# Refueling your Watercraft

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One of the most dangerous things we do as boaters is to refuel our boats. Improperly done, refueling can lead to disastrous consequences, sometimes resulting in death. Let's review the process and the safety precautions.

Before we begin let's learn a little about gasoline. Gasoline is the fuel of choice for most of our boats, and as such, requires great care in using, storing, and transferring. In order to have combustion you need three things: fuel, an ignition source, and oxygen. These three things form what is known as the fire triangle. If you completely remove one of the three elements there should be no fire. For example, if you store the fuel in a closed airtight metal container, no spark can reach it, so it should be safe.

Gasoline has a very low vapor pressure which means that when exposed to the atmosphere, it will vaporize and easily mix with the air. This mixing creates an invisible fuel rich cloud which is denser than the surrounding air. Left alone, this dense cloud or layer of fuel and air will settle to the lowest point in the surrounding area. When you are filling your gas tank, suppose you accidently spill a very small amount of fuel on the floorboards of your boat. While you are searching for a cloth to wipe the spill up, some of the raw fuel vaporizes and becomes mixed with the air inside of the boat. Very quickly and totally unseen, the layer of gasoline and air vapors settles to the bilge where it remains in suspension. Meanwhile, you wipe up the small amount of gasoline and dispose of the rag, thinking you have properly addressed the spill and eliminated the potential problem.

Fig 1 – Upon starting his jet ski, the individual was blown off his jet ski when leaking gasoline led to an explosion.

A minute later when you hit the key and engage the starter a spark ignites the vapors and you boat blows up. This scenario happens with amazing regularity each year. Sadly, too many boaters are burned or die while their boats explode and burn.

So, the question becomes; what should we do to prevent this tragedy? At the risk of being overly simplistic, the first order of business is to make your passengers aware and enforce a strict rule that everybody leave the boat during refueling. Second, use a metal funnel which fits your filler neck properly.

Third, before you begin refueling, have disposable paper towels on hand to immediately wipe up any spills if they occur. After refueling, run your bilge blower for at least five minutes to ensure there are no residual fumes lingering in the bilge before you reboard your passengers or attempt to start the engine. Do not get bullied by the next person in line at the fuel dock to start-up and move along. It's fine to loosen the lines and move down the dock, but don't attempt to start the engine. If you want more assurance that the fumes are gone, stick your nose down in the bilge and sniff for fumes or install a gasoline fume detector in the bilge or engine room. The sniffers have a sensor mounted in the bilge area and can detect the fumes then alert you with an audible and visual alarm. Some of the deluxe versions will also automatically activate your bilge blower.

While filling the tank, always ground the funnel against the gasoline filler neck on the deck and be careful not to overfill or spill the fuel. Do not flip on the ignition to check the fuel gauge to see if the tank is full. This is a place where that good old wooden fuel level stick comes in handy. Filler necks and the hoses connecting them to the tank are often the root cause of fuel leaks. Carburetor, fuel pump, and fuel filter lines and fittings are next.

Be careful with static electricity. Plastic or fiberglass docks can be a source of static electricity as can plastic gas containers or funnels. When fueling, keep the metal fuel nozzle grounded by remaining in constant contact with the filler neck or metal funnel. The fuel running through the nozzle can sometimes create static electricity. If you create static electricity, it can serve as an ignition source for a fire or explosion. Static electricity can easily occur by simply sliding across a vinyl seat. In the end, you must make sure there are no dangerous fumes in the boat before trying to start it. The proper way to lessen the chances of an explosion or fire


Fig 2 – This fuel sniffer will sound an alarm when it detects gasoline fumes, and then provides the option to automatically turn on the Bilge Blower.

is to run the blower for the prescribed time before even attempting to start the engine.

Always make sure your boat and engine are outfitted with all of the required US Coast Guard approved equipment. A case in point is the starter. An automotive starter and a marine starter may look identical to the untrained eye, with the only difference being the price, which is typically almost double for the marine version. Without the knowledge, and wanting to be economical, many boaters opt for the automotive starter, not realizing the downside risk they have just taken. The marine starters and generators have shielding and spark arrestors to reduce the chance of fumes entering the brush area where the sparks fly.

If you have a fire or explosion in your boat, the insurance company loss investigator will thoroughly inspect your equipment such as the bilge blower, distributor, starter or alternator, fuel pump and flame arrestor to make sure they comply with current USCG regulations before they pay a claim. Auto parts stores are often unaware of the difference or of the USCG marine requirement and may unknowingly sell you an automotive part, which will start the engine, but offer no protection from fumes.

Always have the Coast Guard Approved flame arrestor in place on the carburetor. If the carburetor is leaking fuel, or if you pump the throttle too often before starting, you run the risk of creating a dangerous condition. Today the marine rated equipment will bear a stamp indicating "USCG Approved" some of the material may also have a label "SAE J117".

What most people do not realize is just how little fuel it takes to create enough vapor to completely engulf a boat in flame. As little as a tablespoon of Gasoline can create enough vapor to create an explosion capable of destroying your boat.

Properly selected, installed, and maintained, there is enough specialized equipment in place to ensure a safe boating environment. As long as you understand the procedures, requirements, adhere to the rules, and take all the necessary precautions you should have nothing to worry about, providing that you follow the procedures!

Here is the smoldering remains of the jet ski.

**Think before you turn the key!**

**SAFE BOATING TO YOU ALL!**