CEROS Project Description

Project: ***Emergency Pocket Water Desalinator (EPWD)*** [1]

Contractor: **SEE/RESCUE Corporation, Honolulu HI**

Summary: The objective of this contract is to develop a simple, compact, and passive water purification technology that can be carried by an individual and used at sea or on shore. The prototype device will be designed to provide potable water from saline or contaminated water by a solar distillation process, and will have application to both military and civilian users.

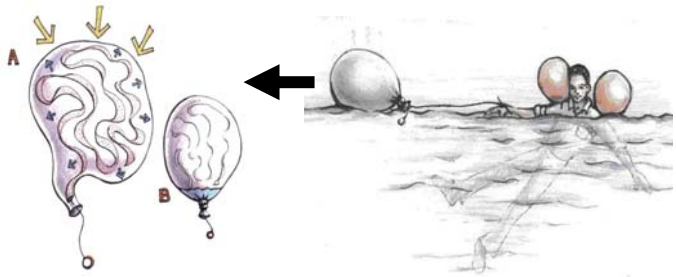

Figure 1. The EPWD concept illustrated in a man-overboard scenario; the orange floats provide flotation for the person and are not necessarily related to the EPWD.

Description: A minimum of 0.5 liter of fresh water per day is generally thought to be essential to sustain the life of an individual in a survival or evasion scenario. For sailors and fliers, spare water packs and reverse-osmosis pumps are provided in larger survival kits (e.g., on life rafts or seat kits), but there is no present ability for individuals to either carry or make sufficient quantities of emergency drinking water.

The EPWD described here is intended to continuously convert salt water into potable water in emergency situations. One operational concept uses a rugged inflatable balloon containing tubular hydrophobic material such as expanded polytetrafluoroethylene (or ePTFE, as shown in Figure 2, commonly used under the trade name Gore-Tex); contaminated water is introduced and sealed into the tubular insert. Solar insolation would cause the evaporation of water molecules, which readily pass through the ePTFE and collect in the balloon for later consumption. Contaminants remain in the ePTFE tube and can be flushed out prior to re-use.

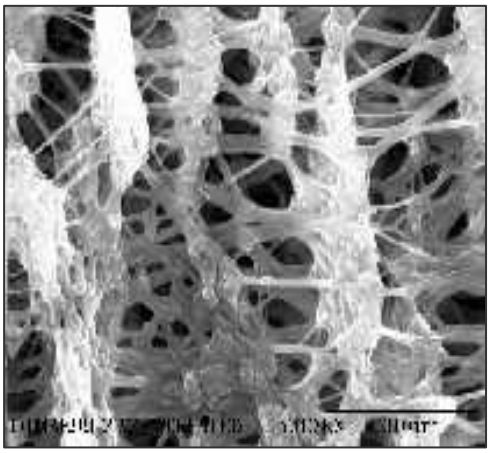

Figure 2. Scanning electron microscope image of expanded PTFE pore spaces.

For prototype development purposes, the balloon concept proved to be impractical because of the limited availability and high expense of tubular ePTFE materials, the small surface area exposed to sunlight, and the difficulty of bonding the ePTFE to other plastic materials (heat welding of ePTFE to other materials proved to be difficult). Flat plastic bags, which offered more surface area exposure

[1] CEROS FY04 contract 51953, initiated 30 June 04

Figure 3. Salt water contained under the white ePTFE material is vaporized by solar energy and then condenses on the clear collection bag surface.

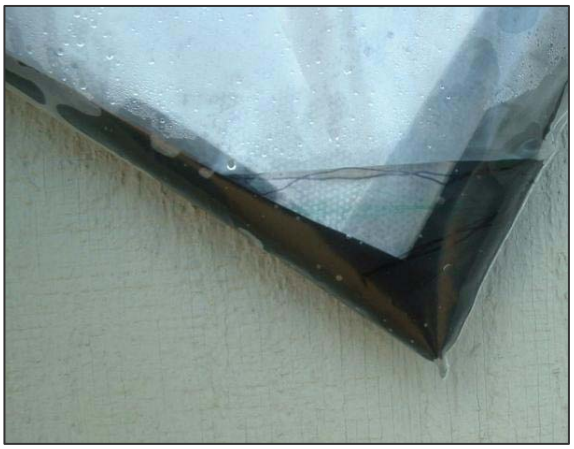

Figure 4. Approximately __ milliliters of fresh water was produced by the EPWD after 5 hours of exposure to sunlight.

and easier fabrication, were substituted for the balloon shape; several prototypes of varying sized were built and tested.

White ePTFE sheets were bonded and sealed to black plastic extraction bags; the black surface became much warmer in sunlight and hastened the evaporative process. The ePTFE and black plastic bag assembly was in turn contained in a clear plastic collector bag. Seawater was introduced into the ePTEF and black plastic bag; under sunlight, the water evaporated, passed through the ePTFE, and then collected on the inside of the clear collector bag (Figure 3). The collected water was verified to be fresh and potable.

Freshwater production was tested and measured for several EPWD prototypes of differing sizes (three successful prototypes are graphed in Figure 5). The variants differed mainly in the size of the ePTFE patch that was bonded to the black plastic bag. The best-performing prototype (pictured above in Figures 3 and 4) produced approximately 0.25 liter of potable water during an exposure period of 5 hours.

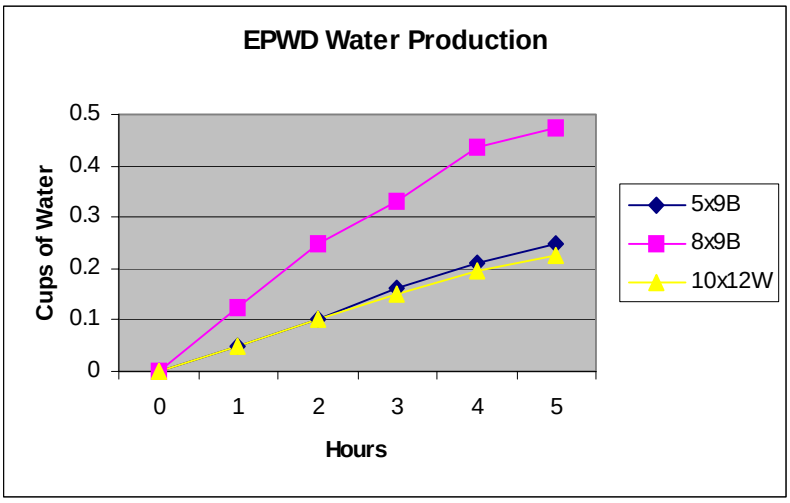

Figure 5. Plot of water production versus time for three EPWD prototypes; one cup equals approximate 0.25 liter.

The EPWD technology was shown to be successful in producing small amounts of drinkable water from seawater. Further development and refinement of the EPWD concept will be needed to produce the requisite amounts of freshwater for survival purposes.

This contract was performed under the sponsorship of the Defense Advanced Research Projects Agency. The content of this document does not necessarily reflect the position of the Federal Government, and no official endorsement should be inferred.