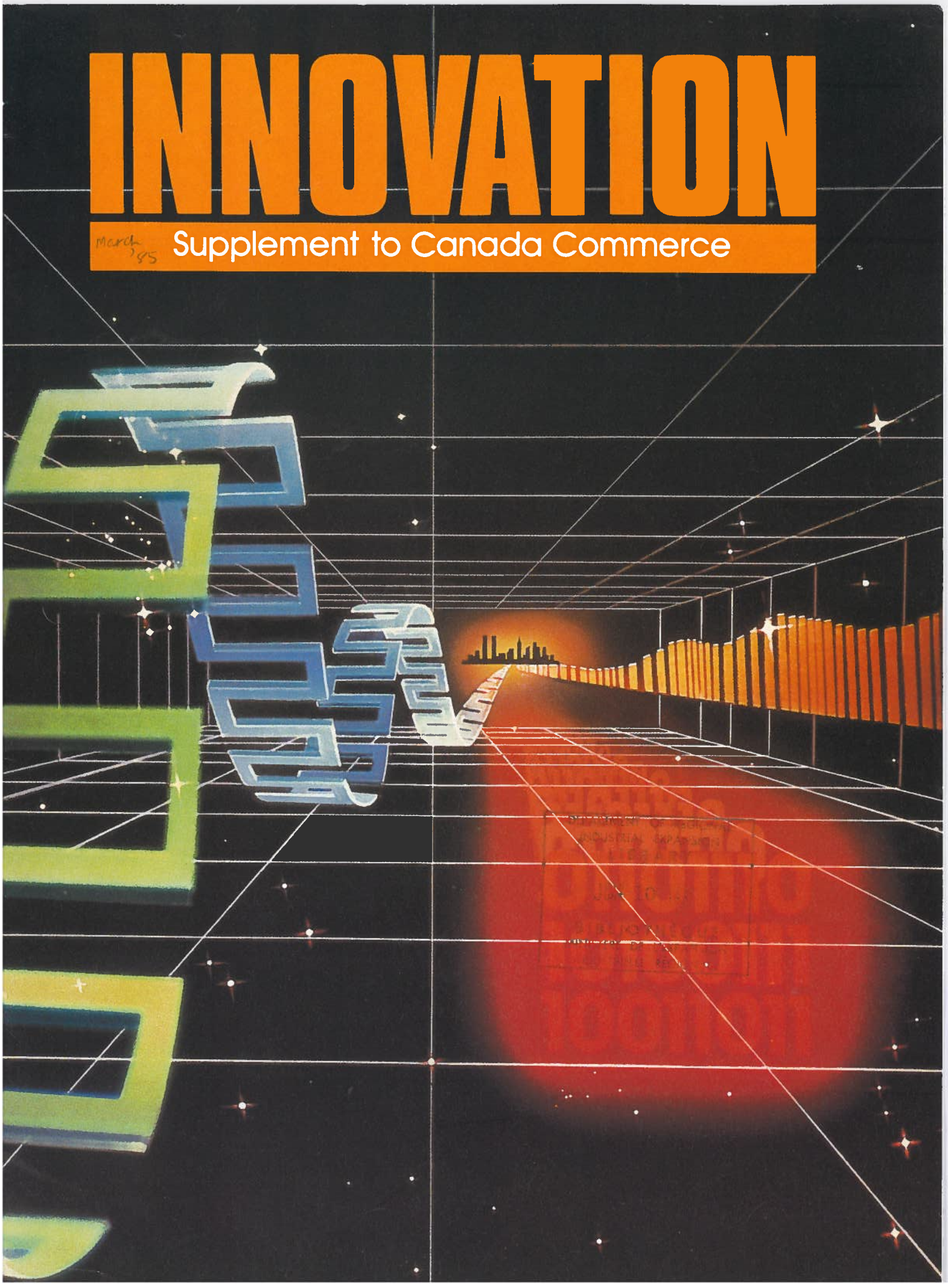
INNOVATION

March '85

Supplement to Canada Commerce



Introduction

Innovation Supplement to *Canada Commerce* has been devised to take the place of the publication *New Products Bulletin* but will provide a much more complete service.

The *New Products Bulletin* simply listed patented products and offers of technology transfers and was distributed to a limited readership. The *Innovation Supplement*, which will be published four times a year, does all of this but on a more selective basis to serve as examples rather than providing complete lists. In addition, the supplement introduces a new feature in publishing requests for technology transfers as well as offers. It will also include articles and information of interest on innovative companies, organizations, products, processes, programs, services — in short, anything that emphasizes the innovative spirit of Canadians.

The *Innovation Supplement* will be distributed to the full subscription list of *Canada Commerce* across Canada.

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. Ideas for articles and information, even finished articles, will be welcomed.

We invite you to become a part of the *Innovation Supplement* with your comments and ideas. You can contact us at:

Innovation Supplement
Technology Transfer Services (EOII)
Office of Industrial Innovation
Department of Regional Industrial Expansion
235 Queen Street
Ottawa, Ontario
K1A 0H5
Tel: (613) 995-2235

CANADIANS ARE INNOVATORS!

As I write this article, one of the most recent examples of Canada's innovative capability is circling high above the earth. I'm referring, of course, to the Canadarm, which has proved to be a solid performer in the space shuttle.

I could, however, mention many other examples of Canadian technology in space, such as the Anik telecommunications satellites which have been providing Canadian telephone and television relay services for more than 11 years. Then there were the Alouette scientific satellites, the first of which was launched in 1962, just five years after the space age began. Alouette I set a new and remarkable standard of reliability when it continued to transmit useful data for more than 10 years — the satellite was originally designed to function for only a single year.

Another example of Canadian innovation is the outstanding group of satellite component systems developed by Com Dev Ltd. of Cambridge, Ontario, which have found their way into space on many different satellites in the past few years.

The important point to note is that Canadian individuals and companies are continuing a long record of early innovation in new technologies that have significant impact on people all around the world.

Innovations in Communications and Transportation

From the earliest days, the geographic imperative of Canada has driven us to pay attention to the communication and transportation needs of our citizens. Thus, we undertake unparalleled challenges. We lay railroad tracks for thousands of miles across some of the most forbidding terrain in the world; and, right beside those tracks, we place the telegraph cables that allow us to communicate with each other.

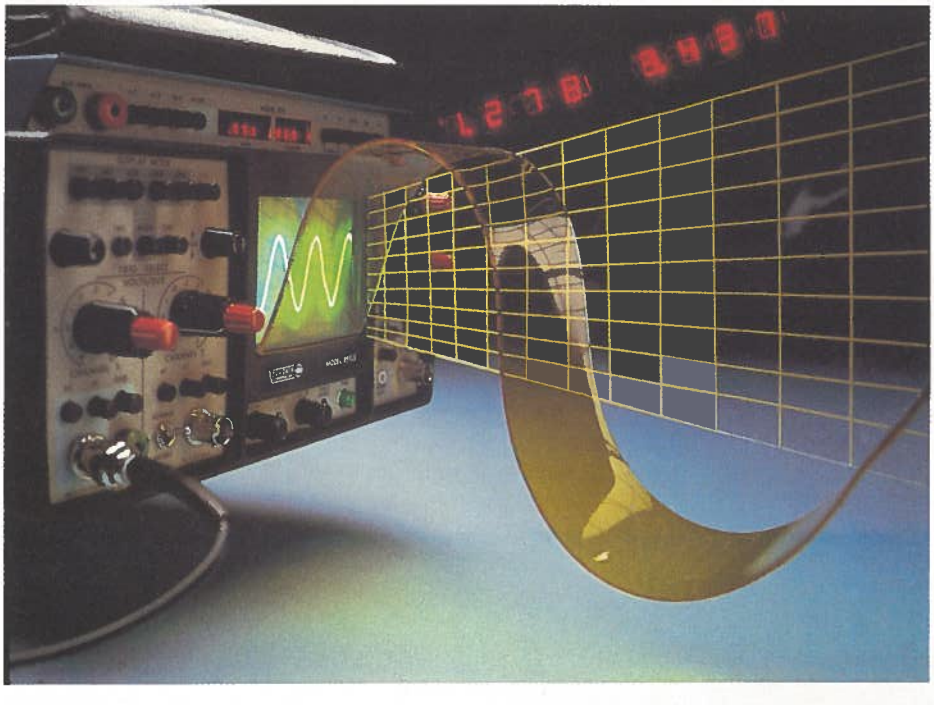
It was this desire to communicate that, in 1874, drove Alexander Graham Bell in Brantford, Ontario, to pursue the challenge of improving on the telegraph; and drove Canadian Reginald Fessenden in 1906 to broadcast the first human voices ever sent without wires. This same desire led to the first scheduled radio broadcast in the world, from station XWA (now CFCA) in Montreal on May 20, 1920.

