

COMMERCIALIZING ENVIRONMENTAL TECHNOLOGIES IN THE INTERNATIONAL ENVIRONMENTAL MARKET, [R. V. Laughton](#)¹

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INTRODUCTION

Although the development of environmental technologies and the corresponding sale of those technologies either nationally or internationally has been deemed a "new and emerging" technology for Canadians, it is no different than what has been experienced in the automotive, communications or computer fields. To be successful it is important to have a clearly defined and active market, an adequate supply of a technically sound technology, and the necessary approvals for the application of that technology in the different jurisdictions. This presentation deals with the capabilities of Canadian firms to develop and promote environmental technologies in a highly competitive international marketplace. Several case studies are used to illustrate the achievements to date.

There are several excellent European and American technologies that can, and have been, imported into Canada to deal with specific environmental concerns. It is important when evaluating the success of market penetration from our friends across the boarder that we take note of how our regulations and approvals mechanisms are structured and how this relates to our corresponding difficulties in penetrating markets overseas. Standards, approvals and regulations are the key components that restrict the easy transfer of these technologies between countries.

To be successful in the transfer of Canadian technology to the international market, a Canadian firm must be able to provide the following key components:

- the product whether goods or service must be unique and competitive in the country of destination;
- the technology upon which the process or service is offered must be technically sound and capable of undergoing extreme scrutiny by other approvals or regulatory bodies in the foreign countries;
- adequate financing from the Canadian supplier; and
- the proponent must be prepared to work long and hard to establish a key market place while developing strategic alliances with foreign country partners, in close cooperation with consular and embassy staff world wide.

As Canadians we have become spoilt by the relatively stable political nature of our economy, however this can not be an assumed fact when dealing on the business market internationally. All too many great Canadian projects have fallen to the way side, often at a great financial loss to the proponent, as a result of political upheavals in the receiving country. The early establishment of a "godfather" in the foreign country political structure can be a definite asset to the introduction of Canadian products or services, however collapse of this chain of communication can lead to swift and early termination of the assignment. In one particular instance, in which our firm was involved, four years of development in the Catalan Province of Spain fell to the way side when the public works department was split to form a new

environmental department.

As a result of that split our key contact in the public works department was removed from office. Not only did project development come to a quick and early halt, but our first major assignment in Spain was cancelled immediately by the new regulatory body. Apparently the new group felt little need for Canadian technology despite the prior request for and approval of the Canadian approach.

Prior to telling you a little about Pollutech's success selling environmental consulting services in the international market place, I would like to tell you about some of our friends and associates, members of the CENSOL INC. (Team Canada!), who have chartered a path that we can all follow.

Solarchem Environmental Systems

Over the past few years I have had the opportunity to travel internationally with Dr. Samuel Stevens, president and founder of Solarchem Environmental Systems, during which time I have not only had the opportunity to learn from his marketing techniques but also to obtain an appreciation of the technical soundness and international acceptance of Solarchem's advanced UV oxidation systems.

The Solarchem oxidation system, referred to as RAYOX, is based on the catalytic oxidation of complex organics using ultraviolet light and oxygen radicals (the photochemical degradation process). Solarchem's technology description indicates that:

- the process is an enhanced oxidation process designed to destroy water borne toxic/hazardous organics;
- it is based on the use of photons from high intensity UV lamps in combination with oxidizing agents, such as ozone or hydrogen peroxide;
- the target toxic contaminants can be oxidized to carbon dioxide, water, chloride ion and simple non-toxic organics; and
- it is best used when the contaminant loadings are less than 1 % (10,000 ppm) and 99.999 + % destruction is required.

RAYOX has been described as having process advantages because it can attain zero discharge criteria, it is easy to operate and maintain, the residuals are non-toxic and it is built to CSA and UL standards.

