



## Fact Sheet

### DuPont Sustainable Mobility

*Building the Energy Efficient Car of Tomorrow... Today*

DuPont technology enables engineers and designers to realize performance milestones in virtually every form of transportation, with a wide range of products available to help manage the toughest of transportation challenges. In the automotive industry, DuPont brings science-based solutions for design and development through more than 100 products used in every major system of the vehicle.



Today, automotive original equipment manufacturers (OEMs) are driving to sustainable mobility in response to rising fuel costs, regulatory requirements and the need to reduce CO<sub>2</sub> emissions. This drive includes improving vehicle efficiency by *reducing overall vehicle weight, reducing energy loss through friction, using new technologies to boost output of smaller internal combustion engine as well as reducing energy used at vehicle manufacturing facilities*. At the same time, the OEMs are introducing advanced propulsion systems – from hybrids through fuel cells – that run on various alternative energy sources.

Automakers are also interested in replacing petroleum-derived materials with those made from renewably sourced materials to reduce greenhouse gas, lower energy consumption and improve performance.

#### **Vehicle Lightweighting**

This all-consuming challenge has today's automakers rethinking multiple components and systems, especially in the engine, driveline and fuel systems.

The stake for reducing vehicles' carbon footprint and improving fuel economy is high. Several studies show a 25 kilogram weight reduction can yield a 1 percent increase in fuel economy, depending on the vehicle. A 100 kilogram weight reduction can reduce CO<sub>2</sub> emissions by 8.5 grams per kilometer.

High-performance DuPont engineering resins make possible replacement of metal parts and components, contributing to weight reduction, fuel savings and CO<sub>2</sub> emission reductions. If all 4-cyl. cars on the road in the US today used plastics in known or proven engine applications, we would save 93 million gallons of gas every year. That's enough gas to put more than 380,000 new hybrids on the road. It would also take 1.86 billion pounds of carbon out of the atmosphere – you would have to plant almost 550 million trees to absorb that much carbon.

- **Recent Examples:**

- **Daimler Mercedes-Benz C Class model oil pan module** - the world's first commercial-volume, polymer-based, oil pan module. The joint development, between Daimler, Brass and DuPont Engineering Polymers using [DuPont™ Zytel® nylon](#) captured a "Most Innovative Use of Plastics Award" from the Society of Plastics Engineers and cuts more than one kilogram of weight from the vehicle.

- **Digital Rotary Control Valve** –New digital system can manage critical fluid systems in a way that significantly improves fuel economy, reduces emissions and engine/driveline wear to help extend the life of fluids critical in the operation of engine components. Developed by Hollis and manufactured by the Minco Group, which includes All Service Plastic Molding, for MileageMatrix Inc., the component relies on [DuPont™ Zytel® HTN PPA](#) for the valve body, tube and diverter.

### **Using Renewably Sourced Materials**

DuPont also offers a growing portfolio of [renewably sourced products](#) to reduce greenhouse gas emissions, lower energy consumption and improve performance for use in composites, fabrics, elastomers and automotive fluids to reduce environmental impact while offering superior performance. The current portfolio includes 9 high-performance families, each containing a minimum of 20 percent renewable content by weight with current active programs, in applications such as headlamp bezels, seating, carpets, hose and tubing.

#### ○ **Recent Examples:**

- **DENSO Corp. Radiator End Tank** - DuPont Engineering Polymers and DENSO have introduced a new DuPont™ Zytel® nylon resin, containing 40 percent renewable content by weight derived from the castor bean plant, which meets requirements for exceptional heat resistance, durability and road salt resistance. Initially for radiator end tanks, DENSO announced it plans to use the new polymer in multiple vehicle applications.
- **Developmental Sample - Headlamp Bezel of DuPont™ Sorona® EP** - [DuPont™ Sorona® EP thermoplastic polymers](#) contain between 20% and 37% renewably sourced material (by weight) and exhibit performance and molding characteristics similar to high-performance PBT (polybutylene terephthalate). In addition to good strength and stiffness, early tests indicate improved surface appearance, lower warpage, and good dimensional stability, making it a prime candidate for headlamp bezels, where low condensables can prevent lamp lens fogging.

### **Supporting Adoption of Flex Fuel Technologies**

With its broad portfolio of high performance thermoplastics, elastomers and Applied BioScience offerings DuPont is uniquely positioned to apply its insights on biofuels and materials science to respond to today's dynamic fuels landscape with fuel system solutions that best meet the industry's performance needs.

DuPont materials experts can offer ready fuel system solutions for the range of fuels under development for today and tomorrow to help customers meet chemical compatibility and permeation requirements no matter which fuel alternatives are chosen. DuPont's long-standing participation in the fuel system value chain provides deep knowledge of materials compatibility and testing standards.

Material selectors to identify materials compatible with bio-based fuels and low permeation products to reduce emissions are available at [automotive.dupont.com](http://automotive.dupont.com) on the fuel systems link.

- **Recent Examples:**

- **DuPont™ Zytel® HTN PPA used in Ford’s unique “Capless” fuel filler system** is compatible with biofuels and supports the compliance of Ford’s vehicles to all California Low Emission Vehicle (LEV II or PZEV) requirements. This application, manufactured by Martinrea, was named finalist in the SPE “Most Innovative use of Plastics Award.” The Capless Fuel Filler, available on Ford Flex, Escape, F150, Expedition and Lincoln MKS vehicles, eliminates the need for the operator to remove and replace the fuel cap.

### **More Power to the Wheel: The Friction Story**

The stake for reducing energy loss through friction is also high. Studies have shown that approximately 15 percent of the energy available in gasoline actually gets used to move a vehicle down the road. The remaining 85 percent of the energy is lost to engine and driveline inefficiencies, accessories and idling. DuPont™ Vespel® parts and shapes and [DuPont™ Teflon®](#) help industry improve efficiency and get more power to the wheel by reducing friction, especially in driveline systems.

For example, Vespel® can deliver a 30 percent to 40 percent reduction in friction when used in fork pads, which are used to engage gear sets in manual transmissions. Similarly, use of Vespel® in automatic transmissions can improve the torque loss of seal rings by up to 50 percent.

In April, DuPont introduced [DuPont™ Vespel® SP-2515](#) polyimide parts with lower friction and enhanced wear properties that invite use of light-weight aluminum without costly inserts to further help take weight and cost out of vehicle engines and drivelines.

### **Energy Efficient Auto Manufacturing**

DuPont also is contributing to energy efficient systems for the automotive manufacturing process. The [DuPont EcoConcept system](#) streamlines the OEM painting process by eliminating one complete coating layer, the primer-surfacer, and combining it into a single environmentally compliant water-based basecoat. This allows the automobile manufacturer to eliminate an entire spray booth and its associated drying equipment. The benefits include reduced emissions of greenhouse gases due to reduced solvent use, lower energy consumption and higher productivity. The innovative process received a PACE Award in 2007 from Automotive News. DuPont also has begun licensing the technology, providing an opportunity for more OEM’s to adopt it. DuPont EcoConcept technology is currently used at two Volkswagen plants in Mexico and Spain. Some 200,000 cars have been produced using the process.

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