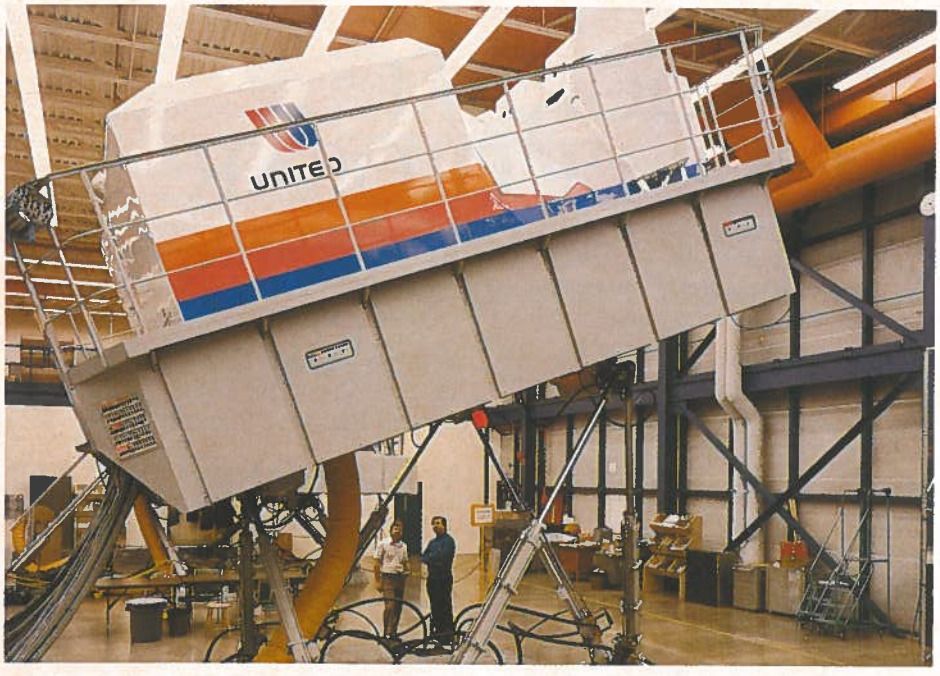
For many years, we have been just as innovative in dealing with the challenges of transportation in the area of flight. In the early 1900s, Bell's work on fight aerodynamics led to the design and development of the Silver Dart and its fight over Bras d'Or in 1909 with Doug McCurdy as pilot. And Turnball's development of the variable pitch propellor ushered in a new era of economical flying not possible before.

In a more modern vein, we are all familiar with the story of the Avro Arrow, a plane five to 10 years ahead of the competition when it first flew in 1958.

The subsequent cancellation of the Arrow program stands as one of the more regrettable actions ever taken by a Canadian government.

However, with an admirable doggedness, Canadians have continued to seek out opportunities for this innovative talent. We can point with considerable pride to the success of the CAE





flight simulators, and to the de Havilland Dash 7 and Dash 8 aircraft. The latter are the latest in a long line of special short takeoff and landing aircraft originally developed to open up our north.

A little closer to earth we again find Bell, this time experimenting with hydrofoil boats. In 1919, his HD-4 set a water speed record that lasted for 12 years.

A few years later, along came young Armand Bombardier who had been tinkering with ways to get around in the heavy snow of rural Quebec. In 1937 he was awarded the first patent for the snowmobile. From this basic commercial workhorse, he developed the Ski-Doo in 1959, spawning an industry with as many as 132 manufacturers at one point.

Back on water, we find thousands of people around the world sailing the Laser, one of the most phenomenal achievements in boat design in recent years. Bruce Kirby in 1969 designed the Laser based on an idea from Montrealer Ian Bruce. This craft has achieved sales of more than 220 000 boats, and has had full international class status since 1974. No boat in history has had the same level of commercial success.

As one might expect, we also have a continuing record of innovation in agriculture and food. Some of the most notable achievements were the development of Fife wheat in 1843; Sir Charles Saunders' growth of Marquis wheat in 1908; Pablum, developed in 1930; and Thomas Carroll's development of the self-propelled combine harvester at Massey-Harris in 1938. We can even go back as far as 1811 when the McIntosh apple was first discovered in Canada.

Canadian Innovations in Sports

When it comes to sports, Canadians have been "participating" for many years. In 1867, Lacrosse was adopted as our national sport, but our first love was ice sports. The first hockey game was played on the frozen lake beside the Royal Military College in 1855, and in 1888, the clamp skate was invented.

Since some of us would rather be inside during the winter, Joe Naismith in 1891 developed the game of basketball; and, for shorter people, Tommy Ryan created five-pin bowling in 1905.

To take advantage of our love of hockey and our need to be warm, table hockey arrived in 1932. More recently, local high school student Paul Wilson invented the "Puttacup" to give indoor golfers a more natural putting-practice green.

And the list of Canadian innovation in many fields goes on and on:

- Standard time zones: Sir Sandford Flemming in 1879;
- Insulin: Banting and Best in 1922;
- The gas mask: Dr. Cluny MacPherson;
- Usable newsprint: Charles Fenerty in 1838;
- Kerosene: Dr. A. Gesner in 1846;
- Snowblower: Arthur Sicard in 1925;
- Zipper: Gideon Sunback in 1934;
- Paint roller: Norman Breakey;
- Trivial Pursuit: Abbot and Haney in 1979.

Today's Opportunities for Innovation

Thus, to restate the obvious, Canadians, both individually and collectively, are a very innovative lot.

And there is little or no evidence that the opportunities to innovate have become fewer or the environment tougher. On the contrary, in a world of instant communications and heightened awareness of the world's problems, it can be argued that there is more opportunity to innovate, to create a host of new ideas, products or services that address some very real and pressing needs.

However, the innovator of today and tomorrow must often be prepared to look harder and further afield to identify those needs that he might creatively address. He needs more and better information than was necessary in the past. But, given information leading to well-defined problems, there is every reason to expect that Canadians will continue to contribute to the world's supply of innovative ideas at the same high level and with the same dedication as we have in the past.

— by Gordon Cummer
Marketing Manager
Canadian Industrial Innovation Centre/Waterloo

SIMULATION PROGRAM SAVES STEAM AT PETROSAR

How a major petrochemical refinery is using computer-simulation techniques to optimize its steam system and improve overall energy efficiency.

Steam generation — either by direct firing or through process heat recovery — accounts for nearly half the fuel consumption at Petrosar's petrochemical refinery at Sarnia, Ontario. More than two-thirds of this steam is used for power generation.

Steam Consumption Higher than Design

The problem at Petrosar first came to light in mid-1980 when it became apparent that steam consumption was running higher than design figures. In fact it was averaging 20 per cent higher.

The designed capacity calls for the refinery to use about 453 500 kilograms (one million pounds) per hour of steam. The steam system has four pressure levels. It is generated at 105 kg/cm^2 (1 500 psig), energy is extracted and it is let down to 35 kg/cm^2 (500 psig), 14 kg/cm^2 (200 psig) and 3.5 kg/cm^2 (50 psig). At each level there are head exchangers and turbines which use the steam. Condensate is then returned to the central area for reuse.

