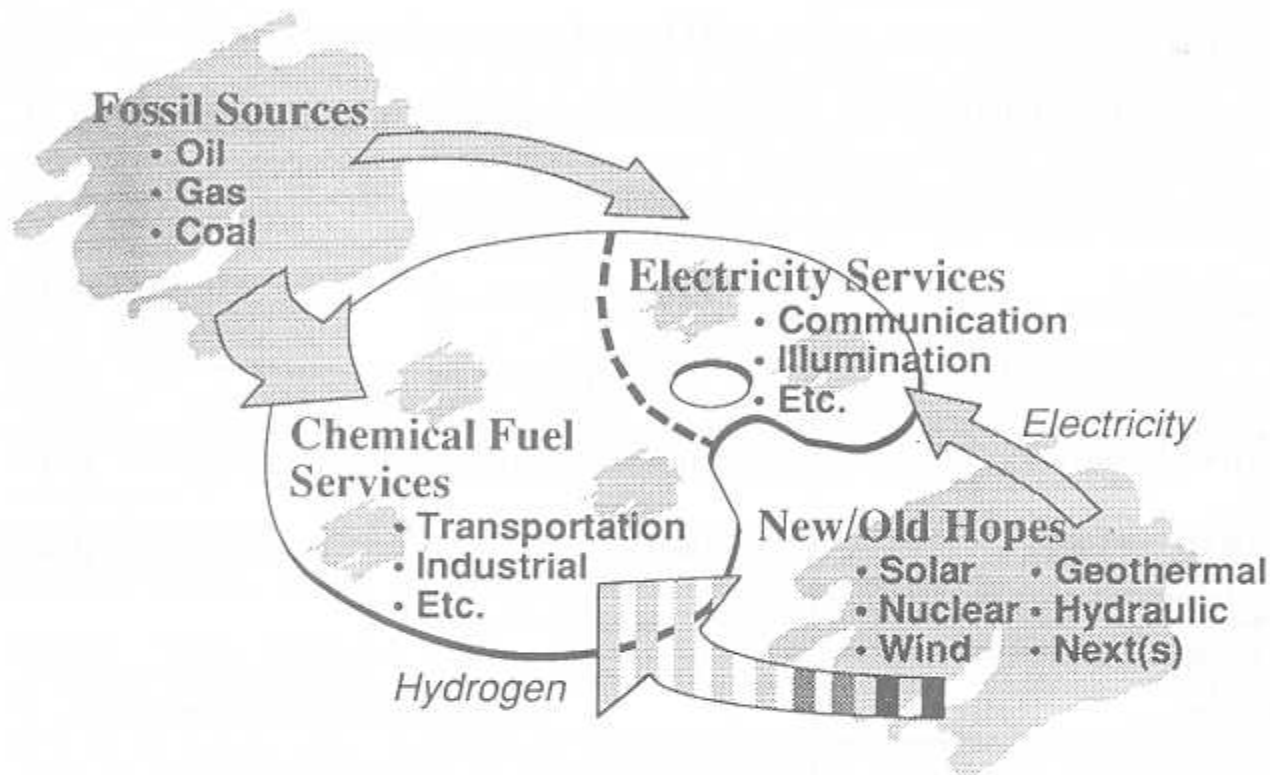


March
1993

bio-joule

PUBLISHED BY THE

BIOMASS ENERGY INSTITUTE



ANAEROBIC DIGESTION

- Construction cost cutting
- Energy Forum '92
- Straw slicer
- Ethanol news
- Wood energy

BUGS WORK FOR US!

Allan J. McInnes, President C.E.O.
BERCAN ENVIRONMENTAL
RESOURCES INC.

6028 Mount View Road, P.O. Box
238, Lantzville, BC V0R 2H0
Tel. 604-390-3113 (Fax -2312)

BERCAN ENVIRONMENTAL is a developer of anaerobic/facultative bio-remediation technology. They completed first and second stage research and development over a five year period, commencing in 1974 on to 1979 within the field of advanced formulas for fermentation/decomposition of organic matter using first generation microbial populations, encapsulation of both anaerobes and facultative anaerobes. This work provided compound formulations now manufactured in Canada with distribution through market representatives direct sales, to Bio-Augment and Bio-Remediate, natural fermentation by assisting natural organic decomposition. The manipulation of natural beneficial microbial populations allows for double the wastewater handling capacity in a conventional aerobic / anaerobic fermentation digester/ reactor system commonly found world wide in every town, city and village for sewage waste management. In many cases, anaerobic digestion is taking place without the knowledge of the user! Settling tanks, holding pits, and lagoons all act as anaerobic digesters.

Commercially used aerobic biodegradation is, generally speaking, the conversion of waste organic matter into new bacterial cell matter which can subsequently be stripped of its water component. The remaining solids from this process are then typically disposed of by landfill or

incineration. The anaerobic process, in comparison, converts organic wastes to gaseous end-products and micro-nutrient solids. Anaerobic municipal wastewater plants are quite common in European cities. Population densities and lack of suitable landfill sites, plus the potential for methane recovery for co-generation, have been the driving factors for this development.

Major Products and Markets

The firm manufactures products for industrial, commercial, domestic, institutional and environmentally safe cleaners replacing chemical products used for the same purposes. For example:

- Removal of noxious odours (hydrogen sulphide gas from decomposition), the latter a major former of (sulphur dioxide) as in "Acid Rain", provides such functions as air pollution control, drain openers, the removal of heavy organic deposits from sewer lines, and plumbing fixtures.
- Grease trap bio-augmentation/remediation of grease, fast waste in restaurants, hospitals, institutions, with disease bacteria control, storm drain cleaners, garbage waste management with biological separation replacing incineration method.
- Hazardous chemical waste management, toxic chemical waste management with anaerobic, facultative bio-remediation formulas.
- Sewage, farm animal wastewater management with disease bacteria control, air pollution control, ground water pollution control, with recovery of micro nutrient fertilizers, natural gas (renewable energy).
- All bio-augmentation/bio-remediation completed without the addition of oxygen and the release of effluent waters free of biochemical oxygen demand (BOD) is completed before effluent waters are discharged into pristine ecological reserves ie. river, lake, ocean, ground water, stream, all preventing environmental pollution.

