FLAME OUT

A DEDICATED FIXED FIREFIGHTING SYSTEM JUST MAY BE THE BEST, CHEAPEST INSURANCE YOU'LL EVER PURCHASE.

BY STEVE D'ANTONIO

BOAT OWNERS ASSOCIATION OF THE

Engine room fires can quickly take off and become out of control. A fixed-mounted suppression system attacks at the first sign of flames and extinguishes them using chemicals that won't destroy your motors or other nearby equipment.

What would you do if you saw smoke rising from the engine room's air intake louvers, or flames dancing through the port in the engine room door? A portable fire extinguisher requires you to face the fire head-on, by entering its space; at best it's a daunting prospect, at worst a death-defying one. To compound matters, it's entirely possible that a portable fire extinguisher just won't be enough when facing a fire in anything but its earliest stages. Moreover, the corrosive contents of the dry chemical extinguishers that most vessels are equipped with will almost certainly cause damage to engines if they succeed in dousing the flames, and to electrical and electronic equipment.

Fortunately, there's an alternative, and it comes in the form of a fixed fire extinguisher (or what I call an FFE). These systems have a permanently placed extinguisher bottle in a protected space: the engine room, lazarette or other engineering compartment. All FFEs have automatic actuation; the system will discharge its fire-extinguishing agent when the FFE bottle's nozzle reaches a preset temperature, typically 175 F.

The agent used in these systems employs one of several chemical formulas, each with different properties. The common denominator is that they are all considered "clean" agents. In other words, they rely on gasses that leave no residue and are not harmful to the equipment located in these spaces.

An FFE bottle's size is based on the volume of the space it's meant to protect. For most recreational vessels, this means the system is "pre-engineered," which means it's a pre-assembled kit designed for installation in a compartment of a given size. (These systems may consist of just the bottle, or the bottle and other accessories, which we'll address momentarily.) Systems that require custom engineering, alternatively, are referred to as "engineered" ones. Pre-engineered systems are available for compartments up to 1,500 cubic feet, whereas custom-engineered systems are required for larger spaces.

COMPARING CLEAN AGENTS

For years, halon was the primary FFE clean agent; halon systems were so prevalent that the term became generic. Halon has many advantages. It's an effective fire-extinguishing agent, and so efficient that it takes less halon to extinguish a fire than it takes other agents. Most importantly, when used in the correct concentration, it's also nontoxic, giving those in the space where it's been released time to safely exit. It has, however, one major drawback: Because it's an ozone-depleting agent, production of new halon has ceased, and it's been banned for sale to the general public since 1993.

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Contrary to popular belief, however, existing, functional halon systems installed before 1993 are neither forbidden nor in need of replacement. In fact, because of their effectiveness, safety record, efficiency and small footprint, they shouldn't be replaced.

Alternatives to the original halon include a range of gasses, such as HFC 227, also known as FM 200, FE227 and Solkaflam 227. All of these clean agents work well, and like halon, all are approved for use in what are termed "normally occupied spaces." (They were initially designed for shoreside duty in storage rooms for computers and documents.) While these agents effectively supplant traditional halon, they are also less effective, which means more gas (50 to 70 percent more) is required to cover the same volume. So when replacing an older halon system, a larger footprint is required for the new installation.

FE 241 and carbon dioxide (CO_2) are also clean agents. The former behaves much like the other clean agents, with one significant difference: Because it won't support life in a space flooded with it, it's not approved for use in normally occupied spaces. Why, then, would anyone consider it? Predictably, it's less costly than the other clean agents, and when used in an engine compartment or other engineering space, it meets the letter of the law (except in the European Union).

CO_2 is a well-known, effective fire-extinguishing agent that's been used in FFEs and portable fire extinguishers for many years. That said, while FE 241 can be fatal because it displaces oxygen, CO_2 is an asphxyiant and cerebral dilator, and also lethal. (Exposure to concentrations as low as 10 percent can cause death.) While thankfully uncommon, the inadvertent discharge of CO_2 FFEs has killed both recreational boat owners and commercial and military mariners. Nearly every CO_2 system I encounter is equipped with a delayed discharge mechanism that sounds an alarm before flooding the space, allowing those who may be present to exit quickly. CO_2 systems are rare on smaller recreational vessels, but I have found them on older boats as small as 42 feet, and more frequently aboard vessels over 70 feet.

