

Sustainability Now

Newsletter of the Sustainability Initiative

of the Association of Professional Engineers and Geoscientists of B.C.



If not now, when? If not us, who?

Editorial

Consulting Engineers and Geoscientists typically work in small independent enterprises, and work for clients on a contract basis. The margins are thin, and the competition sometimes global. In this environment, consulting engineers and geoscientists often feel that they do not have the power to implement sustainable solutions, that they are constrained by the budget and scope of their contract. However, the Sustainability Committee at APEGBC believes that knowledge is power, and by becoming aware of alternate solutions that address environmental and social issues while still meeting the bottom line, engineers and geoscientists can make a big difference.

For example, consulting engineers and geoscientists are often tasked with designing systems for resource extraction, energy supply, and waste management. These are areas that have huge implications for the environment and society. The choice of technology or process can impact land use, climate change, endangered species population and job growth. To find our way through this web of interactions we need to know what alternatives are

available, and what the likely consequences of our choices are.

This issue of Sustainability Now takes a look at applying sustainability to Consulting Engineering and Geoscience practice. The Consulting Engineering and Geoscience Industry has looked for cost competitive, long term solutions since long before sustainability became a catchphrase. More recently, FIDIC, the international body of consulting engineering has taken a strong, proactive stance on sustainability. In their policy on Consulting Engineers and the Environment, it is stated that:

“Engineers should provide leadership in achieving sustainable development — development that will meet the long term needs of future generations of all nations without causing major modification to the earth’s ecosystems”.

Sustainability Now aims to show how engineers and geoscientists can provide that leadership.

Anthea Jubb, EIT, Editor

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In Conversation with Raymond Tarnai, P. Eng

Project Manager, Sandwell Engineering Services Ltd.



Sandwell Engineering is the largest BC owned consulting engineering firm. Ray Tarnai, P. Eng, shares some of his experience implementing sustainability.

AJ: Please tell me a about your background and education and how you came to work with Sandwell Engineering.

RT: I am a 1985 UBC grad in Mechanical Engineering. I worked with Domtar for two years in Ontario, and when things started to pick up here on the west coast I moved back and

have been working with Sandwell ever since. I was able to work my way up from area engineering to project management. I also specialize in green energy, particularly biogas. I have worked a lot with the GVRD and with independent power producers who are coming up with green energy initiatives.

AJ: Just as an aside, did you work on the landfill gas project in Delta? (This project is featured in Sustainability 2004: Greening the Built Environment. See Page 6.)

In Conversation with Ray Tarnai, P. Eng Cont.

RT: That's right, I was the Project Manager for the LFG compression, clean up and transmission between the landfill and the powerhouse, located 3km away at the greenhouse. We did a similar project at the Hartland Landfill in Victoria.

AJ: Sandwell Engineering is a BC consulting engineering success story. Please tell me about its history and current operations.

RT: Sandwell itself was started in 1948 in Vancouver. It merged with a company called Swan Wooster in 1986. Swan Wooster dates back to 1925 so there is a tremendous amount of history within the organization. Between that time and now we have completed in excess of 25,000 projects world wide dealing with all major industries. We do full service engineering in all disciplines. Currently Sandwell is BC's largest locally owned engineering company.

AJ: What is an energy audit?

RT: An energy audit is a review of a facility in order to come up with ways to improve energy efficiency. It involves the collection of data, interviews of maintenance people and operations staff, and tests and analysis of the process in order to understand the current operation and to identify potential improvements from an energy standpoint. After the facility review and improvement identification process, the capital costs are estimated and life cycle cost analysis takes place. All the findings of the study are summarized in a report.

AJ: What is the role of the Federal Government Agencies in energy audits?

RT: The federal government's role is primarily around funding opportunities and incentives for doing these kind of studies and for implementing them. They are also a key player in promoting energy awareness, and identifying companies that are leaders in energy efficiency.

AJ: Are you able to directly relate the results of an energy audit with greenhouse gas emissions?

