

The season for soy-based resin

Deere, Case are harvesting applications to compete with traditional plastics

By Rhoda Miel
PLASTICS NEWS STAFF

More than 60 years after Henry Ford tested a soybean-based plastic for automotive panels, the material is beginning to make headway in some commercial applications.

Agricultural equipment makers like Deere and Co. and Case New Holland Global NV are using soy-based polyester resin on large structural parts and finding it can compete with traditional plastics.

"The soybean-based material will probably come into its own soon, depending on its use," said John Cerny, a staff engineer in Moline, Ill.-based Deere's John Deere's plastics composite group. "The volumes are going up."

Deere has used 500,000 pounds of soy-based resin, starting with a

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A Deere 9860 STS Row Crop Combine harvests soybeans. Deere has been making slow, but steady advances with soy-based sheet molding compound parts for its combines.

Soy resins moving from fringe to forefront

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1997 experiment using it on a component door for a baler. Case uses a soy oil-based polyurethane for exterior trim on its AFX series combines, with 370 pounds of the resin used on each vehicle.

The companies also are looking into the possibility of a soy polyurethane foam for seat padding.

"We're moving ahead and we have an opportunity on some of our tractor hoods, industrial equipment parts and there are other opportunities out there," Cerny said. "We also see in the future, and closer to that, the possibility of using soy in some of the cushioning in seats. That seems to be an area of great potential."

Soy and other bio-based resins have been on the fringes for years, with supporters making previous claims about its potential. Automaker Henry Ford first demonstrated his soy-based resin panels in 1941.

The difference now is that the material is proving out processability improvements combined with U.S. federal incentives for bio-based material and rising raw material costs, said Lawrence Drzal, a professor of chemical engineering and materials science at Michigan State University and director of its composite materials and structures center.

The Department of Agriculture has set a target to have 10 percent of its purchases by 2010 come from soybean and other renewable resource materials, climbing to 50 percent by 2050.

"That's the carrot part of the equation in increasing the use of bio-based resins," Drzal said. "The stick is the increasing oil prices."

Use of resins using soybean oil — and similar vegetable-based oils — will be gradual, Drzal predicted, with a few key players like John Deere pushing the material forward.

"There aren't any major hurdles that are going to require a breakthrough," he said. "This is going to be an evolutionary process, a deliberate process where you have targets you want to meet."

Interest has increased in the polymer said Dwight Rust, business development manager for resin supplier Ashland Chemical Co.'s composite polymers group. Other users also have contacted Ashland to test out its use in everything from transportation, architectural, construction and

the furniture industries. None have made the commercial commitments of the farm equipment makers yet, though.

At John Deere, the soy resin program nearly ended because of cost issues just as it began. The first part, the baler door, was produced through resin transfer molding as a replacement for a troublesome metal part.



Soy-based SMC, used to make parts for Deere combines, outperform standard resins in the mold, with better flow, reduced repair issues and an improved surface for painting.

The door looked good, Cerny said, but was too expensive to manufacture. The development group put it in an internal design show, though, and it had a strong enough response that Deere went back to the drawing board.

The new design switched processing to sheet molded compound, rather than RTM. The change made the material cost competitive because the soy-based SMC could even outperform standard resins in the mold, with better flow, reduced repair issues and an improved surface for painting.

"You're not going to be able to go to the shelf and just take a soy oil and replace it with a petroleum oil-based product," Drzal said. "It's going to have to be carefully developed."

That is not to say soy resins have a clear shot everywhere, even within Deere. There have been problems with a soy ure-

thane used in reaction injection molding, for example, he said, but it is proving an ability to stand on its own elsewhere in the right application.

"Our first issue is cost," he said. "If it's environmentally friendly, that's OK too."

The United Soybean Board provides a link between farmers and end users while promoting the crop. It has placed a strong emphasis on backing projects that have real commercial prospects, said Eric Niemann, a Nortonville, Kan., farmer and chairman of the group's new uses committee.

"We've talked to [end users], we've understood that the bottom line is cost, cost, cost," he said.

The group wants to take its data and enthusiasm beyond universities and into the real world. The farmers have visited Detroit to meet with automakers to discuss what they would need from a soy-based resin, and are enthusiastic about the Ford Motor Co.'s Model U concept vehicle that debuted in 2003, with a soy composite tailgate.

Still they realize that it must prove itself.

"We want to use this material," Cerny said. "We want to continue to use this material, but if something else comes along that's less expensive, our supply people are going to look at that too."