Steam System Very Complex

The plant's steam system is very complex. There are over 200 pieces of equipment involved, many of which can operate quite independently. Although Petrosar's engineering group was aware that steam consumption was running higher than planned, they had some difficulty getting a handle on exactly what were the reasons for this.

Process engineer Gary Gildert — a key member of Petrosar's energy optimization group — outlined the situation for us: ". . . at that point we didn't know just where we were losing steam. We couldn't determine if it was process inefficiency, equipment malfunctions, or some other causes.

"All we knew was that we were using a lot more steam than we should, and we couldn't track down the reasons."

At this point it was decided to look at some outside help and try using computer-simulation techniques.

After some investigation, Petrosar contracted with SACDA — a specialized computer services group based at the University of Western Ontario — to develop a computer simulation of the refinery's steam system. Petrosar's engineering group provided an overview of the plant. SACDA systems analysts used this to adapt their standard ENERGY program model to simulate the Petrosar refinery steam system.

Step changes were made on the computer model to determine the effect on the boilers. The same changes were made in the real world of the plant. There proved to be a very close correspondence.

From this exercise it was decided that the computer simulation program was a worthwhile development. Further investigation indicated the possibility that considerable savings in operating costs could be made by using the program to make small changes in plant operation to make best use of some items of equipment.

At this point it was decided to bring the program "in-house" and develop it as a real engineering tool. The main purpose was to provide an operator interface capability so that Petrosar engineers could actually do their own simulations in the control room. This was in early 1981.

Principal Objectives

In developing the ENERGY program as an in-plant engineering tool, Petrosar engineers had three main objectives:

- They wanted to be able to predict how much steam was actually needed for the various through-puts.
- As there are a limited number of meters in the system, they wanted alternate ways of estimating steam flows in various areas.
- Once they had established just where the steam was going, they wanted a simple means to try out different operating scenarios to determine the cause/effect relationships.

With engineering development and actually writing the program, it took almost a year to finally get the program in place.

It was not until mid-1982 that the program really got rolling and they started to make some positive changes in the operation of the plant. However, results were quick to emerge and by mid-1983 they had recognized a reduction in stream costs of almost 20 per cent.

The program is run through Petrosar's Univac mainframe computer. It is driven by Fortran language, but an interpreter also enables basic English to be used.

What Did the Program Reveal

So what did the simulation program tell them? Gary Gildert of Petrosar's process engineering group continues: ". . . we found that the principal causes of our overconsumption of steam were

small process inefficiencies, as well as some inappropriate uses of turbines and electric drivers.

"A few percentage points here and there, but the cumulative effect really added up. To fully understand this you have to understand the complexity of our steam system. There are over 200 pieces of equipment, most of which can be operated independently, but each one tends to affect how some of the others can operate."

How Was This Done?

"In which specific areas were these kind of savings realized?" he was asked.

"Well . . . the main compressor was one, and the back-pressure turbines were another.

"For a long time we recognized the compressor was a bottleneck. We just couldn't seem to get enough power out of it. Meters were never in service for more than a few months so it was difficult to assess what power it was using and exactly what the through-put of the machine was. But using indirect methods, doing balances on the headers, we managed to determine how much steam it was actually using, even though we couldn't meter it indirectly. This enabled us to focus on this particular machine and ask ourselves where the operation was not being optimized.

"This is a fairly complex piece of equipment with many flows going in and out. It was difficult to pinpoint it as a problem until we knew for sure that it was. Once we realized this and focussed in on the machine we managed to reduce its power consumption by almost 20 per cent!"

"How did the program help you do this?"

"The simulation pointed out that there WAS over-consumption. It confirmed our suspicions and enabled us to concentrate on optimizing this particular piece of equipment."

"And just how did you do that?"

"The changes we made were very small, little things like reducing the recycle flows, slightly reducing the surge controls, etc. But they add up."

"What happened with the turbines?"

"Our steam system has a lot of back pressure-turbines using high pressure steam, exhausting to low pressure. The problem was, we didn't NEED that much low pressure steam. Nowhere near, in fact, what we were producing! So, one very important thing the simulation program showed us was how much we could save by shutting down these turbines. We found ways to substitute electric motors instead.

"Using the simulation program enabled us to quantify the benefits of this approach, as opposed to the possible risks of process upsets in the more critical operations, should there be a loss of electric power. For instance, if the turbine costs us the same amount to run as the electric motor, then the turbine looks very favorable. But . . . through using the simulation program we recognize that the turbines frequently cost three times as much to operate as the electric motor!"

Gary Gildert expanded a little further on the significance of this. "In a major petrochemical plant like ours, we have many drivers in the 500 to 1000 hp range. When you are looking at differences in operating costs between electric motors and turbines, a one megawatt motor costs roughly $200 000 per year to operate. The same size turbine would cost us about $500 000 per year!

"In this case the electric motor begins to look much more cost-effective, and we didn't develop this until we began using simulation program!"

"What changes are you making in your operating methods?"

"We set up priorities based upon the magnitude of consumption. At this point we feel we have done all the easier ones, where we have been able to look closely at the operation and determine what the particular through-puts should be.

"Historically there was very little difference in our steam consumption between summer and winter, and between nameplate through-put and complete turndown. We never saw changes in steam consumption. Now, however, we can see changes of 20 per cent or more between extremes of operation. We can take advantage of the turndown situation instead of taking severe penalties."

"Limit of Operation is Optimum"

One interesting fact the simulation program established was that optimization occurred at the limits of operation (either maximum or minimum) of various items of equipment. The program helped to establish these various limits.

For example, in the turbine area, the simulation program indicated they should run the minimum number of turbines in the 35-14 kg/cm^2 (500 psib - 200 psig) system. The appropriate instructions were given to the operations staff, who simply switched to electric drive where possible.

If and when unusual operating conditions arise, the operations staff requests assistance from the engineering group. They then go through the simulation process to provide an answer.

Future Objectives

Steam generation accounts for almost one-half of the total fuel consumption in the plant. It is, in fact, the largest single area of energy consumption. (This includes the waste heat from the cracking heaters in addition to direct firing.) Petrosar's process engineers have several defined objectives for their energy-optimization program as a result of using this simulation program. They feel their biggest task is to consolidate their current gains, also to put monitoring programs into place to ensure they do not slip back from their established optimization points.

Using the simulation program also enabled them to do a little creative thinking along the way

PETROSAR REFINERY — A BRIEF OVERVIEW

Petrosar Limited is Canada's first world-scale petrochemical refinery. It is also one of North America's largest integrated petrochemical refinery complexes.

It has the capability to produce 1.2 billion kilograms (2.8 billion pounds) of primary petrochemicals annually, together with various fuel co-products for both domestic and export markets.

The refinery is situated at Corunna, Ontario, in the middle of Sarnia's Chemical Valley.

Petrosar's annual production of primary petrochemicals currently supplies about 40 per cent of Canada's total requirements for ethylene, propylene, butylene, iso-butylene, butadiene, benzene and toluene/xylene.

The plant is a 0.4 billion kilogram-per-year (billion pound-per-year) ethylene producer. It also produces synthetic natural gas, LPGs (propane/butane), #2 fuel oil, vacuum gas oil, heavy fuel oil, toluene/xylene and gasoline components.

There are 22 fired process heaters distributed through the various areas of the refinery. These range in size for 10 MBTU/hr to 250 MBTU/hr. Many of them are able to fire both oil and gas.

There are three main high pressure CE boilers rated at 136 000 kg/hr. (300 000 lb./hr.) each on the site.

and identify a number of capital projects. For example, they are looking at ways to minimize the number of back-pressure turbines kept on line. Where possible they will be removing some of these turbines and replacing them with electric motors.

An offshoot of this program will also be to look very closely at the efficiency of ALL the back-pressure turbines.

They are also looking hard at the possibility of making some changes to the actual configuration of the back-pressure turbines, where they exhaust, temperatures, pressures, etc.

