Green Driving: Rules, Cars and Fuels

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Braking reduces fuel mileage more than anything else! Braking grinds off speed that you can gain back only by accelerating. While accelerating back up to speed, a standard midsize sedan averages less than 10 mpg (miles per gallon: miles traveled divided by gallons consumed), and a large SUV may average as low as 5 mpg.

- In order to minimize use of your brakes, look far ahead and let off the gas well in advance of having to stop or turn. As you gradually slow down, you will be getting 50 to 100+ mpg, and that will help offset the inefficiency of accelerating back up to speed.
- Don't follow close behind the cars in front of you. Leave enough room so when cars in front of you brake or slow down, you can just let off and gradually slow down without using your brakes.
- When you see a red light ahead, ease off and give the light time to change. On the other hand, you should not speed up when you see a green light ahead; if the light catches you—as it often will—you may have to brake hard, wasting all the fuel you used speeding up.
- When you are stopped at a traffic light, wait a couple of seconds after it turns green before you go. Don't start up so quickly that you have to brake if the car in front of you slows up.
- Avoid routes with many stops or heavy traffic. A road with a stop every mile can reduce fuel mileage by more than 10%. In-town routes with heavy, stop-and-go traffic can cut your fuel mileage in half. Fuel is wasted by repeatedly braking and accelerating, as well as by idling and creeping along in lower gears.
- Before you start your engine, decide on your route. Give preference to routes with the fewest stops and turns, and the least traffic. Note: Traffic lights don't waste as much fuel as stop signs; traffic lights are green at least some of the time, stop signs never are.
- If you accelerate to pass another car, don't let off abruptly, just ease off and gradually slow back down.
- When you start off, accelerate just fast enough to get out of lower gears promptly (fuel mileage is poorer in lower gears), but don't accelerate so fast that the engine seems strained. If you have a tachometer, try not to exceed 3000 rpm during acceleration. Engine and driveline frictional losses increase as engine speed and power output increase.

Fuel mileage declines at higher cruising speeds (aerodynamic drag increases proportional to the square of speed). Dropping your cruising speed from 75 down to 65 mph can improve fuel mileage by as much as 10%. The larger the vehicle, and the less aerodynamic it is, the more money is saved by slowing down. SUVs and trucks have large frontal areas and poor aerodynamics, so their fuel mileage decreases more sharply as cruising speed increases.

- Start a few minutes earlier and drive slower. Generally speaking, you will get the best fuel mileage at speeds between 35 and 50 mph. This speed

range is fast enough for your car to shift into a high gear, but slow enough to minimize air resistance.

- To get the best fuel mileage, don't exceed the speed limit, and don't exceed 65 mph regardless of the speed limit. On Interstates and other divided highways, traffic tends to go 5 mph over the speed limit, so you may be passed frequently if you hold your speed to 65 mph. On highways with two lanes in each direction, the right lane is the safest place to be, but when there are three or more lanes in each direction, the center lane(s) may be the safest because faster traffic can pass on either side.
- When the weather is good and the traffic not too heavy, use cruise control to prevent speed from creeping up and reducing your fuel mileage. It is also safer and more comfortable to hold a steady speed.

Leaving your engine idling can significantly reduce fuel mileage. Idling uses more fuel than you might guess, and the larger your engine, the more fuel is wasted by idling.

- Don't start your engine until everyone is belted in and ready to go.
- Don't sit idling to warm up the engine. It doesn't help the engine; it will warm up faster as you drive.
- Don't leave your engine running while you wait for someone or something. If the wait is likely to take more than 15 seconds, shut your engine off.
- On hot days, leaving you car idling with the AC on is a luxury that you pay for. Try shutting the engine off and opening your windows.
- When you park, turn the engine off immediately.

Don't waste fuel looking for the best parking space. Your mpg is more than cut in half while you drive around in lower gears looking for a better spot.

- If you are parking on the street, take the first safe space.
- Avoid parking decks and large parking lots. When you must park in a large lot or deck, take the first safe space, preferably near an entry/exit.