Through the application of this technically sound technology, Solarchem has been able to penetrate not only the Canadian environmental market but the international environmental market as well. Since 1989 Solarchem has been marketing the RAYOX process and now has 40 full-scale industrial applications in America, Europe and Australia. Treatment technologies have been put in place to handle contaminated ground water, industrial process water, and steam distillate from the regeneration of GAC columns.

In discussing the success of the Solarchem technology and marketing plan with Sam Stevens, he stated that his success in Canada and internationally was primarily attributable to a number of factors but primarily the following:

- regulations and enforcement;
- understanding where Rayox enjoys a competitive advantage in the market;
- working with customers to find the best value for dollar treatment alternative;
- strong support to existing customers;
- an active R&D program to stay ahead of the competition and to offer on-going improvements to customers.

Trojan Technologies Inc.

Most Ontario environmental engineers are familiar with Trojan's UV technologies, as it relates to the introduction of UV or ultraviolet disinfection as an alternative to chlorination principally for municipal wastewater streams. We at Pollutech have not only be fortunate enough to travel internationally with Hank Vander Laan, President of Trojan to learn of his marketing successes and technological advances but also to participate here in Ontario with pilot plant studies using the Trojan UV systems. For confirmation of Trojan's application in Canadian advanced technology, one need only to look at the new storm water treatment system for the City of Nepean which incorporates the Trojan UV technology. Chlorination would not only have been unpractical but would have been technically unacceptable at an application point such as the storm water ponds.

Trojan's story of commercialization is typical of the long hard process to gain acceptance for new technologies, and in particular for as a replacement for standard chlorination practices. In achieving this technical acceptance, Trojan relied on the following key points:

- resources spent on product development;
- government agencies that provided support (Environmental Technologies Commercialization Process, Environment Canada, and Export Development Corporation); and
- the Canadian and Provincial government support for full scale prototype testing and evaluation, as exhibited by the Tillsonburg evaluation by the Ontario Ministry of the Environment.

The commercialization of the Trojan UV system began in 1979, leading to the first prototype being installed at the Ontario MOE facilities in Tillsonburg in 1981. The success has grown with the installation of the first US system in Maryland in 1983, the first system installed in Australia in 1985 and the first U.K. system installed in 1989. The first "non-demonstration" system was installed in Canada in 1988. To date over 500 municipal wastewater UV disinfection systems are in place worldwide. In addition, hundreds of industrial applications have been place. Adding on to this some 60,000 household systems in over 20 countries demonstrates why Trojan is becoming a household name.

Today Trojan is active in Europe, Australia, New Zealand, Japan, the Pacific Rim and South America. Despite this international growth, 80 percent of their business still comes from the United States and Canada.

In discussing the pros and cons of introducing a new technology into both the Canadian and international market place, Hank Vander Laan of Trojan was very clear in his response. Hank stated that the his emphasis on marketing has been placed on the development of a professional network of manufacturer's representatives. He believes that Trojan's network of

over 70 representatives in the USA, Canada and overseas are the very best available. The network is key to enabling Trojan to respond quickly and efficiently to the customer's needs, through local professionals.

Aer-O-Flo Environmental Inc.

The group at Aer-O-Flo under the direction of Harry Marshall, President, have shown that there is a market for well designed rigidly constructed water and wastewater treatment equipment across Canada and internationally. Aer-O-Flo manufactures a wide range of screens, clarifiers, package aeration systems and sludge de-watering mechanisms for both the municipal and industrial market.

We have been fortunate not only to be able to put Aer-O-Flo systems to work here in Canada, but also working closely with them on international pilot plant projects for the introduction of this Canadian technology. The Aer-O-Flo success we strongly believe is based on the principal foundation that if equipment or process doesn't work they will repair or replace it for free or take the equipment back. As a firm involved primarily in process optimization and treatability studies, we at Pollutech have seen all too many systems abandoned and left to rot both here in Canada and internationally because they did not use the philosophy expressed by the Aer-O-Flo organization.

