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Boat Explosion Investigations
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Many recreational boat explosions occur at the fuel dock, after the operator has filled the fuel tank/s. There is a federal requirement to run the mandated bilge blowers for 5 minutes after the fueling event and prior to attempting to start the engine/s. The boat blows up anyway, with injuries or death to those onboard or on shore.

In a recently settled project the owner had completed fueling and 30 minutes thereafter started the starboard engine and then when attempting to start the port engine the boat blew up fatally injuring the owner/operator and injuring a party on the fuel dock.

Federal regulations, 33CFR 183 subpart J provide the regulations for the installation of the gasoline fuel system. This system consists of the fuel fill hose and vent for the tank/s and the fuel supply line/s to the engine/s. Subpart J specifies the type acceptance for the fuel fill, vent and supply lines, the testing and construction material/s of the fuel tank. There is also a 2 ½ minute fire test on the fuel lines. These regulations are a part of the Boating Safety Act of 1971 and my personal experience indicates they have gone a long way to reduce boat explosions.

So why are they still occurring?

The most common explosion occurrence is after a re-fueling event. The unique circumstance present is that the fuel is now present in the fill and vent fuel lines until operation of engine/s consumes that relatively small volume of fuel in the lines (fuel tank/s are often 100 gallons or more).

The regulations cited earlier specify the fill and vent lines do not have to be manufactured to withstand the rigors of exposure to fuel at all times, as the feed lines are required to do. The fill and vent hoses degrade over time to where external cracking (photo at right) is visually evident and the interior liner degrades fouling the fuel tank and filter/s. The fill and vent hoses are often obscured from visual inspection because they are routed behind bulkheads or partitions within the enclosed spaces the engine/fuel compartments.

The previously cited regulations require the fuel hoses be clearly marked indicating the name of the manufacturer, the USCG certification type, and the date of manufacture. These regulations also require that the hoses at fitting be 'readily accessible' for inspection. Therefore, there are inspection ports at the location of the deck fill fitting and hose connection and another access port the connection of the hose with the fuel tank. The covers on these access ports can be removed without the use of tools, i.e. 'readily accessible'.

The marine industry suggests (and USCG Office of Boating Safety) the fuel system be inspected annually and if cracked hoses are found they be replaced. Boats are often stored out of water for the winter at a marina. The marina usually performs a "safety check" of the boat and it's equipment when accepting it for storage (this is required under National Fire Protection Standard 303 "Marina's and Boatyards). The marina will have a fill in form completed by their personnel saying something like "Inspect hoses and Belts", or "Check fuel system for leaks". In practice this marina inspected is relegated to the hoses or fuel system components within the engine compartment that can easily be seen by the technician when completing the winterization of the engine and systems. The boat owner is rarely present when this form is completed so when it is received with the bill, the owner is under the impression the fuel hoses or system was inspected and is fine.

So what do I look for in the investigation?

- Check all hoses on the boat for cracks. If you see cracks it is likely the fuel fill or vent hose was cracked.
- Check for the remains of the reinforcing steel in the fill hose. If the origin is within the hose all that will be left is the steel reinforcement.
- The boat ten or more years old? If the hose has not been replaced it is likely cracked
- Did the marina inspect the hose/s at the inspection ports during the annual winterization?

What about the ignition source?

The regulations 33CFR183.410 require electrical devices be ignition protected. SAE marine has requirements for engine mounted components. Check them all for the compliance with 33CFR183.410 label. Don't forget spark plug wires, there is a marine requirement under SAE with OEM wires likely in compliance and non-OEM wires either non-compliant or ill fitting resulting in electrical leakage.

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