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Alternate Fuel – A Literature Review

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Abstract--- *This study concern with the use of alternate fuels for automobiles. Since the automobiles are the main source of transportation, its usage increases day by day. Thereby it is necessary to identify a cheaper fuel for it. The currently existing and widely used fuel named gasoline also called as petrol. The cost of this fuel day by day increases and also it will be exhausted in future after some years. The another problem currently using fuels are the exhaust. The exhaust consists of* NO_x*, CO,* CO_2*,* SO_x*, lead and other particulates which lead to air pollution and adverse affect on human beings. So it is important to opt for alternate fuels, which are cheaper and less pollutant to environment.*

Keywords--- *Ethanol, Energy, Pollution, Availability, Greenhouse, Efficiency.*

I. INTRODUCTION

Currently, motor vehicles are estimated to contribute about 14% of the global CO_2 emissions, 50-60% of the CO, HCs, and lead, 30% of the NOx and about 10-20% of the particulate emissions (Faiz 1993). The pervasiveness of the automobile (like many other technological marvels of the 20th century) is closely linked to global "development." As a result, even though car ownership in the industrialized nations is approaching saturation levels, the relative numbers of cars are much lower in most of the lesser industrialized countries (LICs) or newly industrialized countries (NICs). For example, the level of car ownership in the United States is 1000 times that of China and 250 times that of India; in fact, at present, only 16% of the world's population owns 81% of all automobiles (Boyle 1990). There is no doubt that the next few decades are likely to see an enormous increase in the numbers of automobiles worldwide, especially given the fact that the global economy is desperately in need of inducting potentially gigantic consumers like India and China into the global marketplace. Projections indicate that the worldwide number of vehicles is expected to double by 2020 (Faiz 1993). A commonly discussed approach to severely curtail or eliminate the emissions of carbon dioxide (the primary greenhouse gas) is to switch to alternative sources of fuel (or energy) for powering automobiles on a large scale. This article seeks to examine the feasibility and effectiveness of such an approach, especially in terms of its large-scale implementation. Successful widespread use of alternative fuels is contingent upon the development of automotive technology that allows their use, as well as the development of economically feasible fuel production technologies. Toward this end, the possible automotive technologies based on nonconventional fuels or energy sources that could mitigate greenhouse emissions, as well as the possible sources for these alternative fuels, are discussed. The advantages and disadvantages of the various options, both from a technical feasibility and a greenhouse emissions perspective are considered. For the total greenhouse gas emissions from the use of these alternatives, the tailpipe emissions from the automobile, as well as the emissions generated during the production of the fuel are taken into account in the discussion. In addition, as some other pollutants from automobiles can also have significant health and environmental impacts, the effects on

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such emissions from the use of these alternatives are also considered briefly. Also discussed are some of the environmental, social, and economic issues that become relevant as the large-scale use of alternative fuels is considered. Finally, adopting a broader perspective, other options and policy instruments that might be useful in mitigating the greenhouse impact of the transport sector are also discussed in some detail. The aim of this study, then, is to attempt to clarify the ethanol enrichment debate, by examining the entirety of this topic, with particular attention to issues. Since so much is unknown especially when applied to countries such as Australia it is not always possible to summarize the 'facts' for this reason the study proceeds by posing a series of questions, many of which require further research. The study mainly concerns environmental impacts, based on a comprehensive review of the peer-reviewed technical literature since the mid-1980s, and many government or privately commissioned research agency and company reports. Although the study makes specific reference to the Australian experience, the review is quite broad and applicable to most other industrialized countries, at least in moderate temperate to tropical climates. The study is restricted to ethanol enrichment of unleaded gasoline (unleaded petrol), and does not examine heavy vehicle fuels such as diesel and biodiesel, although these are an important (separate) environmental issue. The study mainly concerns 10 vol.% (3.5 wt%) ethanol ingasoline (E10), and close variants such as 15 and 20% blends (E15 and E20). Nonoxygenated(neat) unleaded gasoline is referred to as 'E0'. Reference is also made to an85% ethanol fuel (E85), used in ethanol-fuelled and certain hybrid vehicles..