Aer-O-Flo Environmental's major achievements in the international market have included:

- three biological treatment plants over 200,000 gpd at Egyptian resorts;
- oil water separators for the power industry in Israel;
- heavy metals removal systems for manufacturing plants in Mexico;
- biological treatment plants for the oil fields of Russia;
- mine site treatment systems in Chile; and
- tannery waste treatment facilities in Korea.

The key points of success leading to advancement of the Aer-O-Flo technology across Canada and into the international markets extending from Israel to Chile can best be attributed to the following:

- producing a high quality system at a competitive price;
- flexibility of engineering management, ie. we can't always do international work the "Canadian way";
- the solutions approach - sell a system, not just a piece of equipment; and
- most importantly , the dedication of personnel to deal with the international market.

Aer-O-Flo has shown that following this approach, using Canadian manufacturers, they can ship plants throughout the world cost effectively. For example, even though the labour costs are lower in Egypt, Aer-O-Flo Environmental can ship to that country on a cost effective basis, and as Harry Marshall states "providing the quality that Canada has become famous for".

Summarizing his view, Harry Marshall stated that "despite the positive rewards the power of the large multi-nationals, as they become involved more actively in the environmental market, are going to make international market entry for the small entrepreneur more and more difficult without a cohesive national plan of technology introduction".

DelCan International Corporation

Moving away from the equipment manufacturers and suppliers and into the international consulting, we are fortunate to be able to present the Delcan International Corporation success story, as a key example of how Canadian technology can be exported internationally.

Although Delcan may not be the largest supplier of environmental consulting services in Canada, they are rapidly becoming the largest supplier of Canadian environmental engineering services internationally.

Having worked with the Delcan organization since the early 1980's we at Pollutech have seen them become the highest profile Canadian Environmental Consulting firm working on the international market. Delcan International under the direction of David Duggan, and the recently retired Bob Curtis, have been responsible for major environmental projects now under way in Venezuela, Turkey, Africa and Trinidad. These projects have not only required the application of Canadian design technology into the third world market place but have also required the development of Canadian manufacturing to be able supply in content required for these exports under EDC financing agreements. These side benefits to the Canadian manufacturing sector have been significant and will continue to grow.

In developing their technological expertise internationally, Delcan has clearly demonstrated the need to provide the following key services:

- a thorough understanding and familiarity with the international development banks, whether that be the African Development Bank, the Asian Development Bank, the Inter-American Development Bank, the World Bank or the newly formed European Bank for Reconstruction and Development;
- it is necessary to have a presence in the county where you are operating and thus there is a requirement not only for a strategic alliance with a local partner, but also the capability to put a Delcan work force at the point of the project during the early development stages;
- the prime consultant must be able to draw together a Canadian team as an equal or superior force to the giant British, French, German and Italian consortiums; and
- the firm must have the financial and personnel resources to be able to sustain a long term push into the international market place.

Some of the key projects that have been exciting not only for Delcan but for the sub-contractors and equipment manufacturers working with their organization are described as follows:

- the construction of two new major wastewater facilities near Maracaibo, Venezuela, serving a population of approximately 500,000 people at an estimated capital construction cost of \$65 million dollars;
- the design of new major regional wastewater treatment facilities in Kemer, Turkey; and
- the design of a large waste water treatment plant for the City of Kayseri Turkey, population 700,000.

In speaking with Bob Curtis, retired Vice-President and Chief Engineer of the Delcan

organization, who is currently on assignment for the development of international projects, we learnt that DELCAN's success has been based upon the previously mentioned key factors, plus the following:

- over 30 years experience in overseas operations as success does not happen overnight for persistence and staying power are essential ingredients to a successful endeavour; and
- a dedicated, committed number of people who believe in the development of offshore projects and who are prepared to make personal and family sacrifices which the extensive international travel entails.

