Elbow Deep In Ethanol Energy

The Dow Chemical Co. [1] and the DOE National Renewable Energy Laboratory [2] (NREL) recently agreed to jointly develop and evaluate a process that would convert biomass to ethanol and other chemical building blocks. The collaborative effort demonstrates Dow and NREL's commitment to deliver sustainable solutions to the nation's current energy challenges by reducing dependence on foreign oil. The companies believe a mixed alcohol catalyst from Dow could be the key to unlocking the potential for this promising renewable energy resource. The process would use non-food ingredients, such as the leaves from a corn plant or wood wastes, and convert the bio-based material through a gasification process to synthesis gas. Dow's technology helps convert the synthesis gas into a mixture of alcohols, including ethanol, that can be used as transportation fuels or chemical building blocks. "NREL is interested in reducing the cost of biofuels in support of the nation's energy goals," according to NREL Director Dan Arvizu. "Dow's catalyst technology, and expertise in catalyst development and testing, will be extremely helpful as we evaluate the viability of this approach on a larger scale." The joint evaluation program will focus on improving the mixed alcohol catalyst, as well as demonstrating pilot-scale performance and the commercial relevance of an integrated facility.

The Skinny On The Catalyst

In a thermochemical process, biomass gasification uses high temperatures (of greater than 550° C) to thermally degrade the feedstock. The result is a gas primarily composed of CO and H_2 , which can be upgraded to fuels using Dow's mixed alcohol catalyst technology. The collaborating companies believe some of the technology's benefits are:

- Thermochemical processes convert more feedstock into liquid fuel than biochemical processes, and can be used for conversion of nearly any biomass feedstock, even those of inconsistent quality, such as corn stover (stalks and leaves).
- Moving toward biomass feedstocks dramatically increases the amount of suitable feedstocks for biofuel production that today is dominated by food crops, such as corn, improving both the energy balance and emissions profile of fuels production.
- A recent study by the USDA and DOE concluded that there are 1.3 billion tons of biomass available in the U.S., equivalent to nearly 2 billion barrels of oil per year-approximately equal to the total oil the U.S. currently imports each year.
- Products of the thermochemical process, in addition to being good transportation fuels, are potentially useful as chemical feedstocks. Thus, thermochemical biomass conversion offers renewable feedstock options for production of bio-based chemicals.
- Reasonable catalyst and process improvements stand to further improve

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the process economics and lower the ultimate fuel production cost.

- The energy balance ratio (energy yielded over energy needed for production) for cellulosic ethanol is at least 6:1 compared to approximately 1.3:1 for corn-based ethanol.
- Some fossil fuels would be required for harvesting, biomass transportation and product distribution, but the net effect of this process is an estimated 80 percent reduction in CO2 emissions relative to fossil fuels.

"This agreement exemplifies how Dow uses its technology to generate sustainable solutions that address energy challenges in the U.S., while building our portfolio of alternative energy and feedstock options," reports Juan Luciano, Dow's Business President of Hydrocarbons and Energy. "By using ethanol derived from biomass as an alternative to raw material or feedstock, Dow is exploring new ways to reduce the cost and volatility of its inputs to produce chemicals and plastics that are essential to a wide range of consumer products."

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Links:

[1] http://www.dow.com/

[2] http://www.nrel.gov/