

# Glycerin

## Goes With the Flow

Perhaps the motto of the biofuel revolution should be as follows:  
“At every turn there is an opportunity — for those who can see it.”

Story & photo by Ed Haag

If there is a Phoenix story in America's ongoing biofuel saga, it is most certainly the tale of the rise, fall and potential rise again of glycerin.

A product used in manufacturing everything from toothpaste and cosmetics to dynamite, glycerin's most recent incarnation is of particular relevance to beef producers who are staggering under the weight of record-high feed prices and are in desperate need of a low-cost replacement for corn lost to the ethanol industry.

In the mid-1990s, quality glycerin sold on the open market for more than a dollar per pound. Demand was slightly higher than production, and the price seemed predictably stable, as long as production did not exceed demand. At least, that is what those who

invested in its production infrastructure believed.

But all is not what it seems. Already there were forces at work that would undermine the fine balance between supply and demand.

Federal and state legislators, in an effort to reduce sulfur emissions and lower particulate counts from diesel engines, were making a concerted effort to promote the use of B-20, a cleaner-burning diesel fuel with 20% biodiesel. In 1998, the Energy Policy Act (EPACT) of 1992 was amended to include biodiesel. EPACT mandated that specified federal, state and public utility entities make a certain percentage of their fleets alternative-fuel vehicles. EPACT proved particularly advantageous to the producers of biodiesel because, unlike other alternative fuels, no vehicle modifications were required to run B-20.

Promoting biodiesel might have been beneficial for the environment, but it certainly wasn't good for the glycerin industry. A primary objective when processing biodiesel is removing the glycerin that is resident in all bio-based oils. For every 10 gallons (gal.) of biodiesel produced 1 gal. of glycerin reached the market as a byproduct, and that was not good news for those who had a vested interest in controlling the amount of glycerin available for purchase.

By 2000, biodiesel production had reached 2 million gal., quadrupling the previous year's production, but that was just the beginning. By 2006, production had soared more than a hundredfold, to 250 million gal. a year.

The National Biodiesel Board reports that U.S. biodiesel manufacturing capacity today is nearly 900 million gal., with another 1.7 billion gal. of capacity under construction. When all plants are operational, agricultural

## Feeding & Feedstuffs

economists predict an annual production of glycerin will exceed 200 million gal.

The same economists add that as the volume of glycerin reaching the market increases, that availability is very likely to precipitate a price reduction, making it more attractive to the livestock industry.

### Glycerin prices drop

This has already started occurring. During the last 12 months, the price of low-purity glycerin has been cut in half, dropping to 3¢ per pound, or \$60 per ton. (This price should not be confused with feed-grade glycerin that sells for about 11¢ per pound, or \$220 per ton.)

With corn hovering at \$120-\$160 per ton, this could be good news for beef producers across the country comfortable in the knowledge that glycerin offers ruminants an energy component comparable to corn and, when combined with the appropriate protein source, could offer a suitable low-cost replacement.

This optimism, vis-à-vis livestock feed, was articulated by European Union (EU) Energy Commissioner Andris Piebalgs in an address given in March 2007. Quoting from a recently released report, titled *Biofuels Progress Report: Report on the progress made in the use of biofuels and other renewable fuels in the Member States of the European Union*, he noted that animal feed and meat products will become cheaper globally when bioenergy is implemented on a large scale.



► Not just for toothpaste anymore, glycerin is emerging as a key component in a dynamic new feeding strategy.

Contrary to previous assumptions that the siphoning off of feedgrains on a massive scale into the energy sector would create feed shortages and precipitate higher prices for livestock feed and meat, Piebalgs argues that valuable byproducts from ethanol production (in the form of distillers' grains) and biodiesel production (in the form of glycerin) will more than offset that loss.

He adds that the science of transforming readily available biofuel byproducts into livestock feed is in its infancy. As it matures, new ways to take greater advantage of the nutritional value available are sure to emerge.

### New balance sought

Terry Klopfenstein, a University of Nebraska animal scientist who specializes in the feeding of biofuel byproducts to ruminants, agrees with Piebalgs' overall assessment of what role research will play in bringing new biofuel-based feeds to the marketplace. However, he also says the jury is still out on whether byproducts will be able to totally replace conventional feedgrains.

"Certainly we don't want to use all of our corn for ethanol production," Klopfenstein says. "It is all about establishing a balance that addresses both food and energy needs."

In the future, Klopfenstein sees more emphasis placed on allocating specific feedstock resources to the tasks they are best suited to perform. He cites, as an example, palm oil being better-suited for biodiesel production than for food production.

"Nutritionally, it is not a great oil to feed to humans or cattle; but, when you burn it as a fuel, the diesel engine doesn't care about saturated fatty acids," Klopfenstein says.

While palm oil has less than a sterling reputation as a food oil, 1 acre of palm feedstock produces 635 gal. of biodiesel. This is substantially more than the 48 gal. per acre we are now producing with soybeans, or the 127 gal. per acre we produce with rapeseed.