Technology of the Company

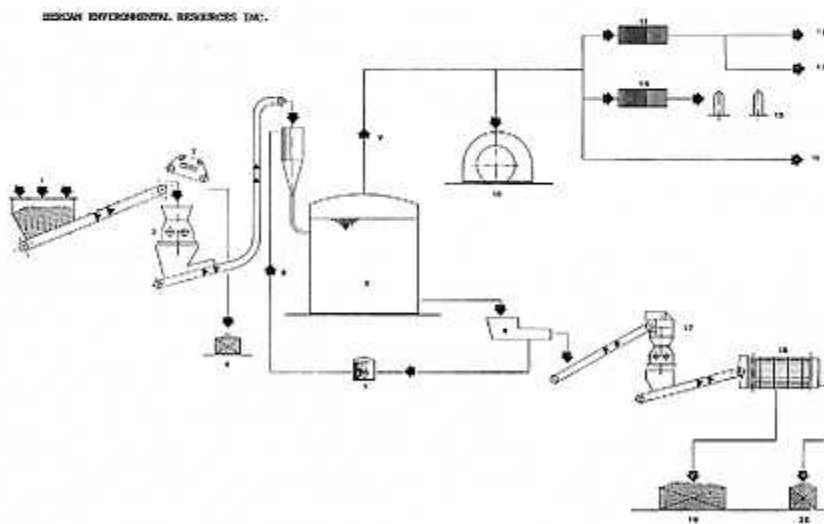
The discovery of beneficial anaerobic, facultative microbial populations of first generations along with the patent pending method of encapsulation of them in particular, the strains of genus methanobacteriaceae and others beneficial is a first time discovery of the types supporting anaerobic fermentation (beneficial) to man, with their first generation numbers available since the beginning of time. It has been proven by the assembly of these anaerobic, facultative types of microbes that not only organic matter in simple form can be decomposed and made safe but that chemical and hazardous wastes in man's environment can be decomposed and made non toxic to the environment as well. These bio-remediation components are available under varying trade names in different countries and are currently in use in Europe, United States, Australia, New Zealand, the Far East and Canada.

Some of the chemicals treated by anaerobic, facultative formulas are; ethylene glycol, methanol, xylene, toluene, patent armor-all (undiluted), phosphoric acid (26%), propylene glycol, addiment (concrete additive), cleaning compound, insecticide, compound resins, water based resins, propionic acid, vehicle lubricants (hydrocarbons), liquid synthetic plastics, tributyl phosphate, acetic anhydride, sonoco adhesives, linoil (linseed oil), sodium hydroxide, acetic acid (84%), resin plasticizer, neopentyl glycol and polyvinyl adhesives.

Products in Development

Anaerobic, facultative fermentation provides active supernatant liquors that can be drawn off for inoculation purposes. By force feeding this supernatant down into garbage landfill sites, using gas well drilling equipment, the landfill can digest the biodegradable matter contained. This procedure can produce large volumes of high quality natural gas, free of hydrogen sulphide gas, for use as a renewable energy source. Further, the porosity created in the landfill by digestion of matter, takes away the lateral pressures that are known to force leachate out and into arable lands, causing pollution. This same supernatant pumping can be applied to bioaugmentation of bitumen locked into sand and bitumen unpumpable in drilled oil wells. The procedure employed is to apply supernatant to increase fluidity, then directly ship the crude to refinery where heat temperature's applied will pasteurize in the process of refining by-products.

By applying bio-augmentation formulas of this type into existing sewage treatment plants, for example, these systems be they aerobic or anaerobic design, the new fermentation method will increase their handling capacity. As aerobic systems, at best, take care of approximately 30% of the organic solids introduced, the introduction of this bio-augmentation method brings them up to 98% efficiency, the same applies to anaerobic systems. As microbial population can be made to work harder by our method, completing decomposition in less time, the need for expensive hardware installations and addition is not required. We have shown that conventional digestors have been made to double their handling capacity, which means half the hardware costs are required to manage the average sewage wastewaters delivered into designed sewage treatment plants and removing the need for chlorination procedures as BOD and disease bacteria are biologically removed from the effluent discharge into the environment.



Bercan Environmental Resources Inc. Process

Thiokol

Thiokol Inc. Corporation, Utah, manufacture hi-tech equipment for the U.S. space technology program. They were in trouble with their wastewater treatment facilities, that had become so toxic from flush water polluted with everything from rocket engine fuels, to laboratory chemicals, that they simply stopped working. It was so bad that the nearest sewage wastewater treatment plant authorities would not accept the delivery by truck for treatment and disposal in their facilities. Further, EPA would not allow pumping out these systems and disposal in the nearest landfills. The consulting engineers were called in and advised that a new plant would cost \$1.8 million. We were called in and the septic tank system which had ceased to operate was brought into substantial EPA compliance and odours gone within 8 days of infusion of biocatalytic agents by BioConversion Technology, Inc., Salt Lake City, Utah. The problem solving provided us with introductions to treat other major areas of pollution problem solving. We now have annual maintenance contracts for all of Thiokol plants in U.S., and also secured their sister company's business, the Morton Inc. Corporation, manufacturers of air bags for the auto industry and NASA.

Legend

- 1- Conveyor-belt which feeds the plant
- 2- Scrap-metal removal unit
- 3- Crushing unit
- 4- Covered scrap metal
- 5- Anaerobic Reactor
- 6- Liquid-extraction press
- 7- Liquid recovery vat
- 8- Recycling of liquids to feeder unit
- 9- Biogas
- 10- Storage of biogas
- 11- Turbine
- 12- Electricity production
- 13- Hot water production
- 14- Biogas scrubbing unit (if required)
- 15- Gas ready for use (under pressure)
- 16- Biogas to distribution network
- 17- Unit for breaking up compost
- 18- Revolving drum for sifting
- 19- Production of sifted compost
- 20- Recovery of paper and plastic

Influent was treated at source points and personnel were cautioned that large slabs of grease and fat buildup to the interior of conduit lines would detach. The on-site treatment supervisor noted these deposits coming down the line into the diversion box about two weeks into the treatment. He observed one about three feet long!

