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Red Deer PROSPECTS

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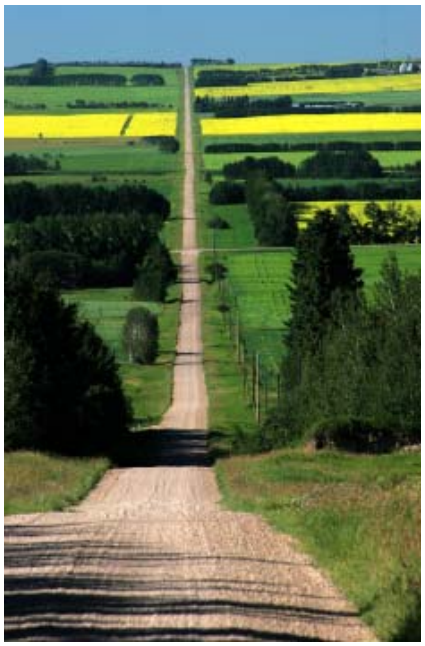
# Creating designer lubricants from the sun and soil

Canada's Red Deer Corridor flows through the heart of one of the world's most productive economies, drawing much of its impetus from two important natural resources. Rich cropland growing cereal grains and oilseeds blankets abundant deposits of fossil fuels, including oil, gas and coal.

In a world where the demands for both food and energy are growing rapidly, technical developments have created new links between these two apparently unrelated resources.

Natural gas production is reaching new heights, especially from shallow gas in coal seams, as deep-well reserves become harder to find. As the value of natural gas continues to rise, a growing circle of Red Deer visionaries is looking beyond the horizon for the means to develop field crops that will not just replace but improve upon the multitude of products traditionally created from fossil fuels.

A variety of factors merge to generate new economic potential within the Red Deer Corridor for producing a range of industrial products from canola, a locally grown oilseed crop that can be modified to meet highly specific needs.



- Canola is a renewable resource, grown as a regular part of the annual rotation on farms throughout Central Alberta. As concerns grow over the environmental and cash costs of extracting energy from oil and gas, greater interest is growing in finding alternative sources, including development of the biodiesel, biogas and bio-lubricant industries. These products are considered safe and desirable for use in sensitive applications where toxicity from petroleum-based products could harm the environment. While petroleum-based oils can persist in the environment for years, vegetable oils are low in toxicity and do not cause harm to fish, wildlife and vegetation.
- Specific varieties of canola can produce superior fuels and lubricants with performance characteristics that can be precisely engineered to meet the end user's specific requirements.
- Under Canadian health regulations, petroleum-based lubricants are not allowed in certain commercial food processing facilities. The food-processing industry, which includes a number of small, medium and large players within the Red Deer Corridor, is required to use vegetable-based lubricants in most of its equipment.

## Biodiesel: fuel source, waste management strategy, economic development tool

As biofuel refining in Central Alberta prepares for its first large-scale biofuels plant, a local Red Deer County resident is already operating many of his vehicles and heating his house with the very same technology. Len Aucoin, an instructor at Red Deer College in the Trades and Technology Faculty, is doing on a small scale what the proposed $400-million integrated biodiesel and ethanol refinery will do on a large scale.

Two years ago Aucoin set out to design, build, test and use an affordable biodiesel production unit that is financially self-sustainable and can supply biodiesel fuel to operate his vehicles and heat both his house and shop. Aucoin's plan was a success; with three biodiesel processors built to date Aucoin has developed some proprietary technology in his process and can utilize waste restaurant oils or crushed canola oil to feed his process.

"Biodiesel can be seen as a fuel source, a waste management strategy and an economic development tool," said Aucoin. "It is an environmentally friendlier diesel substitute, which can reduce greenhouse gases, significantly reduce other air emissions and is a substitute for sulphur as a lubricant in diesel fuel; it's my way of giving back to the environment."

