



Environment

# Contaminated Water Treatment

Methods for recycling a contaminant liquid to provide re-drinkable water

Scientists at NASA Ames have developed a method and system that offers a novel way of processing and recycling of liquids to remove contaminants. Space exploration requires a life-support system that sustains astronauts on journeys lasting from a few days to several weeks or longer. The life-support system must be designed to reduce the mass required to keep humans alive in space. Water accounts for about 80 percent of a human's daily mass intake. As a result, recycling water, including urine, offers a high return on investment for space exploration missions as well as increasing mission safety. It provides an emergency supply of drinking water, when other sources are exhausted or contaminated.

## BENEFITS

- Reduces the mass of potable water at launch
- Renews/ recycles drinking water
- Provides a temporary source of additional nutrients for use by a spacecraft occupant
- Reduces the volume of biological waste stored aboard a spacecraft
- Is biologically safe
- Eliminates the need for urine dumping during space voyage
- Is portable + low cost

technology solution



# NASA Technology Transfer Program

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## THE TECHNOLOGY

This invention is a system and associated method that is a two step process. It provides a contaminant treatment pouch, referred to as a “urine cell” or “contaminant cell” that converts urine or another liquid containing contaminants into a fortified drink, engineered to meet human hydration, electrolyte and caloric requirements. It uses a variant of forward osmosis (FO) to draw water from a urine container into the concentrated fortified drink as part of a recycling stage. An activated carbon pretreatment removes most organic molecules. Salinity of the initial liquid mix (urine plus other) is synergistically used to enhance the precipitation of organic molecules so that activated carbon can remove most of the organics. A functional osmotic bag is then used to remove inorganic contaminants. If a contaminant is processed for which the saline content is different than optimal for precipitating organic molecules, the saline content of the liquid should be adjusted toward the optimal value for that contaminant.



The NASA developed technology could be used to produce recycled drinking water.

## APPLICATIONS

The technology has several potential applications:

- Space missions
- Army missions
- Water source for developing world
- Extreme environments like hiking/camping, yachting, mountaineering, Antarctic exploration missions, etc.

## PUBLICATIONS

U.S. Patent 7,655,145

“Progress in the Development of DirectOsmotic Concentration Wastewater Recovery Process for Advanced Life Support Systems,” 2005, SAE Technical Paper 2005-01-3031, doi:10.4271/2005-01-3031.

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