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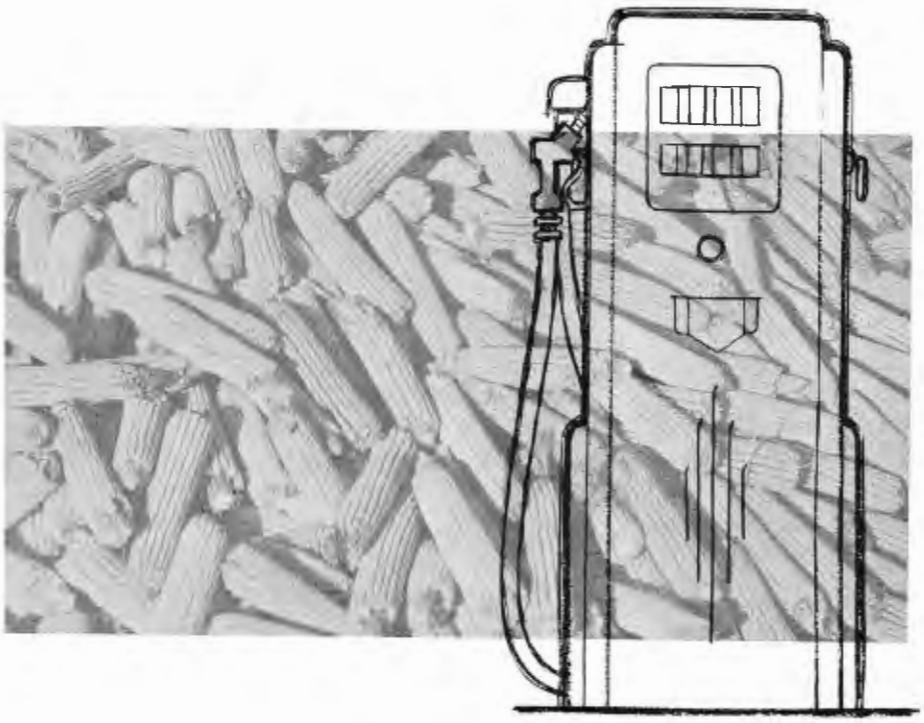

Use Surplus Corn for Alcohol?

Ethyl alcohol has many present and potential uses. As for using corn, however, ethyl alcohol can be produced much more cheaply from other materials by synthetic alcohol plants than it can by fermentation plants.

by Lionel K. Arnold

ADDING CORN alcohol to gasoline is a popular and frequently suggested solution for the corn surplus problem. The use of gasoline-alcohol blends has been studied extensively and was tried successfully in this country during World War II. There's no mystery about the process of making ethyl alcohol from corn. And alcohol is now being used in blends with gasoline in certain foreign countries.

If we were to blend 10 percent corn alcohol with the gasoline used in the United States, it would use about 2 billion bushels of corn per year. Score two points: (1) Corn alcohol-gasoline blends can be used successfully for motor fuel, and (2) we could use up a lot of surplus corn. Why isn't it done? Why isn't it a feasible method of solving the problem of surplus corn for us?

Too Expensive . . .

The answer is that ethyl alcohol—made from corn or any other known source—is too expensive to be used in motor fuel in the United States at current motor fuel and alcohol prices. The cost of producing alcohol is the sum of the cost of the raw materials and the cost of processing them into alcohol. At present, both of these costs are lower for synthetic than for grain alcohol.

A bushel of corn will produce about 2½ gallons of 95-percent alcohol. If we add the cost of malt, making an allowance for the alcohol produced from it, the raw material cost when using corn at $1 per bushel is about 46 cents per gallon of corn alcohol.

Estimates of processing costs vary, but 25 cents per gallon probably is a realistic figure. This, added to the raw material cost, gives a total of 71 cents per gallon. The value of any by-products can be subtracted from this cost. Distillers' grains (used as a high-protein feed) and fuel oil are the by-products normally marketed. Carbon dioxide and corn oil are other possibilities which normally aren't recovered. A credit of 1 cent for the fuel oil and 13 cents for the distillers' grains can be allowed, for a total credit of 14 cents per gallon.

With this allowance, and with corn at $1 per bushel, the cost is 57 cents per gallon of corn alcohol. (With corn at $1.25, the cost would be 68-69 cents a gallon.) But converting the 95-percent alcohol to anhydrous alcohol, suitable for blending with gasoline, adds another 7 cents to the cost.

