Cutting Edge

Industry Trying to Stay on Top of the Game

Whether it's in a university or government research lab, an industry setting, or a pilot-plant setup, someone in the agricultural world is trying to make things faster, better, cheaper, "greener," or more versatile. Here's a look at four examples.

Syrupy Sweet Fuel?

Biodiesel Processing Is Yielding Surpluses of Glycerin That May Be Burned for Energy

Dan Lemke

Quickly scan the product ingredient panels in a medicine cabinet and "glycerin" will show up frequently. The sweet, thick liquid has hundreds if not thousands of uses—from toothpaste, lotions, and cosmetics to livestock feed and medicine.

But the demand for glycerin may not exceed a growing supply.

Crude glycerin is the main coproduct of biodiesel processing. As the biodiesel industry grows, so does the supply of crude glycerin, which decreases its value.

But Minnesota's Agricultural Utilization Research Institute (AURI)-sponsored research is looking at using glycerin for fuel—a new use with huge potential.

In January, 150,000 pounds of glycerin were combusted at a Minnesota industrial plant to evaluate it as a fuel. Tests were conducted at Central Bi-Products in Redwood Falls because the plant is permitted to burn yellow grease in its boilers. Central Bi-Products is part of Farmers Union Industries, LLC, which also operates FUMPA Biofuels, a 3 million gallon-per-year biodiesel facility. Emissions test results were sent to the Minnesota Pollution Control Agency for review.

"We're looking for the full gamut of emissions information…particulate matter, nitrous oxide levels, metals, sulfur and particularly acrolein," said former AURI chemist Rose Patzer. Acrolein is a regulated toxin that forms when certain pollutants break down in outdoor air or from burning gasoline, turbine engine emissions, forest fires, spray painting, and other sources.

Despite being an intriguing project that has generated national and international interest, the results weren't encouraging—this time. "Because of its lower energy value, crude glycerin just doesn't have enough available energy to support a flame on its own," Patzer said. She added that the test provided baseline fuel information and identifies boiler and operational parameters that could be used elsewhere. The baseline tests do not cover every possibility because each boiler setup may react differently, requiring specific adjustments.

Besides emission tests, AURI analyzed crude glycerin for its energy value, moisture levels and ash, carbon and hydrogen content. While primarily geared toward identifying emissions information, the tests revealed other factors in determining glycerin's future as a fuel.

Patzer says glycerin introduces higher levels of ash, metal, chlorine and water, but not enough energy to work as a stand-alone fuel. She said a blend of 10 percent glycerin and 90 percent yellow grease was successful in powering the boiler, but it caused a significant buildup in the burners, which would result in down time for cleanup.

"This demonstration was very specific to this boiler and these fuel parameters," Patzer added, "but it could be a guide. Boilers are made to run on certain fuels, so modifications would be necessary. While 100 percent glycerin didn't work in this case, individual results may vary."

Mixing 100 pounds of oil with 10 pounds of alcohol yields about 100 pounds of biodiesel and about 10 pounds of glycerin. Each gallon of glycerin weighs about 10 pounds. At full capacity, Minnesota biodiesel refineries would produce about 63 million gallons of biodiesel

and 63 million pounds of glycerin annually. Other biodiesel producing states are dumping glycerin on the market as well, creating a huge surplus.

Just four years ago, crude glycerin sold for around 35 cents a pound—today it may fetch a nickel. In some cases, manufacturers are paying to get rid of excess glycerin.

The glycerin in personal care and food products is highly refined. Most biodiesel refineries lack the necessary equipment to further purify glycerin, because of the expense. Finding a large-scale use for crude glycerin—such as being used for fuel—would help alleviate growing supplies and give the biodiesel industry a new revenue stream.

Pure glycerin contains about 19,000 Btu energy value per pound, while crude glycerin yields just under 7,000 Btu. But the price may be right. At 5 cents per pound, crude glycerin could produce one million Btu of industrial fuel for less than $7—a good buy for industry.

From AURI's AG Innovation News and AG Innovations newsletter. Dan Lemke is AURI's Communications Director.