The use of ethanol as a gasoline (petrol) additive, at levels around 10% by volume ('E10') as well as an 85% blend ('E85'). By detailed reviews of the peer-reviewed and technical literature, five environmental aspects of ethanol enrichment are examined: (1) its purported reduction in air pollutant emissions; (2) its potential impact on subsurface soils and groundwater; (3) its purported reduction in greenhouse gas emissions; (4) the energy efficiency of ethanol; and (5) the overall sustainability of ethanol production. This study indicates that altering the proportion of Ethanol gives more efficiency and less pollution.

II. ALTERNATE FUELS FOR VEHICULAR CO_2 EMISSION REDUCTION

The two main fuels that come under this category are the lower alcohols, namely methanol and ethanol. The commercial use of such fuels is not a new concept; Brazil, for example, has had an extensive ethanol 1970s (Geller 1985). Similarly, in the U.S.corn is used as a fermentation feed stock for ethanol, which is subsequently used in 90/10 gasoline-ethanol fuel blends.

For light duty vehicles (such as cars and pickup trucks), methanol and ethanol can both be used as fuels, either neat or in blends with gasoline. The composition of such fuels is described through a nomenclature such as M85or El00 for example, where the prefix M or E denotes methanol or ethanol respectively, and the numbers following indicate the percentage of the alcoholin a blend with gasoline. Generally, it is felt that the M85, M100, E85, or El00fuels are the most serious contenders for alternative alcohol-based fuels (OTA1990).

Though some research has been carried out on IC engines usable with alcohols, the design of IC engines operating with pure alcohol or alcohol-gasoline blends is still far from being optimized in terms of balancing performance, economy, and emissions. The physical and chemical properties of alcohols, and consequently their combustion characteristics are substantially different from those of gasoline.

As a result, deriving the maximum operational benefit that alcohols can offer necessitates their utilization in IC engines designed specifically for them, as opposed to retrofitted gasoline engines or flexible fuel vehicles. In addition, the use of pure alcohol fuels (M100 or El00) leads to problems such as difficulty in cold starting that have not been completely worked out yet (Mills and Ecklund 1987).

The energy density per unit volume of methanol is about half, and of ethanol about two-thirds, that of gasoline. However, factors such as charge cooling due to the high heat of vaporization of these alcohols, and the possibility of operation with higher possible compression ratios and leaner mixtures(higher air-fuel ratios) lead to an improved thermal efficiency of the combustion cycle (Geller 1985; Mills and Ecklund 1987; OTA 1990). In fact, the thermal efficiency of an engine designed for ethanol use is about 17-25°70 greater than a gasoline engine, whereas methanol engines have thermal efficiency gains of about 25-4607o over gasoline engines (Lynd 1990). Thus, in very rough terms, the use of alcohols makes the engine operation (in an engine designed for use with the specific alcohol) much more efficient, but greater volumes of alcohols are required to provide the same energy output from the engine.

Alcohol fuels can be commercially produced by two major sets of feed stocks fossil fuels and biomass. In the former category, fuel methanol is currently produced from natural gas, and gasification of coal has also been proposed as a potential route to methanol production. If the alcohols are fossil fuel derived, not much of an advantage (if any) is gained over gasoline in terms of CO_2 emissions. On the other hand, biomass-based alcohols have a significant potential to reduce CO_2 emissions from automobiles, and it is this route to alcohol production that merits detailed discussion.

