The "Second Half" of the Life Cycle

BY LOUIS GORENC

With the expense in time, personnel, and equipment required to refill expended fire suppression system bottles, the author suggests an alternative that should save money and time in replacing fire suppression agent.

In her article, "Sustainment Moves to the Next Level: Rethinking Our Life-Cycle Focus," in the September–October 2009 issue of *Army Sustainment,* General Ann E. Dunwoody, the commanding general of the Army Materiel Command, stated, "We must now renew our focus on the 'second half' of the life cycle—the maintenance, distribution, sustainment, and disposal of equipment." When I read this, I realized that General Dunwoody's statement applies to my work in supporting Army ground vehicles' automatic fire-extinguishing systems (AFES) at the TACOM Life Cycle Management Command Integrated Logistics Support Center's Tools Group, Fire Suppression System.

While working with the Tank Automotive Research, Development and Engineering Center, program executive offices, and other Department of Defense agencies, I was surprised to learn of the vast numbers of replacement fire extinguishers being used by tens of thousands of mine-resistant, ambush-protected vehicles (MRAPs), high-mobility multipurpose wheeled vehicles (HMMWVs), armored security vehicles, and light and heavy combat vehicles.

Replacing discharged fire suppression system (FSS) bottles, cylinders, and discharge valves has been expensive, costing millions of dollars just to purchase cylinder assemblies. For example, I noticed new procurement orders from various integrated logistics support centers for thousands of FSSs, consisting of the cylinder, discharge valves, and extinguisher agents (which made up the bottle and cylinder assemblies), at an average cost of $1,500 per unit, with some priced at more than $3,000 each.

Proper management of the second half of the life cycle, which includes maintenance, distribution, sustainment, and disposal, is essential to FSS equipment and support items.

Diverse FSS Assemblies

Currently, more than 20 major groups of vehicle platforms use AFESs. These include heavy combat, light combat, MRAP, light tactical, and heavy tactical vehicles. All have FSSs with single or multiple cylinder assemblies that use from one to eight discharge cylinder assemblies.

This currently used rechargeable bottle assembly weighs 28 pounds and carries 7 pounds of extinguishing agent. A lighter, single-use, disposable, plug-and-play extinguisher will replace this bottle.

Several different agents are used for different areas of a vehicle. The vehicle's engine compartment FSS might use a different agent from that of the crew area, which could be different from that of a fuel tank or tire FSS. For example, the M88-series has eight bottle assemblies using carbon dioxide as the agent, while the up-armored HMMWV has three bottles using HFC227, with sodium bicarbonate powder to neutralize the acidity of the agent and prevent mucous membrane irritation for the crew.

AFES equipment is produced by several different original equipment manufacturers (OEMs). This adds to the mix of variables for different engineering designs using different agents, different capacity bottles, different valves, and different control modules and sensors within a vehicle's FSS.

It is costly to train personnel to troubleshoot and repair the many different OEM systems. Replacing discharged bottles and refilling empty bottles for reuse or disposing of empty bottles and purchasing new ones is very expensive. A vehicle without an operating AFES must be deadlined, possibly forcing the crew to use a vehicle with less armor or less FSS protection to continue their mission. A better solution must be found.

FSS Agent Replacement Issues

Three years ago, with so many new MRAPs and up-armored HMMWVs being built and quickly pressed into theater service, the Army was regularly replacing AFES bottles because of errant discharges, operator errors, and engineering design flaws. Platform item managers were purchasing from new OEMs at an unbelievable rate.

The average weight of a filled bottle assembly was approximately 40 pounds. The shipping costs of 3,000 to 4,000 bottles from the continental United States to the U.S. Central Command was millions of dollars, and the lag time for shipping was considerable.

The Army soon had private contractors refilling some bottle assemblies in theater, which also cost millions of dollars. The serviceable bottle assemblies that were not refilled were tossed in the scrap heap or stored by the thousands at retrograde yards in Southwest Asia. Certain bottle assemblies needed rebuilt discharge valves at a cost of approximately $400 each, plus the cost of shipping the assemblies to the OEM in the continental United States. The turnaround time was months. Gradually, a better and faster refilling service was developed, but new bottle assembly procurement continued.

FSS Bottle Assembly Logistics Footprint

The replacement procedures for a discharged bottle assembly are very specific. Remove the discharged bottle assembly from the vehicle. Install a new replacement bottle assembly. Transport the discharged bottle assembly back to a collection point or refill station for turn-in, or destroy the bottle to make it unavailable for other uses. Obtain another bottle assembly.

Beyond the cost of the bottles themselves is the cost of handling them. If the discharged bottle assembly goes to a refill station, it must be transported there by personnel. At the refill station, the bottle assembly is serviced by at least two trained individuals in a building with utilities, reclaiming and refilling agent equipment, and test equipment. A storage area is needed for discharged and refilled bottle assemblies.

If the bottle assembly is transported back to an Army supply unit for exchange, supply personnel are needed along with a building equipped with utilities, storage space, and equipment for disposal or refilling and packaging.

Sustainment and Disposal

The FSS sustainment process is long, complicated, expensive, and convoluted, with much unnecessary handling by many individuals. After a designated number of years in service, bottles or cylinders must be hydrostatically tested by a Department of Transportation-certified testing facility. This testing ensures that the bottle is structurally safe to use with high pressure agents.

The disposal of FSS bottle assemblies currently requires total control of the empty forged or deep-pressed bottles or cylinders. Most current bottles and cylinders are made from ⅜-inch-thick steel weighing approximately 20 pounds that can withstand up to 1,800 pounds of pressure per square inch. To demilitarize a bottle, it must be cut into pieces with a power saw or with an oxygen acetylene torch to render it safe. It cannot be crushed because of its wall strength, but it may be buried deep enough to make it unrecoverable, or it can be exploded.

Second Half of the Life Cycle Alternatives

The alternative to the large logistics footprint might be the disposable fire suppression bottle assembly—a plug-and-play assembly as a direct replacement for the refillable bottle assemblies now in use. A disposable plug-and-play assembly would have the same physical dimensions, electrical connections, discharge flow volume, and discharge flow time as the current system. Constructed of high tensile-strength, thin (⅛-inch), stainless steel with a lightweight valve, the bottle weighs 50 percent less than a forged or deep-pressed steel bottle or cylinder. Since the valve would be used once, it could be constructed of a high-strength plastic or carbon fiber or fiberglass material. The valve would have a diagraph disk punctured by a small squib device, allowing the complete, instantaneous discharge of the agent. A vehicle using three replacement disposable bottles instead of refillable bottles would reduce the total FSS weight by approximately 45 pounds, allowing for more water, ammunition, or other gear to be carried.

Using this disposable bottle or cylinder would eliminate the need for personnel to refill and recharge bottles, training for those personnel, a refilling or recharging facility, utilities, refilling equipment, recharging agents, and shipping discharged bottles and cylinders back to and from a refill station.

General Dunwoody's insightful statement, "We must now renew our focus on the 'second half' of the life cycle—the maintenance, distribution, sustainment, and disposal of equipment," should apply to one-use disposable FSSs. They are the future.

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