RT: There is relationship between energy savings and greenhouse gas reductions. BC Hydro and NRCan carry out studies and surveys to come up with this information. In terms of tons of CO₂ offset per gigawatt hour of electricity, the average number here in BC is presently around 31 tons of CO₂ per GWh. For natural gas it is in the order of 55 kilograms of CO₂ per gigajoule of natural gas.

AJ: Aside from the cost savings, are there any other direct benefits to the client in GHG reduction?

RT: The greenhouse gas offset credits can add value to a project in different ways. For example, GHG credits could be used to improve the rate in an energy purchase agreement.

AJ: Aside from environmental reasons, why would a company choose to do an energy audit?

RT: The main reason is operational cost savings, but the increased efficiency also has all sorts of other benefits that seem to appear. Energy efficient operations tend to become more advanced, with better quality control and improved operations. It also challenges the staff to excel.

AJ: Please give me a specific example of an energy audit, including recommendations and results.

RT: A good example of an energy audit is a mill wide study we carried out for a BC newsprint mill. We looked at reducing water, compressed air, and steam consumption, waste stream utilization and so forth. We came up with about 50 different recommendations. Some improvements were easy to approve – they had an instant payback. Many had a payback of less than 2 years. So just to pick one as an example – a paper machine shower water heating system – the paper machine shower water is fresh water that has to be heated to from 50 to 150 degrees Fahrenheit. What we identified was that there was heat from paper machine hood exhaust glycol heaters that was not being used in the summer time, so there was an opportunity seasonally to take heat that was being rejected in the summer and reduce the amount of steam required for the final heating of the shower water. The payback on the \$100,000 job was less than 2 years.

AJ: What do you see as major barriers to increasing energy efficiency among your clients?

RT: Financing issues - A lot of companies put a tight cap on the number of years for payback. This tends to rule out projects that perhaps should go ahead but don't because of the internal financing restrictions. Staff - Many of these companies do not have the extra staff needed to implement these projects. Upper management buy in – People who have been in the industry for years, doing it their way, are quite happy with their process and are just not motivated to make these changes right away.

AJ: Do you have any suggestions for overcoming these barriers?

RT: Clearly demonstrate the advantage of energy efficiency to management by showing examples of where other businesses have benefited from the energy auditing process. The consultant must demonstrate that this is legitimate, that there are some improvements that will save money for sure. Once a company sees a few of the improvements, then perhaps they will go all the way and maybe even put into their mission statement that energy efficiency is part of what their company is all about.

In Conversation with Ray Tarnai, P. Eng Cont.

AJ: Have you had that happen in the past?

RT: Yes. Schneider Foods was a good example of that. They got so excited about it that their management incorporated it into their mission statement and they started to do audits at most of their facilities across Canada.

AJ: What is the level of interest in energy efficiency at manufacturing / industrial facilities?

RT: Right now it is really mixed. Interest is growing in businesses that are impacted by the rising cost of energy and increased competition. Certain businesses have really embraced energy efficiency and are flying with it but others are still at the starting block.

AJ: How do you see the role of APEGBC and of Professional Engineers in addressing energy efficiency and climate change?

RT: Continue to emphasize the importance of energy efficiency and sustainability in our projects. APEGBC's continued recognition of sustainable projects would also be beneficial. For example, CEBC, (Consulting Engineers of BC) looks at sustainability as part of their award criteria. So certainly for anything APEGBC is involved in, recognition of sustainability would be a good criteria as well.

Staying current with developments in issues related to climate change does take a certain level of effort, but it is important. Clearly as engineers we need to demonstrate to our clients the benefits of more energy efficient processes, and that requires a clear demonstration of reduced operating costs, improved maintenance, reduced environmental impact, and the fact that it does tend to attract more talented staff.

I think engineers have an incredibly important role to play, especially since it is their recommendations that the clients are going to be following. Engineers are in a position to make a significant impact on the advancement of sustainability.

AJ: Please recommend books or websites related to sustainability.

RT: BC Hydro at www.bchydro.com/environment and the GVRD at www.gvrd.bc.ca/sustainability.

