

# Space waste: Handling garbage when your dumpster is 100 million miles away?

November 18 2008

---

In space, no one takes out the trash. Garbage can pile up, spoil and become a health hazard for astronauts in the cramped living quarters of a space station.

There has never been a good system for dealing with space waste - the space shuttle now brings full trash bags back to Earth; on the Russian space station MIR, junk would accumulate in hallways for months before it was sent to burn up in the Earth's atmosphere.

And that is why Jean Hunter, associate professor of agricultural and biological engineering, has been working with research partner Orbital Technologies Corp. (ORBITEC) of Madison, Wis., to develop a cutting-edge trash dryer for NASA. The space agency will need a new solid waste strategy before it sends astronauts on extended missions to Mars or an outpost on the moon.

Why bother drying trash? In space, waste can't simply be "thrown out." If astronauts place it outside the airlock, it will orbit alongside their spacecraft. If they eject it away from the spacecraft, they might encounter it again later. Or - even worse - it could contaminate another planet.

"We don't know if there's life on Mars," said Hunter, "but we know that our trash is teeming with it." Yes, the trash could be launched toward the sun, she says, but better to take usable resources out of it first. By that she means water, which is the most precious resource that astronauts

take with them into space.

Hunter's group has developed a system that blows hot, dry air through wet trash and then collects water from the warm, moist air that emerges. This water can be purified for drinking, and the remaining trash is dry, odorless and inert. The air and the heat are both recycled to contain odors and save energy.

Heat-pump dehumidification drying, as the technique is called, which has commonly been used for drying lumber, needs to be adapted for space, though, because existing systems depend on the Earth's gravity and contain materials unacceptable for spaceflight. Hunter's team - including graduate student Apollo Arquiza, Jasmin Sahbaz '10, Carissa Jones '09 and high school student Trudy Chu - has been testing the dryer with fake "space trash" - a mix of paper towels, duct tape, baby wipes and dog food (to simulate the astronauts' food scraps).

"When people think about garbage in space, they remember the trash compactor scene from "Star Wars" - and believe it or not, there's some truth to that scene," Hunter said. "Trash in space is like you saw in the movie: big, wet, nasty and varied" (though, of course, without any trash-dwelling monsters).

A prototype heat-pump dryer is currently being tested at the NASA Ames Research Center. If NASA selects the Cornell/ORBITEC model (which Hunter describes in several peer-reviewed Society for Automotive Engineer technical papers) over dryers developed by competing groups, ORBITEC will make a prototype that performs under zero gravity, is small and light enough for a spacecraft and can survive the rigors of a rocket launch.

The future of Hunter's trash dryer technology - and of the entire manned spaceflight program, for that matter - will ultimately depend on the goals

of the Obama administration.

"This whole thing could get mothballed," Hunter said, although she's hopeful that NASA will continue with its plans to return humans to the moon by 2019. "Now that we see India, Japan and China all interested in going back to the moon, I think the next president will want our nation to be part of that, too."

Recycling urine in space: Jean Hunter's team is also working on recovering potable water from space wastewater. On the International Space Station only cabin humidity condensate (moisture exhaled by astronauts and evaporated from wet towels and clothing) is now recovered and purified. Urine is chemically stabilized and stockpiled, and the astronauts use baby wipes and moist towels to keep clean, so there is no hygiene water.

On the planned lunar outpost, urine and hygiene water will have to be recycled. Existing NASA technology can recover around 85 percent of that water, but the last 15 percent, charitably called "brine," poses a much greater challenge. Hunter's team has a grant with ORBITEC to develop a new specialized brine dryer, but the team has submitted another proposal to dry brine in the trash dryer.

Source: Cornell University

Citation: Space waste: Handling garbage when your dumpster is 100 million miles away? (2008, November 18) retrieved 25 April 2024 from <https://phys.org/news/2008-11-space-garbage-dumpster-million-miles.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.