acquire, through a licensing arrangement, the manufacturing and marketing rights to new over-the-counter pharmaceutical products.

Write to: Mario Thomas, New Products Director, Burroughs Welcome Inc., 16751 Trans-Canada Highway, Kirkland, Quebec; Tel: (514) 694-8220; Telex: 05-821860.

Federal Republic of Germany

Rubber-Related Technologies and Products

(Case No. B709)

A West German company wishes to acquire, through licensing or joint-venture arrangements, new rubber formulas for special applications; thermoplastic rubber; moulded parts made from rubber, rubber-metal and rubber-plastic; new products for recapping tires; new processes for recycling rubber and/or plastic and products made from them.

Devices and Tools for Industrial and Craft Workshops

(Case No. B710)

A group of West German companies is searching for new devices and tools for industrial and craft workshops, e.g., chucks for cutting, grinding, drilling, welding, etc.; clamping devices for Computerized Numerical Control (CNC) machine tools and robots; tools for cutting sheet metal. Licensing or joint-venture arrangements are sought.

Chemical Specialties and Additives

(Case No. 8306)

A West German firm wishes to acquire, through a licensing arrangement, chemical specialties and additives. Products sought include: antifoam and flocculating agents for food, sugar, yeast, alcohol, starch, pharmaceutical and paper processing; additives for the rubber industry and for sealants; specialty chemicals for water treatment.

For further information on the above requests, write to: Götz Schaudé, Innovationsberatung, Finkenstrasse 14, D-7534 Birkenfeld, Federal Republic of Germany; Tel: (0 72 31) 48 07 23; Telex: 17 7231 113.

Gabon

Consumer Goods Sought

A company from Gabon wishes to enter into a joint-venture agreement or any other type of business arrangement for the acquisition of Canadian consumer goods (cosmetics, hygiene, food, etc.) for manufacturing and/or marketing in Gabon.

Write to either: I.E. Efford, Honorary Consul for the Republic of Gabon, 1909 Broadmoor Avenue, Ottawa, Ontario K1H 5B3; Tel: (613) 526-4427, Telex: 053-4741; *or to:* A. Moussadji, COGADIEY, Libreville, B.P. 215 and 4136, Gabon; Tel: 76.43.67, Telex: 5489 GO.

Italy

Acquaculture Technology

An Italian company is seeking, through a joint-venture arrangement, the technology related to the intensive farming of frogs and tadpoles.

Write to: CONSORZIO LATINA EXPORT, Via Umberto 1, 84, 04100 Latina, Italy; Tel: 0773/493365; Telex: 680457 CCIALT I, att. LT/EXP.

Special Events

Summary

Canada

- Fisheries Council of Canada 1988 Annual Convention
Québec City — October 1988
- International Interior Design Exposition (IINDEX)
Toronto — November 1988
- New Uses for Milk
Québec City — November 1988

Bahrain

- MECOM 89
Bahrain — January 1989

Denmark

- 6th International Trade Fair for Machine Tools and Tools
Copenhagen — October 1988
- 4th International Trade Fair for Road Transport, Internal Materials Handling and Storage Systems
Copenhagen — October 1988
- 3rd International Fair for Industrial Robots and Robot Technology
Copenhagen — October 1988

France

- SIAL '88
Paris — October 1988

Federal Republic of Germany

- ELECTRONICA 88
Munich — November 1988
- BAUMA 89
Munich — April 1989

Finland

- 1989 International Mechanical Pulping Conference
- PULPAPER '89
Helsinki — June 6-8, 1989

Great Britain

- TECHMART
Birmingham, England — November 1988

U.S.A.

- Instrument Society of America
Houston — October 1988
- WESCON
Anaheim — November 1988
- WORLD TECH 89
New York City — June 1989

U.S.S.R.