Natural Resources Canada at www.nrcan.gc.ca/es and Climate Change at www.climatechange.gc.ca.

The Ontario Center for Environmental Technology Assessment, OCETA, at www.oceta.on.ca.

The US Department of Energy, Energy Efficiency and Renewable Energy at www.eere.energy.gov

Technology Brief: NORAM Bio Systems Wastewater Treatment

NORAM Engineering and Constructors Ltd. specializes in the commercialization of new chemical processes for the chemical, pulp and paper, minerals processing, electrochemical, and wastewater treatment industries. NORAM is truly a B.C. Consulting Engineering success story with clients worldwide. In the wastewater treatment area, NORAM has advanced a technology that substantially reduces land impact over conventional treatment.

VERTREAT™ (VERTical TREATment) is a high-rate activated sludge process, and VERTAD™ (VERTical Thermophilic Aerobic Digestion) is an auto-thermophilic, aerobic sludge digestion process. These biological processes are complemented by NORAM's Supercritical Water Oxidation Technology (SCWO) which effectively destroys persistent non-biodegradable organic compounds, including dioxins, furans, and PCBs.

The VERTREAT™ process treats high-strength industrial and municipal wastewater streams. A compact, aerated shaft replaces the primary clarifiers and large open aeration basins commonly found in activated sludge systems. Operating

costs are reduced by about 50% compared to conventional systems.

The VERTAD™ process achieves greater than 40% volatile solids reduction in a 4-day detention time, producing pathogen-free Class A biosolids. VERTAD™ is a good retrofit for facilities utilizing mesophilic anaerobic digestion, transforming a Class B biosolids facility to Class A biosolids, while reducing the volume of biosolids, decreasing operating costs, and increasing digestion capacity. The reduction in volatile solids and dewatering polymers has an added benefit in the reduction of greenhouse gases associated to the reduced transportation requirements.

Both VERTREAT™ and VERTAD™ use an in-ground vertical aerated shaft. This design results in a smaller reactor volume and reduced energy consumption. The in-ground installation of the processes requires only 10-30% of the land of a conventional treatment system. In some cases the entire treatment plant can be housed in a building, eliminating nuisance odors.



E3—Environmental Excellence in Exploration

By Barry Simmons, P. Eng. E3 Project Manager,
Prospectors and Developers Association of
Canada

Environmental Excellence in Exploration, E3, was conceived by a group of industry geologists who recognized the need for an accepted database of environmental mitigation procedures that could be undertaken during exploration activity. As a leading advocate and representative of the global exploration industry, the Prospectors and Developers Association of Canada, PDAC, concurred with this need and agreed to develop such a database and launch its distribution. Over \$500,000 was raised from various sponsors and the product was developed and launched in early 2003 at the PDAC Convention. To date, E3 has users in 24 countries across the world representing most of the world's largest mining companies, many junior exploration companies, governments, NGO's, academia and other stakeholders. Response has been universally positive.

E3 is a unique, on-line resource of field-proven, environmental best practices for use during exploration activities anywhere in the world. All activities are covered from acquisition, through access and surveys to drilling. The E3 program is an on-going vibrant project. By early March, the site will include a section on conducting exploration in areas of archaeological and cultural significance. This section is



being prepared with the cooperation of some of the most respected archaeologists in the world today. With the participation of experts in the area, we are also adding 'best practices' specific to certain geographic/climatic areas of the world including arctic, desert, tropical and alpine terrain.

With E3, the collective image of the mining industry can be improved, unrealistic regulations need not be imposed by bureaucrats and access to lands containing valuable mineral deposits should not be further compromised. As a global community, we need these mineral deposits to maintain and enhance the quality of life throughout the world. The mineral industry is committed to discover these deposits with as little environmental disturbance as possible. E3 is a significant addition to the tools necessary to fulfill this commitment.

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BC Offshore Oil and Gas Development Economic Outlook

The BC and Federal governments are currently considering lifting the Moratoria on Offshore Oil and Gas exploration off the BC coast that were put in place in 1981 following the Exxon Valdez oil spill. Environmental and resource title concerns are associated with this decision, but so are economic gains. A brief look at the economic gains to Newfoundland from the offshore oil and gas development in Hibernia is useful for assessing opportunities.

