

# The Worth of Water

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## How Hydration Products Help Keep Soldiers Alive.

A soldier in the theater can have all of the armor, ammunition and all-terrain vehicles in the world, but none of this is going to keep the servicemember alive if there is no drinkable water available. In order to keep soldiers hydrated with water that will not make them sick, the military works diligently to find the right products that can purify water in any environment and eliminate many different kinds of contaminants—whether they are biological, chemical or nuclear in nature.

“It’s key that we don’t get the soldier sick. It can cause a big problem if we have contaminated water. If one batch is bad, we have to throw it all out,” said Patricia Plotkowski, project manager force projection at the Army’s Combat Support and Combat Service Support.

The U.S. military currently fields four bulk water purification systems capable of treating 125-3,000 gallons per hour of fresh water (non-seawater). Often called reverse osmosis water purification units (ROWPUs), since they are based on reverse osmosis technology, these systems produce large quantities of safe, potable water that can be used for drinking, personal hygiene, cooking, vehicle washing, or any other activity requiring water.

“The military has developed requirements documents that dictate the capabilities required of water purification systems,” said Dr. Steven Richards, environmental engineer, water supply management program, U.S. Army Public Health Command. “Overall, these systems must be able to treat virtually any type of water source, including seawater, be capable of reducing waterborne pathogens and chemical contaminants, and be ruggedized for field use. Additionally, the systems must provide a residual disinfectant to the treated water to discourage recontamination during storage and distribution. The newest water purification systems are designed with increased mobility, better purification technologies, automation, and feedback to the operator.”

“We are currently fielding two new water purification systems. Termed the Lightweight Water Purifier (LWP) and the Tactical Water Purification System (TWPS), these systems use cutting-edge technologies to

minimize footprint while maximizing treatment capabilities and mobility," said Richards. "The LWP is a highly mobile modular unit that can fit inside of a HMMWV and can be set up and operated by two soldiers. The TWPS is a semi-automated unit that can be transported using a variety of load handling systems.

Both treatment systems use hollow-fiber membrane technology to pre-treat the water prior to the RO membranes. Effective pre-treatment is critical to increase the life and minimize fouling of the RO membranes. Not only are these new systems more technologically advanced, but are more mobile and versatile than the previous systems.

### **Making Clean Water**

For the last 10 years, Aspen Water Inc. has designed and built water purifiers that have been used by the Army, Navy, Air Force and the Marine Corps. One of these systems, the Aspen 2000, is a reverse osmosis water purification system that had been tested extensively by the Aberdeen Proving Ground and the National Sanitation Foundation prior to being approved for use by soldiers in Afghanistan.

The product is an energy-efficient, self-contained unit that can run for up to eight hours and then flush itself out when the water has been processed. In addition, the Aspen 2000 is designed to stop running if the water that is being processed is unsafe, so that soldiers running the product can check it and perform necessary maintenance. As a result of these features, all branches of the military have been able to successfully use the product to meet their water purification needs.

"It is difficult and expensive to continue to take water to soldiers in small operating bases," said Ed Atchley, vice president, marketing and business development at Aspen Water. "What our systems add to the capability of the military is to provide a small, low-energy, water purifier that will take virtually any water in the world and provide safe water for the soldier in the field. There is a significant cost savings."

### **Forward Osmosis**

Hydration Technology Innovations LLC, or HTI, is a membrane technology company that was founded in 1987. Through their work and research in this area, HTI has developed forward osmosis products that the military can use to purify water. The forward osmosis method, which moves water through the product much the way that water is moved through plants or through the human body, is a non-mechanical way of purifying water—which means that soldiers can purify the water that they need with little effort.

"The soldier spends very little time actually working to produce the water that they're using," said Nathan Jones, vice president of government sales at Hydration Technology Innovations. "It's an automatic, passive, ongoing filtration system that they don't have to stop and pump. They also don't have to spend time cleaning the filter, so it's a huge time saver."

### **Keeping It Fresh**

The way that water is delivered to the soldier is just as important as how it is purified. With this in mind, Blackhawk! makes a hydration product called the HydroStorm, which is designed to keep the water that soldiers drink fresh after it has been purified.

Part of what makes the HydroStorm unique is the way that the product's reservoir is made—which allows users to quickly visually inspect the water inside so that any visible bacteria can be detected.

"A lot of reservoirs out there are very dark in color, so it's hard to see if there is any growth or anything going on," said Bruce Ruddock, the director of marketing communications at Blackhawk!.

"With our reservoirs, they're very light blue and clear, so you can hold it to the light and you'll see right through it and be able to see if there's anything going on inside."

In addition, the product is made with a protective coating that cannot wear off, or be scratched off, because it is actually built and molded into the product on the molecular level. Many similar products only coat the inside of the reservoir with such protective material, which makes it easy for it to come off during extensive use. In addition, the HydroStorm is easy to clean and strong enough to withstand the wear and tear that it is subjected to when being used by soldiers in the theater.