The simulation program has also proved to be a useful tool in evaluating the impact of new capital projects on the steam system.

Tie-in to Process Control System

Another area under investigation for plant optimization is to tie the simulation program into the process control computer at the main olefins plant. This is a Modcomp distributed digital system.

In addition, they are looking towards putting a link between the process control computer and the mainframe computer. This will enable them to use the information in the process control computer to drive the simulations directly, instead of having to use manual entry.

What Were the Costs?

So . . . the inevitable question . . . what does a program like this cost?

Actual upfront costs are fairly moderate. In this particular application Petrosar leases the SACDA ENERGY program under licence. There is also a maintenance fee for all the updates made to the program. (This rounds out to about 10 per cent of the license fee.)

Added to this, however, are the "hidden" costs of three to six person-months of time the systems analysts had to take to bring the simulation program up on to Petrosar's in-house system and adapt it to their working needs. There were also about six person-months of dedicated engineering group activity. The way this system is configured means that Petrosar has, in fact, its own "front end" on top of SACDA's "front end."

These licence fees and time costs do not include other monies for terminals, time sharing costs, etc.

Total costs incurred by Petrosar for development and testing the program were less than $100 000.

What Were the Real Benefits?

As to the other question of just what did they get for their money, Gary Gildert puts in this way: "The computer model of the plant has provided a valuable engineering tool for us to recognize the potential in our steam system equipment. It has helped us trouble-shoot historical problem areas and provided information in areas where it appeared that none existed before. Reduced steam consumption as a result of using this program returned our costs within two months."

He went on to list some of the peripheral benefits of the program, such as being accurate and easy to use for the average engineer with a little background in program discipline. The normal one-day training program provided is considered quite adequate for most of the smaller jobs. Petrosar's experience also found the program fairly adaptable to various particular situations in its plant.

Who Else Could Use Simulation?

In Gary Gildert's opinion, the simulation approach to energy management would be feasible for most operations who use more than 45 300 kg/hr (100 00 lb./hour) of steam. Especially if their system is fairly complex and metering is limited.

— by Arthur Kendrick
Reprinted from Canadian Chemical Processing

TECHNOLOGY TRANSFERS

OFFERED

CANADA
- 11 CPDL Cases
- Emergency Soft Landing System
- Compound Pneumatic Valve
- Medical Instruments and Devices
- Building Component
- 10 Cdn. Patents

AUSTRALIA
- Cements from Waste Materials
- Health Fitness Unit for the Home — P

AUSTRIA
- Oil Spill Clean-Up Well Process

BELGIUM
- Derisurf — P
- Wireless Magnetic Transmission — P

FINLAND
- 1 Cdn. Patent

FRANCE
- Integral Peripheral Locking Device
- Tape Recorder Cassettes
- Chemical Products for Water Treatment

ISRAEL
- Melting Heat Absorbing Composition
- Self-Hardening Paste for Closing Cracks in Auto-Engine Casings
- Fire and Heat Protective Ablative Materials and Components
- Concentrate for Salted, Spicy and Pickled Fish Preservant
- Unique Electric Separation Process

SWITZERLAND
- Chemical Admixtures for Concrete — P
- Street Sweeper — P
- Pigment Paste
- Stainless Steel Multi-Grill Apparatus — P

UNITED STATES
- 1 Cdn. Patent
- Air Cleaning Systems and Sound Control
- Technology for Two-Way Data Transmission on Power Networks
- Sale or Joint Venture — Machine Tool Company
- Airmotor

FEDERAL REPUBLIC OF GERMANY
- Field Trial Results

SPECIAL EVENTS

TSUKUBA EXPO 85, Japan/March-Sept. 85
HANOVER FAIR, Federal Republic of Germany/Apr. 85
13TH INTERNATIONAL EXHIBITION OF INVENTION AND NEW TECHNIQUES SPEMAC, Switzerland/Apr. 85
TECH EX '85 AMERICAS, Florida/Apr. 85
TECHNOLOGY/INPEX™ '85, Pennsylvania/June 85

TECHNOLOGY TRANSFERS

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CANADA

Cross Correlated Signal Processor — Case 7692
This baseband processor allows a non-linear amplifier to be driven to saturation without degrading the error rate performance or introducing channel interference in the system. Power limited digital satellite communication systems and radio systems especially would benefit from using this processor.

An Optoelectronically Switched Phase Shifter for Radar and Satellite Phased Array Antennas — Case 7815
This is an improved apparatus for introducing phase delays to a signal. It has a frequency response in excess of 1 GHz, a switching time of less than 10 ns, a bandwidth in excess of 500 MHz and an isolation of more than 80 dB, which make it suitable for Time Division Multiple Access (TDMA) communication satellites and certain radar systems. The same apparatus operates also as a switch for transmission and reception gating.

System for Applying Sulphur Dioxide to Forage — Case 7525
Apparatus and methods for the treatment of forage and silage with liquid sulphur dioxide or liquid anhydrous ammonia. These treatments sterilize the forage and minimize the loss of nutritional value while in the stack or silo. This technology also allows the storage of high moisture content barley and corn without expensive pre-drying.

Method and Means to Predict Several Material Properties Based on the Thermal Detection of Ultrasonic Absorption — Case 7783
The ultrasonic absorption in a material is calculated from the measured relative variation of the temperature modulation and from the measured attenuation in order to determine at least one property of the material, other than defects. Applications include 1) the identification and sorting of metal alloys, 2) characterisation of the effect of cold work on metals, 3) detection and measurement of fatigue in materials of pieces in service, and 4) detection and measurement of residual stress in metals.

Computer Speed Control — Case 7852
A retrofittable system for micro-computers which will slow down their sequential operation in a controllable manner to enable handicapped people to use them. The speed of action games, for example, may be selectively slowed down to match the capabilities of the user.

Flexible Broadband UHF Antenna — Case 7906
This compact lightweight flexible omnidirectional broadband UHF antenna is suitable for vehicle or mast mounting.

Producing Codeine from Cell Cultures — Case 6974
This invention concerns the production of codeine from modified cell cultures of *Papaver somniferum* and *Papaver setigerum*. This allows codeine to be manufactured safely and independent of traditional sources of supply.

Constant Pressure Diffusion Cell — Case 7522
In determining the penetration of vapours through fabrics, this diffusion cell measures the penetration of vapour, from a challenge liquid, through a sample of garment material. Constant pressure measurements and measurements with intermittent extra pressure can be made. An inert carrier gas conveys the vapour to the detector for quick and accurate results.

Optoelectronic Compound Switching Matrix — Case 7680
An optoelectronic switching matrix apparatus which allows the switching of multiplexed input signals and the transmission of selected signals by means of conventional heterodyning-filtering techniques. The desired outputs can thus be obtained from multiplexed input signals without the added complexity and cost of demultiplexers.

Digital Colour Photographic Image Video Display System — Case 7847
This system reduces the amount of data and consequently the frequency bandwidth and/or time required to transmit digital colour photographic images. It accomplishes this by exploiting the fact that the human eye is about four times as sensitive to brightness as to colour. Hence, brightness information (luminance) is transmitted for each pixel but colour information (chrominance) may be averaged and transmitted for a group of contiguous pixels without sensible degradation of the image.

Reflex Optoelectronic Switching Matrix — Case 7919
An optoelectronic switching matrix is combined with simple optical or electronic delay apparatus for broadband signal processing at frequencies higher than 100 MHz. Applications for the device include digital switched filters, digital word generators, programmable bandpass filters and programmable delays.

For any of the offers listed above write to:
Canada Patents and Development Limited
275 Slater Street
Ottawa, Ontario
K1A 0R3
Please quote the appropriate case number.

CANADA

OFFERED

Emergency Soft Landing System
A Canadian inventor offers to a Canadian company, under licence, the manufacturing rights for Canada to his soft landing and other emergency systems for helicopters. Believed to be useful in lowering a disabled helicopter safely on land or water. It is claimed that this composite device will maintain the craft afloat for an indefinite period. **Write: Frank B. Stiles**, P.O. Box 41, Carp, Ontario K0A 1L0.