When you are not intentionally planning to take the scenic route, avoid routes through hills and mountains. Braking on downhill runs (even engine braking that occurs when you take your foot off the accelerator), along with shifting to lower gears going uphill, can reduce fuel mileage by more than 10%. Most modern cars cruise in a very high fourth gear, a fifth gear, or even a sixth gear, so they tend to shift down even for small hills. Cars with weaker engines or cars traveling at lower cruising speeds will shift down more frequently.

- On roads varying between steep uphill and downhill, turn the cruise control off and modulate the accelerator to let your car gain speed going downhill, and then let your speed gradually drop back to your cruising speed as you go uphill. This will be eliminating engine braking going downhill and reducing downshifting going uphill.
- In rolling hill terrain, you can just set the cruise control to a higher speed to reduce the tendency to downshift on long inclines (engines develop more power at higher rpm). Although this will have only a small effect on fuel

consumption (there is a trade off between reduced frequency of downshifts and increased wind resistance), travel can be smoother and faster without wasting fuel.

Check your tire pressure every couple of months. Four very low tires can easily reduce fuel mileage by 5%, as well as cut tire life in half.

- The recommended tire pressure can be found on a sticker that can be seen when the driver-side door is open. Don't pay for air; most tire stores will check your tires for you and air them up free.
- You can safely add 2-3 pounds to reduce roll resistance a bit (many tire stores do this without asking if they should!). The higher pressure will slightly improve fuel mileage, but for the most comfortable ride, don't exceed the recommended pressure.

Operating the air conditioner can reduce your mileage by 2-3%. In moderate, dry weather, the fan alone may provide adequate cooling. Just turn the fan speed up and aim the air toward you. Make sure the vents are set to bring in outside air, rather than re-circulate. Note: If you turn the AC on to cool off the interior and then turn it off, it will release an unpleasant burst of very moist air (from condensation on the evaporator) into the car. It is better to open the windows to let the interior cool off before you start the car.

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By following all the guidelines for efficient driving, you should see a 20% increase in mpg (for example, from 25 to 30 mpg). If, however, you drive a "hybrid" (see below), some of the rules of efficient driving will offer little or no savings. On the other hand, if you drive a standard vehicle that gets poor fuel mileage, you can save a considerable amount of money by following rules of efficient driving. For example, if you drive a "gas guzzler" that gets only 15 mpg, and you drive 20,000 miles a year, you can save about $900 a year by increasing your overall fuel mileage to 18 mpg. Whereas if your car averages 30 mpg, to save $900 you would have to increase your fuel mileage to 45 mpg!

To keep fill-ups consistent and avoid spillage, always stop filling when the nozzle clicks off. Fill-up levels can vary by as much as a half-gallon, depending on which way the ground slopes, so you should calculate mpg over several fill-ups. For comparison, you can record your mpg before and after you start following the fuel efficiency guidelines listed above. Get a notebook and create columns to record dates, odometer readings, and the amount of gasoline purchased for each fill-up, or if you find that too tedious, you can just record your trip meter reading on the fuel purchase receipt and then reset the trip meter. By saving your receipts you will have a complete record of the dates, gallons purchased, fuel price, and miles driven.

Sidebar I

Some not-so-good ideas for decreasing fuel costs

- *Slipstreaming*. Driving very close behind (or close in front of) someone reduces aerodynamic drag, so when two cars, traveling at freeway speeds, are only a few feet apart, both cars may decrease their fuel consumption by 5% or more, but the safety considerations make this a very bad idea. Leave slipstreaming (or "drafting") to racecar drivers.

- *Turning the ignition off at long-holding traffic lights*. This saves fuel but is a lot of trouble and a little dangerous—and could, if taken to excess, wear the starter out prematurely. Leave this for the new breed of expert fuel savers who call themselves "hypermilers."

- *Coasting out of gear*. This can save fuel by reducing the engine braking effect, but it requires careful operation of the shifter and can be a little dangerous. Again, don't bother with this unless you are an aspiring hypermiler.

- *Filling your tank only half way*. A half tank of fuel is 40-70 pounds lighter than a full tank—but if you run out of gas just once, you will leave this one to the hypermilers.

- *Removing heavy objects in your trunk*. Fifty pounds of additional weight will slightly reduce your fuel mileage, but not nearly as much as one adult passenger—and just how often do you to leave 50 pounds of anything in your trunk?

