WHAT FUEL ALTERNATIVES

Alternatives are needed:

- to replace current octane (anti-knock) enhancers in gasoline
- to oxygenate (add oxygen to) gasoline for pollution reduction
- to extend Canadaâs dwindling domestic supply of light crude petroleum used to produce transportation fuels.

Oxygenates

Oxygenates are compounds such as alcohols and ethers which contain oxygen in their molecular structure. Oxygenates improve combustion efficiency, thereby reducing polluting emissions. Many oxygenates also serve as excellent octane enhancers when blended with gasoline.

Ethanol

is a non-corrosive and relatively non-toxic alcohol made from renewable biological feedstocks. It is used directly as fuel (most commonly in Brazil), or as an octane-enhancing gasoline additive (throughout the United States, Canada and Europe). Approximately 12% of all U.S. gasoline contains ethanol at a blending percentage of 10%. In Canada, blends containing 5-10% ethanol in gasoline are being marketed by several companies (throughout Ontario, Quebec, the western provinces and the Yukon), and are available at 1,000 retail outlets across the country. Approximately 5-10% of Canadian gasoline contains ethanol. Blends of 10% ethanol with gasoline can be used in all gasoline-powered automobiles, without engine or carburetor modification.

Methanol

is an alcohol made from natural gas, biomass or coal. It can be used directly as an automobile fuel (the automobile engine needs modification for this purpose), or as a gasoline-blending compound. When methanol is blended with gasoline, a co-solvent such as ethanol is required. Methanol is quite corrosive and poisonous. Methanol is produced primarily as a derivative of natural gas.

Methyl tertiary butyl ether (MTBE)

is an oxygenate which has been used in recent years in the U.S. and Canada as an octane-enhancer for gasoline. It is currently manufactured from methanol (derived from natural gas) and isobutylene (an oil refinery product). MTBE has been found in groundwater in the U.S., and is the cause of significant public concern.

Ttertiary amyl methyl ether (TAME),

another oxygenate produced with methanol, is being tested in the U.S.

Ethyl tertiary butyl ether (ETBE),

although more expensive than MTBE, has the technical superiority (slightly higher octane and lower energy content) to promote its use in the future. ETBE is manufactured from ethanol and isobutylene. The lower volatility of ETBE, relative to other oxygenates, would help reduce the evaporative emissions, but could cause problems with respect to cold starting and driveability. **TAEE** (**tertiary amyl ethyl ether**), the ethanol-based counterpart of TAME, is also being evaluated as an oxygenate.

Aromatic Hydrocarbons

These are petroleum-derived compounds including **benzene, xylene and toluene** characterized by the ãbenzeneä ring in their molecular structure. They are being used increasingly in recent years as octane enhancers, even though some of them are carcinogenic (e.g., benzene), or form highly toxic compounds during combustion.

MMT (methylcyclopentadienyl manganese tricarbonyl)

MMT is widely used in Canada as an octane enhancer in lead-free gasoline. In the U.S., the Environmental Protection Agency (EPA) banned MMT usage in lead-free gasoline for many years. This ban was over-turned as the result of a 1995 court challange. However, MMT usage in U.S. gasoline remains very small. Automobile manufacturers are opposed to the use of MMT-blended gasoline in vehicles equiped with catalytic converters because MMT tends to plug the converters and oxygen sensors, resulting in increased emissions. All MMT used in Canada is imported from the United States. The Canadian government introduced legislation to ban the importation of MMT for environmental reasons in 1997. Subsequently, the federal government lifted its restrictions on MMT in July 1998 in response to a recommendation from a dispute-settlement panel established under the Agreement on Internal Trade.

Propane and Natural Gas

Both of these fuels are based on fossil hydrocarbons and, therefore, their combustion contributes to increased levels of atmospheric carbon dioxide. As well, modifications to vehicles are required to use these fuels. In Canada, federal and provincial governments have provided fuel tax reductions or exemptions, as well as grants for vehicle conversion, to encourage the use of these ãalternativeä fuels.

Frontier and Foreign Oil Sources

Tapping into frontier energy reserves is very expensive, and the reliability of foreign oil supplies can be uncertain. Producing and transporting oil from either source can have serious environmental consequences. Supplies of fossil fuels are finite and their combustion increases atmospheric carbon dioxide levels, contributing to global warming. Despite heavy subsidization of the tarsands and Hibernia mega-projects, domestic fuel prices are expected to continue to climb, and the importation of light crude oil will continue to grow.

The Bottom Line

Ethanol blended at 5-10% with gasoline compares favourably with other alternative fuels.