Compound Pneumatic Valve
A Canadian inventor offers to a Canadian company, under licence, the manufacturing and marketing rights for Canada and the U.S. for a miniature compact pilot-operated diaphragm valve developed to control pneumatically operated medical and dental patient supports. It is claimed that this invention has potential uses in robots and low-cost automation and is easily interfaced with microprocessor and/or computer controllers. **Write: R.M. Sharp**, P.O. Box 46283, Vancouver, British Columbia V6R 4G6.

Medical Instruments and Devices
A Canadian inventor offers to a Canadian manufacturer of medical instruments and devices, under licence, the manufacturing rights for Canada for his ultrasonic micro-cardiovascular blood clot (and other) rapid dissolving and removal vacuuming instrument. It is claimed to be useful in speedily removing blood from the heart, stones, etc., from the human body without major surgical intervention. **Write: Frank B. Stiles**, P.O. Box 41, Carp, Ontario K0A 1L0.

Building Component
A Canadian inventor offers to a Canadian company in the wood products industry the manufacturing, marketing and export rights for his new invention, a multiple use building component with which many products can be made in addition to being a flooring product in its basic format. **Write to: B. Spiers c/o W. R. Edgar, Burke-Robertson, Chadwick & Ritchie**, 130 Albert Street, 18th Floor, Ottawa, Ontario K1P 5G4.

Device for Detachably Fixing a Lightweight Anchor Onto a Boat
A device for detachably fixing a lightweight anchor of the pivoting fluke type, in a very simple and fast manner, onto a rail extending upwardly from a boat. The device comprises a tubular, hollow member having an inner diameter wide enough to receive the shank of the anchor together with the chain connecting this shank to the boat. A pair of clamps are externally secured to the member for detachably mounting it onto the rail so that it extends in parallel. In operation, the anchor is fixed by mere insertion of the end of the shank with the connected chain into the upper end of the hollow member, the anchor remaining fixed into the device by gravity with the shank extending inside the member. **Write to: C. Langlois**, 7 Lecours Street, St-Antoine sur Richelieu, Québec J0L 1R0.

Apparatus for Geophysical Exploration
Two vector components of the EM field, e.g. Hy and Ex, are picked up by suitable probes. The resulting signals are filtered by narrow bandpass filters around a centre frequency and amplified by gain selectable amplifiers to an acceptable level for a pre-processing circuit which enables fast mathematical operations to be done. The pre-processing circuit uses an all pass quadrature (90°) phase shifter, four fast multipliers and four integrators under the control of a timing circuit. The output of the pre-processing circuit is converted to digital values to permit mathematical processing. Then, the ratio, the phase shift and the coefficient of coherence between the two vector components of the MT-EM field are calculated. The above operations can be repeated for various frequencies ωo. The coherence value gives an indication of the quality of the measurement. With a low coherence value, the measurement must be repeated because the noise is too high. A graph of the ratio and phase shift values of the EM field with respect to ωo enables a geophysicist to make an interpretation of deep rock conductivities at various depths. **Write to: M. St-Amant**, 8458 St-Hubert, Montréal, Québec H2P 1Z5; **M. Chouteau**, 955 Davoar 9, Outremont, Québec H2V 3B6.

Hanging Magazine Holder
In the storage of magazines it is common practice to place the magazines in a cardboard container or to place them loose on shelves. These systems have disadvantages. In accordance with the present specification a rigid slotted holder is provided with hooks at either end which fit into a rack or hanging file system and hold the magazines. The device is easily removable from a rack or hanging file and the magazines can be easily removed. The device is also adapted for use with other folded paper and with books and brochures. **Write to: J. L. Radcliff**, 5344-104th Street, Delta, B.C. V4K 3N3.

Machine for Cutting Curbstones, Sidewalks and the Like
Machine including a powered truck-like vehicle having a support base at the rear end and an apparatus for cutting a drive-in passage across a concrete curbstone, a sidewalk or the like. The apparatus is mounted on the base and essentially comprises two spaced parallel booms mounted at one end on the base and an elongated bridge structure extending between and perpendicularly to the booms, being connected to them and pro-

vided with a drive so that it can be displaced along the booms with respect to the support base of the vehicle. The booms and bridge structure are pivoted from an inoperative position, in which the bridge structure is above the support base, to an operative position in which the booms and bridge structure are swung outwardly of the support base in a position for cutting the curbstone, sidewalk or the like. A carrier, having a concrete rotary cutting saw, is mounted on the bridge structure and displacable in a first direction along one face of the structure, the saw itself being displacable along a second direction which is perpendicular to the first mentioned direction. In this manner, with the apparatus in the operative position, the rotary saw is first advanced in the second direction through the curbstone, sidewalk or the like and then in the first direction to cut an elongated slot determining the elongated extent of the drive-in passage. **Write to: R. Bertrand**, 648 Lasalle, St-Jean, Québec J3B 2R2.

Electrically Operated Apparatus
An electrical apparatus useful to prepare a hot beverage from a flavour substance. The apparatus has a flow-through heater, a container for a liquid and a cup unit for the flavour substance. A pipe joins the cup unit and the liquid container. The cup unit includes a cup and there is a filter carrier to fit in the top of the cup and to carry a filter containing the flavour substance. A passage extends through the filter carrier and is open at both ends of the carrier. A channel is formed between the base of the filter carrier and the passage. Further passages join the interior of the passage to the channel. The filter carrier has upper and lower closures. The heater unit has a container for a liquid, a heater for the liquid and a head to fit over the cup unit. The pipe extends from the heater to the head. The apparatus allows the liquid to pass from the container through the pipe, through the head, into the filter and through the upper closure of the cup unit so that liquid may pass through the flavour substance in the filter to form the beverage. **Write to: P. Klein**, 19763-44 Avenue, Langley, B.C. V3A 3C9.

Wheel-Lifting Kit for Bumper Jacks
A bumper jack or a body jack supplied with a vehicle is designed to raise the body of the vehicle high enough that a selected wheel may be changed, but the body must be raised considerably before the wheel leaves the ground. "Do-it-yourself" mechanics and hobbyists frequently need to raise a vehicle, wheels and all. In this invention the use of bumper jacks is extended by means of an apparatus kit fitted directly to a wheel-and-inflated-tire assembly for lifting. With it, a block 15 to 20 centimetres high may easily be placed under a wheel in one jacking operation. This invention offers a safe and simple means of providing under-vehicle access with readily-available inexpensive equipment. **Write to: W. G. Greene**, 28 Scott Road, West Brome, Québec J0E 2P0.

Photographic Printing Device
A device for making both photographic proof sheets and enlargements. It includes a flat base plate with a low rectangular fence defining an area for accommodating a sheet of photographic paper; template carriers connected and hinged to the base plate; and a variety of glassless templates which are slidable into and out of the carriers for making photographic proof sheets without the use of a pressure plate, masking a variety of areas of photographic paper while providing a light-tight seal when closed upon the base plate and holding photographic paper flat for the printing of enlargements. **Write to: M. B. Achtman; M. S. Achtman**, 116 Bermondsey Way N.W., Calgary, Alberta T3K 1V4.

Insulated Chimney Structure
An insulated chimney structure of the type comprising an outer casing, an inner flue spaced from the casing and made of metal sheet, and a solid heat insulating material between. The metal sheet of the flue has a pair of longitudinal edges and is folded into a closed cylinder with its edges connected to each other in a non rigid manner to define a continuous, expansible lock joint. Due to this expansible lock joint, the metal sheet flue may freely expand whenever heated, without radially pressing against the insulating material and outer casing thereby avoiding damage to the chimney structure or draft reduction. **Write to: Security Chimneys Ltd.**, 2125 Monterey, Laval, Québec H7L 3T6.