Pakenham

The "Pakenham" Melbourne, Australia, sludge pond has been desludged every three years. The desludging (dewatering and disposal) procedure normally incurs very high capital and environmental costs. Bio remediation treated the toxic, hazardous, aerobic sludge and wastes placed together in a huge waste dug out lagoon. The inoculation program utilized the anaerobic inoculant known as Biospan BR90 and started December 30, 1991. By January 1, 1992 there was a 53.4% reduction in sludge solids. In this case we even reduced the heavy metals and the E. Coli, the latter down to very low content levels, along with the odour (hydrogen sulphide gas). Sludge removal continues as sludges are taken from the aerobic treatment plant and dumped regularly into the sludge lagoon. Further, we understand this lagoon receives septic tank sludges and industrial wastes, along with many others to numerous to mention. The BR90 formulation contains a proprietary method of sustaining methanogens.

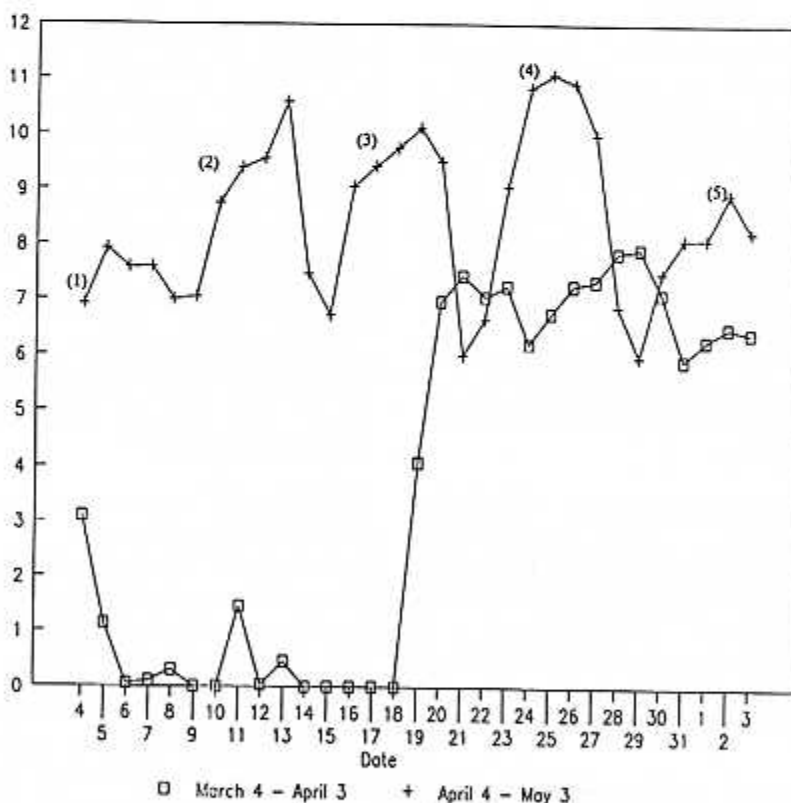
Canadian trials

Lethbridge, Alberta, Canada Packers required heavy deposit removal from one of the main City of Lethbridge lift stations. In this case our dealer did report that a crew had to enter this lift station weekly to shovel the sludge from the meat packing plant and hide works, as the build up was so bad that the lift pumps in the station were with serious cavitation that could cause them to burn out. The City of Lethbridge authorized a test using the Bercan Bio Sonic Filters. Constant monitoring of the project showed a

substantial decrease in odours and grease accumulation dropping from 130 cm to less than 15 cm in a 3 week period. Within this same time frame, the overall biogas production at the waste treatment facility increased approximately 30%. Further to our problem solving this situation, the BR90 biological applied, finally reaching the anaerobic digesters located in the Lethbridge sewage treatment plant, caused increased sludge digestion removal and increased their methane gas production.

The City of Calgary Sewer Division authorized tests on the sanitary sewer lines servicing First Street SE adjoining and including Riverfront Avenue SE. The treatment procedure for grease removal in these lines was to place measured amounts of Biocat in slow release modules and attach them to ladder rungs below the waterline in a selected manhole. The conclusion by our dealer and the City of Calgary, after five weeks of treatment was that approximately 90% of the grease and organic materials had been removed from the sewer lines.

The thing we can not understand is the fact that the City of Calgary will not use our filters even when we are absolutely certain it will save them one million dollars a year in maintenance costs. Further, others have telephoned the City of Calgary to discuss these very good results after viewing a tape made of the project. We understand callers have been told it does not work. It was also brought to our attention that Lethbridge does not use our system with similar comments from them. It's hard to believe why when there have been good demonstration results and the technology is used in domestic, commercial and industrial applications around the world. But it's one of the many reasons that we do not sell our technology in Canada. I do not intend to give up on Canadians accepting this technology and we are very interested in securing dealers in Manitoba, Ontario, Germany, France, and the Netherlands.



(1) Week 1 Treatment started on 5th Avenue Lift Station (2) Week 2 overall gas production on increase (3) Week 3 Methane gas production starts and peaks at (4) Week 4 (5) Treatment test period concluded

City of Lethbridge Results

Wastes Converted to Energy and Compost



Some of Partners travel to Portage la Prairie to site in March 1992

(Lto R: Ken Brown, Dan McInnes, and Chemical Engineer from Poland, City of Portage; Jan Oleszkiewicz, Daniel Bockru, Trin Yuthasastra-Kosol, University of Manitoba; Dan Hooper, PML; Luc de Baere, OWS; Hector Poggi-Varaldo, U. of MB.; Hector Franco, Laidlaw; Dan Archer, Manitoba Industry and Trade; Riek Slasor and Louis Chagnon, Environment Canada. Picture taken by Beth Candlish, Biomass Energy Institute)

The Environmental Engineering Division of the Department of Civil Engineering, University of Manitoba demonstrated in Portage la Prairie Manitoba, the Dranco pilot plant operation which will turn biodegradable municipal solid waste into compost. The equipment maintained a good environment for the growth of anaerobic microorganisms using sludge from the wastewater treatment facility at Portage and biodegradable municipal solid waste.

