

Engineers devise new process to improve energy efficiency of ethanol production

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Carnegie Mellon University Chemical Engineers have devised a new process that can improve the efficiency of ethanol production, a major component in making biofuels a significant part of the U.S. energy supply.

Carnegie Mellon researchers have used advanced process design methods combined with mathematical optimization techniques to reduce the operating costs of corn-based bio-ethanol plants by more than 60 percent.

The key to the Carnegie Mellon strategy involves redesigning the distillation process by using a multi-column system together with a network for energy recovery that ultimately reduces the consumption of steam, a major energy component in the production of corn-based ethanol.

"This new design reduces the manufacturing cost for producing ethanol by 11 percent, from \$1.61 a gallon to \$1.43 a gallon," said Chemical Engineering Professor Ignacio E. Grossmann, who completed the research with graduate students Ramkumar Karuppiah, Andreas Peschel and Mariano Martin. "This research also is an important step in making the production of ethanol more energy efficient and economical ."

For a long time, corn-based ethanol was considered a questionable energy resource. Today, 46 percent of the nation's gasoline contains some percentage of ethanol. And demand is driven by a federal mandate

that 5 percent of the nation's gasoline supply – roughly 7.5 billion gallons – contain some ethanol by 2012.

Corn is most often used to produce ethanol, but it can be made from grains, sugar beets, potato and beverage wastes and switchgrass.

The research was conducted through the Chemical Engineering Department's Center of Advanced Process Decision-making in collaboration with Minneapolis-based Cargill, an international provider of food, agricultural and risk management services and products.

"As a result of the explosive growth of the U.S. fuel ethanol industry, we decided to collaborate with Professor Grossmann's team to verify how process synthesis tools could be applied to improve the production of ethanol from corn. The work done at Carnegie Mellon demonstrated the potential for considerable capital and energy cost savings in the corn to ethanol process. We look forward to the time when the tools developed by Carnegie Mellon researchers will become part of industry's new toolkit for making the process even more economical and sustainable," said Luca C. Zullo, technical director of Cargill Emissions Reduction Services.

Source: Carnegie Mellon University

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