Artemis Moonbase Simulation One
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MDRS Water Research Project

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Description:

The overall water project is designed to research and develop efficient, cost-effective, and environmentally friendly methods for reclaiming or regenerating used waste water to high standards of purity using low cost, low energy processes and locally available resources. The methodologies so developed are intended to help advance the goals of exploring the near-Earth solar system (i.e., the Moon and Mars, as well as Earth's extremes). They are also intended to simultaneously minimize adverse impacts on the local environment (whether Earth, Moon, or Mars) by reducing the use of scarce resources, minimizing waste products, and recycling water along with other so-called waste products. As well as protecting and preserving the extraterrestrial environments of the Moon and Mars, these methodologies could be employed around the Earth within small remote communities (such as arctic bases, underwater research facilities, Earth-orbiting stations, or developing aboriginal societies) lacking adequate water purification technologies. These applications would certainly help in advancing existing and new technologies associated with human exploration, while at the same time improving upon the quality of life through the provision of safe and clean drinking and bathing water to space- and earth-based peoples.

The explicit purpose of the overall study is to identify regenerable life support system methods and technologies for supporting human life in extreme or remote environments. Our research to date strongly indicates that by far the largest mass category of consumables for space exploration missions is water (and more specifically, wash water) (Wickman, et al, 2004). If the failure to recycle water for space missions continues (as is the case on the International Space Station), large amounts of it will have to be launched on a regular basis, or possibly harvested from polar ice to support the national objective of developing a human base on the Moon, and later on Mars. Either source will be accessed at great expense. A more cost-effective and environmentally friendly solution would be to reclaim and recycle both wash and drinking water to the greatest extent possible in a closed loop life support system cycle. This regenerative approach would help to preserve resources on both the extraterrestrial body as well as the earth: consumables launch masses and frequencies would be reduced, with a concomitant reduction in the exploitation of natural extraterrestrial resources (such as water-ice and soil).

The elements of this study to be focused on during the Moon Simulation Mission at the MDRS are as follows:

1. Observe the operation of the current GreenHab water re-use system.
2. Measure water usage rates using the newly installed flow meters.
3. Test water quality at various stages in the GreenHab system.

4. Recommend GreenHab upgrades.