Anaerobic digestion has been used for treatment of sludge from sewage treatment plants for years. The solids concentration in this type of feedstock is below 8%. During anaerobic digestion, biogas (about 60% methane or natural gas) is produced and can be used for energy generation.

Laboratory work conducted at the University of Manitoba on a difficult-to-digest, high-in-cellulolytic material solid waste mixed with sewage sludge, demonstrated the optimum treatment

conditions at levels of solids from 30 to 35% total solids in the feedstock and a need for mass retention times equal to or larger than 20 days. The objectives of the Portage project were to demonstrate the technology of anaerobic digestion at higher solids level, about 30%. The feed included municipal and industrial solids, and sludges from the combined wastewater treatment plant in Portage. The City of Portage is a food industry centre and has a solid waste management problem.

The anaerobic digestion project was sponsored by ten organizations. The University of Manitoba has a long history in researching anaerobic digestion processes and together with PML (Poetker, MacLaren and Lavalin Inc.) personnel wanted to demonstrate this technology for producing a gas useful for energy purposes, in addition to compost. The Biomass Energy Institute promoted the project to the Environment Canada, Environmental Partners Fund, and the Manitoba Department of the Environment

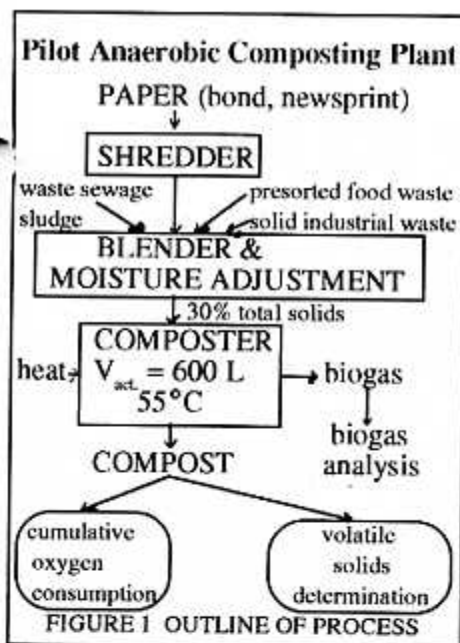
by Jan Oleszkiewicz,
Environmental Engineering Division
Department of Civil Engineering,
University of Manitoba
Winnipeg, MB R3T 2N2

indicated interest in the project. The City of Portage had a strong interest in the idea and provided an area near their wastewater treatment facility to test the equipment. Laidlaw bought the North American rights to Dranco through the purchase of another company and the Dranco pilot facility was in the United States. The equipment was loaned to the project.

Since the beginning of the project in 1991, three new "partners" became involved. Two employees to work on the project were obtained through the On-Site program. Organic Waste Systems, the Belgian company responsible for the development of the Dranco process in Europe, wanted involvement in the start-up of the pilot facility to assure success for the project and Procter & Gamble Inc. offered financial assistance for bringing a technical representative to Manitoba from Belgium to advise.

THE PROCESS

The general outline of the process is shown in Figure 1. The paper component, consisting of a combination of bond and newsprint, was shredded in a large shredder and fed into a blender. Pre-sorted food waste from the largest institutional kitchen in town; waste sewage sludge



consisting of sewage cake from the municipal sewage treatment plant; and the solid industrial waste consisting primarily of potato processing solids were blended with the shredded paper in the blender.

Following the blending and moisture adjustment to the required 30% of total solids, the mixture was gradually transferred to two 40 L reactors and the 1000 L composteur with an active digesting mass of 600 L. All three reactors were to be maintained at 55°C.

The equipment received on loan needed additional accessory equipment prior to commissioning of the reactors. In addition, the commissioning was much more complex and troublesome than anticipated. Biogas production was measured daily. Twice a week, methane and carbon dioxide content in biogas, alkalinity, acidity, and volatile organic acids in the extract, the total and volatile solids in the solids streams were analyzed in the Environmental Engineering Laboratory at the University of Manitoba in Winnipeg.

WASTE CHARACTERIZATION

Samples of waste were collected directly from a typical garbage truck route, sorted and weighed (the averaged composition is shown in

Figures 2 and 3). Compared to data reported in the literature, the municipal residential waste in Portage was high in food waste and low in paper waste. The annual quantities of solid waste from various sources in Portage were estimated at 4400 tonnes of residential or household waste, and some 99 tonnes of commercial waste.

The reactors achieved volatile solids destruction efficiencies in the order of 51 to 60%, comparable to commercial installations in Europe. The biogas (60% methane) production, at 90 to 130 L/kg fed was also comparable. The process proved robust and resistant to toxicity from air exposure and disturbances due to transient conditions. The process proved to be effective in decreasing the digesting mass and volume of municipal solid waste combined with the sewage sludge. The density of the compost was 760 to 1000 kg/m³ as compared with 600 kg/m³ in the feed.

The compost from the pilot reactor was high in ammonia and acetic acid and would need additional stabilization, perhaps through the application of an aerobic post treatment. Aerobic post treatment is standard procedure with the commercial Dranco process. The compost had a low concentration of heavy metals, mostly in the form of insoluble metal sulfides.

