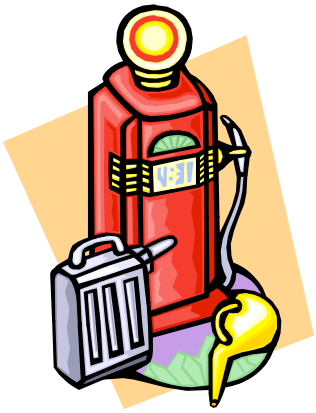
Dos & Don'ts

At the Gas Pump



Static Electricity Fires – How to Prevent Them

Participant Handout

PURDUE UNIVERSITY

Purdue Extension
Knowledge to Go
1-888-EXT-INFO

Objectives of the Program

A woman who was badly burned in a refueling fire created this program to help you understand the potential dangers of handling gasoline and refueling vehicles. As a result of participating in this program, you will learn:

1. How to handle, store, and dispose of gasoline safely.
2. How static electricity can affect refueling your car.
3. Safety guidelines for refueling a vehicle.

What Is Gasoline?

Gasoline is a flammable liquid and should be stored at room temperature, away from potential heat sources such as the sun, hot water heater, furnace or space heater, and other ignition sources. Gasoline vapors are heavier than air and can travel along the floor to ignition sources. The vapors are highly flammable. Therefore, gasoline should be stored more than 50 feet away from appliance pilot lights or igniters.

Handling and Storing Gasoline

Approved containers or tanks are a must for storing gasoline. Storage in anything other than an approved container is strictly prohibited by fire prevention codes.

Storage of gasoline requires precautions for spill cleanup. Minor spills should be absorbed with kitty litter, an absorbent clay material available at all auto parts store, paper, or rags. Larger spills should be contained and collected. Check with your local government or hazardous waste disposal center to determine the proper avenues for disposing of spilled gasoline. NEVER dispose of spilled gasoline or cleaning materials on the ground or in your garbage, drains, toilets, or sewers. This could cause a fire, or the gasoline could seep into streams, lakes, or groundwater.

How Can Gasoline Be Safely Stored?

If the gasoline will not be used for four to six months, will be exposed to direct sunlight, or will be stored much of the time at temperatures above 80˚ F, add a fuel stabilizer/additive to the gasoline when you first buy it. Fuel stabilizers contain antioxidants, which prevent gum and other compounds from forming in gasoline; biocides, which prevent microbial growth; and corrosion inhibitors, which prevent the formation of rust and corrosion. Fuel stabilizers/additives are available at auto parts stores.

Freshness of the gasoline is improved if the container or gas tank is stored in a cool place and is kept about 95 percent full. However, leave some headroom for gasoline to expand if it warms up in storage. Without an air space, expansion will force liquid gasoline out of the container or distort the container.

Precautionary Measures

1. Do not smoke where gasoline is handled or stored. Smoking around gasoline causes more fires than static electricity does.
2. Always keep gasoline out of the reach of children.
3. It is best to handle gasoline outdoors for proper ventilation.
4. Keep gasoline containers tightly closed and handle them gently to avoid spills.
5. Do not mix even a small amount of gasoline with kerosene or diesel fuel.
6. Do not use gasoline in kerosene heaters or lamps.
7. Store gasoline in a building separate from the house or place of occupancy, such as a shed or garage.
8. Put gasoline in a small engine (such as a lawnmower) only when the engine and attachments are COOL.

Static Electricity and Refueling Your Car

Static electricity is an electric charge caused by an imbalance of electrons on the surface of a material. It is most commonly caused by the contact and separation of materials. The area of contact, the speed of separation, relative humidity, and other factors determine the amount of charge created.

An example of this is a person walking across a carpeted floor. Static electricity is generated as their shoe soles contact and separate from the carpet. The amount of static electricity generated will increase in proportion to the size of the sole surface, lower humidity, and increased speed of movement.

One of the many potential causes of static electricity buildup is exiting and re-entering a vehicle, particularly in cool or cold and dry conditions. This can cause a buildup of static electricity similar to shuffling your feet on the carpet. When you exit and re-enter your vehicle while refueling, there is the potential for sufficient static electricity to build up that a spark can discharge between your body and the fuel nozzle. In rare circumstances, the spark can ignite gasoline vapors around the fill spout, causing a brief flash fire.

Once the vapors ignite, the fire will continue until the fuel supply is shut off. Although, in most cases, damage and injuries have been minor, serious personal injury and major property damage have occurred when the fuel supply from the dispenser has not been stopped.

How Does It Happen?

When you pull into a gas station to refuel your vehicle, you open, then shut the car door, open the fuel pipe cover on the vehicle, touch the nozzle on the gas pump, and perhaps touch the pump to use your credit card — all before you insert the nozzle into the fill pipe. Any static charge that was picked up in the car has been dissipated several times.

A new static charge can be picked up if you get back into the car after the refueling has started. The synthetic material of the car seats and clothing add to the possibility of picking up a static charge. If you don’t touch metal before returning to the nozzle and fuel pipe, that static charge can be transferred upon touching the nozzle, thus creating the potential for a flash fire.

How Many Fires Are There?

No one knows how many static fires there are in a year. The Petroleum Equipment Institute (PEI) has a Web page where fires can be reported, but people need to know to file the reports. About 175 accidents have been reported since 1992, most since 1998.