III. NON-CARBON-BASED ALTERNATIVES

Among the various alternatives to reduce CO_2emission from automobiles, some technologies have been the focus of much attention and discussion because they have the theoretical potential to eventually eliminate the use of carbon as the basic pivot in the automotive energy cycle

IV. ELECTRIC VEHICLES

Of all the alternatives to the conventional automotive technology, electric vehicles have been receiving the most attention. Some of the reasons for this are obvious: there is a widespread distribution network of electric power supply that could possibly be used for recharging electric vehicles, and these vehicles do not cause any local air pollution. Probably the largest driving force for the recent widespread interest in electric vehicles is the urgent need for air pollution control in many urban areas. California has recently passed a law requiring that by 1998, 2°70 of the cars sold by any manufacturer in the state be zero-emission vehicles (ZEVs), increasing progressively to 10070 by 2003. ("Zero emission" is actually a misnomer in this case; a stricter description would be "zero local emission.") At present, the only technology that can feasibly satisfy this stipulation is the electric car. Such a shift toward severe pollution control is likely to become more common(along with markets for zero or low emission vehicles), at least for some urban areas in industrialized countries. In many other ways also, electric vehicles are ideally suited for the urban environment, because they can be mad every compact and are not as wasteful as IC engines in stop-and-go traffic. Also, one of the biggest limitations of the electric vehicles, namely a limited range,should not pose a major problem for use in the urban environment.

One of the biggest drawbacks with most electric vehicles so far is that they have mostly been based on existing automobiles that were designed for IC engines. As an example, the first commercially available electric car from a major manufacturer, the Fiat Panda Elettra is derived directly from a petrol driven Panda (Rogers 1991). Recently, though, has there been a major effort devoted to vehicles designed to be electric-based from the beginnings of the design process. This has resulted in pure-electric vehicles such as the GM Impact and the Nissan FEV.

V. IMPROVING AUTOMOBILE FUEL EFFICIENCY

The CO_2 emissions from conventional-fuel operated automobiles can be directly reduced through an improvement of fuel economy of the vehicles in use. Recent years have seen the evolution of a host of design modifications that can significantly improve the fuel efficiency of automobiles and therefore reduce the CO_2 emissions pervehicle-mile. Among these technologies, the more noteworthy are lean-burn engines (e.g., Honda's VTEC-E, and Mitsubishi's Vertical Vortex), two-stroke gasoline engines (such as the Orbital), improved electronics for fuel management, advanced diesel engines, transmission improvements such as continuously variable transmission, use of lighter materials (such as aluminium and plastics), and aerodynamic body designs. Most of these technologies are incremental, but some can offer a dramatic potential for fuel savings; for example, the Volkswagen Golf Ecomatic has an electronically controlled diesel engine that shuts off when the car is standing still and restarts automatically when the accelerator pedal is depressed. In start-and-stop urban driving, this car offers a large improvement in fuel efficiency, with over 20% reduction inCO2 emissions, and substantial reduction in other emissions as well (Frankel1993). Some manufacturers have developed high-efficiency experimental prototypes(e.g., the Toyota AXV and the VW E-80) with highway fuel-economy of 100 or more miles-per-gallon (Bleviss 1990). Overall, it has been estimated that with moderate cost-effective implementation of the currently existing efficiency-improving technologies, the fuel economy of a new car could be improved by 65070 compared to 1990 levels (DeCicco and Ross 1994).

Unfortunately, these advanced technologies have been very slow to diffuse through the automotive industry as there is not much of an incentive for auto manufacturers to promote them in commercial vehicles or for consumers to buy such vehicles (Hughes 1991; DeCicco and Ross 1994). On top of this, the magnitude and the real costs of the environmental insults associated with the production and operation of automobiles are not completely measurable or even completely understood. Even though the choices of car buyers are eventually linked to these environmental effects, most of them are unconcerned or unmindful of the eventual effects of their choices. This manifests itself in consumption patterns such as a preference for higher vehicle performance over fuel efficiency, and for spacious, air-conditioned cars over simpler, smaller models. The automobile industry, of course, has no major problem with such a philosophy because larger, more luxurious cars are also more expensive and allow greater profit margins. As a result, many of the design improvements are applied toward increasing the performance of automobiles with almost no improvements in the fuel economy. For efficiency-enhancing designs to effectively contribute to fuel economy or other emissions reduction goals, research and development efforts that have been traditionally geared toward increasing the horsepower of automobiles, and designing high-performance vehicles needs to be redirected toward the more desirable goal of improving the fuel economy while keeping the performance constant (or even lowering it to some reasonable level). Moving toward that goal requires a philosophical transition on part of the manufacturers and the consumers that is unlikely to come about on its own. Still, some automobile manufacturers are already beginning to rethink their philosophy in those terms. Honda, for example, has withdrawn after a long and highly successful career in Formula I racing reportedly to focus its engineering innovation on "green" issues (Yates 1992).