WASTE CHARACTERIZATION

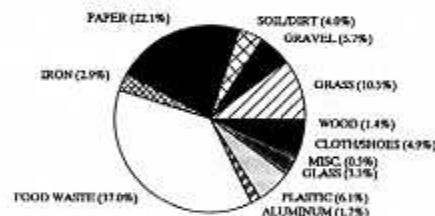
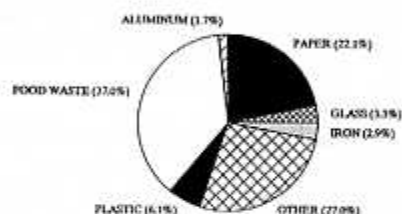



FIGURE 2 SIMPLIFIED COMPONENTS



FIGURE 3 DETAILED COMPONENTS

The project had many unforeseen delays in proceeding to the start-up of the reactors which meant an early termination to the original plan due to lack of funding. In spite of the reduced time of operation of the reactor, many useful results were obtained which will facilitate future potential to commercialize the dry anaerobic digestion process in Canada. The production of an energy source, the biogas, provides a resource not available when wastes are aerobically composted. Anaerobic digestion is an environmentally-friendly, sustainable technology.

**ANAEROBIC COMPOSTING
OF URBAN WASTES**
PILOT PROJECT UNDERTAKEN BY


**THE UNIVERSITY OF MANITOBA
CIVIL ENGINEERING**

IN ASSOCIATION WITH

 ENVIRONMENTAL PARTNERS FUND
 Manitoba ENVIRONMENT
THE CITY OF PORTAGE LA PRAIRIE
Poetker MacLaren Lavallin

PROCTER & GAMBLE INC. biomag
Organic Waste Systems Laidlaw Technologies Inc.

Winter Construction costs cut!

by Beth Candlish

Have you ever been to the parts of Canada which have building construction proceed in cold weather -- like -20 to -30°C? I am familiar with this technique of housing the site in a sheet of plastic and heating the area so work can continue on such tasks as pouring cement and erecting structures. As you can imagine, this is an expensive procedure, but does mean construction workers can be employed in the cold months of the year.

Tim MacLeod, T.J. MacLeod in Thunder Bay is the general contractor for C.D. Howe building a three story building for a Community Health Centre in Thunder Bay. Ordinarily, Tim would rent gas-fired, propane heaters to heat the construction site. For the job at the Community Health Centre, Tim budgeted \$25,000 for heating. Between submission of the proposal, acceptance and beginning work, Tim heard about wood boilers made in Greenbush, MN and sold in Thunder Bay by H & H Imports.

After receiving authorization from C.D. Howe and the other authorities, such as Environment Canada and safety regulators, Tim proceeded to cut his costs for heating, purchasing rather than rent equipment and provided an example of initiative which can utilize local wood as an energy source and save on waste disposal of construction wastes by burning these wastes to provide heat for the building site!

In addition to the wood boiler purchased, Tim says, "I needed three radiators to put inside the enclosed area for the hot water to circulate through, and the plumbing contractor on the job said he had some old radiators which I could use. The boiler is outside the building, and fire authorities were happy! The wood costs about \$1000/month for the winter months. I will probably still remain within the \$25,000 budget figure, and have purchased equipment which will do me for another number of jobs -- saving expensive rental costs."

Comments from all concerned have been very favourable and Tim MacLeod anticipates the procedure of an outside, wood-fired boiler and inside radiators for hot water circulation, will be used in the future where the economics is right! Plans are in place to use a wood boiler to heat a six apartment building in Armstrong, Ontario -- another project for C.D. Howe.

(Contact: An enthusiastic Tim MacLeod, T.J. MacLeod Construction, 700 Norah Crescent, Thunder Bay, ON P7C 4T8. Tel. 807-623-7875. H & H Imports, R.R. #, Thunder Bay, ON P7C 5M9. Many thanks for this interesting story to Ron Quick, Ontario Hydro and Janice Huston with the Community Health Centre. Ron has just about paid for his dinner now!)

World Resources Institute Announces new President

(World Resources Institute, 1709 New York Ave., N.W., Washington, D.C. 20006 USA)
The board of directors of the World Resources Institute selected Jonathan Lash, a distinguished leader in environmental law and former Vermont Secretary of Natural Resources, as the new president of WRI. Mr. Lash took over as head of the independent policy research center in January, 1993, when James Gustave Speth stepped down.

"I am delighted to join WRI because it is unique in drawing the connection between environmental change, development, and justice. WRI combines long-term vision with work of immediate practical significance," Mr. Lash said.

Forestry News

DOMTAR to save \$90-million a year

Recycling process to make fine paper called a world first

(Globe and Mail, February 13, 1993)

A new process to make fine paper from old cardboard boxes is expected to save Domtar roughly \$90-million a year in costs at its mills in Cornwall, Ontario and Windsor, Quebec. This is believed to be a world first in recycling that allows replacement of much of the softwood pulp now used to produce fine writing and printing paper with cheaper old cardboard boxes.

The new patented process was developed at a cost of about \$3-million over two years. At a news conference in Senneville, Quebec, site of the company's research centre, Stephen Larson, President of Domtar's pulp and paper division, said this technology will reduce its paper-making costs by up to \$125 a tonne. The cost savings are based on pulp selling at \$650 per tonne and on old corrugated selling at about \$80 per tonne. The technology is cheaper to install and to run than a traditional de-inking plant and produces almost no sludge.

Decision on Forestry Postponed

(University of Toronto)

The Academic Board's Planning and Priorities Committee has postponed making a decision on the future of the undergraduate forestry program. A dozen speakers urged the committee reject the recommendation for closure. Professor Emeritus Morris Wayman of Forestry said, "The elimination would likely result in fewer donations to the University and a less favourable attitude towards U of T by government decision-makers. It is short-sighted to save pennies and squander our good name and lose millions."

BIOMASS INFORMATION SOURCES

SUSTAINABLE ENERGY AND MINERAL DEVELOPMENT:

A Realistic Response to the Environmental Challenges.

Standing Committee on Energy, Mines and Resources. A. Johnson, Chairman. 1993. 202 pp. Standing Committee on Energy, Mines and Resources, 6th floor, 180 Wellington St., Ottawa, ON K1A 0A6. Free. BEI 1404.