"It is all a matter of balancing our resources to our needs and coming up with the best fit," Klopfenstein says.

He adds that in the quest for cost-effective livestock feed, cattle do have one distinct advantage compared to swine, poultry and other nonruminants.

"The ruminant animal is really unique in its ability to utilize an extremely broad spectrum of feed sources," Klopfenstein says, adding that ruminants might not be the most efficient converter of feed to meat, but they are certainly the most versatile. Within this new context, Klopfenstein sees the glycerin byproduct becoming a major player in the beef industry.

"Obviously the glycerin from biodiesel production has excellent potential as an

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**— Terry Klopfenstein**

energy source for animal feed," he says. "Just basic nutrition tells you it has value."

### Methanol toxicity an open question

What makes crude biodiesel glycerin an especially good fit as an ingredient in cattle feed is the possibility that methanol resident in the byproduct is less likely to have a negative effect on ruminants than it would on nonruminant livestock.

"While methanol is toxic to nonruminants, ruminants can metabolize it fairly readily," Klopfenstein says. "That seems to be the general consensus at this point in time."

He notes that before we see large-scale feeding of crude glycerin to ruminants, researchers need to determine at what levels cattle are capable of metabolizing methanol. Once those levels are established, Klopfenstein says, the Food and Drug Administration (FDA) will have to give its final approval. The FDA's current limit for methanol in feed products is 150 parts per million (ppm), while crude glycerin from biodiesel production can contain methanol levels up to 26%.

Larry Risty, director of sales and marketing for Central Byproducts, a subsidiary of Farmer's Union Industries (FUMPA), agrees that, in the long term, a healthy biofuel industry could offer beef producers a new generation of low-cost biofuel byproducts.

However, Risty adds that first the markets must be willing to make the transition from conventional feed products, such as whole corn, to ones that reflect the new economic reality. "Before anything really happens, we [have] to get hurt economically," Risty says. "Then you have the innovators who respond by turning a challenge into an opportunity."

### Glycerin goes with the flow

Risty says he sees this happening now with glycerin. While feed-grade glycerin hovers around \$220 per ton, which is \$60 per ton over the current price of corn, there are some uses that already justify its inclusion, even at the higher price. He cites, as an example, the use of feed glycerin in the production of byproduct feed pellets.

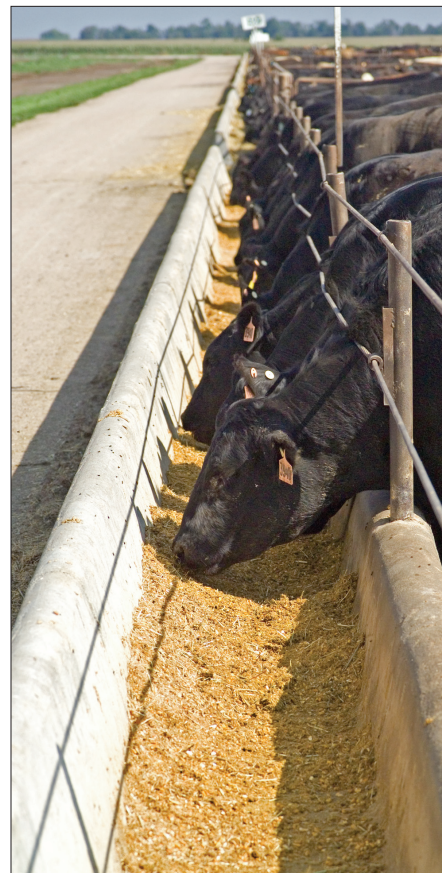
"We are going to see a lot more of this in the future," Risty says.

Central Byproducts is already producing and marketing a livestock feed pellet under the brand name Gro Mor Hi-Torque to the dairy and beef industry. The pellet combines feather meal, from an affiliate operation, with up to 17% glycerin produced at a Farmer's Union biodiesel plant in Redwood Falls, Minn.

"One of the main reasons for pelletizing byproduct like feather meal or even dry distillers' grains (DDGs) is ease of handling," Risty says. "You put regular DDGs in a rail car and ship them out to the West Coast, by the time they get there they are like cement."

He notes that products like oat hulls and DDGs are extremely difficult to pelletize without the addition of some sort of binder. For the feed pellet industry, glycerin is emerging as the ideal solution. Possessing the viscosity of molasses but none of the stickiness, glycerin can easily be combined with dry ingredients to form a pellet.

"Glycerin is an excellent binding aid where you get the benefit of an energy source as well," Chuck Neese, FUMPA's Biofuels Division director of research and development, says. "When it is pelletized with DDGs the stability of the product is improved, it is less susceptible to mold, and it is easier to unload when it gets to the destination."



► Glycerin is already being fed to beef cattle as a binding agent in a range of byproduct pellets.

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PHOTO BY MICKY WILSON