

EXTRACTIONS



a newsletter from **O'CONNOR ASSOCIATES**

Number 31, January 2000

THE FUTURE IS NOW

We hope you enjoy this, our first issue of 2000, which features stories about new technologies such as alternative energy sources and transgenic goats.

UNDERGROUND ENERGY STORAGE

Underground thermal energy storage (UTES), while common in China and parts of Europe, is relatively new to Canada. The Sussex Hospital in New Brunswick is the first hospital in Canada — and the second in North America — to adopt UTES.

Two separate aquifers are tapped by wells drilled about 200 metres deep. During the summer, cool groundwater is extracted from one aquifer and circulated through the building. The warmed water is then pumped into the second aquifer for storage until it's needed for winter heating, when the pumping direction is reversed. The insulating properties of the earth keep the water at a constant temperature. This cyclic process can be repeated indefinitely, typically decreasing cooling costs by 80% and heating costs by 40%. It also reduces greenhouse gas emissions. The Sussex Hospital has saved nearly \$50 000 a year in energy consumption and reduced its carbon dioxide emissions by 720 000 kilograms annually.

Environment Canada in the Atlantic region actively promotes this energy-efficient technology and has developed tools and procedures for implementing it including tests to determine the thermal properties of boreholes, water treatment technologies for high-temperature applications, and environmental screening techniques.

Other successful Canadian UTES projects include the Saskatoon Airport and Carleton University in Ottawa.

The National Trust in the UK uses a similar heat pump technique for a restored building in Brancaster, Norfolk, which draws heat from the nearby tidal mudflats.

[from <http://www.ec.gc.ca/science/sandesept99/article5_e.html>, <http://www.ntenvironment.com/html/homepage/_index/index.htm>]

ALTERNATIVE AUTO FUELS

The recent rise in oil prices not only benefits Alberta's oil patch, but also makes alternative energy sources more attractive.

Petro-Canada is steering towards greater ethanol production as an alternative to gasoline. They have invested in an ethanol plant in Ottawa which uses enzymes to convert wood cellulose and agricultural wastes into sugars that are then fermented and the resulting ethanol distilled. Currently produced cars can run on a 10% mix of ethanol, and future vehicles may run on even higher mixtures. Producing and using ethanol in place of gasoline reduces greenhouse gas emissions by 90%, according to US Department of Energy studies.

Suncor in Ontario and Mohawk in Western Canada are also blending ethanol with their gasolines.

[from *Calgary Herald*, September 30, 1999]

SOYBEAN DIESEL

In the next few years, you may be pulling up to the pump at your local service station, and saying, "Fill it, please, with beans." Soybeans, that is. A family of fuels called biodiesels allow internal combustion engines to run on mixtures of compounds made from renewable biomass, such as the hardy, high-yielding soybean.

Environment Canada, Health Canada, and the Ontario Soybean Growers Marketing Board have been working together to determine how tailpipe emissions from this plant-based fuel compare to those of conventional diesel fuel. They found that, under both summer and winter simulated conditions, the overall emissions were similar. However, the particulate measurements showed a marked difference. In a typical low-sulphur diesel fuel, 100% of the particulates are of inhalable size — less than 2.5 microns in diameter. However, with methyl soyate, the figure is only 60% — suggesting that the widespread use of biodiesels could reduce fine-particulate emissions up to 40%, a significant health benefit.

[from <http://www.ec.gc.ca/science/sandesept99/article2_e.html>]

FUEL CELLS

Whether large or small, fuel cells are becoming a viable alternative energy source. The biggest will be in Alaska where a \$400 million project at the Anchorage Mail Processing and Distribution Facility will see a fuel cell system produce one million kW. The fuel cells will provide continual backup power, and the generated heat will warm the buildings.

A recent breakthrough in miniaturization could see fuel cells powering automobiles sooner than we might think. Researchers at the US Department of Energy's Pacific Northwest National Laboratory have successfully tested a miniature fuel reformer that converts available fuel such as gasoline into hydrogen to power a fuel cell. The reformer's reactor and heat exchanger have microchannels (about three times the width of a human hair) that intensify the chemical reactions and reduce the size of the reformer to one tenth that of current units.

[from <<http://ens.lycos.com/ens/aug99/1999L-08-19-09.html>>, <<http://ens.lycos.com/ens/aug99/1999L-08-03-09.html>>]

GREENHOUSE PURIFIES SALT WATER

An award-winning greenhouse design may help the drier areas of the world both grow food and make fresh water from salt water. Charlie Paton won the award from the Royal Institute of British Architects for his self-sufficient design that will desalinate water at a cost of about 50 cents per 1000 litres.

The steel-framed greenhouse has corrugated cardboard evaporators at each end. The first evaporator uses salt water to cool and humidify the air, creating optimum growing conditions. After the air has blown through the building, picking up additional moisture from the plants, it arrives at the second cardboard evaporator. The moisture in the air condenses on the cooled evaporator and is collected for growing vegetables and for drinking water. Electricity is only needed for the fans and pumps that circulate the air and water. In most cases, this electricity can be generated on site with solar panels or wind turbines.

The first seawater greenhouse was built on Tenerife, partly with European Commission funds. A second is under development in Oman, and there are plans for many others.

[from *Calgary Herald*, October 9, 1999]

SOLAR HEATS UP

Israel is the site of a new, industrial-scale solar power system that uses solar energy to directly power the same turbines that are now used to generate electricity from natural gas.

This technique reduces the need for long pipelines and extends the life of the power plants and electrical transmission lines. The Weizmann Institute of Science is constructing the prototype solar furnace that will generate 300 kW by concentrating sunlight 10 000-fold with mirrors and optical concentrators. A solar receiver with hundreds of ceramic pins maximizes the heat transfer to compressed air that drives the turbines. If successful, the system will be enlarged to generate up to 10 MW of power.

[from <<http://ens.lycos.com/ens/nov99/1999L-11-05ws.html>>]

TRANSGENIC GOATS

For some time people have recognized that spiderweb silk, with a tensile strength of 300 000 pounds per square inch, is one of the strongest materials. However, it has never been produced in much quantity since spiders are difficult to domesticate.

So, where do the goats come in? Researchers at Nexia Biotechnologies in Montreal have successfully spliced the spiderweb silk gene into the mammary cells of goats. The milk from these transgenic goats contains 2 to 15 grams of silk protein per litre of milk, opening the door to commercial production.

The manufacturers, if we can still call them that, of Biosteel® suggest uses for the product including strong, bio-compatible medical sutures, low-weight bulletproof vests, and fibres for tires and aerospace components.

[From <<http://www.discover-g.com/exclusive/biosteel.htm>>, <http://www.nexiabiotech.com/biosteel.html>]

GARY S. KARP

O'Connor Associates is pleased to announce that Gary S. Karp, B.Sc. is returning to Winnipeg after spending 10 years as a project manager in O'Connor Associates' office in Toronto.

Mr. Karp's expertise is in environmental science, geology, and chemistry, and he has undertaken consulting projects throughout Ontario, Western Canada, and North Africa.

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You can view current and back issues of EXTRACTIONS on our web page at

<<http://www.oconnor-associates.com/>>,

and send your comments on EXTRACTIONS to editor@oconnor-associates.com.

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