- SKLAD '88
Moscow — October 1988

Canada

- **Fisheries Council of Canada 1988 Annual Convention**
Auberge de Gouverneurs, Place Hauteville
Québec City, Quebec
October 4-6, 1988
Write to: Fisheries Council of Canada,
505-77 Metcalfe Street, Ottawa, Ontario
K1P 5L6; Tel: (613) 238-7751.
- **International Interior Design Exposition (IIDEX)**
Metro Toronto Convention Centre
Toronto, Ontario
November 4-6, 1988
Write to: Reva Karstadt, Executive Director,
Association of Registered Interior Designers of
Ontario, 168 Bedford Road, Toronto, Ontario
M5R 2K9; Tel: (416) 921-2127.
- **New Uses for Milk**
Hôtel Loews le Concorde, Québec City,
Quebec
November 16-18, 1988
Write to: Bureau de l'extension, Pavillon Paul-
Comtois, Université Laval, Québec, Quebec
G1K 7P4; Tel: (418) 656-5693. Organized by
Le Groupe Stela, Tel: (418) 656-3951.

Bahrain

MECOM 89

6th Middle East Electronic Communications Show and Conference, and 6th Middle East Computer Show

Bahrain

January 23-24, 1989

Write to: Unilink, 5 Donalda Crescent, Agincourt,
Ontario M1S 1N5; Tel: (416) 291-6359; Telex:
06-968027; Fax: (416) 291-0025.

Further details contact: Mecom 89, c/o Depart-
ment of External Affairs, Middle East Division,
Mrs. Terry Brophy, (613) 990-5984.

Denmark

6th International Trade Fair for Machine Tools and Tools

Bella Center

Copenhagen

October 18-21, 1988

Write to: Bella Center A/S, Center Boulevard,
DK-2300 Copenhagen S, Denmark; Tel: (01) 51 88 11;
Telex: 31 188 dk.

4th International Trade Fair for Road Transport, Internal Materials Handling and Storage Systems

Bella Center

Copenhagen

October 18-21, 1988

Write to: Bella Center A/S, Center Boulevard,
DK-2300 Copenhagen S, Denmark; Tel: (01) 51 88 11;
Telex: 31 188 dk.

3rd International Fair for Industrial Robots and Robot Technology

Bella Center

Copenhagen

October 18-21, 1988

Write to: Bella Center A/S, Center Boulevard,
DK-2300 Copenhagen S, Denmark; Tel: (01) 51 88 11;
Telex: 31 188 dk.

France

SIAL '88

International Food Fair

Paris

October 17-21, 1988

Write to: NOWEA International GmbH, Postfach
32 02 03, Stockumer Kirchstrasse 61, Halle 11,
Messegelaende, D-4000 Düsseldorf 30, Federal
Republic of Germany; Tel: (211) 45 60-02;
Telex: 8 588 351 now d.

Federal Republic of Germany

ELECTRONICA 88

13th International Trade Fair for Components and Assemblies in Electronics

Munich

November 8-12, 1988

Write to: Münchener Messe- und Ausstellungsge-
sellschaft mbH (MMG), Messegelände, Postfach
12 10 09, D-8000 München 12, Federal Republic
of Germany; Tel: (89) 51 07-0; Telex: 5 212 086
ameg d.

Bauma 89

22nd International Trade Fair and World Forum for Construction Equipment and Building Material Machines

Munich

April 10-16, 1989

Write to: Unilink, 5 Donalda Crescent, Agincourt,
Ontario M1S 1N5; Tel: (416) 291-6359; Telex:
06-96 80 27; Fax: (416) 291-0025.

Finland

1989 International Mechanical Pulping Conference, and PULPAPER '89, Trade Fair for the Pulp and Paper Industry

Helsinki Exhibition and Congress Center, Helsinki, Finland

June 6-8, 1989

Write to: Erik Kihlman, The Finnish Paper Engineers' Association, Pietarinkatu 1 C, SF-00140 Helsinki, Finland.

