

Time:
1 Hr.

Ignition Protected Systems

Key Concepts: Keeping out of harm's way by not using automotive parts.

Main Teaching Points:

- 1) **Review automotive fuel components that may release fuel and vapour into the engine room, and/or emit sparks**
- 2) **Review the differences between the marine engine parts and automotive equivalents listed below:**
 - a) **Alternators:** A standard automotive alternator has exposed electrical contacts that can create sparks and ignite fuel vapours in the engine room. On marine alternators the contacts are sealed inside.
 - b) **Distributors:** Automotive distributors create high energy sparks internally that can escape through a vent which permits the release of ozone gas. In marine distributors the vent has a flame arrestor device to prevent sparking that could cause a fire or explosion in the engine room.
 - c) **Starters, Generators, Accessory Motors (hydraulic pump, tilt drive, etc):** These motors have brushes and an armature which spark in normal operation in an automobile. The marine versions of these motors are usually completely sealed and are also equipped with an additional seal between their motor section and bendix gear section.
 - d) **Starter Solenoids:** Each time the solenoid operated, it creates a high energy spark internally. A vent hold in the automotive starter solenoid for the release of ozone, is absent on a marine starter solenoid that is ignition-protected.
 - e) **Carburetors:** The float chambers on carburetors are vented to permit the free flow of fuel into and out of the chambers. On automotive carburetors any overflow from the vents flows outside the carburetor into the engine room. On a marine carburetor the vents lead into the carburetor throat so that any overflow is consumed by the engine.
 - f) **Fuel Pumps:** Automotive fuel pumps have a vent hole that will leak gasoline into the engine room if the fuel pump diaphragm fails. The diaphragm pump on the marine version must not leak fuel if the primary diaphragm fails.
 - g) **Batteries.** If the battery is not properly insulated and secured in a battery box when a boat is steered into a sharp turn, the battery can slide across the deck bringing the terminal into contact with the side of the fuel tank, causing a spark and then an explosion. Tightly secure batteries and ensure positive terminals are insulated.

Notes

Quick Points

	Review automotive fuel components
	differences between the marine engine parts and automotive equivalents

Instructors note:

There are major differences in the environments in which marine engine components and their automotive equivalents are designed to operate.

Fuel vapours do not accumulate under the hood of a car, but they quickly reach explosive levels in the engine room on a boat

Use overhead to review marine and automotive engine components.

Material Linked to LP

ABYC- Electrical and Fuel System Standards.
PCCC Student Manual
TP 1332 Construction Standards for Small Vessels.

Rationalization: To someone who is replacing or repairing the components above, the automotive component might seem like a bargain, but have you looked at the value of human life?

Suggested Activities:

Have the class break into groups. If no engine components are available, have each group review pictures of both marine and automotive engine components. Include outboard components as well; in this case unscreened opening may exist even if the component is ignition protected.

Students will ID marine components by UL label or SAE rating.

Students should be looking:

- to see if it is an automotive replacement part
- for unscreened openings
- for cracks and breaks in wires
- for cracks, breaks or holes

Describe the difference between inboard, *outboard* and standard automotive parts.

Case Studies

1990 Fire-- Kitsilano Coast Guard, Base

Insert photograph of vessel and have class brainstorm cause of fire.

Hint: Some serious fires and explosions have occurred on boats equipped with side terminal batteries and portable fuel tanks!



<i>Method of Evaluation & Condition</i>	<i>Skill / Knowledge and Standard</i>
<u>Skill</u>	
Each candidate can be evaluated for these points by written examination or oral questioning during vessel examination. Given an inboard gasoline engine each candidate shall be able to locate and identify ignition protected systems. If no engine is available, candidates may be evaluated through table top scenario (given either engine parts or photographs) verbalizing examination criteria with an instructor.	When examining inboard gasoline engine each candidate will look: <ul style="list-style-type: none"> • to see if it is an automotive replacement part • for unscreened openings • for cracks and breaks in wires • for cracks, breaks or holes
<u>Knowledge</u>	
Each candidate can be evaluated for these points by written examination or oral questioning during vessel examination. Given an inboard gasoline engine each candidate shall be able to locate and identify ignition protected systems. If no engine is available, candidates may be evaluated through table top scenario (given either engine parts or photographs) verbalizing examination criteria with an instructor.	Each candidate will be able to recognize the difference between automotive or marine engine part such as a relay, alternator, starter or distributor. Each candidate will be able to ID an ignition protected engine part by UL label or SAE rating.