According to Canada-Newfoundland Offshore Petroleum Board 1997-1998 annual report, approximately 5 jobs per million invested went to Newfoundland residents with most of those in temporary construction. The Hibernia project was exempted from NAFTA, which now requires companies be compensated with subsidies for upholding local hiring policies. The currently preferred design for offshore exploration

is floating platforms. No deep sea port on BC's north coast has expertise or facilities for construction of these platforms, whereas they can be floated in cheaply from China and South Korea. These factors indicate that the percentage of local jobs is likely to be lower in BC than it was in Hibernia.

A report compiled by Dale Marshall of the Canadian Centre for Policy Alternatives details how Hibernia has required billions of dollars in subsidies from both the federal and provincial governments: grants, investment capital, tax exemptions, interest-free loans, and loan guarantees. Government royalties are tied to the highly variable world market price of crude, making it unclear whether the royalties from Hibernia will ever equal the amount of money the two levels of government have poured into the project.

Alternatives to oil and gas should be (see *BC Offshore* pg. 6)

Letter from Africa: Ghana's Multifunctional Platform (MFP) Project

By Mike Quinn, Mechanical Engineering Student
Engineers Without Borders (EWB)

Engineers Without Borders is a registered charity dedicated to international development. It depends on the generous donations of engineers and firms across Canada to support projects like the one described below. For more information on the organization visit www.ewb.ca.

When I received the call from Engineers Without Borders (EWB) that I was going to Africa, I was ecstatic. I had been given the opportunity to apply all my hard earned technical knowledge in mechanical engineering at The University of British Columbia (UBC) to alleviating poverty in Ghana, a poor West African country that ranks 129th out of 173 countries on the United Nations (UN) Human Development Index. This volunteer placement, I thought, would let me do what I believed all engineers should be doing – using our technical expertise to help *people*. After all, I had learned that over 800 million people in the world are hungry, 1 billion lack access to water, and more than 2 billion don't have basic sanitation services. I thought: *Couldn't technology driven by Canadian engineers provide solutions to some of these problems?*

I have now spent the past four months volunteering with EWB's partner, the Kumasi Institute of Technology and Environment (KITE). KITE is a Ghanaian non-governmental organization (NGO) with a mission to alleviate poverty through the promotion of decentralized, environmentally friendly rural energy technologies, information and communication technologies (ICTs), and on a macro-level, energy policy implementation. Over 80% of rural Ghanaians lack access to electricity, and those who are plugged into the grid suffer from frequent blackouts. In addition, Ghana's hydropower generation capacity has been maximized and the country is left in somewhat of an energy crunch – both in terms of generation and delivery.

As one possible energy alternative, KITE is championing the adaptation of the Multifunctional Platform (MFP) to Ghana. An MFP is a 10 hp diesel engine mounted on a steel chassis that can power various agro-processing machinery such as a corn mill and oil press. It can also drive an alternator to charge batteries, power a water pump, and light up to 200 bulbs. Furthermore, it can power hand tools such as saws and welders, spurring small-scale industrial development. MFPs are well established in nearby Mali as part of a decade

long United Nations Development Program (UNDP) and United Nations Industrial Development Organization (UNIDO) initiative.

But the MFP is much more than just an energy tool, as it is chiefly designed to ease the burden on rural women through the mechanization of tedious agricultural tasks. In 350 Malian villages with MFPs, the average annual income per woman has tripled from US\$34 to US\$101. Women beneficiaries have saved between 2 and 6 hours of time per day, and the attendance and performance of school age girls has increased as a result of not having to stay at home to help their mothers. Men benefit from the use of electricity for hand

tools and creation of jobs as operators and repair artisans. And the entire community benefits from an injection of life that follows the first light in a dark village.