- *Buying tires with low roll resistance*. Hard and narrow tires have low roll resistance. They compromise ride and traction in order to gain 2-3% in mpg. The smoother ride and better traction that you get with standard tires are worth the extra cost for fuel.

- *Turning the AC off and opening the windows*. This can improve mpg at the expense of increasing noise, wind, fumes, and dust. At highway speeds, some of the mpg gains will be lost to increased aerodynamic drag.

- *Removing the roof rack*. A roof rack may very slightly reduce fuel mileage at cruising speeds, and may cause additional wind noise, but it can also offer some utility. A loaded rack greatly increases aerodynamic drag and significantly reduces mpg—but not nearly as much as pulling a trailer.

- *Installing a new air filter*. You should, of course, replace all dirty filters, but don't expect higher mpg from a new air filter.

- *Getting a tune up*. This was a good idea—40 years ago. Modern cars don't really require "tune ups." Get maintenance according to the schedule listed in your manual.

- *Buying fuel early in the morning when fuel is cooler.* Cooler fuel may have more molecules per gallon, but underground tanks maintain virtually the same temperature all day.

- *Driving with your shoes off.* This is supposed to give a lighter touch. A better idea is not to drive in cumbersome shoes (boots, running shoes, clogs, etc.). You may not get better mpg, but you will be able to drive more smoothly and safely.

- *Putting nitrogen instead of air in your tires.* Buying nitrogen in hopes it will prevent tires from slowly losing pressure is quite a bit more trouble than just checking your tire pressure every couple of months.

- *Buying premium gasoline.* If your car is designed to run on regular, premium gasoline will not improve fuel mileage or engine life. Check your manual to see if your engine requires premium. High-performance engines designed to run on premium will compensate when low octane is detected, but performance and mpg may be diminished.

- *Using additives in your fuel or oil.* Don't expect to pay less at the pump, just more at the counter where you buy the additives. Additives may also have negative side effects that can lead to additional expenses in the long run.

- *Changing to synthetic oil.* Don't expect a significant improvement in mpg, just higher cost for oil changes. Switch to synthetic oil only if you owner's manual recommends it.

- *Converting a Diesel car to burn used cooking oil from restaurants.* Surprisingly, this is a great idea, but only for engineers or mechanics who live alone and don't mind their car, garage, and clothes smelling like stale French fries. This extreme fuel saving technique is for dyed-in-the-wool hypermilers.

Sidebar II

Can You Save Money by Buying a More Fuel-Efficient Car?

Generally speaking, the costs associated with buying a new car cannot be offset with fuel savings. The worse your current fuel mileage is, the less you will receive on trade in, while the better the fuel mileage of the new car you want, the more likely you will have to pay list price (or more). If a new car improves your mileage 10 mpg (say, from 20 mpg to 30 mpg), and you drive 20,000 miles a year and pay $4.50 per gallon for fuel, you will save about $1500 each year. A new car can cost you much more than that in annual depreciation and interest on financing (or loss of interest on savings if you pay cash), and then there may be increases in taxes and insurance as well, plus your new car is likely to be smaller and less useful to you. Don't let fuel costs stampede you into a costly trade for a less desirable vehicle; remember, next year there will be new cars that are even more fuel efficient. For now, leave car trading to save fuel to expert car traders who know how to buy at wholesale and sell

at retail. After all, fuel efficiency is just one of many factors to be considered in buying a new car.

If you are considering buying a fuel-efficient used car, check it out on kbb.com. Keep in mind that the federally mandated mpg rating system was changed in 2008 to be more pessimistic—and closer to reality—so the official mpg ratings for used cars appear to be better than they would be under the new system. Most people don't like to buy used cars, because finding one that is reliable requires good luck or professional expertise—or both. So, if your only reason for buying a used car is to get better mpg, take your time and do lots of research, and keep in mind that older cars may lack some of the safety features of new cars.

Which New Cars Are Most Fuel Efficient?