Drain Assembly
A drain assembly for sinks and the like, having a Y-branch member with a vertical stem portion and a branch portion extending upwardly from the stem portion. The upper end of the stem portion can be connected to a sink drain while the upper end of the branch portion can be connected to a waste line. A catch member is connected to the bottom end of the stem portion and a tubular strainer, held in position by the catch member, extends across the opening joining the stem and branch portions together to prevent objects from passing into the waste line. **Write to: E. Dubois**, 3455 Hôtel de Ville, Montreal, Quebec H2X 3B5.

Rotary Holding Tool
The invention is a rotary holding tool for rotatably holding a workpiece during machining of the workpiece by a lathe, grinding tool or similar equipment. The rotary holding tool has both a means for accurately and rapidly adjusting the angular orientation of the workpiece by five degree intervals and also a vernier means for fine adjustment of that angular orientation. **Write to: A. W. Wright**, P.O. Box 208, Straffordville, Ontario N0J 1Y0.

INTERNATIONAL

AUSTRALIA

Cements from Waste Materials
Australian university research offers, to a Canadian company of building materials, a manufacturing licence for Canada to its new technology of producing low-cost hydraulic cement utilizing industrial solid waste, industrial liquid wastes and agricultural waste. It is claimed that the excellent physical and chemical properties include high strength, dimensional stability, surface smoothness and resistance to fire and efflorescence. **Write: N. W. Lim, School of Civil Engineering**, University of New South Wales, Australia.

Health Fitness Unit for the Home
Australian inventors offer to a Canadian company the manufacturing, marketing and export rights for Canada, the United States, West Germany, Italy and The Netherlands for their simple, economical Vibrosaun machine. The no-exercise method, the latest in fitness and weight control for men and women, is claimed to achieve amazing results in the relief and treatment of most therapeutic ailments. **Write: L. J. Coleman, Vibrosaun**, 8 View Avenue, Surfers Paradise, Queensland 4217, Australia.

AUSTRIA

Oil Spill Clean-Up Well Process
Austrian firm offers to a Canadian manufacturer in the lines of equipment construction, well construction or in the field of environmental protection in general, the manufacturing and marketing rights for Canada and possibly the export rights for North America for its equipment for the protection of ground water. It is claimed that this equipment makes it possible to combat soil contaminations by mineral oil products quickly, economically and successfully, without having to demolish any production facilities or buildings. **Write: OAR i.R. Christian Gurschner, Consulting Engineer** for **Environmental Protection and Process Technology**, Haydn-Strasse 2, A-5020 Salzburg, Austria.

BELGIUM

Wireless Magnetic Transmission
Belgian inventor seeks Canadian small or medium-sized business engaged in electromechanical production for partnership or joint venture involving the development of a magnetic engine operating without wires or current; offering rights to manufacture under licence in Canada, and marketing and export rights for Canada and the United States. **Write to: Harry Manfred Goldschmidt**, 5 avenue de l'Armistice, 1420 Braine l'Alleud, Belgium.

DERISURF
Belgian firm offers to a Canadian company the manufacturing rights, through joint venture arrangements, for North America to a new recreational product which replaces, in part, the traditional sailing dinghy and the wind surfboard. The DERISURF 300 is made entirely of fibreglass-reinforced polyester and, despite its small size, can easily accommodate two adults. It is claimed that its lower hull is both very stable, which makes for a feeling of complete safety, and glides very easily because its ski forms an integral part of the body; this results in a craft of high performance. **Write: Thierry Hoolans, MOULHOU**, 44, rue du Midi, B-7700 Mouscron, Belgium.

FINLAND

Method for Making Concrete Weather-Resistant
An invention relating to a method of making concrete used in hydrotechnical structures weather-resistant as regards the freezing of water absorbed into the pores of the concrete. The problem in this connection consists of the expansion of freezing water and the consequent state of tension in the concrete. According to the inventor, a small amount of micro-sized rubber powder is mixed with the concrete mix, the rubber particles forming even-surfaced, closed buffers into which the water expanding when it freezes can expand without producing states of tension in the concrete. The rubber particles are ground from the rubber parts of used automobile tires. **Write: Oy Partek Ab**, SF-26100, Parainen, Finland.

FRANCE

Integral Peripheral Locking Device
A French firm offers to a Canadian company in the wood, metal doors and safes manufacturing sectors, the exclusive manufacturing and marketing licence for Canada, for its patented closure system for doors, shutters, safety vaults, trailers, etc. It is claimed that this device offers absolute security against break-ins. **Write: Michel P. Montet, Office of the President, CODIM**, 46, rue Edgar Quinet, 42100 Saint-Etienne, France.

Tape Recorder Cassettes
A French inventor is offering the manufacturing and marketing rights (complete operation) under licence in Canada for his tape recorder cassette fitted with an indexing system of the tape winding, permitting accurate information at all times on the portion of the tape being recorded or played. Also, a dial accurately reveals at all times the recording time already used and the time still available. The invention has a variety of applications: audio and video, data-processing, cinema, television and so on. **Write: Aristide Hébert**, 10, rue Pierre de Coubertin, 50100 Cherbourg, France.

Chemical Products for Water Treatment
A French inventor offers a Canadian company the manufacturing and marketing rights for North America for his chemical products used in water treatment, based on a recent invention. These products are characterized by the activation of metallic salts in an aqueous solution through the agency of a few specific types of silicates. The field of application ranges from the treatment of drinking water and industrial uses, to the purification of the most difficult-to-treat waste water. **Write to: Hans Heidenreich**, 50, avenue du Grand Port, F 73100 Aix-les-Bains, France.

ISRAEL

Melting Heat Absorbing Composition
A composition for recurring use with an absorption capacity of cca. 100 cal/gr and a composition for single use, with an absorption capacity up to 300 cal/gr. These compositions, besides offering high heat absorption, require easily accessible rough materials, involve simple, low-cost production (synthesis) processes and are adaptable to manufacture of products of any form.

Self-Hardening Paste for Closing Cracks in Auto-Engine Casings
A new paste which is claimed to have a practically unlimited range of operation. The operating range of the repaired section is said to always surpass that of the original (300 to 400 000 km). The paste is also suitable for closing cracks in aluminium components. Can be used in automobile and aircraft, industry, in general machine construction, in shipbuilding, etc.

Fire and Heat Protective Ablative Materials and Components
A group of materials developed for the protection of various materials and products against direct exposure to flame and high temperatures. When protected by 8-10 mm layer of the composition materials such as shells, explosives, photographic films, boxes, etc., placed in the epicentre of a fire will neither explode nor ignite for a minimum period of one hour.

Concentrate for Salted, Spicy and Pickled Fish Preservant
A number of new concentrates have been developed for obtaining different kinds of preserves (in wine, eggs, mustard, spicy and other jellies) for salted, pickled and spicy fishes, pastes of anchovy, herring, etc.

It is claimed that these preserves make the final product less expensive by reducing the technological process and the cost as well as the volume of shipments. The concentrates which contain only natural biologically active substances (such as protheolytic berments), spices, flavouring additives and conservants are easy to prepare from frozen raw material.

Unique Electric Separation Process
High gradient electric separation (HGES) and dielectric filtration (DF). This new technology is said to have enormous potential in mineral processing, the petrochemical industry, waste treatment and chemical and biochemical engineering.

For all offers listed above, write:
Attention Abraham Rom
Israel Institute of Innovation
27 Rothschild Boulevard
P.O.B. 30867
Tel Aviv, Israel 61308

SWITZERLAND

Stainless Steel Multi-Grill Apparatus
A Swiss company offers to a Canadian firm the manufacturing and marketing rights for Canada, under licence, for its new space-saving, fully gas operated multi-grill, with four burners that may be used separately. **Write: S. Cozzio, Seco Multi-Grill**, Burenstrasse 25, CH4411, Lupsingen, Switzerland.

Pigment Paste
A pigment paste for the paint, varnish and coating industry. The preparation is suitable as tinting paste as well as for the formulation of full shades for aqueous, solvent-poor and solvent containing paints and adhesives, mono and multi-component systems, free of glycol. **Write to: PINOVA LTD. — Paint Technology**, P.O. Box 218, 4552 Derendingen, Switzerland.

