Biotech breakthrough could end biodiesel's glycerin glut

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With U.S. biodiesel production at an all-time high and a record number of new biodiesel plants under construction, the industry is facing an impending crisis over waste glycerin, the major byproduct of biodiesel production. New findings from Rice University suggest a possible answer in the form of a bacterium that ferments glycerin and produces ethanol, another popular biofuel.

"We identified the metabolic processes and conditions that allow a known strain of E. coli to convert glycerin into ethanol," said chemical engineer Ramon Gonzalez. "It's also very efficient. We estimate the operational costs to be about 40 percent less that those of producing ethanol from corn."

Gonzalez said the biodiesel industry's rapid growth has created a glycerin glut. The glut has forced glycerin producers like Dow Chemical and Procter and Gamble to shutter plants, and Gonzalez said some biodiesel producers are already unable to sell glycerin and instead must pay to dispose of it.

"One pound of glycerin is produced for every 10 pounds of biodiesel," said Gonzalez, Rice's William Akers Assistant Professor in Chemical and Biomolecular Engineering. "The biodiesel business has tight margins, and until recently, glycerin was a valuable commodity, one that producers counted on selling to ensure profitability."

Researchers across the globe are racing to find ways to turn waste

glycerin into profit. While some are looking at traditional chemical processing -- finding a way to catalyze reactions that break glycerin into other chemicals -- others, including Gonzalez, are focused on biological conversion. In biological conversion, researchers engineer a microorganism that can eat a specific chemical feedstock and excrete something useful. Many drugs are made this way, and the chemical processing industry is increasingly finding bioprocessing to be a "greener," and sometimes cheaper, alternative to chemical processing.

In a review article in the June issue of Current Opinion in Biotechnology, Gonzalez points out that very few microorganisms are capable of digesting glycerin in an oxygen-free environment. This oxygen-free process -- known as anaerobic fermentation -- is the most economical and widely used process for biological conversion.

"We are confident that our findings will enable the use of E. coli to anaerobically produce ethanol and other products from glycerin with higher yields and lower costs than can be obtained using common sugar-based feedstocks like glucose and xylose," Gonzalez said.

Source: Rice University