PANCOPIA

Pancopia's high performance water recycling system designed for space exploration is revolutionizing how wastewater is purified on Earth.

One million dollars per day is the cost to supply water to the astronauts on the International Space Station (ISS). Four astronauts on the ISS require 12 gallons of water each day, and at $83,000 per gallon to lift into space, the costs quickly add up. This prompted NASA to invest in a new, lower cost solution to biologically recycle and reuse water for both the ISS and other future manned space exploration efforts.

PROJECT
Water Recycling System for Space Exploration

MISSION DIRECTORATE
Human Exploration and Operations

PHASE II SUCCESS
Total SBIR awards of $885,000

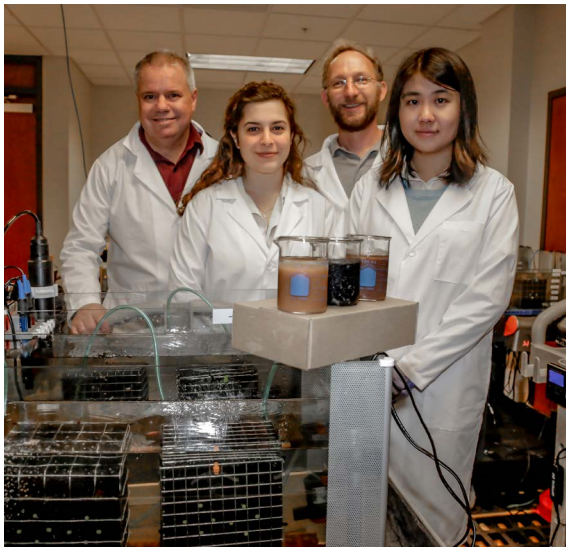
SNAPSHOT
An innovative water recycling process that leverages novel microorganisms to provide cost-effective, closed-loop water purification on the International Space Station (ISS) and on Earth.

PANCOPIA
Hampton, VA
pancopia.com

Water is as critical for survival in outer space as it is on Earth. In fact, 92% of the cost of sustaining human life on the ISS is attributed to making safe drinking water available. As a result, astronauts must make the most of water supplies by recycling this precious resource, which can save millions of dollars. Through NASA's SBIR Program, Pancopia developed a new biological water recycling system that can remove high levels of organic carbon and nitrogen, the two major pollutants in wastewater, at a lower cost than systems currently in use.

Pancopia, a small business based in Hampton, VA, developed a technology that makes use of a newly discovered group of bacteria called anammox, which is combined with two other types of bacteria used in conventional wastewater treatment (nitrifiers and denitrifiers) to purify wastewater. This novel technology can remove these pollutants more reliably and at a faster rate. In addition, Pancopia's innovation is more cost effective than existing systems. Traditional treatment systems are expensive due to the high amounts of energy and consumables required. Inclusion of anammox reduces treatment cost by improving the stability of the system.

"Pancopia's system uses three types organisms to enhance the stability of the bacterial community. The different bacteria act as checks and balances to each other as they naturally adjust to changes in composition of the wastewater," according to Bill Cumbie, Pancopia's Founder and CEO. "The self-regulating feature of the distinct organisms allows for effective operation without specialized supervision which is responsible for the high cost of water purification. Less supervision equals less money to run the system."



LEFT
From left to right:
Bill Cumbie, CEO
Rachel Willinger, Business Manager
John Whitelaw, CTO
Fei Dai,
Laboratory Manager

RIGHT
Phase II closed-loop Beta Reactor

Another innovation that has resulted from this research is the ability to freeze-dry the bacteria for transport and reactivation after extended periods of storage. Once activated, the water treatment process can start within two weeks. This has great potential for low cost transport of space-based systems. It also permits long-term storage of additional organisms for emergency backup.

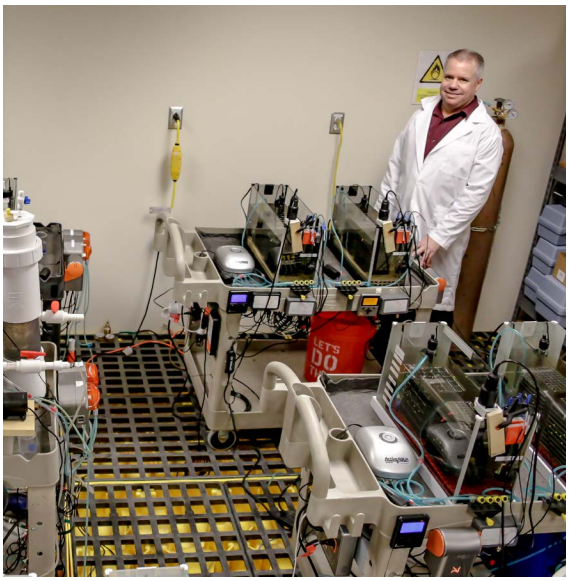
Although this technology was developed for use by NASA for manned space exploration, Pancopia is working on a similar system for municipal wastewater that has the potential to cut treatment expenses to less than half the current costs. Residents of Virginia may be the first to benefit from the award-winning water recycling system initially intended for astronauts.

> "Without NASA sponsorship of our technology via the SBIR program, Pancopia would not have been able to transform this innovative, disruptive technology from the laboratory to commercial implementation."
>
> BILL CUMBIE
> PANCOPIA FOUNDER & CEO

The Hampton Roads Sanitation District (HRSD), which has an international reputation for pioneering new water purification technologies, has identified Pancopia's technology as a candidate to replace the nitrogen removal system at one of its large plants. Pancopia will pilot its technology at an HRSD plant this year, and plans to install its first commercial system in early 2019.

Pancopia received two commercialization awards with the United Stated Department of Agriculture (USDA) for this new recycling system — the Federal Lab Consortium's (FLC) Excellence in Technology Transfer Award for the Southeast Region in 2017 and the FLC's National Excellence in Technology Transfer Award in 2018. Pancopia partnered with USDA to license its patented anammox bacteria.

According to Pancopia's Bill Cumbie, "Without NASA sponsorship of our technology via the SBIR program, Pancopia would not have been able to transform this innovative, disruptive technology from the laboratory to commercial implementation. We are so excited to see how this technology can improve wastewater treatment, and potentially save federal, state, and local agencies billions of dollars in construction and operation costs."



CEO Bill Cumbie performing continued testing with several bio-reactors on Pancopia's novel wastewater treatment system