### **Letting Gravity do the Work**

Cascade Designs was founded about 35 years ago and, at the time, primarily served the backpacking, hiking, and mountain climbing markets. Over the years, the company began to develop water purification products that the military took an interest in. One such product is an easy-to-use device that allows users to merely scoop water into the bladder of the product and hang it up; the design allows gravity to do the rest of the work. "This eliminates the need to pump and of course, pumping is work—and it requires hands and attention to the process," said Cascade's director of government sales Tim Davis. "In a tactical situation, you can see where that extra energy and attention might be disadvantageous to the soldier."

In addition, the company also makes a chlorinator that removes bacteria and viruses from water, and a water purification filter that sucks water through a hose and removes the bacteria from the water through this process.

### **Water for People on the Move**

Since 1928, Katadyn, which manufactures its products in Switzerland, has been making drinking water systems that are used around the globe. The company said that its water systems are made specifically for "people on the move."

One of the major characteristics soldiers on the move need in a product is the ability to work for long periods of time—and Katadyn's water filters, known as the Katadyn Pockets, are made with that longevity in mind.

"Every water filter, whether it's for recreational or military use, has a cartridge in it that lasts for a certain amount of time," said Alan Lizee, president of Katadyn North America. "The average cartridge will last between three and four hundred gallons of water and then typically you would replace it. Our product has a very long-lasting ceramic cartridge that will last for 10,000 gallons." Katadyn also makes water purification tablets that the military uses in first aid kits. These products, which are designed to meet the stringent guidelines of the Environmental Protection Agency, have a shelf life of about five years. In addition, the company makes products that are designed to convert salt water into fresh water by pumping the product by hand, which moves the water through a membrane and takes the salt out of it. These products are commonly used on life rafts.

### **Still Has Taste**

One of the major concerns for the military is the dehydration that soldiers may suffer in the deserts of Iraq and Afghanistan. In order to address this concern, Seldon Technologies Inc.—which has been in business for about seven years—makes products to help ensure that the soldiers will actually drink the water that they have. In order to do this, Seldon makes products that purify water so that the taste is appealing and users actually want to drink it. This is done by not taking out the water's salts and minerals, which are important for soldiers' health and make the water taste better.

"When you use chemicals to treat water, it tastes like you're drinking pool water and nobody likes pool water," said Alan Cummings, the company's CEO. "So the result is that people won't drink as much water as they should, because it either smells, tastes or looks bad. The military needs to keep the warfighter hydrated and they want a product that produces crystal clear, clean water that tastes good and has no foul odor."

Seldon Technologies makes products that can be used to treat the water of an entire squad, as well as smaller products meant for individual use.

### **Water Treatment**

The TerraGroup Corporation has developed a series of water purification systems under the TECWAR (tactical environmental component-water asset recovery) banner. The systems are used for military field operations, potable and utility water in emergency response/disaster relief situations, and for CBRN decontamination runoff treatment in the event of an unconventional terrorist attack.

According to the company, the TECWAR system comes complete with all the components necessary to make them operational in the field, are simple to operate and require minimal training to make the systems

fully functional. The systems can be operated and maintained by one operator and general maintenance and repairs require no special tools.

"When you can run a machine for a thousand hours without interruption—other than shutting it down to change the oil—and you don't change the filters for a thousand hours, those are huge differences," said Gary McKissock, who was a logistician in the military before working for TerraGroup.

### **Moving Ahead**

When questioned as to what the military would like to see from industry, Richards comments, "We would like to see greater efficiency both in terms of water recovery and energy. Reverse osmosis is inherently inefficient with water. The majority of the water that is drawn into the system is rejected and sent to waste or recycled to be treated again. The advantages gained in using tight membranes that can treat seawater and give greater confidence in removing contaminants also leads to less efficiency. The same is true for energy. The ROWPUs operate at about 800 psi, thereby requiring a lot of energy for the pumps to create this pressure. Again, the tighter the membrane the more versatile the treatment system, but this results in less water recovery and more energy consumption."

Smaller, on-the-move combat units are difficult to resupply. "We are beginning to see the need for small unit water purifiers [SUWPs] that are ultra-mobile to allow for these combat units to create sufficient quantities of water without resupply," said Richards. "These may range in sizes capable of supplying water for a few to a few hundred soldiers to fill the gap between individual water treatment and the LWP. Additionally, individual water treatment devices for emergency and very short term use during specific missions are emerging. At this time, neither individual nor small unit water purifiers are meant to replace bulk water supplies, but rather fill niche requirements for expeditionary missions and remote bases."

New technologies are primarily headed towards advanced membranes, both in terms of greater water recovery and energy efficiency. Membranes consisting of carbon nanotubes or other nanotechnology may be the next generation of membrane. "The U.S. must field proven technologies, so while we may provide unique water treatment platforms we may not be the first to employ emerging technologies," said Richards. "We are also focused on increased mobility to provide expeditionary missions the water they need to be successful." ♦

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