The original intent of the Committee was to consult industry representatives on what they believed to be a realistic action plan to meet current challenges, and what the cost to them of such a response might be. Early in the process, industry representatives indicated to us that the task set by the Committee was an impossible one owing to what they perceived to be the lack of a reasoned and ordered federal policy on the environment.

The Committee shifted focus to emphasize how governments could improve their environmental policy framework to ensure that industry's response would lead to sustainable development within the energy and mineral sectors.

The Committee members feel that an environmentally effective and affordable response by industry would be greatly facilitated if government made changes in the following areas:

- making the consultation and decision-making process more open;
- prioritizing the Green Plan initiatives according to the relative severity and urgency of the corresponding environmental problems;
- emphasizing the economic impacts of various policy measures;
- harmonizing environmental regulation and legislation throughout the country; and placing greater reliance on market-based measures.

The Committee focused considerable attention on means to enhance energy efficiency opportunities, given Canada's intense use of energy in industrial production. The Committee concluded that the federal government should devise innovative measures, including financial rewards, to achieve energy efficiency gains without jeopardizing Canada's competitive advantage in energy.

Every effort should be made to satisfy domestic environmental objectives by implementing cost-effective measures that would increase the efficiency of energy production and use at home. Countries in Canada's position should also be permitted to receive credit for international action if such action leads to lessening of what is essentially a global problem.

(Excerpts from a letter accompanying the report)

The report reviewed the environmental challenges facing the Canadian energy and mining sectors, including nuclear, coal, oil, natural gas, hydroelectricity, biomass, wind, solar and hydrogen energy. The historical trends and current potential for energy efficiency improvements were examined prior to recommending directions for future federal environmental policies. (reviewed by Beth Candlish)

Most attention was placed on the enhancement of opportunities in the area of energy efficiency, and the issue of global climate change during the hearings. The process used to develop the Clean Air Strategy for Alberta was recommended as a model for improved decision-making. The special management process developed has a flexible, sequential, decision-making framework and is designed to be "ongoing and cause stakeholders to re-evaluate issues, priorities and decisions as new knowledge becomes available and environmental challenges change."

Throughout the hearings, industry expressed its worry concerning a perceived lack of sound scientific understanding of environmental issues enabling problems to be properly identified and appropriate solutions fashioned, thereby avoiding costly mistakes.

In the biomass energy chapter the statement is made that biomass contributes approximately 8% of Canada's energy supply, the usual figure identified. However, early in the report, there is a diagram labelled Primary Energy Production by type 1991 and a segment titled "other" (waste wood, spent pulping liquor, primary steam, other unspecified fuels) was 3%. These two figures must mean different things, but one looking at the primary energy type diagram would assume biomass energy was identified in the "other" category and question the 3%. The future of biomass is seen to be in ethanol for fuel. (see also p. 16)

REPORTS

BEI 1404. SUSTAINABLE ENERGY AND MINERAL DEVELOPMENT: A Realistic Response to the Environmental Challenges. Standing Committee on Energy, Mines and Resources. A. Johnson, Chairman. 1993. 202 pp. Standing Committee on Energy, Mines and Resources, 6th floor, 180 Wellington St., Ottawa, ON K1A 0A6. Free.

BEI 1405. FROM WORDS TO ACTION. Standing Committee on Environment, sub-committee on Acid Rain. S. Darling, Chairperson. 1992. 31 pp. House of Commons, Ottawa, ON. Free.

BEI 1406. NEW DEVELOPMENTS IN GAS SEPARATION TECHNOLOGY. T. Kondo. 1992. 22 pp. Toray Research Center Inc., 3-3-7 Sonoyama, Otsu, Siga 520, Japan.

BEI 1407. EFFICIENCY, TRADE AND THE ENVIRONMENT. Proceedings Energy Forum 92. 1992. 253 pp. Energy Council of Canada, 130 Albert St., Suite 305, Ottawa, ON K1P 5G4. ISSN 0840-884X. Price \$40.00.

BEI 1408. INDUSTRIAL-STRENGTH WOOD ENERGY. Newviews Community Forestry Inc. 1992. 177 pp. Box 1000, Killaloe, ON K0J 2A0. Price \$20.00.

ANNUAL REPORTS

BEI 1409. INTERNATIONAL INSTITUTE FOR SUSTAINABLE DEVELOPMENT. 1991-92. 26 pp. 161 Portage Ave. East, 6th floor, Winnipeg, MB R3B 0Y4.

BEI 1410. NRC-CNRC CANADA INSTITUTE FOR SCIENTIFIC AND TECHNICAL INFORMATION. 1991-92. 30 pp. National Research Council of Canada, Ottawa, ON.

BEI 1411. NRC-CNRC INSTITUTE OF BIOLOGICAL SCIENCES. 1991-92. 80 pp. National Research Council of Canada, Institute of Biological Sciences, Ottawa, ON K1A 0R6.

New Publications Available

REAL LIVE SCIENCE

The Young Naturalist Foundation is a not-for-profit organization committed to nurturing the potential of children by encouraging their understanding and enjoyment of science, nature and the world around them. They publish OWL magazine for ages 8-12 and Chickadee for ages 3-8.

Real Live Science is a book designed to interest young children in science and research by introducing them to 21 Canadian scientists from many disciplines. It is written by Jay Ingram, award-winning science author and radio personality. The scientist is presented, their area of study and an activity illustrating the principles of the scientist's work that can be tried in the home.

Some of the scientists highlighted in the book are orangutan expert Biruté Galdikas, astronaut Roberta Bondar and aeronautical engineer James DeLaurier, co-designer of the world's first flapping flying machine.

Readers are encouraged to take a space trip in a spinning chair, try out some homemade insect repellants, or test the principles of lava with a spongy mixture that becomes breakfast pancakes.