If you are planning to buy a new car, look only at vehicles with reliability ratings and mpg ratings above average for their class. The rating can be found in consumer magazines and at kbb.com. As a group, smaller/lighter cars get the best fuel mileage. The smallest sedans (for example, the Honda Fit, Chevrolet Aveo, Toyota Yaris, Nissan Versa, and Kia Rio) are generally cheaper and more fuel-efficient than "compact" sedans such as the Toyota Corolla, Ford Focus, Honda Civic, or Hyundai Elantra, but the savings must be weighed against a loss in comfort and safety. Midsize sedans (for example, the Chevrolet Malibu, Ford Fusion, Honda Accord, Hyundai Sonata, and Toyota Camry) offer a good balance of fuel efficiency, comfort, and safety. They will tend to get about 5 mpg less than the compacts, but they also get about 5 mpg more than full-size sedans. Small SUVs (for example, the Ford Escape, Honda CR-V, Subaru Forester, or Toyota RAV-4) provide an attractive compromise between utility and fuel economy. They get almost the same mileage as a midsize sedan around town, but because they have larger frontal areas and are less aerodynamic, they are notably less fuel efficient at cruising speeds. If you really need a lot of space, consider a passenger van or the new class of CUVs—"crossover" utility vehicles (for example, the Dodge Journey, Ford Taurus X, Ford Edge, and Chevrolet Equinox). They are built on car-type chassis and tend to offer better fuel economy and better handling than SUVs built on truck chassis.

Option Considerations

At one time, manuals got much better fuel mileage than automatics, but with modern computer-managed automatics with lock-up torque converters, cars with automatics are almost as efficient as the same car with manual transmissions. Only by expertly shifting a manual can you beat an automatic, and keep in mind that resale value for manuals is generally significantly less than for automatics.

Do not pay extra for four-wheel drive, unless you really need it—for example, if you live in an area that gets a lot of snow. Four-wheel drive adds both weight and driveline friction that can reduce mileage 2-3%.

Many new cars have a meter that displays instantaneous mpg as well as the trip mpg. Instant feedback is the best teacher, so this simple meter can help you learn to drive more efficiently. Before you buy, check to make sure the vehicle selected has this feature.

Should You Buy a Hybrid?

A "hybrid" is a vehicle that has, in addition to a standard gasoline engine and drive train, a computer management system that controls a large generator, a battery pack, and an electric motor. The hybrid's computer management system recovers and stores energy normally lost in stop-and-go driving and uses it to assist the gasoline engine in starting off and accelerating. Hybrids are much more fuel-efficient than standard vehicles of the same size. They generally provide a 20-40% improvement in mpg *around town* (city driving), but at steady cruising speeds on open highways they offer much less advantage. Hybrids are generally listed for three to five thousand dollars more than standard cars, but some hybrid models are in strong demand and depreciate very slowly. All said, the average driver would need to keep a hybrid about five years to gain back (in fuel savings) the extra cost of purchase (over a standard vehicle), but hybrids depreciate very slowly, so the primary savings may not be in fuel economy but in resale value. Moreover, if you drive a lot and all of your driving is in heavy city traffic, you could gain back (in fuel savings) the extra cost of the hybrid in a couple of years. If you are interested in buying a hybrid, check the resale value.

Sidebar III

Alternative Fuels

Diesel fuel

Diesel-powered cars (e. g., Volkswagen's Jetta TDI and the Mercedes E320 Bluetec) are marketed as alternatives to hybrids. On the positive side, they are almost as fuel efficient as hybrids, but on the negative side, many filling stations do not sell diesel fuel—and diesel fuel is generally priced higher than gasoline. Diesel-powered cars will probably grow in popularity (just as they did after the gasoline crisis of the 1970s), and today's diesel cars perform much better and quieter than the diesels of earlier eras. They drive and sound like gasoline-powered cars, but diesel cars still don't have quite as much power as similar gasoline-powered cars. Because hybrids are currently more popular than diesels, the price of a new diesel-powered car may be more negotiable. Note: Honda is considering joining the German manufacturers in producing diesel-powered cars for the U.S. Diesel-powered hybrids may also be available in the near future, and they will be even more fuel efficient than gasoline-powered hybrids.

