

Plastic promises

Car companies know that plastic parts made from plants will appeal to 'green' customers. But as **Ichiko Fuyuno** reports, their progress has been painfully slow.

Back in 1941, Henry Ford surprised the public by unveiling a 'biological' car. The legendary car-company boss, who had a long-standing interest in environmentally sound materials, unveiled a prototype of plastic panels made from soya beans, wheat and hemp attached to a tubular frame at a motor show in Dearborn, Michigan. But after the United States joined the Second World War, the project slipped quietly from view.

Sixty-six years on, Japan's car makers are picking up where Ford left off. The hydrocarbon-based plastics conventionally used in the car industry are energy-intensive to produce and difficult to recycle — hurting companies' strenuous efforts to paint themselves green. That increases the lure of bioplastics, which are produced from plants instead of crude oil and generally biodegrade over time.

But these materials have severe limitations — so severe that Toyota, which in 2003 set ambitious goals for the commercial use of bioplastics, is considering scaling back its commitment. If it does, all it will have to show for years of bioplastics research and development will be a floor mat and a cover for a spare tyre.

Mix it up

Typically, bioplastics are made by fermenting glucose obtained from corn, sugarcane or other plants into lactic acid, which is then polymerized to make the polylactic acid that sets to form the plastic. But the materials tend to have poor mechanical properties and degrade quickly, so manufacturers often mix in chemical additives or fibres — or blend them with conventional materials to improve their strength and durability.

The market for bioplastics remains modest. According to Japan's Biodegradable Plastics Society, they account for less than 1% of the nation's consumption of plastics, with almost all of that going to low-grade applications such as food packaging.

Still, Japanese companies are keen to use bioplastics to make things such as computer cases and mobile phones, as well as in the car industry — a sector of bulk plastics users that has high performance specifications.

"It is not easy," concedes Isao Inomata, of



Mazda hopes that its hybrid cars will soon contain bioplastic panels.

Mitsubishi Plastic and an adviser of the society, "but technological advances have made bioplastics available for higher-end products than food packaging, and car makers are actively working on them."

Toyota first started to develop bioplastics in 1999, and four years later it started to sell accessories made from these materials. They designed a floor mat made from 100% polylactic acid, and a spare-tyre cover made from polylactic acid and fibres from kenaf, a plant often used in paper.

Great expectations

In a 2003 Environmental and Social Report, a division of Toyota said that it hoped to produce two-thirds of all of the world's bioplastics and earn ¥5 trillion (US\$40 billion) in sales per year by 2020, but the company says this was never its official business plan. And in 2006, Toyota withdrew the floor mat from production. It is now considering a reorganization of its bioplastics business, according to spokeswoman Atsuko Watanabe.

Toyota's rival Mazda has made the most progress in incorporating bioplastics into vehicles. In 2006, it released a prototype of an instrument panel — made from 88% corn and 12% petroleum — for one of its hybrid cars. The company says it used an additive that allows the

plastic to solidify into small, quick-forming crystals — slow crystallization is a problem with many bioplastics because it increases the costs of making parts from them. The company also says that the panels can be manufactured with conventional injection-moulding equipment, and that they offer as much resistance to shock and heat as products made with conventional materials. Mazda plans to mount this panel on its production hybrids next year, and hopes to widen the material's use thereafter.

Green standards

Also in 2006, Honda released a prototype seat cover made of a biofabric called polypropylene terephthalate. The bioplastic replaces the polyethylene terephthalate typically used in car seat covers, and was synthesized by polymerizing 60% petroleum-based terephthalic acid with 40% of a glycol derived from corn.

The company says that its material will reduce carbon dioxide emissions on disposal by 5 kg per vehicle, or half, from those of its existing plastic seat covers. It has also devised a way to weave the cloth that gives the material a soft texture while retaining its strength and lightness. "We

hope users are going to choose the biofabric because it feels more comfortable," says Keiichi Araki from the design development division at Honda. The company plans to use the biofabric as standard equipment on fuel-cell cars from around 2008.

Difficulties with the strength and durability of plant-based plastics have caused the Biodegradable Plastics Society to effectively 'lower the bar' and allow its members to produce what it calls 'biomass plastics' that contain as little as 25% of plant-based raw materials.

That has led sceptics to cry foul. Yoshio Watanabe, a motor-industry analyst at Mizuho Securities in Tokyo, doubts that companies are genuinely committed to the use of plant-based plastics. "I have never heard of concrete long-term business plans about bioplastics from any car-makers," he says.

But Takahiro Tochioka, an engineer at Mazda who specializes in bioplastics, insists that real progress is being made. For instance, he says that his team has started to develop enzymes that can control the time that bioplastics take to degrade. "About a year ago, many people felt that using bioplastics in cars was unrealistic. But what we have done in the past year has brought back a positive prospective," he says. ■