*Len Aucoin, built a biodiesel production unit that supplies biodiesel fuel to operate his vehicles & heat his house & shop.*

- Low prices for agricultural commodities combined with escalating costs for labour, fuel and inputs are driving farmers to seek alternative sources of revenue. In the current economic climate, Alberta farmers have dramatically increased the amount of canola they are growing in their rotations, to a total of 4 million acres in 2005 and 3.5 million acres in 2006. In many cases, farmers are exceeding the amount of canola in their crop rotation because it is the one crop that will still net a profit (recently at $8.50/bushel). Although canola requires more care than traditional crops including wheat and barley, the grain crops right now cost more to produce than what they are worth on international markets.

- The technology for producing fuels, lubricants and plastics from petroleum translates very easily to producing those same products from vegetable oils. Natural gas is highly valued as a widely exported energy source and as the feedstock for local petrochemical plants, which produce ethylenes, polyethylenes and glycols as well as various byproducts. Those byproducts include electrical generation in the processing facilities and the production at an adjacent plant of ammonia fertilizer for application on field crops.

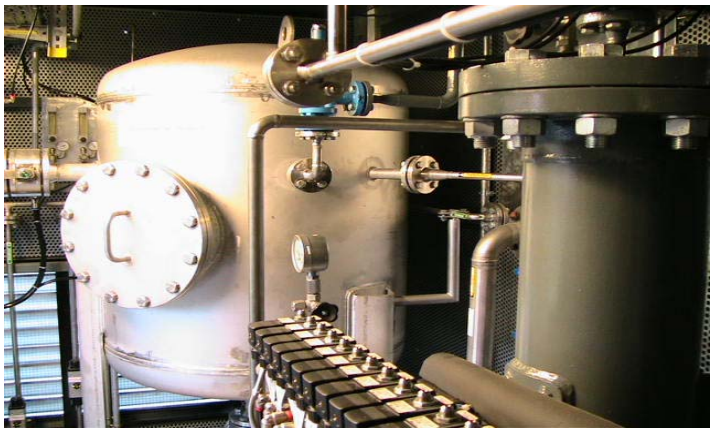
- Red Deer College, noted for it's strong reputation in developing partnerships with local industry, is currently expanding its technology and research facilities. Included in this expansion is the development of a centre of innovation to provide applied research for local industry. With the increased interest in producing energy and plastics from oilseeds, Red Deer College is collaborating closely with Olds College to conduct research that will help develop a viable industry.

- Basic technologies for creating fuels and lubricants from oilseed crops were developed a number of years ago, but are only now becoming an economically viable alternative to petrochemicals. Rising energy costs combined with environmental concerns and the low prices for agricultural commodities make fuels and lubricants an increasingly attractive alternative to products made from natural gas and crude oil.

- Federal, provincial and non-government agencies have increased their commitment to funding innovation and research. The Government of Alberta recently unveiled their Bioenergy Plan, committing $239 million over next five years to strengthen and expand Alberta's bioenergy sector. The Central Alberta Regional Partnership, a consortium of 42 municipalities within and in close proximity to the Red Deer Corridor, is dedicating a large share of its resources toward further development of bio-lubricant, biodiesel and biogas industries. Major industrial players, including Shell, British Petroleum and Dominion Energy Services, are also turning much of their expertise toward developing petroleum alternatives, including biodiesel and biolubricants.

The synergies between these factors create fertile ground for development of a healthy bio industry in Central Alberta. While other crops such as soy bean, corn and flax are also suitable for synthesizing lubricants, in part because of the region's temperate climate and relatively short growing season, canola is its most commonly-grown oilseed, normally comprising about 35 per cent of the total number of acres seeded per year in Alberta.

Farmers throughout Western Canada typically grow their canola as an export crop tailored to meet specific needs within the food industry, mainly processed for cooking oils and margarine, says Rick Tofani, director of applied research and innovation at Red Deer College.



*Bioprocessor already in use in Europe.*

A professional engineer with a Master's degree in business administration, Tofani was formerly employed with the Saskatchewan Research Council and went from there to develop a centre for innovation at Olds College. While canola varieties grown for the food industry will work, high erucic acid varieties, while less attractive as a food source, produce a superior range of industrial products, says Tofani.

"An important step in developing a fuels and lubricant industry for Central Alberta includes inviting significant numbers of farmers to include these specific varieties of canola in their crop rotation.

