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Market: Bus, transit and motor coach industries**Circulation:** 16,000**Frequency:** Monthly**Subscriptions:** (1) 602-265-7600 (toll free: 1-800-541-2670)**Subscribe Now!****Smoke signals** — by David Gray*Technology for suppressing engine compartment fires*

Though serious bus fires are not an everyday occurrence, they are a reality. When fires do occur, they are almost always well documented in the local news and industry publications. Damage from these fires results in both hard and soft costs. Hard costs include the physical damage to the coach, applicable insurance deductibles, lost property of the passengers and lost productivity of the bus itself. Soft costs can include the negative press as well as the potential for lost revenue based on public perception.

There are numerous causes of fires that occur on buses, and, obviously, the engine and generator compartments are primary sources for a fire. Numerous flammable fluids are found throughout an engine compartment of a bus and include more than just the gasoline or alternative fuel. There are also hydraulic, brake, automatic transmission and power steering fluids present, to name a few. Plus, combustible debris can accumulate in and around the engine block. Couple these fluids and/or debris with potential ignition sources such as worn, exposed electrical wires or excessive ambient heat and the formula for a fire is complete. Prevention does go a long way in hedging against these causes, but not all fires can be avoided with prevention alone.

Automatic fire detection and suppression

Fire protection systems for engine and generator compartments have been around for decades. They have come in a variety of configurations, but all of them have one common characteristic - the need for electrical power. Electronic-based control panels, heat/flame detectors and fuel vapor sensors are excellent products that comprise these systems, but with system complexity comes higher costs. Depending on budgets, some companies can easily afford these types of systems, but others cannot. Systems that provide both fire detection and fire suppression that work without any elaborate electronics are available.

Automatic fire detection and suppression systems manufactured by Firetrace International based in Scottsdale, AZ, can easily be configured to protect against excessive fire damage in engine or generator compartments. Since stopping a fire when it is small and containable is key to avoiding catastrophic physical damage to the bus, Firetrace provides a strong fire safety measure: These systems are pneumatic, so they require no electricity to be actively "looking" for and subsequently suppressing a fire.

This fire protection technology has been introduced in the United States from Europe,

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where it was invented more than a decade ago. To date, over 25,000 Firetrace systems have been installed worldwide. Included in this number are over 150 systems that have been installed in buses in Europe for such companies as the Helsinki Citybus Company, Mobitrade Oy, Carrus Turku and Connex in Finland, and Arriva in the United Kingdom.

Fire detection for these systems is achieved with technology that uses flexible, linear pneumatic detection tubing. The detection tubing is specifically designed to quickly detect the heat of a small fire. The detection tubing's flexibility allows for fire detection throughout the engine and/or generator compartments, as flames and the heat from a fire rise and follow any airflow that is present. As the temperature within a compartment dramatically rises from a fire, the detection tubing rapidly softens and ruptures from the internal pressure. This "burst" in the detection tubing is what activates the fire suppression function within the same system.

Installation

It is very important to strategically install the detection tubing above and around all of the compartment(s) that could start or be involved in a fire. When the detection tubing is installed, it must be carefully located far enough away from excessively hot components, such as the manifold, to ensure that ambient working temperatures do not activate the system. However, with proper installation, the detection tubing is more than capable of withstanding the regular temperatures found in and around these compartments.

Since buses have engine and generator compartments that are larger in size, the fire suppression function is provided by Indirect Low Pressure (ILP) systems. By an "indirect" operation, the systems use the detection tubing to automatically detect the fire. That detection tubing is connected directly to a pressure differential valve. The system's valve is kept closed by the downward pressure from inside the detection tubing. When the detection tubing does burst, the downward pressure instantly drops and allows the valve's piston to open and the fire suppression agent to flow into the engine and/or generator compartments.

The ILP's valve is treaded onto a DOT certified cylinder filled with a fire suppression agent that has been selected by the bus owner. Typically, ABC (ammonium phosphate) dry chemical powder is chosen as the suppression agent. This agent works on a variety of fire types and is capable of suppressing fires with flammable liquids, regular combustible materials such as rubber and plastic parts and energized electrical equipment (exposed wires). In addition to ABC powder, agents such as AFFF foam or CO₂ can also be used with the ILP systems.

After the pressure has dropped and the valve opens, the suppression agent flows through discharge lines and out the discharge nozzles. These lines can either be fixed copper pipe, fixed stainless steel pipe or flexible, high-pressure hydraulic lines. The discharge nozzles are selected depending upon the agent used, and they evenly distribute the agent throughout the entire compartment.

The ILP system is a self-contained fire detection and suppression system; however, it can be configured with additional equipment. The system can have an optional manual release for instant system activation. Typically, the manual release is located in the main cabin next to the driver. This is accomplished by "splitting" the detection tubing back at the cylinder. A "T" connector is used to add a length of detection tubing that is extended up to the driver's area. When the safety on the manual release is removed and its plunger is depressed, the pressure from the detection tubing line is instantly released. The system then reacts in exactly the same way as if the detection tubing had burst, and the fire-suppressing agent is discharged immediately.

Pressure switch options

As its name implies, the optional pressure switch is designed to detect a dramatic change in the system's pressure, such as an actual fire detected and full system activation. When the pressure drops, the pressure switch can be configured to illuminate a light or activate an audible alarm installed near the driver, next to the manual release (if included in the system). The battery-operated audible alarm requires no external electrical power.

Additionally, the pressure switch, designed to be either open or closed, can be used with low-voltage current to trigger almost any function that an electronic relay can control. For example, the fuel line can be connected to a solenoid valve that can cut off the fuel supply to the engine. The engine itself can be shut off as well; however, it is very important to consider the drivability of the bus with limited or no power steering or power brakes. The decrease in control could greatly outweigh the benefits of the fuel supply and/or engine being shut off right away. This should be carefully evaluated on a case-by-case basis.

Evaluate the benefits

There can be many advantages to using pneumatic fire protection technology. Foremost is the fact that complete fire detection and suppression are found in one system that does not require any electricity or external power. All of these systems are fully automatic and will detect and suppress a fire even if a bus is not running and/or is unattended - it's always working. They also can be modified to detect higher or lower temperatures based on ambient operating temperatures. This can assist in faster fire detection.

Additionally, the systems offer the design flexibility to be configured with options such as a manual release or pressure switch. The systems can use a variety of agents that allow the owner to choose the best fire suppression agent for their individual needs. Finally, and maybe most important, the systems can meet tight budget requirements, thus bringing automatic fire detection and suppression to owners who otherwise that might not be able to install elaborate, electronic suppression systems on their buses.

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