Street Sweeper
A street sweeper of compact design, capable of coping with city streets and sidewalks. Pickup by vacuum system provided within the machine. It is claimed that the cleaning performance and the overall design and perfection of the sweepers are, so far, unmatched. **Write to: ROLBA COMPANY LIMITED**, Barengasse 29, 8039 Zurich, Switzerland

Chemical Admixtures for Concrete
A Swiss firm offers to a middle/big-sized Canadian company already producing building materials or chemical products for the building industries, under licence, the manufacturing and marketing rights for Canada, for its chemical concrete additives and protective coatings to overcome construction problems. **Write: H.P. Kuoni, Euco-Export Ltd.**, P.O. Box, CH-3422 Kirchberg, Switzerland.

UNITED STATES

Portable Pouch for Insulin
A portable, flexible, small refrigerating pouch for carrying and storing insulin needed by diabetics to prevent it from deterioration, is disclosed. The pouch comprises an insulating layer and a liner whose structure provides separate compartments for a refrigerating agent, a vial of insulin and a syringe. **Write to: J.H. Campbell**, P.O. Box 4162, Foster City, California 94404, U.S.A.

Air Cleaning Systems and Sound Control
A U.S. manufacturer offers for licensing its air cleaning systems technology which includes know-how covering electrostatic precipitators, wet scrubbers and cyclone collectors. The same firm also offers for licensing its sound control technology which incorporates know-how for custom and industrial applications. **Write to: E.P. Stastny, Director, Technology Management, Environmental Elements Corporation**, P.O. Box 1318, Baltimore, Maryland 21203, U.S.A. Telephone: (301) 368-7360

Technology for Two-Way Data Transmission on Power Networks
A U.S. corporation, which designs, develops and manufactures electronic equipment for the purpose of providing data communications over existing power networks, has developed technology that has resulted in a consistently reliable two-way data communications link. The equipment designs are adaptive to variable load changes on the power network and incorporate a method of modulation that overcomes the effects of harmonic noise and can work in an adverse white noise environment.

The corporation is interested in establishing through a joint venture, a Canadian corporation for the manufacture of products and continuing research and development engineering for providing a complete product line of equipment using their technology. **Write to: Robert E. Tolley, Communications General Corporation**, P.O. Box 869, Acton, Massachusetts 01720, U.S.A. Telephone: (617) 263-5469

Sale or Joint Venture — Machine Tool Company
U.S. manufacturer of bench type turret lathes and machine tools is looking for a Canadian investor for a joint venture arrangement or an outright purchase of the existing company. **Write to: J.J. Toomey, President, WADE Machine Tool Company, Inc.**, 49 River Street, Waltham, Massachusetts 02154, U.S.A. Telephone: (617) 894-1050

Airmotor
Inventor offers for licensing AIRMOTOR for bus and truck windshield wipers to operate with 50 per cent less air. The invention is patented in the U.S. **Write to: Dr. R.S. Paulukonis**, 6660 Greenbriar Drive, Cleveland, Ohio 44120, U.S.A.

TECHNOLOGY TRANSFERS

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SERVICES PROVIDED BY THE CANADIAN GERMAN CHAMBER OF INDUSTRY AND COMMERCE

After making initial contact with German firms offering or requesting technology, Canadian companies are invited to avail themselves of the services offered by the Canadian German Chamber of Industry and Commerce to facilitate follow-up.

With offices in Montreal, Toronto and Edmonton, the Chamber has been active in Canada for more than 15 years. It is a bi-national organization consisting of Canadian and German firms, trade associations and individuals active in commercial relations between the two countries. The aims and functions of the Chamber are to promote trade and to encourage mutual investment in both countries.

The Chamber can assist interested Canadian companies by:

- locating and listing sources of supply such as manufacturers, subsidiaries, representatives and agents and importers and exporters;
- providing information on particular markets, statistics, customs and excise duties and legal matters;
- undertaking tailored market research studies;
- providing information with respect to licensing and joint venture arrangements.

Interested companies can contact the Chamber at:

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Pièce 1110
Montréal (Québec)
H3A 1T8
Tel: (514) 844-3051
Telex: 05-24455

480 University Avenue
Suite 1410
Toronto, Ontario
M5G 1V2
Tel: (416) 598-3355
Telex: 06-23581

1330 Scotia Place
10060 Jasper Avenue
Edmonton, Alberta
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Tel: (403) 420-6611
Telex: 037-41662

Code A GTB 101
Auxiliary Motor for Bicycles
A very useful accessory for millions of bicycles worldwide to assist the rider by pushing him up steep roads by means of a small electric motor. Battery driven and easy to fix on any bicycle within 30 minutes.
Contact:
Commercial Division
Canadian Embassy
Friedr.-Wilhelm-Str.18
D-5300 Bonn 1

Code A GTB 102
Door Security System
Manufacturer of door security systems, mechanical and electronic, offers licensed production.
Contact:
Manfred Recke, Sales Manager
Cmd H.M. Recke
Postfach 571
D-7410 Reutlingen 1

Code A GTB 103
Plastic Cover for Cars
New patented awning box, lockable, for cars.
Contact:
Hermann Maurer
Weidenstr. 18
D-7406 Moesslingen 3

Code A GTB 104
Lightweight Collapsible Wheelchair
This wheelchair, approx. ⅔ the weight and collapsed size of conventional chairs, has an upholstered reclining seat of the car/aircraft type. Optional extra-hand lever drive controlling freewheeling, backward roll lock, gear-changing (incl. reverse), braking and steering.
Contact:
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Canadian Embassy
Friedr.-Wilhelm-Str.18
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Code A GTB 105
Aqua-Tech Bathtub Lifting Device
A lifting device for use by handicapped persons in the bathtub, in all environments from the hospital to the home. Fitted easily into any bathtub, and left collapsed while the tub is used by non-handicapped persons, the device is raised by a simple mechanism using water pressure obtained from a connection with the bathwater supply, and can be locked at any level, for example showering.
Contact:
Commercial Division
Canadian Embassy
Friedr.-Wilhelm-Str.18
D-5300 Bonn 1

Code B GTB 106
Productivity Increase in Knitwear Manufacturing
Special clamps for knitwear manufacturing from different coloured wool threads.
Contact:
Julie Pfingsttag
Thueringer Str. 17
D-7410 Reutlingen 24

Code B GTB 107
Modular Design Robots
Manufacturer of robots, modular design, DC motor drive, max. flexible by self-acting modules, interested in manufacturing of robots up to 50 in lifting capacity including periphery installations and software.
Contact:
Hans Hermann Schaper
Mentool Industrie-Leicht-Handling
Haid-und Neu-Str. 7
D-7500 Karlsruhe 1

Code B GTB 108
Glass Fibre Aircraft
German distributor of U.S. two-seat glass fibre covered aircraft interested in manufacturing of four-seat model.
Contact:
Dr. Peter Sautter
Gyroflug Ing GmbH
Flughafen
D-7570 Baden-Baden

Code B GTB 109
Bicycle Accessories
Well-established manufacturer of bicycles including components and production machinery interested in manufacturing mud-guards and electronic speed meters.
Contact:
Mr. Sprick, President
Julius Sprick GmbH Co Kg
Verler Str. 430
D-4830 Guetersloh 1

Code B GTB 110
Plastic Processing
Plastic products manufacturer (Duro and thermo-plastics) looking for further application of his technology in environmental protection products.
Contact:
Mr. Singe
Sico Singe Kg
Industries Str. 12
D-6290 Weilburg-Waldhausen

Code F GTB 113
Robot Modules for Use in Building Handling Equipment
This is a development, ready for series production, of robot modules with a carrying capacity of up to 40 kg designed for use in the simple construction of modular, CNC-operated handling equipment sets comprising up to six motor-driven axes. Cylindrical structuring gives a wide range of radial and axial adjustment, and thus great flexibility. These robots, for which investment and operating costs are low compared to compact robots, are teach-in programmable and have a remote control option.
Contact:
Commercial Division
Canadian Embassy
Friedr.-Wilhelm-Str.18
D-5300 Bonn 1

