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Energy Efficiency Fact Sheet

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Automotive Efficiency

Using technology to reduce energy use in passenger vehicles and light trucks

Key Facts

- While there have been many advances in vehicle efficiency technology in the past 20 years, US automotive fuel economy peaked at 22.1 miles per gallon (mpg) in 1987, and has declined to about 21 mpg in 2005, according to the EPA.
- This trend has occurred due to increased annual vehicle miles driven, greater horsepower, as well as the recent growth of sport utility vehicle (SUV) and light truck sales. From 1981–2003, the average vehicle has gained 24 percent more weight, has 93 percent more horsepower, and has a 29 percent faster 0-60 mph time. In addition, light trucks accounted for 50 percent of vehicle sales of the 2005 model year, nearly twice their market share in 1985.
- Fuel efficient vehicles may reach twice the fuel efficiency of the average automobile. Cutting-edge designs, such as the diesel Mercedes-Benz Bionic Concept Vehicle have achieved four times the current conventional automotive average, as high as 84 mpg for the Bionic Vehicle.

Advanced Technologies

- *Aerodynamics:* Using aerodynamics to minimize drag can significantly help increase vehicle fuel efficiency. For highway cruising, 60 percent of the engine power output is used for overcoming air drag. A typical modern automobile has a drag coefficient (Cd) of 0.30-0.35, while SUVs typically have a Cd of 0.35-0.45. General Motors' H2 Hummer has a Cd of 0.57, more than double the Toyota Prius, which has a Cd of 0.26. The EPA reports that new generations of vehicles have 40 percent less drag than the current average. On a car, simply removing an unused roof rack can recover 1 percent fuel efficiency. On tractor trailer trucks, aerodynamic additions have shown to have fuel savings of as high as 7 percent.
- *Tires:* More advanced tires, with decreased tire to road friction and rolling resistance, can save from 1.5 to 4.5 percent of a vehicle's total gasoline consumption, according to the California Energy Commission.
- *Hybrid Drivetrain:* Hybrid drivetrains are powered by both an internal combustion engine and a battery operated electric motor. When needed, the battery that powers the electric motor is charged through the excess energy captured from the gasoline engine and through regenerative braking. The gasoline engine is turned off when not needed. Hybrid vehicles have achieved up to double the fuel efficiency of similar conventional vehicles. Plug-in Hybrid Vehicles (PHEV's) are fitted with larger batteries and grid plug-in charge capabilities, and have reached fuel efficiencies as high as 250mpg.
- *Weight:* Reducing vehicle weight can significantly improve fuel economy. According to the EPA, for every 10 percent of weight eliminated from a vehicles total weight, fuel economy improves by 7 percent. Improvements in materials technology can reduce vehicle shell weight by 40-50 percent, without sacrificing strength, durability, or safety.
- *DISC Engines:* (This section is 12 point font)The *direct-injection stratified charge engine* (DISC) incorporates many of the high efficiency features of a diesel into a spark-ignited gasoline engine. Though not as energy efficient as the diesel version, DISC engines with advanced valve controls, high compression and other features offer 15-20 percent higher fuel economy than typical gasoline engines.

Maintenance

- *Tire Pressure:* In many cases, fuel economy can be improved over three percent by keeping tires inflated to the proper pressure. Under inflated tires can lower gas mileage by 0.4 percent for every 1 pound per square inch (psi) drop in pressure of all four tires according to the EPA. As both a safety and a national fuel savings measure, the federal government has mandated that all vehicles sold in the U.S. after 2008 be equipped with an in-car tire pressure monitor that notifies the driver when a tire's pressure is low.
- *Air Filter:* Replacing a clogged air filter can improve a car's gas mileage by as much as 10 percent.
- *Engine Tuning:* According to the EPA, fixing a car that is "noticeably out of tune" or has "failed an emissions test" can improve its fuel economy by an average of 4.1 percent, depending on the vehicle and extent of repairs. If a car has a faulty oxygen sensor, the gas mileage may improve as much as 40 percent.
- *Motor Oil:* Fuel economy can be improved 1-2 percent simply by using the manufacturer's recommended grade of motor oil, according to the EPA.

Costs and Benefits

- *Maintenance Costs:* Regular vehicle maintenance reduces long-run vehicle repair cost, improves vehicle safety, and saves gasoline. A \$5 tire pressure gauge can return its investment many times over in fuel saved by keeping proper tire pressure. For many efficiency improving maintenance measures, the largest cost is in public education.
- *Fixed Costs:* Fixed costs on the manufacturer side include re-tooling manufacturing plants to produce fuel-efficient vehicles, acquisition of technology, and R&D costs. For the consumer, many fuel-efficient vehicles are available without a cost premium. For other technologies, such as hybrid vehicles, costs are somewhat higher, but are partially offset by tax rebates contained in the Energy Policy Act of 2005.
- *Benefits:* Increased fuel efficiency saves gas, reduces dependence on foreign oil, saves consumers money at the pump, reduces emissions that contribute to smog and acid rain, and reduces emissions of carbon dioxide, a greenhouse gas. Because vehicles have a long lifetime, benefits accrue. Implementation of increased efficiency measures on large vehicle fleets can significantly improve regional air quality while reducing energy consumption.

For More Information

EPA and DOE's Fuel Economy Informational Web Portal <http://www.fueleconomy.gov/>

DOE Energy Efficiency and Renewable Energy Transportation Program

<http://www.eere.energy.gov/EE/transportation.html>

Ford Motor Vehicles Energy and Fuel Technology Program

<http://www.ford.com/en/innovation/engineFuelTechnology/default.htm>

Natural Resource Defense Council's "Break the Chain" Site <http://www.nrdc.org/breakthechain/howto2.asp>

Green Car Congress www.greencarcongress.com

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