The book is directed to ages nine and up. Price \$9.95 plus tax. There are discounts for buying in quantity. Contact: Sally Loughheed, Sales Manager, Firefly Books, 250 Sparks Avenue, Willowdale, ON M2H 2S4. Tel. 416-499-8412. Fax 416-499-8313.

First Element

A newsletter about hydrogen research. The first issue in January 1993 features research under way to make environment-friendly pulp bleach from hydrogen, Alberta's pulp and paper industry (a brief overview of bleaching processes), a report of a hydrogen research workshop and a research project aimed to upgrade bitumen using a unique process.

Contact: Research and Technology Branch, Sustainable Energy Development Division, Alberta Energy, 11th floor, 9945 - 108 Street, Edmonton, AB T5K 2G6. Tel. 403-427-80442.

FOOD IRRADIATION -

A Canadian Folly
Learn more about food irradiation and its uses, nutritional and safety concerns, environmental risks, the policies of food irradiation, and alternative processes. This 230 page research manuscript is written by Karen Graham, a registered dietitian. Contact: Paper Birch Publishing, 89 Wilkinson Crescent, Portage la Prairie, MB R1N 1A7. Tel. 204-857-7365. Price \$19.95 (includes GST).

COMPOST

Science and Utilization
Engineers, crop specialists, microbiologists and other researchers who develop new ways to convert organic wastes into soil improving compost will be interested in this new refereed quarterly. A one year charter subscription (4 issues) to the journal is US\$121 in Canada, US\$99 in the United States and US\$127 elsewhere.

The first issue has the following topics:

- Improving the aerated static pile composting method by the incorporation of moisture control;
- A kinetic model of the yard waste composting process;
- Characterization of organic matter in MSW compost;
- Enhanced food quality: effects of compost on the quality of plant foods;
- Waste recycling through composting in Nigeria;
- Needed: Regional inventories of organic residuals; and
- Cost considerations of municipal solid waste compost.

Each paper includes: an abstract; descriptive, including graphs, pictures and/or tables; and references. The final paper, from New Zealand, describes the absorption of ammonia released from poultry manure to soil and bark and the use of absorbed ammonia in solubilizing phosphate rock.

Contact: Compost Science & Utilization, 419 State Ave., Emmaus, PA 18049 USA. Tel. 215-967-4135. (Canadians who request a review copy be prepared to pay over \$7 for GST! Apparently the minimum charge for "processing" is \$5!)

Of Interest From Journals

BIOMASS & ENERGY

Vol.3, No.5, 1992

Effect of ambient temperature on the heating/cooling requirement of a single cell protein batch reactor operating on cheese whey by A.E.Ghaly, R.M.Ben-Hassan and N.Ben-Abdallah, (Canada), Technical University of Nova Scotia, Box 1000, Halifax, NS B3J 2X4. p.335-344.

The economy of Single Cell Protein production can be improved by operating several batch reactors in a series in which the heat removed from one unit (during the cooling phase) is used to heat the next unit (during the heating phase).

The stability of silage from fish mortalities by K.V.Lo, Y.Gao and P.H.Liao (Canada) Bio-Resource Engineering Department, University of British Columbia, 2357 Main Mall, Vancouver, BC V6T 1Z4. p.357-361. Acids should be added to stabilize fish silage during storage.

Simultaneous saccharification and fermentation of several ligno-cellulosic feedstocks to fuel ethanol by C.E.Wyman, D.D.Spindler and K.Grohmann (USA). p.301-307.

For the pretreatment conditions employed, excellent results were obtained for corn cobs followed by corn stover, wheat straw, weeping love grass, the woody crops, and switchgrass. Only the legume, *S. lespedeza* did not give good ethanol yields.

Vol.3, No.6, 1992

Quality of gas produced from wheat straw in a dual-distributor type fluidized bed biomass gasifier by A.Ergudenler and A.E.Ghaly (Canada) Technical University of Nova Scotia, Box 1000, Halifax, NS B3J 2X4. p.419-430.

A typical gas composition at the optimum equivalence ratio of 0.25 was 7% H₂, 7% hydrocarbons, 14% CO₂, 22% CO and 50% N₂. The produced gas had a heating value (6.3-7.3 MJ Nm⁻³) higher than most values reported in the literature for several types of biomass fuels.

BIORESOURCE TECHNOLOGY

Vol.43, No.2, 1993

Changes in organic matter during stabilization of compost from municipal solid wastes by C.Ciavatta, et al (Italy) p. 141-145.

Before application to the soil, the organic matter from compost from municipal solid wastes must undergo a phase where easily decomposable organic compounds are transformed to stabilized substances. When the organic matter from compost added to the soil is not sufficiently stabilized, it can cause serious damage to plant growth due to the presence of phytotoxic substances. In this research, stabilization of the organic matter contained in two static piles of compost derived from municipal solid waste was followed for 55 days during both winter and summer.

Vol.43, No.3, 1993

Agglomeration of alumina sand in a fluidized bed straw gasifier at elevated temperatures by

A.Ergudenler and A.E.Ghaly (Canada) Technical University of Nova Scotia, Box 1000, Halifax, NS B3J 2X4. p.259-268.

The results showed that agglomeration was affected by the ash content and temperature: the higher the ash content and/or temperature, the stronger was the bonding. It was, however, possible to operate the gasifier, without any agglomeration or slag problems, up to a temperature of 920°C.

WORLD ENERGY COUNCIL JOURNAL

December 1992

Reviewed the Madrid Conference "We are now launched along a new, more challenging and creative (energy) path. We have issued, and accepted, a challenge to ourselves. We have also challenged those who are ultimately required to bring about desired change: energy consumers and energy policy-makers, and those whose main stated task is to influence them. Thus we have given the ultimate challenge to environmental and ecology groups: not as opponents but as those who share our common problems." (Editorial Review)

WORLD ENERGY COUNCIL JOURNAL

July 1992

Energy prospects from North America by J.W.Landis and A.J.O'Connor. p.73-78.

