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QUESTIONS AND ANSWERS ABOUT
FUEL ALCOHOL

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by

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Q. Are alcohol fuels suitable for use in internal combustion engines?

Yes. Alcohol, both ethanol and methanol can be burned in internal combustion engines. A mixture of 10% ethanol and 90% gasoline is a good automotive fuel. This mixture, called Gasohol, is currently being sold in approximately 2,000 service stations.

Q. Can alcohol be used as a fuel without mixing with gasoline?

Yes. Alcohol or alcohol water mixtures containing up to 30% water (140 proof) can be used as fuel in a gasoline engine. Certain modifications to the carburetor are required.

Q. Isn't alcohol a "hotter" fuel than gasoline?

No. Alcohol actually has less heat value than gasoline. Ethanol contains 86,000 btu per gallon while gasoline has 124,000 btu per gallon. Methanol has about 80,000 btu/gallon. However, ethanol is a higher octane fuel than gasoline so cars fueled with gasohol usually run somewhat smoother than they would on unleaded gasoline.

Q. What about miles per gallon?

Several tests have been conducted to compare mileage from gasohol to mileage from gasoline. Without going into detail, older cars (pre 1974) tend to get better mileage on gasohol. Newer lean-burn engines tend to get lower mileage on gasohol. Both engines get lower mileage on straight alcohol.

Q. How much does alcohol cost to produce?

The cost of producing alcohol depends on many factors, including the cost of grain, fuel costs, processing plant cost, labor, etc. The larger commercial manufacturers are currently charging \$1.70 to \$1.80 per gallon. After making an allowance for profit, it would appear that production is costing between \$1.25 and \$1.40 per gallon. Some people, particularly those with small plants, claim to be able to make the fuel for costs ranging from \$0.15 to \$0.95. The costs on the upper end of this range are conceivable if an individual makes no charge for his own time or for the value of wood used to provide the process heat. However, any cost below \$.60 per gallon would also have to discount the value of the material used as the primary input. The only time this would be reasonable would be if waste material, such as cull potatoes, was being used.

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Q. What materials can be used to make alcohol?

Virtually any product which contains a significant amount of sugar or starch can be fermented to produce alcohol. Corn is frequently mentioned as the input material. Starchy materials, such as grains, must go through a cooking process to convert starch to sugar. The sugar mixture can then be fermented. Sugary materials, such as sweet sorghum, sugar beets, or sugar cane can be fermented directly.

Q. Can alcohol be made from grass, leaves, and similar material?

Yes. These cellulosic materials can be converted to simple sugars which can then be fermented to make ethanol. Two processes, enzymatic hydrolysis and acid hydrolysis, can be used. However, these processes are complex and difficult to control. Also, the economics of the process favor large plants, in the 50,000,000 gallon per year range.

Q. How useful are the by-products from the process?

The primary by-product from an alcohol still is distillers dried grains and solubles. This product (DDGS) contains the nutrients, including protein, that were present in the corn before it was converted. Since the weight of the product is reduced by removing the starches and sugars, the DDGS has a higher percentage of protein. It can be fed in rations as a replacement for soybean meal, although more is needed because DDGS is lower in protein than soybean meal.

Q. How much additional protein is developed when the corn is converted to ethanol?

Very little. The only protein present in the DDGS is that which was in the corn originally plus that contained in the dead bacteria and yeasts which grow while the material ferments.

Q. How much alcohol can we produce?

Virginia produces about 48,000,000 bushels of corn per year. Converting the entire crop to alcohol would yield about 125,000,000 gallons of ethanol. This huge quantity is only about 4.5 percent of our statewide gasoline consumption. Another estimate which was recently made indicated that about 7 billion gallons could be made nationally by using available grain, crop residues, and municipal solid waste. We consume about 130 billion gallons of gasoline per year, so we could apparently supply a little over 5 percent from alcohol.

Q. What is the potential for increasing grain production for conversion to alcohol?

Unused productive capacity undoubtedly exists. For example, Virginia has between 35,000 and 70,000 acres in the "set-aside" program. If corn were grown on this land, 7 to 14 million gallons of alcohol could be produced. However, up to 1.5 million gallons would be needed to produce the crop and other energy would be needed to produce the fertilizers and other input materials and to dry and transport the harvested grain.

There is considerable disagreement about the amount of unused productive capacity that is available. However, even if the corn acreage in Virginia were to be doubled, and the energy cost ignored, we would still not be able to produce enough alcohol to replace 10 percent of our gasoline.

Q. Who should build an alcohol plant?

Many people are interested in constructing a plant to make alcohol. Large plants, selling 200 proof alcohol for commercial distribution in Gasohol, are apparently profitable. They charge enough to recover the cost of production and return a profit to the operation. They also benefit from a federal program which does not require 4 cents per gallon in taxes. This subsidy amounts to 40 cents per gallon of alcohol. In states such as Arkansas, which has eliminated the 9 1/2 cents per gallon tax on gasohol, an additional subsidy is available. The total subsidy can be as high as \$1.35 per gallon. Most states fall somewhere between these two extremes.

Small plants may qualify for the subsidy if they sell the alcohol for use as a motor fuel in automobiles or other road vehicles. However, there is no tax on farm fuel, so there is also no subsidy. The economics of small plants supplying "farm-use" fuel should be evaluated very carefully.

Q. Shouldn't factors other than economics be considered?

Yes. The decision to build or not build an alcohol plant should be made on any criteria an individual deems important. Some examples of criteria which are being considered include: freedom from unreliable supplies of conventional fuels, self reliance, a desire to demonstrate to OPEC that we can reduce imports, etc.

Q. If I build a plant, how much capacity should it have?

Capacity will depend on several factors, including available capital, grain availability and need for fuel. If built correctly, an alcohol plant can be a big investment for an individual. However, even a small 5 gallon still, which can be built for as little as \$200.00 can make up to 1,000 gallons of alcohol per year, depending on how much time is available to operate it.

In summary each situation is different and should be evaluated carefully to determine whether to build a plant and the proper size of the plant, if built.

Q. Where can I get more information?

Further information will be available from Extension when we are sure that it is reliable. The National Alcohol Fuel Producers Association has information. Phone (800) 533-5333 or (800) 535-2840.

Q. How do I get a permit to operate an alcohol plant?

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