To present a paper, submit an abstract of 500 words in English no later than October 14, 1988, to Jan Sundholm, Technical Secretary, The Finnish Pulp and Paper Research Institute, P.O. Box 136, SF-00101 Helsinki, Finland.

Great Britain

TECHMART Technology Transfer Exhibition

National Exhibition Centre, Birmingham, England
November 15-17, 1988

Write to: Carole Jackson, Focus Events Limited, Greencoat House, Francis Street, London, England, SW1P 1BR; Tel: 01-834-1717; Fax: 01-828-0270; Telex: 941-9564.

U.S.A.

Instrument Society of America

Houston, Texas
October 16-20, 1988

Write to: Instrument Society of America, 67 Alexander Drive, P.O. Box 12277, Research Triangle Park, North Carolina, NC 27709, U.S.A.; Tel: (919) 549-8411.

Wescon

Anaheim, California
November 15-18, 1988

Write to: Electronic Conventions Management, 8110 Airport Boulevard, Los Angeles, California, CA 90045, U.S.A.; Tel: (213) 772-2965.

WORLD TECH 89

International Exposition and Conference for Commercial, Industrial and Scientific Advanced Technology

Jacob K. Javits Convention Center, New York City
June 28-30, 1989

Write to: A. Robert Terrero, Account Executive, American European Trade & Exhibition Center Corp. (AETEC), 225 West 34th Street, Suite 906, New York, NY 10122, U.S.A.; Tel: (212) 563-5350; Telex: 697342 euroamf; Fax: (212) 736-0027.

U.S.S.R.

SKLAD '88 International Exhibition of Stock Handling, Warehouse Technology, Automation and Mechanization

Moscow, Krasnaya Presnya
October 19-26, 1988

Write to: NOWEA International GmbH, Postfach 32 02 03, Stockumer Kirchstrasse 61, Halle 11, Messagelaende, D-4000 Düsseldorf 30, Federal Republic of Germany; Tel: (211) 45 60-02; Telex: 8 588 351 now d.

Regional Offices

NEWFOUNDLAND

Parsons Building
90 O'Leary Avenue
P.O. Box 8950
St. John's, Newfoundland
A1B 3R9

Tel: (709) 772-4053

Local Offices

Corner Brook

Tel: (709) 637-4477

Happy Valley

Goose Bay, Labrador

Tel: (709) 896-2741

PRINCE EDWARD ISLAND

Confederation Court Mall
Suite 400

134 Kent Street

P.O. Box 1115

Charlottetown

Prince Edward Island

C1A 7M8

Tel: (902) 566-7400

NOVA SCOTIA

1496 Lower Water Street

P.O. Box 940, Station M

Halifax, Nova Scotia

B3J 2V9

Tel: (902) 426-2018

Enterprise Cape Breton

Sydney

Tel: (902) 564-3614

NEW BRUNSWICK

770 Main Street

P.O. Box 1210

Moncton, New Brunswick

E1C 8P9

Tel: (506) 857-6400

Local Offices

Bathurst

Tel: (506) 548-7420

Fredericton

Tel: (506) 452-3124

Grand Falls

Tel: (506) 473-5556

Atlantic Enterprise Program

Tel: (506) 857-6515

QUEBEC

Tour de la Bourse
Suite 3800

800 Victoria Place

P.O. Box 247

Montréal, Quebec

H4Z 1E8

Tel: (514) 283-8185

Local Offices

Alma

Tel: (418) 668-3084

Drummondville

Tel: (819) 478-4664

Québec

Tel: (418) 648-4826

Rimouski

Tel: (418) 722-3282

Sept-Îles

Tel: (418) 968-3426

Sherbrooke

Tel: (819) 565-4713

Trois-Rivières

Tel: (819) 374-5544

Val-d'Or

Tel: (819) 825-5260

ONTARIO

Dominion Public Building
4th Floor

1 Front Street West

Toronto, Ontario

M5J 1A4

Tel: (416) 973-5000

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