In my opinion, for what I believe are obvious reasons, the nontoxic agents make the most sense. Although the spaces marine FFEs typically protect are supposedly rarely occupied, I spend a great deal of time in them and therefore beg to differ. Ultimately, and for the comparatively small cost difference, why take the chance? If your vessel, or one you are considering purchasing, is equipped with an FFE that lacks the "occupied space" approval, at the very least be mindful of this fact, and make certain it is in good working order. Also remember that the "nonlethal" aspect of the clean agents approved for occupied spaces is predicated upon their rated concentration. An FFE charged with FM 200 that's rated to protect 1,000 cubic feet, for example, would negate the life-supporting feature in a space that measures 500 cubic feet.

INSTALLATION DETAILS

In a full one-third of the vessels I

inspect, FFE systems fail to comply with either American Boat and Yacht Council (ABYC) guidelines or the system's manufacturer installation requirements. Among the more common violations are incorrect volume calculations and mounting locations.

Using the standard volume formula of length multiplied by height multiplied by width, determining the volume of the compartment to be protected would seem simple enough. Engine rooms, lazarettes and other engineering spaces are rarely cube-shaped, however, making some interpolation necessary. When measuring these irregularly shaped spaces, erring on the side of caution is acceptable to a small degree, with at least one caveat: From a volume perspective, with the sole exception of tanks (fuel, water and waste), none of the installed gear (such as engines and generators) should be excluded, and the space should be measured as if they weren't present. As it's safe to assume tanks will not be flooded with clean agent, however, their volume should be subtracted from the calculation.

While installers should always defer to the manufacturer's installation guidelines, a few rules of thumb apply nearly universally. Because all FFEs are triggered by temperature, the nozzle should be installed as close to the space's overhead as possible. Where fire aboard is concerned, every second

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counts; the farther the nozzle is located from the overhead, the longer it will take for heat to trigger the discharge of the fire-extinguishing agent. Bottles should be mounted on or close to the centerline, ideally on a forward or aft bulkhead, ensuring an even distribution of gas, and the nozzle's diffuser should face into the compartment. Most manufacturers allow bottles to be installed vertically or horizontally; however, most prohibit the nozzle from being lower than a horizontal line passed through the bottle's centerline. Installation locations must avoid forced or passive ventilation air being directed onto the nozzle, as through its cooling effect, this will almost certainly delay automatic discharge.

A fire extinguishing system must be capable of flooding the space it protects. Combining two smaller bottles (top) would not comply with standards unless each could flood the space. Tanks should be mounted as high as possible in the engine room and away from ventilation systems (above, left). Installing the bottle's heat-sensitive nozzle close to the overhead enures it will trigger quickly in case of a fire.

Bottles used for larger FFEs are typically heavy; 50 pounds or more isn't unusual. Affixing an FFE to a bulkhead or overhead should take this into account. In addition to the FFE's own weight, the potential g-forces imparted by high-speed runs or aboard offshore passagemaking vessels should be considered also. With few exceptions, the preferred method of affixing bottles relies on substantial through-bolts rather than tapping screws. I've encountered FFEs that have come loose in engine rooms; it's an unsettling sight. If the nozzle were to be sheared off in such a scenario, the bottle could become a gas-powered missile.

Two installation options are well worth considering; in fact, I'd consider them mandatory in all but a very few applications. The first is a manual discharge handle. In the scenarios set forth at the beginning of this article, in which smoke is roiling out of vents or flames are visible in an engine room, the delay of an FFE to automatically discharge could be interminable. The ability to discharge the system at the first sign of fire is incredibly valuable, and very much worth the comparatively small additional expense to this component's installation. (The materials often cost less than $100.) Typically, handles are installed at helm stations (you can have two of them), or on larger vessels, outside the engine room doors (which should always have windows). Not all FFEs are capable of accepting a manual discharge kit, however, so make sure the ones you're considering have this capability.