VI. ETHANOL BLEND OF GASOLINE

There are two advantages of blending ethanol with gasoline.

- Improved Efficiency
- Reduction in Emission

ZlataMuzˇikova*, Milan Pospišil, Gustav Šebor of Czech republic stated in their paper that the using gasoline blended with ethanol give the following experimental results.

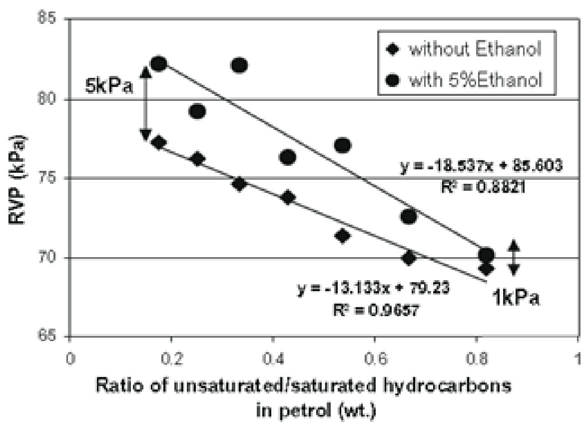

Figure 1: The Influence of Petrol Hydrocarbon Composition on the Rise RVP of Blends with 5 vol% Ethanol

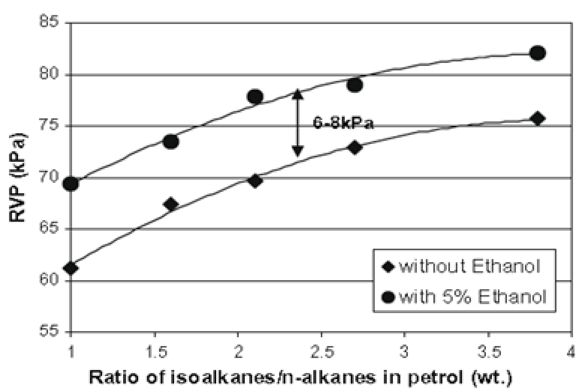

Figure 2: The Influence of Petrol Hydrocarbon Composition (iso –and n-alkanes) on the Rise in the RVP of Blends with 5 vol% Ethanol

VII. CONCLUSION

This study examines the ethanol enrichment of unleaded gasoline, with specific attention to the following environmental impacts

(1) Air pollutant emissions;

(2) Subsurface impacts;

(3) Greenhouse gas emissions;

(4) Energy efficiency and

(5) Sustainability.

Based on detailed literature reviews, it is found that:

The claimed air pollution benefits of E10 over E0 do not match the evidence in the scientific literature. E10 causes lower tailpipe CO and particulate emissions, but higher acetaldehyde, ethanol and NOx emissions. Without RVP control, lower hydrocarbon and air toxic tailpipe emissions are negated by higher evaporative losses; whilst all emission benefits may be negated by life cycle losses. There is some case study evidence of a connection between E10 and higher ground ozone levels.

E10 increases the risk and severity of soil and groundwater contamination, by increasing the risk of tank corrosion, reducing the NAPL-water interfacial tension, increasing contaminant solubility and inhibiting biodegradation. Modeling and case studies indicate that dissolved benzene plumes associated with E10 are 7–150% longer than those produced by E0.

The sustainability of ethanol production is affected by generous producer and agricultural subsidies; trade barriers; oligarchical concerns; and the need for agricultural expansion (existing feedstock) and/or genetic engineering (future feedstock).

The Proper proportion of ethanol with gasoline leads to the increase in fuel efficiency and also considerable reduction in harmful exhaust gases. Since the cost of ethanol is much less as compared to gasoline, a complete research is required for accepting it as an alternative fuel.

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