DuPont Helps Meet Demand for Grain

At an investors conference in New York City the first week of June, DuPont Vice President for Crop Genetics Research & Development Bill Niebur said the company's technologies are helping—now and well into the future—to meet the strong global demand for grain that is being driven by a growing global population and increased biofuels use.

"World population growth plus gross domestic product growth means increased demand for dietary protein," Niebur said at the Merrill Lynch Agricultural Chemical Conference. "This global mega trend is a powerful incentive for farmers around the world to rapidly adopt technologies that will increase their productivity. We are helping increase productivity today through advanced plant breeding and biotechnology, but this is only just the beginning."

In the past year, DuPont seed business Pioneer Hi-Bred has increased its seed corn yield advantage by 50 percent and has significantly increased the number of products with yield-enhancing biotech traits. At the same time, Pioneer has more people working with farmers to increase yield by matching the best seed products to their specific fields and management practices.

"Farmers are looking for every opportunity to increase productivity in a profitable and sustainable manner," Niebur said. "They recognize that biotech traits on the market today, such as the Herculex® XTRA trait, control pests better than other options and allow them to produce increased quantities of better quality grain per acre."

DuPont officials say there are a number of new advancements in the crop genetics pipeline from DuPont that will enable farmers to meet the global demand for grain, which is expected to remain strong.

DuPont has integrated a number of new technologies into its crop genetics research and development effort to reduce the time it takes to bring new ideas to its customers.

"Over the past year, 44 percent of our current pipeline projects have advanced to the next phase of development," Niebur said. "During the past two years, 90 percent of the projects advanced to the next phase in the pipeline. We are excited about this strong record of progress and how our teams will be able to further accelerate new product development and commercialization going forward."

Oklahoma State University Technologies Show Signs of Success

Oklahoma State University's (OSU) Technology Business Assessment Group (TBAG) recently announced that it will fund four faculty research projects "with the potential for commercial success." The group identified these projects from a number of high-level proposals submitted in response to a solicitation this spring. TBAG Director Steve Price said, "The program continues to grow as faculty look for that hard-to-find funding to take their research to the next level."

The group identifies research projects that have the potential for commercial application when fully developed, and then helps move those projects forward by funding early stages of development. Hopefully, these initial steps lead to a startup company or joint venture with an interested company. TBAG was formed in 2005 to further engage research faculty pursuing new technology development opportunities.

TBAG includes private sector partners experienced in new product identification and new technology evaluation, early-stage capital investors, representatives from i2E, the OSU Center for Innovation and Economic Development, the OSU-Okmulgee Economic Development and Training Center, the OSU VP for Research and Technology Transfer and the OSU Assistant VP for Technology Development.

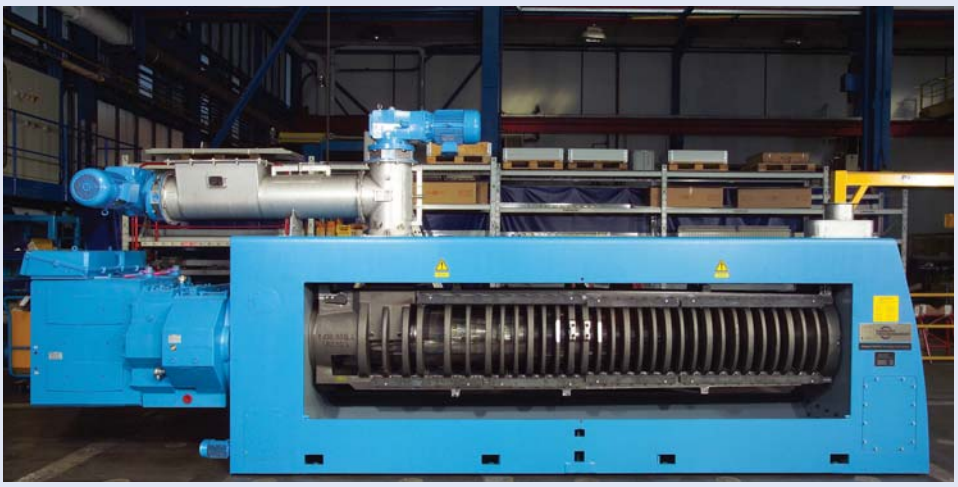
One project that was chosen to receive funding was Niels Maness' "Extraction Alternatives for Agricultural and Industrial Substrates." Maness is in the Department of Horticulture and Landscape Architecture.