Pollutech Environmental Limited

We at Pollutech Environmental Limited are a much smaller player in the international market place than our friends and associates described in the proceeding sections. We believe however that we have clearly demonstrated that a small Canadian consulting firm with a niche market can actively participate internationally and not only gain contract work for themselves but also be a leader in the development of consortium projects for a group of Canadian firms. Our philosophy on the international market place has always been to stick to the projects that we are best at, to be prepared to be any place in the world to respond to an environmental emergency within 48 hours notice, and never to compete against another Canadian firm once we have crossed the international boarder.

If we can not reach an agreement to form a consortium with other Canadian firms participating on an international project with which we have an interest, we will withdraw from the competition. The success of the British, French, German and Italian consortiums has been founded on their ability to put together a comprehensive design organization. We strongly believe that if we are not able to provide the same from the Canadian consortium then we will not be able to compete successfully in the international market place, particularly in the rapidly developing eastern european countries.

The projects that Pollutech has been involved with to date on the international market place are varied and represent the wider array of process consulting and testing services offered by our small Canadian organization. Our experience to date has related to the following:

- evaluation of marine sanitation devices for an industrial client in Hamburg, Germany, wishing to meet Canadian Coast Guard standards;
- environmental projects for sanitation and environmental regulations in Catalunya, Spain;
- process optimization and operator training for domestic waste water treatment in Kemer, Turkey and Maracaibo, Venezuela, as part of the Delcan International team through CIDA;
- a tannery environmental concern in An San, South Korea in conjunction with Aer-O-Flo Environmental;
- a major propylene glycol plant for Dow Chemical in Ningbo, China;
- lead contamination concerns at two distilleries in Nicaragua and Honduras;
- methods of fluoride emission control for the clay brick industry under a joint program with the Canadian Clay Brick Association and the German Institut für Zigelforschung;
- a number of small assignments in Lesotho, St. Lucia, Jamaica and Trinidad/Tobago; and
- two major textile manufacturers from Iran and Hong Kong, relocating to New Brunswick,

Canada.

We have attributed our success to date to a receptive marketplace, the assistance of Consular and Embassy staff internationally that have helped us develop strategic alliances with resident consultants who are familiar with the customs and projects of that country. Pollutech is a recognized test facility for Transport Canada and the Canadian Coast Guard, which enables us to act on marine projects both here in Canada and internationally. As well we have recently obtained NATO Secret Security status from Supply and Services Canada that allows us to work on decommissioning or investigative programs at armed forces basis in a wide selection of NATO countries. We are fortunate to have both the personnel and equipment to respond to significant environmental concerns around the world in a matter of hours. Some people may laugh at our aim to become the "Red Adairs" of the environmental business, but we see no shame in learning from the success of others.

If I was to summarize in few short points the key requirements for a firm such as ours to become successful not only here in Canada but on the international market place I would have to stress the following:

- it is essential to become familiar with consular and embassy staff in the host countries were you wish to begin market development or execute projects;
- it is totally impractical to believe that you can be successful internationally, without having a strategic alliance with the local consulting firm or a thorough advanced knowledge with whom you are working;
- be willing to allocate a great amount of time to responding to hundreds of contacts you will develop around the world, always realizing that it can be the one project that you least suspect that may turn out to be your greatest international success; and
- for a small company such as ourselves we must be prepared to work closely with organizations such as the Ontario International Corporation, Ontario Ministry of Trade & Technology, Investment Canada and Industry Science and Technology Canada to help us with the transfer of our technology internationally.

THE OTHER SIDE OF THE COIN

All of us at one time or another have had the experience not as the export technologists but as the importers bringing foreign technology into Canada to deal with environmental matters. The problems we face in obtaining regulatory approval for the use of international components in Canadian projects or the general application of Canadian technology, was a difficult prospect, but in the recent years this has improved.

