Introducing the Solargizer™ : Solar Technology for Lead-Acid Batteries

by Paul Hornback

THE PROBLEM: Dead or low batteries caused by sulfate accumulation on the battery plates.

THE CAUSE: During the normal charge and discharge cycles of lead acid batteries, sulfate molecules contained in the electrolyte solution move back and forth between the acid and lead battery plates. Unfortunately, not all sulfate molecules that attach to the lead plates are released. This results in sulfate accumulation on the lead plates causing electron flow (electric current) to be reduced. After deep discharge, severe sulfate build-up occurs, which practically eliminates electron flow. The final result is dead batteries. Maintenance personnel must then take specific gravity readings, which are generally low, to determine how many batteries have dead cells and require replacement. A battery in this condition is normally discarded since normal charging/recharging procedures do little to regain battery capacity. The problem here is not a "failed" battery, the problem is sulfate build-up. *In fact, sulfated batteries are the largest single cause of battery replacement in the armor fleet!*

THE SOLUTION: Armor units can extend battery life four to five times by installing a battery conditioning device called the Solargizer™ on their vehicles. The Solargizer™, in effect, prevents sulfate accumulation through the application of pulsed power technology, thereby maintaining peak battery performance. The Solargizer™ is designed for use on 12, 24, and 36 volt electrical systems employing lead acid batteries. A single unit consists of a small solar panel (5.5" x 4.5" x 0.125"), a circuit box (2.25" x 2.25" x 1.5"), and 25 feet of wire to connect the two together. The circuit box is equipped with two output wires which are attached to the vehicle's battery posts. As the name implies, the Solargizer™ uses solar energy to generate a high frequency, low amperage, pulsating electrical current which is passed to the vehicle's batteries. One caution though, the Solargizer™ is only a battery conditioning device, it is not a battery charger! Its primary function is to prevent sulfate build-up on a lead acid battery's plates, thereby enabling the battery to accept a full charge, either from the vehicle's charging system or from a stand-alone charging unit. Installation and continual use of the Solargizer™ will provide the following benefits:

The 24-volt Solargizers are seen here mounted on the Bradley hull.

- Battery life extension by avoiding or reversing sulfate accumulation.
- Battery efficiency improvement to near 100% capacity.
- Battery charge lost due to unavoidable normal internal battery discharge will be replaced.

An additional not insignificant benefit of the Solargizer™, as reported in the Fort Hood Battery Management Task Force Final Report dated 30 September 1994, is:

"... a critical advantage of the Solargizer™ (but one that cannot be monetarily measured) is the improved confidence in, and improved readiness of, the equipment."

PROCUREMENT INFORMATION: The Defense Logistics Agency (DLA) currently has a contract with PulseTech Products Corporation for procurement of the Solargizer™. Mr. Joe Franklin, the DLA Item Manager, reports that units requesting a Solargizer™ will have them shipped directly from PulseTech Products Corporation once DLA forwards the unit's request. The Solargizer™ is a Class IX item, so battery budget money (OMA funds) are acceptable for its purchase. Every two 12 volt batteries connected in series

Item	NSN	Price/FOB Destination
24 Volt Solargizer		
1-9	6130-01-392-8347	$131.64
10-99	6130-01-417-0968	$116.30
100-999	6130-01-417-9073	$105.63
1000-4999	6130-01-417-9079	$94.96
5000 or more	6130-01-417-9291	$89.63
Lexan Frame	6130-01-396-4074	$167.00

Figure 1. Logistics Information

and forming a 24 volt system requires a 24 volt Solargizer™. An Abrams tank requires three 24 volt Solargizer™ units to continually condition the tank's six 12 volt batteries. Also developed for the Abrams Tank is a Lexan Frame (17.5" x 9.5" x 0.5") which conveniently holds all three solar panels and provides added protection against foot traffic and heavy objects. The preceding table depicts NSNs and item cost based on specific quantities. Additional ordering information can be obtained from Mr. Franklin at DSN 695-6148 or Commercial (804) 279-6148.

