NEW TRB SPECIAL REPORT

Tires and Passenger Vehicle Fuel Economy

Informing Consumers, Improving Performance

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Each year Americans spend about $20 billion to replace approximately 200 million tires on their passenger cars and light trucks. Although these tires last far longer today than they did 30 years ago, most must be replaced every 3 to 5 years because of wear. The choices consumers make when they replace their tires affect the handling, traction, comfort, and appearance of their vehicles, as well as the fuel economy.

Tires affect fuel economy mainly through rolling resistance. As a tire rolls, its shape changes repeatedly as it experiences recurring cycles of deformation and recovery. In the process, mechanical energy otherwise available to turn the wheels is converted into heat and dissipated from the tire. More fuel must be expended to replace this lost energy.

The 220 million passenger cars and light trucks in the United States consume approximately 130 billion gallons of fuel each year. Finding ways to reduce this energy consumption is a national goal for reasons that range from ensuring national security to improving local air quality and reducing greenhouse gas emissions.

Consumers prefer tires with longer wear, and maximizing wear life is desirable for controlling the generation of scrap tires. Yet the traction, handling, and operating characteristics of tires also are important because they influence the safety performance of vehicles on the nation's highways.

Congressional Request

Congress requested the National Highway Traffic Safety Administration (NHTSA) to sponsor a study to examine the rolling resistance characteristics of replacement tires for passenger vehicles and the effect of changes in tire designs and materials on rolling resistance and other tire attributes. Under the auspices of the National Research Council of the National Academies, the Transportation Research Board and the Board on Energy and Environmental Systems convened a committee to conduct the study (*see box, page 23*).

The committee examined ways of reducing rolling resistance in tires and the resultant effects on vehicle fuel consumption, tire wear life, and on aspects of tire operating performance that may relate to vehicle safety. The committee also estimated the impacts on replacement tire prices and on consumer spending for tires.

The study committee reviewed the technical literature, met with tire and vehicle experts, and analyzed available data on passenger tire rolling resistance, wear resistance, and traction characteristics. Many aspects of tire design, construction, and manufacturing are proprietary, which limits the availability of information on technologies to improve the energy performance of replacement tires. Nevertheless, sufficient quantitative and technical data are available in the public domain to draw some general conclusions about the feasibility of reducing rolling resistance in

tires and the implications for other tire attributes and consumer spending.

Fuel Savings and Tire Performance

Reducing the average rolling resistance of replacement tires in the passenger vehicle fleet by 10 percent is technically and economically feasible. Such a reduction promises a 1 to 2 percent increase in the fuel economy of vehicles and would save approximately 1 billion to 2 billion gallons of gasoline and diesel fuel per year—equivalent to the fuel saved by taking 2 million to 4 million cars and light trucks off the road. The individual motorist would burn 6 to 12 fewer gallons of motor fuel per year, yielding an annual savings of $12 to $36 when fuel is priced at $2 to $3 per gallon.

Tires in the replacement market that are comparable in type, size, traction, wear resistance, and price often can differ more than 10 percent in rolling resistance, which suggests that rolling resistance can be lowered without major changes in tire technology. Original equipment tires typically are designed for lower rolling resistance than are replacement tires, because of the federal fuel economy standards for new passenger cars and light trucks. If the kinds of materials and technologies used in original equipment tires were used in the replacement market, rolling resistance would be lowered, but consumers would pay more for tires. The committee estimates that consumers would spend $1 to $2 more per year on replacement tires—which would offset a small portion of the savings from the improved fuel economy.

Tires with generally accepted levels of traction vary widely in rolling resistance, which suggests that one property does not necessarily hinge on the other. The committee could not find safety studies or vehicle crash data that provide insight into the safety impacts associated with large changes in tire traction capability, much less with the incremental changes in traction that may occur from modifying tire tread to reduce rolling resistance.

Maintaining resistance to wear and prolonging tire life while reducing rolling resistance will be critical, because of concerns about scrap tire disposal. Although various technologies are being developed and applied to reduce rolling resistance without significant effects on tread wear, the practical effects of these technologies on tire performance characteristics have not been established quantitatively. Continuing advances hold promise that rolling resistance can be reduced further without adverse effects on tire wear life and safety or increases in the volume of scrap tires.

Informing Consumer Choices

The committee observes that consumers now have little, if any, practical way of assessing how tire purchase choices can affect vehicle fuel economy. The committee therefore recommends that Congress authorize and make sufficient resources available for NHTSA to work with the tire industry in gathering and reporting information on the influence of passenger tires on vehicle fuel consumption.

The information should cover a large portion of passenger tires sold in the United States, be easy to understand, and be made widely available to tire buyers and sellers. NHTSA should consult with the U.S. Environmental Protection Agency on how to communicate the information to consumers and should review the effectiveness and utility of the information regularly.

Finally, as motorists receive advice about the energy performance of tires, they also should understand that all tires require proper inflation and maintenance to achieve the intended levels of energy, safety, wear, and operating performance. Motorists must be alerted that even small losses in inflation pressure can greatly reduce tire life, fuel economy, safety, and operating performance. The vigilant maintenance of inflation therefore must be a central message in communicating information to motorists about the energy performance of tires.

TRB Special Report 286, *Tires and Passenger Vehicle Fuel Economy: Informing Consumers, Improving Performance,* is available from the TRB online bookstore, www.TRB.org/bookstore; to view the book online, www.TRB.org/publications/sr/sr286.pdf.

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