The other option, an automatic shutdown relay system, is required aboard diesel-powered vessels seeking ABYC compliance. When an FFE system is discharged, either manually or automatically, the components that consume and expel air (including

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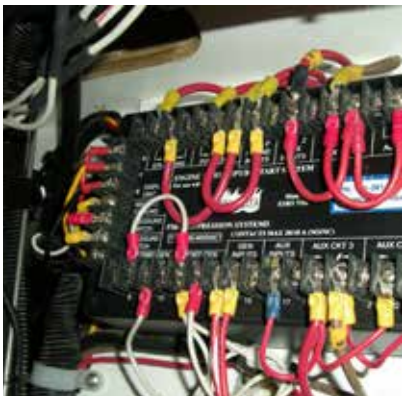

Fixed fire extinguishing systems have several components. Some manual trigger mechanisms include a shipping pin (1) that must be removed once the system's been installed. A wired-in relay (2) automatically shuts down engines and other systems in case of a fire. Manual discharge cables (3) should be periodically inspected. This one on a new vessel was found to be disconnected from its trigger mechanism. A gauge on the dashboard (4) includes a system ready light, a discharge indicator and a shutdown relay override switch that should remain in the "normal" position at all times.

engines, generators and forced ventilation systems), along with the clean agent, should be immediately disabled. If the clean agent is removed before it can extinguish the flames, obviously it does little good.

Optionally, systems may also include articulating louvers over compartment vents, which can be closed when an FFE system discharges. Without a relay that automatically shuts down this gear, it's up to the vessel operator to have the presence of mind to do so (assuming he or she is even aboard, or awake). Clearly, when faced with the prospect of an onboard fire, such expectations are unrealistic. Auto-shutdown relays, while pricey, offer this added measure of security and effectiveness. With this arrangement, after a discharge has occurred and the agent has been allowed to "soak" the space (ideally for a minimum of 15 minutes), it can be ventilated (fumes from burning fiberglass, plastic and fuel are especially noxious) and crew can enter the area prepared with portable fire extinguishers. If it is deemed safe to get underway, you can override the auto-shutdown relay using a helm-mounted switch control.

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A final note on a system configured in this manner: It is critically important that in everyday use, the helm control be left in the "normal" position, not "override." In the latter mode, the auto-shutdown relay is inoperative, and the system won't shut down engines, generators or ventilation systems when actuated either manually or automatically. I routinely encounter systems set to override — either accidentally, if the switch is inadvertently bumped, or because of a malfunction in the relay control unit — making this the only position in which engines and other gear will operate. In either case, it's a dangerous scenario, one that should be corrected without delay.

Vessel owners should routinely inspect FFE systems for loose hardware, corrosion and low pressure. Nearly all units are equipped with pressure gauges. The pressure gauge does not, however, tell the whole story; a unit can be properly pressurized yet still lack the sufficient clean agent to do the job. For this reason, bottles should be periodically weighed by a proprietary fire-equipment service provider or by trained boatyard personnel. During this inspection, manual discharge cables should be tested. (I've encountered seized cables and at least one that had a screw driven through it, rendering it useless). An operational test of the automatic shutdown relay system, during which a discharge should be simulated to ensure the connected gear actually shuts down, should also be conducted.

Professionals and end-users alike should make certain that the shipping or service pin has been removed from FFE nozzles that include this feature. Not to be confused with the pin located on the manual discharge handle, this pin is installed in the bottle's nozzle and prevents it from being manually or inadvertently discharged during shipment and installation. With this pin in place, the system cannot be manually discharged. While this oversight is less common than it once was, I still regularly encounter bottles that have been in service for years with shipping pins that have been in place for the life of the installation.

For any vessel with an enclosed engine compartment, FFE systems are well worth the cost, offering both enhanced safety and peace of mind.

Steve D'Antonio offers services for boat owners and buyers through Steve D'Antonio Marine Consulting (stevedmarineconsulting.com).

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