Ethanol Fuel

Pure ethanol fuel is available in Brazil, but not in the U.S. The only ethanol fuel that is available in the U.S. is E-85, a blend of 85% ethanol and 15% gasoline. E-85 is a good substitute for gasoline, but its cost per mile offers no savings and it can be used only in "flex-fuel" vehicles. Ethanol is often described as an alternative to using fossil fuel, but in fact corn ethanol production requires large amounts of natural gas for fertilizer and distillation, as well as large amounts of diesel fuel for operation of farm equipment and for shipping farm supplies. On the other hand, the production of sugarcane ethanol in Brazil requires far less fossil fuel. Now, to set the record straight, it should be noted that *less than 1% of corn ethanol production in the U.S. currently goes into E-85 fuel production*; 99% of the corn ethanol produced in the U.S. is used as a gasoline additive to enhance octane. Some nasty chemicals, such as

benzene and tetraethyl lead, were once used to enhance gasoline octane, but many years ago methyl tertiary-butyl ether (MTBE) became the primary octane-enhancing additive. In recent years ethanol has largely replaced MTBE. Contrary to political rhetoric we hear, ending tax breaks for ethanol would not significantly decrease ethanol production or reduce the price of corn—at least not until an even more environmentally friendly octane-enhancing additive could be found. The main effect of removing the tax break for ethanol would be a small increase in the price of gasoline and a reduction the sale of E-85 fuel, but that would probably reduce the overall demand for ethanol a few percent at most.

Compressed Natural Gas (CNG)

Natural gas is abundant and clean burning. It emits low CO_2 levels and is much higher octane than gasoline. On the negative side, CNG requires a large, 3600psi tank. Because of the high pressure and flammability, extreme care in handling is required. Fires involving CNG-powered cars present special problems for fire departments. CNG-powered cars are already available (e.g., Honda Civic GX), but until a safety record is established, and CNG is readily available at services stations, it will not be a competitive alternative to gasoline.

Electricity

Hybrids are not electric cars; their battery cannot be charged from external sources. Only "plug-in" hybrids offer the option of plugging into an electrical power source to charge the battery. Once the battery is fully charged, these vehicles can go 10 to 15 miles before they start running on gasoline, but there are currently no plug-in hybrids on the market, although Ford and Toyota plan to introduce plug-in hybrid models for 2010.

Since their first introduction (in the late 1890s), electric cars powered by batteries have been used primarily for local driving—for example, as taxis and in-town delivery vans. Just imagine taking a trip that requires stopping at a charging station every 50 to 75 miles, and plugging up for a few hours. There are currently no practical electric cars on the market in the U.S., but Nissan plans to introduce a small electric sedan in Japan and the U.S. in 2010, and GM has a concept car named the Volt that has a gasoline-engine-powered generator that can recharge the battery en route. GM's Volt should be available in November of 2010. It will be called a "plug-in" hybrid, but it is really a "fire-up" electric. It can be driven over 40 miles on a full battery charge, before the engine-generator starts up. Plug-in hybrids, electrics, and fire-up electrics are for those who don't mind the inconvenience of plugging up when they get home, but because the cost per mile of electricity is less than one-third the cost of gasoline, there will likely be a battery-powered car of some type in your future. A final note: Most electricity is generated by burning coal, so the "zero emissions" claim for electric cars is nonsense. The ultimate solution for charging electric cars will be solar panels mounted on the roofs of homes, but for now, a solar panel system large enough to keep an electric car charged up could cost as much as the car itself.

Hydrogen Fuel

It is appropriate to consider hydrogen as the equivalent of a battery pack—a way to store electricity in an electric car. Electricity is used to produce hydrogen, just as it is used to charge batteries. Fuel cells must be installed in hydrogen-fueled cars to convert hydrogen back into electricity. They are expensive to produce, so, for the foreseeable future, electric cars will be powered by batteries, not hydrogen. And it is not just vehicle costs that make hydrogen fuel a long shot. Filling stations may be reluctant to store and handle a fuel that must be contained at 10,000 psi (pounds-per-square-inch), and moreover, tanks containing liquid hydrogen that are small enough to be incorporated in the construction of cars would provide enough fuel for only 100-150 miles.

Bio

William M. (Bud) Gardner is a long-time member of the Society of Automotive Historians and has published articles on automotive history in *Special Interest Autos*, *Bulb Horn*, and *Traces of Indiana and Midwestern History*. He also authored a comprehensive history of eight cylinder engines. His *Encyclopedia of Eights* is available in pdf format on CD. Gardner is a retired professor who lives with his wife Gail in Fairhope, Alabama. You may send comments and queries to budgardner@bellsouth.net.