In Ghana, I have just helped KITE construct and install the country's first MFP in a rural community of 2000 inhabitants near La Côte D'Ivoire border, 30 km from the nearest electricity pole. The platform has been given on loan to a female entrepreneur who runs a cassava processing business to supply

gari (a popular local food that is made by grating cassava and then frying it over a fire) to the village school. This pilot platform consists of an engine, corn mill, cassava grater, and alternator for battery charging and lighting, and can be expanded at a later date.

I now recognize that technology driven by Canadian engineers will not solve the problems facing rural Ghanaian women because they are too complex and vary even between adjacent villages. Rather, Ghanaian engineers are the ones that need to drive the development of their country with technology appropriate to them. This is what Engineers Without Borders aims to do – *promote human development through access to technology* in a thoughtful and cost-effective manner. By focusing on building the capacity of local organizations like KITE, we can assist them in tackling locally driven projects like the MFP. And we can also reach out to the Canadian engineering profession to raise awareness of the human development challenges faced by billions of the world's people everyday, because change first has to start from home.

For more information on KITE and the MFP program in West Africa, visit www.kiteonline.net and www.ptfm.net.



Forest Stewardship Council of BC

Forest Stewardship Council (FSC) Certification is a chain of custody standard applied to timber and wood products that guarantees sustainable management of the forest resource and the wood processing facilities. Although other certification schemes exist, FSC is the most widely recognized internationally, and preferred by major retailers including Ikea and Home Depot. Since 1997 work has been ongoing in developing the FSC standard for British Columbia. This work is now in its final stage. A 3rd draft of the BC standards was completed and received preliminary accreditation from the FSC International governing body in July 2003. The FSC BC expects to complete a certification standards for BC in 2004. These standards will help deliver sustainable forest management through FSC certification on different forest types; provide protection to BC forest ecosystems, wildlife habitat & biodiversity through the application of the BC Standards; and assist forest managers to develop working relationships with First Nations, forest workers unions and environmental groups through the FSC certification process.

For more information on FSC lumber, including local suppliers, see www.fsc-bc.org.

Canada Green Building Council

Leadership in Energy and Environmental Design (LEED) is a US-based voluntary standard for developing sustainable buildings. The Canadian Green Building Council (CaGBC) is working to establish Canadian versions of this building rating system. LEED BC was approved by the USGBC in July 2003, and will be launched April 2004.

For more information on LEED Canada, visit www.CaGBC.ca.

Energy Research and Development Award

The Canadian Institute of Energy recently honoured Lignol Innovations Corporation with its 2003 Energy Research and Development Award for Biorefining for Green Fuel Production.

The award recognizes outstanding R&D achievement in the field of energy technology in B.C. A broad spectrum of potential energy technologies are eligible for this award, including those related to energy extraction, conversion, transportation, and utilization.

The APEGBC Sustainability Committee proudly congratulates Claudio Arato, P. Eng, Senior Engineer, Lignol Innovations.

BC Offshore (Continued from pg 4)

examined for long term economic benefit. The market for renewable energy technologies is growing rapidly, and, according to the Pembina Institute, renewable energy projects create 60% more jobs than conventional energy. Renewables also created long term, sustained employment.

BC Hydro has mapped Vancouver Island for wind energy, and a number of independent power producers are eager to develop wind power opportunities. In the UK, AMEC has developed and is operating five wind farms. Tidal power also presents opportunities for BC.

For more information see: www.amec.com; www.policyalternatives.ca; www.bchydro.com; or www.pembina.org.
- Anthea Jubb, EIT, Editor

Sustainability 2004 Traveling Exhibit

You can catch Sustainability 2004: Greening the Built Environment at various venues all spring. The exhibit is a collaboration between the APEGBC Sustainability Committee and the Architectural Institute of BC Energy and Environment Committee. It showcases over 30 innovative projects by professional engineers, architects, planners and students. To check the current schedule, visit www.sustainability.ca.

Sustainability Now

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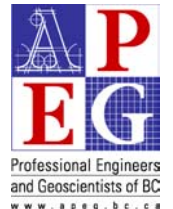
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"In every deliberation, we must consider the impact on the seventh generation" - Haudenosaunee (Six Nations Iroquois Confederation)