BACKGROUND DATA: In November 1993, LTG Funk chartered the Fort Hood Battery Management Task Force (BMTF). The primary goal of the task force was to institute a broad-based program that would reduce Fort Hood's battery consumption by 50% and associated disposal cost by 30%. The Solargizer™ was a commercially available technology recommended by the BMTF to help achieve this goal. An operational evaluation at Fort Hood, using M1A1s from the 3-66 Armor Battalion (2AD), indicated the Solargizer™ increases performance in vehicle lead acid batteries, makes the batteries last longer, and is durable enough to withstand an armor unit's rigorous operational environment. The BMTF Final Report estimated that the current 6TL lead acid battery life of one year could be extended to a minimum of five years.

Item	Current Abrams	Abrams with Solargizer™
Battery Cost		
1st Year	$390.00*	0
2d Year	$390.00*	0
3d Year	$390.00*	0
4th Year	$390.00*	0
5th Year	$390.00*	$390.00*
3 Solargizers	0	$316.89
Lexan Frame	0	$167.00
Total 5-Year Cost	$1950.00	$873.89

*Cost to replace all 6 vehicle batteries

Figure 2. Five-Year Battery Cost Data

MAINTENANCE INFORMATION: The Solargizer™ requires minimal Preventive Maintenance (PM) with the only PM procedure being to clean off the top surface of the solar panels or the Lexan Frame (if installed) to remove accumulated dirt, dust, and mud. Troubleshooting can easily be accomplished using a voltmeter to measure the no-load voltage at the battery terminal connection point to ensure the Solargizer™ is providing a high voltage, low amperage current to the platform's batteries. Recommended mounting locations for the solar panels on the Abrams, Bradley Fighting Vehicle, and High Mobility Multipurpose Wheeled Vehicle (HMMWV) are as follows:

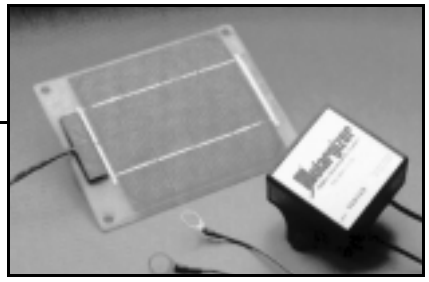
Abrams. The three solar panels are placed in the Lexan Frame and mounted on the back deck next to the battery box.

Bradley. Two solar panels are mounted on the non-skid surface area just behind the driver's hatch but ahead of the periscope (conditions hull batteries). One solar panel is mounted on the right side of the turret just below the antenna mount (conditions turret batteries).

HMMWV. One solar panel is mounted on the inside left lower corner of the passenger windscreen.

For a detailed list of installation instructions for the Abrams, Bradley, and HMMWV, contact the author or Mr. Roy Holley, III Corps Scientific Advisor, DSN 737-7145 or Commercial (817) 287-7145.

SUMMARY: Based on information obtained from operational evaluations and early use by armor/mechanized infantry units, the Solargizer™ performs as advertised. However, will the unit save money? The table in Figure 2 depicts the associated battery costs for an Abrams (without the Solargizer) and the projected costs with three Solargizer™ units installed (includes a Lexan Frame).



Solargizer and transformer

Cost data presented covers a five year period and is based on the 6TL battery cost of $65.00 (six 6TL batteries @ $65.00/battery is $390), the one year 6TL battery life, the estimated five year (minimum) extended battery life resulting from Solargizer™ use, the initial Solargizer cost (three Solargizer™ units @ $105.63 each is $316.89, assumes a quantity discount for 174 units to equip an armor battalion), and the Lexan Frame ($167.00 each). Maintenance costs were excluded in order to provide the units "pure" dollar savings (i.e., in-pocket, hard currency savings).

Installation of the Solargizer™ on an Abrams tank nets a savings of $1076 over a five-year period. On a much larger scale, a battalion of 58 tanks could save approximately $62,400 over a five year period with an initial investment of only $28,065. Obviously, the Solargizer™ is a cost effective measure which would provide a substantial benefit to the armor fleet.

Paul Hornback is a general engineer with the federal government. He is presently assigned to the HQ TRADOC Combat Development Engineering Division, Fort Knox Field Office, which provides engineering support to the Directorate of Force Development, Fort Knox, Ky. He holds a Bachelor of Science degree in Mechanical Engineering from the University of Louisville and is currenly completing a Masters of Science degree in Industrial Engineering. His military experience comes from a six-year tour as a UH-1N helicopter pilot in the U.S. Marine Corps, where he attained the rank of Captain.