These costs explain why alcohol from corn isn't added to gasoline in the United States—with the current price of 91-octane gasoline at the refinery at about

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12 cents a gallon. Except for medicinal and beverage use, in fact, grain alcohol can't compete on a cost basis with synthetic alcohol. This is currently quoted on a tax-free basis at 52 cents per gallon for 95-percent alcohol and at 59 cents for the anhydrous grade.

Increase Gasoline Cost . . .

The addition of 10 percent alcohol from $1 corn would raise the price of gasoline slightly more than 5 cents a gallon. From $1.25 corn, the cost would increase another cent. These costs don't include any transportation or mixing costs and are based on the price of corn as *delivered* at the alcohol distillery.

At one time, the anti-knock properties of alcohol appeared to give it a premium value for use in gasoline. This probably is no longer true with today's improved gasolines. The addition of ethyl alcohol to modern high-octane gasoline would probably do no more than replace part of the cheap butane normally present.

It is a fact — one frequently pointed out—that blends of gasoline and alcohol are used, despite the cost of alcohol, in some foreign countries. But the explanation is that the cost of gasoline in these countries is much higher in relation to alcohol than in the United States.

Looking Further . . .

It probably wouldn't be necessary or desirable to convert all of the corn surplus now stored into alcohol over a period of a few years. It might be more desirable to convert only the annual surplus production each year. Otherwise, some corn might simply come out of storage for alcohol production while new surplus corn was going into storage. The amount of corn placed under support during the past 3 years has averaged about 400 million bushels each year. This would produce enough alcohol for about a 2-percent blend with gasoline at an increased material cost of about a cent per gallon of gasoline.

This kind of program might be attractive and feasible—*if* it were possible to use a 2-percent blend. But, at present, the use of less than a 10-percent blend is considered impractical. Blends containing less than 10 percent alcohol take up enough moisture from the air to make the alcohol and gasoline separate. We might look forward, however, to the possibility of developing a blending agent that would allow the blending of alcohol containing some water.

Oil Stocks Depleting?

Suggestions have also been made that alcohol can be used to supplement inadequate supplies of petroleum in the near future. But there's no immediate shortage of petroleum. American petroleum producers — to prevent flooding the market—actually are restricted on the amount of crude oil they can remove from their wells at the present time.

When the supply of crude oil becomes inadequate, we can expect production of oil from vast deposits of oil shale. And another possibility is the production of synthetic gasoline from coal—at a higher cost than from crude oil, but from which low-cost alcohol would be a by-product.

Nongasoline Use?

From a cost standpoint, it would seem more feasible to substitute corn alcohol for 52-cent synthetic alcohol than for 12-cent gasoline. The production of synthetic alcohol plants in 1956 was 181 million gallons — about 75 percent of their estimated capacity. At the same time, the estimated capacity of *idle* fermentation-alcohol plants was 217 million gallons. The lower production costs of the synthetic plants account for their dominance in the industrial alcohol market.

It's not probable that synthetic alcohol costs will go up materially in the near future. And the price of delivered corn would have to be *substantially lower* than either the $1 or $1.25 figures used earlier for industry to even *consider* reactivating the fermentation alcohol plants. Even the synthetic plants aren't operating at capacity, and the production costs for these are less than for the idle fermentation plants.

It's possible that the cost of producing corn alcohol can be reduced somewhat. Experimental work indicates that the substitution of fungal amylase for malt can reduce the material cost perhaps 5 cents per gallon. It has also been suggested that the removal and use of the corn protein for human food before the starch of the corn is fermented could result in lower alcohol costs. This would require considerable research.

But a fact to face is that, even if *all* of the synthetic alcohol now produced could be replaced by corn alcohol, this would require only about 18 percent of the current annual corn carryover.

Still another suggestion is to use corn alcohol in the manufacture of butadiene for synthetic alcohol production. This was done during World War II. At present, butadiene is made from butane or butylene originating from petroleum. To be competitive, it's estimated that the alcohol, however, would have to be available at 20-25 cents a gallon.

Ethylene, used in polyethylene plastic, can be made from ethyl alcohol. But, here again, the cost would be too high to compete with the product from petroleum.

In summary, ethyl alcohol and its derivatives have large present and potential uses. But, because of the present cost of alcohol produced from corn, it is being used only to a limited extent.