What is Cellulosic Ethanol?

By Kim Smith

"The fuel of the future is going to come from fruit like that sumac out by the road, or from apples, weeds, sawdust -- almost anything. There is fuel in every bit of vegetable matter that can be fermented. There's enough alcohol in one year's yield of an acre of potatoes to drive the machinery necessary to cultivate the fields for a hundred years. The fuel of the future," was how pioneering automotive engineer Henry Ford described ethyl alcohol in 1925. He was expressing an opinion that was widely shared in the automotive industry.

On November sixth of this year, ground was broken on the first-ever commercial-scale cellulosic ethanol plant near Soperton, Georgia. Nearly one hundred years later Henry Ford's prediction is becoming realized. What is ethanol? What is cellulosic ethanol? And how does it differ from other biofuels? Ethanol is alcohol—a colorless, volatile, flammable liquid either synthesized or obtained by the fermentation of sugars and starches. It is widely used, in either its pure form or denatured, as a solvent, in drugs, explosives, cleaning solutions, intoxicating beverages, and as a fuel. Cellulosic (cellulose, or cell wall) ethanol is fuel made from woody plant fiber. Conventional ethanol is made from soft starches such as corn. Cellulosic ethanol is created from a wide range of resources. Plant and plant-derived material, referred to as biomass, can be converted into cellulosic ethanol. Examples of biomass include wood chips, corn stalks, sawdust, olive pits, peanut shells, paper pulp, hog manure, and municipal garbage. Resources that would otherwise be considered waste are used to create a new and useful fuel.

The new plant, built by Range Fuels, will be the first in the United States to produce ethanol from biomass. Using leftover wood reside from timber harvesting, the modular plant is being built in Soperton because of its close proximity to the renewable forest-derived waste, or feedstock as it is referred to in the industry. Range Fuel's two-step thermo conversion process is driven by design efficiency, not only in how the ethanol is created, but where. Rather than having to transport biomass to a distribution site, the modular design brings systems to sources where the biomass is most plentiful. The two-step process utilizes a thermo-chemical process that relies on the chemical reactions and conversions between forms that naturally occur when materials are mixed under specific combinations of temperatures and pressures. Conventional conversion processes use enzymes and yeasts to convert between forms.

Step One. Solids to Gas: Biomass, such as agricultural waste, is fed into a converter. Utilizing heat, steam and pressure the feedstock is converted into synthesis gas (syngas).

Step Two. Gas to Liquids: The syngas is passed over Range Fuel's proprietary catalyst and transformed into mixed alcohols. These alcohols are then separated and processed to maximize the yield of ethanol for use in fueling vehicles.

The energy generated by the sun's light connects us all. Just as plants capture energy from the sun through photosynthesis, we can do the same by converting the waste generated from agricultural products into cellulosic energy. Our dependence on foreign oil, which is produced in countries with unstable governments, coupled with the deadly effects of these fossil fuels on our environment, has resulted in a recent poll that finds 91 percent of Americans believe our nation is heading towards an energy crisis and 86 percent say they want our government to aid in the development of alternative fuels. Unlike ethanol made from sugar cane, which needs a plentiful supply of water, a long hot growing season, and is in part harvested by child labor, or ethanol made from corn, which competes with farm land better served to feed people and also requires

plenty of water (thinking of cycles of drought), ethanol made from biomass is practical, efficient, and abundant, and adds no net greenhouse gases to the atmosphere.

What can we do immediately? The House and Senate have passed two separate energy bills and are now working to combine the two into final legislation that could come up for a vote by year's end. In order to gain bipartisan support, economic incentives for alternative fuels are being shelved. Call the offices of your State Senator and House Representative and tell them that you want to keep the economic incentives for solar, wind and cellulosic ethanol as part of the energy bill.

Talley and Heinsohn, in an article published in the Wall Street Journal on November 12th, 2007, report both bills are designed to lessen American reliance on foreign oil by calling for higher fuel economy and mandating greater use of ethanol. Their view is that this is a drawback because anything that creates uncertainty about gasoline over the long term means less incentive for the U.S. to expand their refining capacity thereby increasing foreign dependency. Saudi Arabia and Kuwait are preparing to build new refineries and with these significant investments coming on line, it will be difficult to build a new refinery in the U.S. Which poses the question isn't this good for the long term health of our economy and the environment? Brazil was forced to relinquish dependency on foreign oil during the oil crisis of the 1970's and is now a leader in using alternative fuels. Mr. Wicker, spokesman for Jeff Bingham, the New Mexico Senator who chairs the Senate Energy and Natural Resources Committee, notes, "There are big oil companies that are also looking at investing in ethanol refineries. They are energy companies, not oil companies, and if the market is trending towards domestic grown or produced energy, I certainly hope that the industry sees that and acts accordingly."

"The production of cellulosic ethanol represents not only a step toward true energy for the country, but a very cost-effective alternative to fossil fuels. It is advanced weaponry in the war on oil."—Vinod Khosla, financier of Range Fuels.

End note: For an overview of the cellulosic plant underway in Georgia and an interactive look into how cellulosic ethanol is created, visit the website of Range Fuels at www.rangefuels.com