Although there are numerous international technology restrictions that are experienced when entering Canada, such as obtaining CSA status or insuring that motors are wired to the correct voltage, there is a more restrictive criteria and that is obtaining provincial regulatory approval for the use of the technology. The classic example in Ontario has for many years been the introduction of the European technologies for rotating biological contactors at Canadian operations.

In the 1970's the Ontario Ministry of Environment, through their own research facilities determined that the maximum loadings for these facilities to be approved were far less than what had been applied internationally. At the time this technology was being introduced into

Ontario, there were numerous European and American installations where it had been clearly indicated that the loadings could far exceed the criteria established by the MOE. The Ministry of the Environment however remained firm and enforced their design standards.

With the introduction of the new guidelines for the design and operation of wastewater treatment facilities, the requirements clarified that the design guidelines were to be used unless pilot plant testing had been used extensively to confirm the design data.

In the early 1980's Pollutech was retained by the Regional Municipality of Niagara to determine the waste treatment needs for the City of Niagara Falls treatment facilities. Extensive pilot plant testing not only showed that the RBC technology provided superior performance for the food and beverage industry wastes but also that a conventional activated sludge plant could not be operated under the severe and wide range in organic and hydraulic loading rates. Even after completing a years study on the use of six bench scale biological reactors a pilot scale biological reactor and a side by side rotating biological fixed film reactor, the Ontario Ministry of the Environment was still hesitant to approve the system. It was only through the persistence of the Regional Municipality of Niagara and the extensive negotiations carried out between Pollutech, the Region and the Ministry that a Certificate of Approval was finally issued for the system.

As of this date, some eight years later the Niagara Falls RBC system has consistently met or exceeded the effluent criteria established by the Ontario Ministry of the Environment without any major mechanical or structural failures of the shafts in the RBC system. Although numerous challenges were made by the Ministry of the Environment with respect to the biological growth on the disks, and the capability of the units to meet the effluent criteria, we can clearly state that all of the regulations have consistently been met. In fact the process has far exceeded what any conventionally biological system would have been able to achieve.

We have been pleased to see two publications recently also reporting the use of egg shaped digesters for the secondary anaerobic digestion of municipal/biological sludge as engineers having exposure to the international market the use of egg shaped digester and the benefits has been common knowledge for many years, however, their application has been slowly recognized in Ontario. We often wonder how we can expect such immediate and quick response to the transfer of Ontario or Canadian technology internationally when we as a province or country ourselves are so slow to react to high quality technology from our friends abroad. Can we really consider ourselves to be any different that the people that we criticize across the boarder.

The final example I will illustrate today is of an ongoing operation of the newly constructed facilities that physical/chemical treatment is an appropriate way to handle peak flows or storm water flows at municipal sewage treatment plants. In two applications with the consulting firm of R.V. Anderson Associates Limited, in Welland and Port Dalhousie Ontario, the physical/chemical treatment technology has been applied with great success. A similar installation now undergoing commissioning here in the Town of Carleton Place as constructed by J.L. Richards & Associates Limited using the chemical/biological approach.

On several fronts there continues to be a challenge from the design approvals and regulatory officials who have been brought up in the days of biological waste treatment systems that were mirrored every time an expansion was required. It is clear today that full scale plant

optimization and treatability studies must be utilized to demonstrate the acceptability of alternative technologies. This in itself is a prime area of technology transfer to our partners in Europe, Asia and South America.

THE TEAM CANADA APPROACH

What we have attempted to demonstrate in discussion of the case studies presented today is the need to have a sound technical solution, a knowledgeable regulatory approvals process and a committed team structure to be able to handle the international challenges in environmental control. We must be willing to not only offer this as Canadians operating internationally but we also must be willing to accept this as a way of the future as Canadians operating within our own national borders. The powerful British and French water operating authorities are not far away and as much as we wish to cross the international borders so do they. As much as we require a strong offense, we also require a strong defence. The key to this I believe is a well educated technically cohesive and adventurous work force who is willing to tackle the international challenges of the future.

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