Three Causes of Static Electricity Fires

- 50% — refueler returns to vehicle during refueling – doesn't shut door or touch other metal when leaving car to remove gas pump nozzle from car's fuel pipe
- 29% — refueler unscrews gas cap
- 21% — something else happened

Some Theories about Why More Fires

There are several theories about why static fires at the pumps seem to be occurring more often now. One of the theories is the almost universal switch to self-serve pumps, which require millions of people who are unfamiliar with the volatility of gasoline to handle it once or twice a week. Also, vehicles today have more electronics – CD players, geopositioning systems, satellite radios, cruise control, ABS, on-board diagnostics, and electronically controlled fuel injection. Those elements, plus nylon seat covers, could create more static and a greater potential for static buildup.

Other theories include: more volatile fuels – fuel meant to be sold during cold weather is blended to be more volatile; tires – less carbon and more silica in them; fill pipe cover release inside the vehicles; and dissimilar automobile parts, such as plastic and metal.

Who Are the Victims?

Of the refueling fires reported, 50 percent of the cases involved the person getting back into the vehicle while the gas was still flowing into the tank. When they return to the fill area and touch the nozzle to complete the fillup, a static spark ignites the fumes, which causes a flash fire. Of the static fires reported, 78 percent happen to women. Why? Some of the reasons why motorists re-enter their cars during refueling seem to be gender specific:

- return the credit card to purse
- check on the kids
- get warm
- use the cell phone
- get money out of purse
- write a check
- write down odometer reading
- put on lipstick

Safety Guidelines when Refueling

1. **Always** turn off your vehicle engine while refueling.

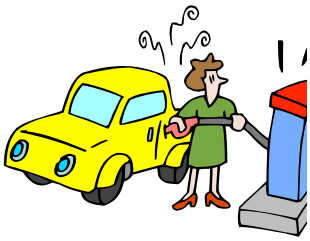
2. **Stay near** the vehicle fueling point during the process.

3. **Never** smoke, light matches, or use lighters while refueling.

4. Cellular phones and other electronic devices may have the potential to emit electrical charges, and should therefore be left in the vehicle during fueling. (There have been **no** reported fires due to cell phone use.)

5. **Do not** get back into your vehicle during refueling – even when using the nozzle's automatic hold-open latch. If you must re-enter your vehicle, discharge static electricity buildup when you get out by touching the outside metal portion of your vehicle, away from the filling point, before attempting to remove the nozzle.

6. To avoid gasoline spills, **do not** overfill or top off your tank. The fuel dispenser will shut off automatically when the tank is full.



7. Use only the hold-open latch provided on the gasoline nozzle. **Never** jam or force the hold-open latch open by using some other object, such as the gas cap.

8. When dispensing gasoline into a portable gasoline can, use only an approved container. Always place the container on the ground and keep the pump nozzle in contact with the container when refueling to avoid a static electricity ignition of fuel vapors. Containers should never be filled inside a vehicle, in the trunk, on the bed of a pickup or flatbed truck, or on the floor of a trailer. The bed of the truck and the bed liner act as insulators, as does the carpeting in a car or in its trunk, which may allow static electricity to build up in the can while it is being filled. That static electricity could create a spark between the container and the fuel nozzle.

9. If a flash fire occurs during refueling, you should **leave the nozzle in the vehicle fill pipe** and back away from the vehicle. Notify the station attendant at once so that all dispensing devices and pumps can be shut off with emergency controls. If the facility is unattended, use the emergency intercom to summon help and the emergency shutdown button to shut off the pump.

New Signage

The following warnings are on nozzle scuff guards (the plastic cover on the top of the nozzle) made after April 1, 2003:
WARNING

- Improper use may cause a hazardous condition
- No smoking/extinguish all flames
- Avoid static hazard — remain at nozzle
- Do not top off
- Licensed drivers only
- Refer to posted warnings

The National Fire Protection Association has approved the following additional signage. Now the legislature or fire marshal's office in each state has the option of making it mandatory for their state.

- Discharge your static electricity before fueling by touching a metal surface away from the nozzle.
- Do not re-enter your vehicle while gasoline is pumping.
- If a fire starts, do not remove nozzle – then back away immediately.
- Do not allow children under licensed age to use the pump.

Resources

American Petroleum Institute, http://api-ec.api.org/newsplashpage/index.cfm. Follow the link “About Oil and Natural Gas,” then the link “At the Pump.”

Beaty, William J. “*Static Electricity” Means “High Voltage*,” http://www.amasci.com/emotor/voltmeas.html. 1999.

Bellingham Fire Department/Whatcom Medic One. *Gasoline Safety: Preventing Gasoline Burn Injuries*, http://www.cob.org/fire/safety/Gasoline/index.htm. March 27, 2002

Conklin, Clark. *Motor Vehicle Fueling Fires*. Nebraska State Fire Marshal’s Office, http://vmhost.cdp.state.ne.us:97/~sfmweb/page22.html.

Electrostatic Solutions Ltd, http://www.static-sol.com. Follow the link “Static Shocks and How to Avoid Them.”

Institute of Physics. *Better car seat materials could reduce electric shocks*, http://www.ioppublishing.com/Physics/News/0104p. March 16, 1998

Oklahoma State Department of Health Injury Prevention Service, *Gasoline-Related Burns Fact Sheet,* www.health.state.ok.us/PROGRAM/injury/factsheets/gasoline_related_burns.htm

Petroleum Equipment Institute “Stop Static” safety campaign, http://www.pei.org/static.

Safety Sense. *Shriners Hospitals Offer Gasoline Safety Tips*, http://www.napsnet.com/pdf_archive/65/50942.pdf.

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