The World Energy Council has divided the world into eight regions in order to obtain a mosaic input of information for its global energy report entitled "Energy for Tomorrow's World". North America is one of those regions. For the purposes of this study, North America has been defined to include only Canada and the United States. The energy economies of Mexico and Central America were deemed to be more closely related to South America and were included in the Latin American region.

John Landis, United States, Stone & Webster Engineering Corporation and Arthur O'Connor, Canada, Energy Strategies Ltd. are the joint coordinators, North American Region. Energy consumption per capita is higher in North America than in any other region. Two of the reasons are: temperature variations and transportation. In many locations, annual temperature variations exceed 70°C requiring heating or cooling.

Distances are vast in many areas of North America requiring more expenditure of fuel on transportation. North America is rich in energy resources. End-use energy at reasonable cost supports production and transportation of raw materials, food and primary manufactured goods to nations not so well endowed with natural resources.

Policy initiatives most needed in North America must:

- * diversify the energy mix;
- * preserve and renew the nuclear option;
- * enhance efficiency and conservation;
- * expand the economic use of renewable energy resources;
- * foster research;
- * establish realistic standards for energy-related emissions; and
- * ensure constructive dialogue.

NEW TECHNOLOGY JAPAN

Vol.20, No.7 October, 1992

Production of methane from methane using *Methylosinus trichosporium*

The organism was treated with cyclopropanol to suppress the enzyme inhibiting oxidation of the intermediate product methanol. When ethane or propane is used in place of methane, the corresponding alcohols, ethanol and propanol are produced, indicating that the technique is also applicable to the manufacture of other alcohols. Tokyo Institute of Technology, Department of Bioengineering, Faculty of Bioscience & Biotechnology, 4259, Nagatsuta-cho, Midori-ku, Yokohama City, Kanagawa Pref. 227.

ENERGY STUDIES REVIEW

Vol.4, No.2, 1992

Hibernia and the Newfoundland Treasury by W.Locke. p.107-116.

Negotiated provisions for offsetting equalization payments were an important component of accords signed by Newfoundland and Nova Scotia to manage and share revenues from their respective offshore oil and gas fields. These are analyzed.

Estimating future hydrocarbon supplies by M.Power and J.D.Fuller p. 128-143.

Failure to account appropriately for the role of price in determining the portion of the resource base that is commercially usable weakens the strictly geological approach to resource estimation. However, the use of information on the dwindling size and number of potential discoveries in the geological-based models yields insights into the petroleum exploration and discovery process denied econometricians.

RESOURCE RECYCLING

Vol.XI, No. 12 December 1992

A database on composting facilities: A progress report by A.Blackwell and A.Neering. p.54-59. The Solid Waste Composting Council has developed a database of 1,300 composting facilities. Information is still lacking on what is being composted, at what cost composting technologies are being implemented and where finished compost is going.

FOREST PRODUCTS JOURNAL

Vol.42, No.10, October 1992

Short-rotation poplar: a harvesting trial by B. Hartsough et al. p.59-64.

Two systems for harvesting were studied in Oregon, one utilizing a tracked skidder and the other based on cable yarding. The terrain was flat, and dry enough to allow the use of tractive equipment. Stump-to-truck pulp chip cost estimates were \$33/ bone dry ton and \$57 for the observed skidder and yarder systems.

Medium density fiberboard made from phenolic resin and wood residues of mixed species by P.Chow and L.Zhao. p.65-67.

Medium density fiberboard made from steam-pressure-refined wood residues (a mixture of 70% hardwoods and 30% softwood species) met most of the specifications required for service class hardboard and achieved equal to or better strength properties than commercial plywood.

Vol.43, No.1, January 1993

Opportunities for composites from recycled waste wood-based resources: a problem analysis and research plan by R.W.Rowell et al. p.55-63.

This report describes the recycled resources available for low-cost and high performance composites, problems associated with collecting, sorting, cleaning, breakdown, classification, and blending; and process considerations for forming various types of composites.

Forestry Profiles

(CIDA, 200 Promenade du Portage, Hull, PQ K1A 0G4. Tel. 819-997-6579. Fax 819-953-4676)

Describe the Hardwood Forest Development Project in the Republic of Honduras and the Canada-Jamaica: Trees for Tomorrow.

CANADIAN PAPERMAKER

Vol.46, No.1 January 1993

Load shifting by J.Senett

The transfer of high energy demand processes to off-peak hours and Ontario Hydro providing substantially reduced off-peak demand charges means restructuring by St.Catherines, Ont.-based QUNO Corp., formerly Quebec and Ontario Paper Co. Ltd. Their Thorold, Ont. newsprint mill is reported to be the most energy efficient in Canada. The largest single component of total operating costs is the hydro bill at 20%. A flotation de-inking plant was built in 1987 and de-inked fibre is combined with furnish from the mill's thermomechanical plant (TMP). Producing a tonne of TMP requires about eight times more energy than it does for a tonne of de-inked furnish (2.5 megawatt hours per tonne versus 0.3 megawatt hours per tonne). TMP production is being shifted to night time and the de-inking capacity is being expanded.

MSW MANAGEMENT

Vol.3, No.1 January/February 1993

Does the heirarchy make sense? by J.Schall. p.25-32.

The Yale University 's School of Forestry and Environmental Studies published a working paper which questions the solid waste management heirarchy of reduce, reuse, recycle, compost, incinerate with energy recovery and, lastly, bury. This is a condensed version of the study that concludes not only does it make sense, it's the only effective way to address the issues. The overwhelming conclusion of this research is that the heirarchy is on a firm technical, economic and environmental foundation. The following article provides comments from others.

Department of Energy, Mines and Resources Canada/ Natural Sciences and Engineering Research Council Research Agreements for 1992-93

Contractor	Summary	\$
Gordon, A.M. University of Guelph Guelph, ON N1G 2W1	Assessing Riparian Zones for biomass and energy production	10 000
Zsuffa, L. University of Toronto Toronto, ON M5S 1A1	A study of the relationship of biomass growth and growth yield characteristics in willow energy plantations	15 000