## Sunterra Meats

Sunterra Meats is a Central Alberta meat processor that uses biodegradable fluids to lubricate all equipment that that comes into contact with its products. Locally owned and operated, Sunterra Meats found that the performance of these biolubricant products was very comparable to petroleum-based oil with the added value of being biodegradable and non-toxic for systems that operate in the highly regulated food-processing sector.

"The fact that biolubricants are essentially biodegradable and are made from a renewable resource gives them a significant advantage over their petroleum-based competitor," said Mathew Beierle of Sunterra Meats Innisfail. "The food-processing industry, which includes a number of small, medium and large players within the Red Deer Corridor, is required to use vegetable-based lubricants in most of its equipment and we're proud to be one of the companies using these products."

In Canada, the use of biolubricant products can extend into many allied industrial applications such as manufacturing, oil and gas and food industries. The use of agricultural crops for lubricants offers significant potential for the Red Deer Corridor given the new bio-lubricants lab/ applied research efforts at Red Deer College and Olds College School of Innovation.

## Red Deer County likely option for biofuel refinery

The first of its kind in North America, the proposed $400-million integrated biodiesel and ethanol refinery will mark the first large-scale biofuels plant in Alberta.

With plans to locate approximately 1.5 km north of Innisfail, the plant could provide an economic boom to Central Alberta farmers. The plant will create approximately 100 full time jobs, with feedstock for the canola crushing plant and ethanol facility to come from local growers.

The Alberta biorefinery will include a canola crushing plant, a biodiesel refinery and an ethanol refinery, each capable of producing up to 100 million U.S. gallons, or 374 million litres, per year of product. Along with the production of biodiesel and ethanol, the plant will also create distillers grain and canola meal, which can be fed to livestock; the complex will capture its carbon dioxide emissions, which will be sold for oilfield production enhancement; and glycerin, which is used in a number of products.

The project is led by Florida-based Dominion Energy Services and follows the provincial government's recent, $239-million over five years, initiative to boost biofuels production.

Prospects is a quarterly publication of the City of Red Deer, Red Deer County, Red Deer College and the Red Deer Chamber of Commerce describing economic development issues. Prospects is compiled in a manner to ensure accuracy. However, the partners do not guarantee the correctness of all information herein, nor the absence of errors or omissions. No responsibility can or shall be assured.

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*Rick Tofani, director of applied research & innovation at Red Deer College.*

To accomplish this, farmers will need to see evidence of the economic benefits available from growing varieties that are more suited to producing fuels, motor oils and gear lubricants," he says.

"On the other side of the equation, industry itself must also become a willing participant in creating these products on a commercial scale to ensure the industry's long-term viability. While government programs are available to assist in the research, this must be a market-driven initiative, supported by private-sector players who would benefit from development of a fuels and lube industry here, both in the production side and as end users."

A report completed in 2006 on behalf of the Central Alberta Economic Partnership makes a strong case for developing this very promising industry. Within the body of its report, CAEP states that "these green products deliver the same or better utility, greases and lubricants for machines and tools. They are especially good for sensitive natural areas, lakes, forests and food production needs, as well as manufacturing and oils and gas, among others."

The CAEP report, conducted by Toma and Bouma Management Consultants, goes on to state that the potential for biolubricant products and other oilseed derivatives can lead to a variety of related spin-off businesses.

"Canola, for example, can be fractioned into micro-components for uses in biolubricants, biodiesel and biocosmetics (glycerin). The market potential is judged to be in the order of five per cent to 20 per cent of current products, based on European Union experience."

Its authors suggest that a number of products can be developed for Canadian and export markets, with an investment of $2 million or more needed to create an operating facility.

*Canola fields by Nova Chemicals*

Adding attraction to this type of investment, Canada is developing incentive policies to encourage the development of an oilseed-based industry, following a lead already established in the United States and the European Union.

Based on Toma and Bouma's research, CAEP estimates that the total value of a bio-lubricant industry in Canada could reach $115 million within the next four years, with growing potential to develop export markets.