Ambient temperature extraction of lipid-soluble substances may be accomplished with various extractants, but the most common are propane, butane, and carbon dioxide. The extraction of oils and fats from agricultural feedstocks using ATE solvents at speeds which are commercially viable at low temperature and at sub-critical pressure has not yet been accomplished and is the essence of the technology being commercialized. Because extraction temperatures never exceed 20ºC, ATE oils and raffinates retain a flavor, color, aroma, and protein profile representative of a product's fresh state. Consumer demand in this area is enormous, and ATE products will provide end users a better way to meet existing demand.

Collaborating with Ambient Temperature Extraction Partners and Food Mech, a Stillwater-based engineering company, a commercial extraction system rated at 100 tons-per-day oilseed throughput has recently completed the preliminary engineering phase. The system was designed for soy, but canola is a more important oilseed crop in Oklahoma and would require fewer pre-processing handling steps than soybeans. Thus, proof-of-concept will be completed with canola. A pilot unit will provide the critical documentation needed for company operation of commercial ATE installations. Such an installation at OSU would provide a one-of-a-kind research tool.

Funds for faculty research and development are generated from OSU royalty income which reached $1M in FY 2006—a major milestone for the university. TBAG funds projects to strengthen copyright/ patent status; new faculty startup companies; projects that have not yet yielded any intellectual property and require feasibility tests; and projects with Oklahoma companies that have an interest in co-sponsoring and/or commercializing a technology.

For more information about TBAG or the project mentioned here, please contact TBAG Director Steve Price, OSU Office of Intellectual Property Management, Stillwater, OK 405-744-8920.



A new strainer cage concept with an optimized interlocking system significantly reduces the time needed by the operator to open and close the cage.

Harburg-Freudenberger Presents a New Generation of Screw Presses

Excellent quality can always be exceeded. This was the approach adopted by the engineers from Harburg-Freudenberger Maschinenbau GmbH (H-F) when they set about further improving the technology, operation, and design of their worldwide successful screw press models.

The first noticeable aspect is the modern appearance created by an industrial designer for this 18-ton high-performance machine for oilseed processing. Jens Schulz, technical director of the Edible Oil Division of Harburg-Freudenberger, is very proud of the new look of the machine: "Obviously, there is more to it than just appearance since the performance specifications of the screw presses are also very impressive. However, we do believe that even the most modern technology has to be underscored by a modern and progressive appearance. This can often be one of the determining points when deciding a purchase."

The improvements are concealed under the new beautifully-styled case. These improvements concern primarily screw press operation in day-to-day production. The engineers wanted to enhance the operating and maintenance ease of the presses. Consequently, a new strainer cage concept was developed that featured an optimized interlocking system to significantly reduce the amount of time needed by the operator to open and close the cage. The use of new nut and bolt connections has reduced the 220 man-minutes required for these operations in the past to only 96 man-minutes, according to H-F.

Furthermore, the cage halves have been positioned at a higher level within the machine so that they can be opened at an angle of 84 degrees. Obviously, this is a tremendous advantage when replacing screw parts, cage bars, or in the event of emergency emptying. "The new strainer cage concept reduces machine downtimes to an absolute minimum. This is a tremendous benefit when the machine is operated in countries with an unstable power supply system where, in the event of a sudden power failure, the cage has to be opened and emptied so that the press can be restarted without any problems," explains Schulz.

The cage bars have also been improved according to the company. Compared with the predecessor models, they are easier to install and have a 30 percent larger drainage area to boost the machine's operating efficiency. A new rod seal between the two cage halves ensures added safety and prevents solids from entering.

The first noticeable aspect of the new Harburg-Freudenberger screw press models is the modern appearance created by an industrial designer.