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PERSPECTIVE OF ETHANOL USAGE AS FUEL IN THE DOMINICAN REPUBLIC*

by

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I.- INTRODUCTION

DURING 1978 THE UNIVERSIDAD AUTÓNOMA DE SANTO DOMINGO ANNOUNCED THE BEGINNING OF A PROGRAM TO INVESTIGATE THE POSSIBILITY OF EXPLOITING NON-CONVENTIONAL ENERGY SOURCES AVAILABLE IN OUR COUNTRY.

ONE OF THE RESEARCH PROJECTS, ALCOHOL FROM PLANTS, GRASS OR VEGETABLES WAS TAKEN UP BY ONE CHEMICAL ENGINEERING AND THREE MECHANICAL ENGINEERING STUDENTS AS THESIS WORK.

EVERYTHING WAS DONE ALL OVER AGAIN, THE OLD COMPARISON BETWEEN PRODUCTION COSTS OF TRANSPORT FUELS AND ALCOHOL, BUT APPLIED TO OUR ECONOMICAL REALITY.

THE DOMINICAN REPUBLIC A NON-PRODUCER OF FOSSIL FUELS, IS ONE OF THE LARGEST SUGAR CANE EXPORTING NATION IN THE WORLD, AND A LARGE PRODUCER OF MANY OTHER TUBERS.

II.- Raw Material Selection

Sugar cane, molasses and other produce were compared to select the raw material. Table 1 summarizes the results of the comparison.

TABLE 1

Produce	Yield M.T./Acre	Production Cost RD$/Acre	Ethanol Yield Liters/Mt.	Ethanol Yield Liters/Acre
Yucca	2.94	140	305	897
Sweet Potato	3.67	140	305	1119
Potato	4.40	450	265	1166
Sugar Cane	20.57	100	65	1337

Note (1) 1 Acre = 4074 SQ Meters: (2) RD$ = US Dollar

The information above shows clearly that sugar cane has the lowest price and the largest yield of ethanol per unit area. Moreover, because of the high prices of sugar cane of the mid-seventies and the low prices of today, there remains an excess of cane after every harvest. This excess alone, represents about one hundred of fifty million liters of ethanol. Molasses, a subproduct of sugar, was also considered as ethanol raw material. It was quickly established that its total production had a highly competitive and growing demand. Besides, its dependency on the production of sugar made it an unstable raw material. It was also established that cost of producing ethanol directly from cane was not appreciably higher than from molasses.

III. Ethanol Fuel Properties

Table 2 lists some pertinent properties of ethanol and the gasoline available in the local market.

TABLE 2

Fuel	Heating Value Kcal./Kg.	Heat of Vaporizacion Kcal./Kg.	Density Kg/L. at 20°C	RON
Ethanol	6400	216	0.79	106
Gasoline	10500	100	0.74	95

Note: RON Stands for Research Octane Number.

Considering heating values by themselves, ethanol appears to be a much poorer fuel than gasoline. However, the remaining properties partly compensate for that drawback to the point that, on a volumen basis, ethanol specific consumption is only slightly higher that of gasoline. The larger heat of vaporization allows a more efficient heat exchange, the higher density gives a greater heating value per unit volume, and the larger octane number permits a much higher compression ratio, which also translates to better efficiency. In this work, however, the proposal is to use 20% ethanol in gasoline, which is a mixture hardly different from pure gasoline. Alcohol is miscible in light hydrocarbons in all proportions and there is no need to modify the carburation system of normal vehicles.

IV.- Economical Aspects

The present gasoline consumption in the Dominican Republic is around 460 million liters per years. Given a rate of growth of 3% and three years to put the distillery on stream, it means a 100 million liters production the first year, to substitute 20% of the gasoline sells. The plant capacity should be about 140 million liters per year to supply the market without modifications for a period of ten years. We have estimated the total cost of this project in $25,000,000. We also estimated that the production cost of ethanol, including raw material, will be overtaken by that of gasoline in four to five years at the current rise of 10% in crudes prices. Lastly, the hard currency savings due to less naphtha importation was computed. Table 3 illustrates those points.

TABLE 3

Year	Production Gasoline	10^6 L Ethanol	Cost, RD$/L Gasoline	Ethanol	Savings for 20% less Naphtha Imported, 10^6 US$
1982	400	100	0.158	0.211	12.3
1983	415	105	0.174	0.211	14.3
1984	426	107	0.191	0.211	16.0
1985	439	110	0.211	0.211	18.1
1986	453	113	0.232	0.211	20.5
1987	466	117	0.255	0.211	23.3
1988	480	120	0.280	0.211	26.3
1989	494	124	0.308	0.211	29.9
1990	510	127	0.339	0.211	33.7
1991	525	131	0.373	0.211	38.2

AS CAN BE SEEN, THE PRICES OF ETHANOL IN THE PERIOD CONSIDERED REMAIN THE SAME. A PROJECTION OF DECLINING SUGAR CANE PRICES AND L.RGER PRODUCTION ACC UNT FOR THIS B..HAVIOR. A VERY INTERESTING AND OFTEN OVERLOOKED POINT, IS THAT WHILE 80% OF THE GASOLINE PRODUCTION COST (RAW MATERIAL) IS HARD CURRENCY AND GOES OUTSIDE THE COUNTRY, EXACTLY THE OPPOSITE OCCURS WITH ETHANOL. THAT SITUATION BOTH HELPS JR INTERNAL ECONOMY AND OUR BALANCE OF PAYMENTS. A LAST POINT WHICH DERIVES FURTHER SAVINGS IN FUEL, IS THE UTILIZATION OF THE BAGASSE PRODUCED BY THE DISTILLERY, IN THE GENERATION OF 130 MILLION KILOWATT- HOURS IN A POWER STATION. THIS IS MORE ENERGY THAN THAT GENERATED BY OUR LARGEST HYDRO-ELECTRIC PLANT.

V.- CONCLUSION

NECESSARILY, THE PROJECT HAS TO BE IMPLEMENTED BY THE GOVERNMENT THROUGH ITS DEVELOPMENT AGENCY, SINCE AT FIRST IT IS NOT GOING TO APPEAL TO THE PRIVATE SECTOR. THERE ARE OTHER REASONS:

1) THE COUNTRY HAS TO LESSEN ITS DEPENDENCY ON FOREIGN FUEL BY DEVELOPING ITS OWN.

2) THE PROJECT WILL HELP TO INDUSTRIALIZE AGRICULTURAL PRODUCTS, ONE OF THE MAIN GOALS IN OUR CURRENT ECONOMICAL PLANS.

THE FINAL GOAL SHOULD BE THE PRODUCTION OF ENOUGH ETHANOL TO RUN ALL VEHICLES FULLY ON THAT FUEL. THE GENERATION OF ENERGY DURING PEAK HOURS, CURRENTLY DONE BY GAS TURBINES CONSUMING GAS OIL, SHOULD BE INCLUDED IN THE LONG TERMS PLANS.

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