Transforming Urine into Water: Astronauts to Install New Space Station Water System

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NASA&acutes new Water Recovery System will make it possible to double to six the number of crewmembers who can live aboard the International Space Station. Michigan Tech researchers helped optimize the design, increasing its efficiency by 30 percent. [NASA Marshall Space Flight Center (NASA-MSFC)]

Two hundred and fifty miles above the Earth puts you a long way from the nearest kitchen tap. And at $10,000 a pint, the cost of shipping fresh water aboard the space shuttle is, well, astronomical.

So astronauts on the International Space Station have to recapture every possible drop. That includes water evaporated from showers, shaving, tooth brushing and hand washing, plus perspiration and water vapor that collects within the astronauts' space suits. They even transfer water from the fuel cells that provide electric power to the space shuttle.

Until now, however, NASA has not attempted to tap one major potential source of water: urine. That will soon change with the deployment of the new Water Recovery System. It departed Friday, Nov. 14, from the Kennedy Space Center on the Space Shuttle Endeavor.

The Water Recovery System, made possible in part by researchers at Michigan Technological University, can transform ordinary pee into water so pure it rivals the cleanest on Earth.

David Hand was the lead researcher on the project, which ran from 1993 to 1997 at Tech. It was a memorable time. "We received jars of sweat from NASA," he said. "Then we did experiments on the system, measured it at every step, evaluated it and made recommendations."

Under the new system, urine undergoes an initial distillation process and then joins the rest of the recovered fluids in the water processor. The processor filters out solids such as hair and lint and then sends the wastewater through a series of multifiltration beds, in which contaminants are removed through adsorption and ion exchange.

"What's left over in the water are a few non adsorbing organics and solvents, like nail polish remover, and they go into a reactor that breaks them all down to carbon dioxide, water and a few ions," said Hand, a professor of civil and environmental engineering.

After a final check for microbes, the water is again clean and ready to drink.

NASA's Layne Carter, the Water Recovery System lead engineer at Marshall Spaceflight Center in Huntsville, Ala., credits Hand and the rest of the Tech research team with making the system as good as it is. "Without a doubt, if it hadn't been for their modeling effort, we never would have been able to redesign the multifiltration beds and achieve

that level of efficiency," Carter said. "They did a fantastic job."

Using mathematical models, the Tech researchers helped improve the overall design of the multifiltration beds, The redesigned beds have 30 percent more capacity, which means that NASA doesn't have to send about 60 pounds of additional supplies up to the space station annually. "That may seem trivial, but it saves NASA about $600,000 each year," Carter said.

For more information on the Water Recovery System, visit www.nasa.gov/home/hqnews/2008/ … SS_Water_System.html .

Provided by Michigan Technological University