Code F GTB 114
High-Temperature Solid Heating Modules for the Manufacture of Industrial Furnaces
The elements consist of solid furnace-ceramics. The heating coils are not embedded in fibrous material but are secured through solid ceramic pipes, therefore they can be stressed up to the material limit of the heating wires without any local danger of superheating. Any additional control of the temperature of the heating wires is unnecessary.
Contact:
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Canadian Embassy
Friedr.-Wilhelm-Str.18
D-5300 Bonn 1

Code F GTB 115
System for Optional Operation of Internal Combustion Engines on Gasoline or Liquid Gas
A fully developed, cheaply produced system containing a new dosing device and a pressure regulator used together with modern electronics. Good operating characteristics are achieved by the liquid gas injection system, which regulates the fuel mixture, depending on the air intake volume and the load on the engine, in such a way as to achieve maximum fuel consumption without performance loss.
Contact:
Commercial Division
Canadian Embassy
Friedr.-Wilhelm-Str.18
D-5300 Bonn 1

Code F GTB 116
Electric Tools, Dividing Units, Rotary Tables
Well-established manufacturer of electric tools/dividing units, NC or automatic controlled and rotary tables, offers technology and manufactures to customers' design.
Contact:
G.H. Lange Werkzeugmaschinen
Telgenbrink 11
D-4800 Bielefeld 15

Code G GTB 117
Printed Pattern for Optical Cursor Control
A pattern comprising a particular arrangement of bar codes which, when read by a monocular optical sensor, enables the direction of movement and path to be determined, for the purpose of directly controlling a cursor on a computer screen. Since the pattern offers a high degree of usable redundancy even if the sensor only travels a short distance, the overall resolution achievable in the determination of the direction and path is dependent primarily on the resolution capacity of the sensor.
Contact:
Commercial Division
Canadian Embassy
Friedr.-Wilhelm-Str.18
D-5300 Bonn 1

Code H GTB 119
Printed Circuit Board Tester
Manufacturer of board tester including software for printed circuit boards interested in manufacturing of high-speed and in-circuit testing equipment.
Contact:
Commercial Division
Canadian Embassy
Friedr.-Wilhelm-Str.18
D-5300 Bonn 1

Code H GTB 121
Measurement System for Process Control Parameters
Non-intrusive measurement process and analysis system for determination of process parameters (density, thickness, homogenity, etc.) by X-ray, IR, UV, scintillation, etc.
Contact:
R. Loeffel or J. Bors
Loeffel Verfahrenstechnik GmbH
Haydnstr. 2A
D-7514 Eggenstein-Leopoldshafen 1

Code G GTB 201
Optics/Optronics Firm Seeks Laser, Display and Infrared Technology
Small business developing and producing optical components and optronic equipment, and with know-how in the field of high vacuum coating, seeks partner firm or licenser in the area of laser, display and infrared technology.
Contact:
Commercial Division
Canadian Embassy
Friedr.-Wilhelm-Str.18
D-5300 Bonn 1

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TSUKUBA EXPO 85
DWELLINGS AND SURROUNDINGS — SCIENCE AND TECHNOLOGY FOR MAN AT HOME
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Ibaraki Prefecture, Japan
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TSUKUBA EXPO 85
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April 17-24, 1985

Mr. Wiegmann
Deutsche Messe und Ausstellungs AG
Messegelaende
D-3000 Hanover 82, Federal Republic of Germany
Telephone: 0511-89-2735
Telex: 992728

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M5X 1B1
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Tel: (705) 675-0711
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Manitoba
P.O. Box 981
400-3 Lakeview Square
185 Carlton Street
Winnipeg, Manitoba
R3C 2V2
Tel: (204) 949-4090
Local Office:
Thompson
Tel: (204) 778-4486

Saskatchewan
814 Bessborough Tower
601 Spadina Crescent East
Saskatoon, Saskatchewan
S7K 3G8
Tel: (306) 665-4400
Local Offices:
Regina
Tel: (306) 359-6108
Prince Albert
Tel: (306) 764-7169

Alberta
Cornerpoint Building
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Edmonton, Alberta
T5J 3S3
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Local Office:
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British Columbia
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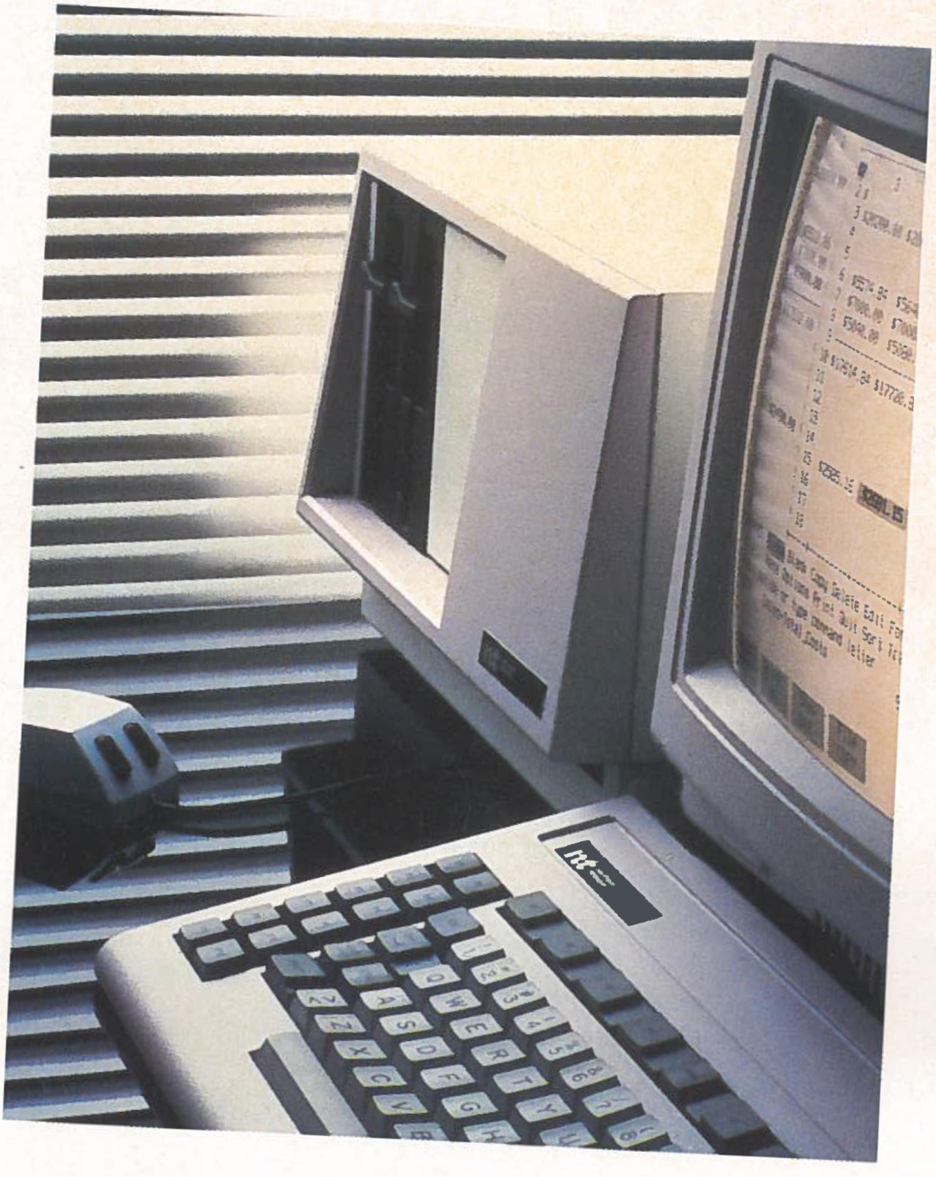

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