

Performance of Water Recirculation Loop Maintenance Components for the Advanced Spacesuit Water Membrane Evaporator

Tony Rector, Barbara Peyton and John W. Steele
United Technologies Aerospace Systems., Windsor Locks, CT 06095

Grant C. Bue, Colin Campbell and Janice Makinen

NASA Johnson Space Center, Houston, TX 77058

Water loop maintenance components to maintain the water quality of the Advanced Spacesuit Water Membrane Evaporation (SWME) water recirculation loop have undergone a comparative performance evaluation with a second SWME water recirculation loop with no water quality maintenance. Results show the benefits of periodic water maintenance. The SWME is a heat rejection device under development at the NASA Johnson Space Center to perform thermal control for advanced spacesuits. One advantage to this technology is the potential for a significantly greater degree of tolerance to contamination when compared to the existing Sublimator technology. The driver for the evaluation of water recirculation maintenance components was to further enhance this advantage through the leveraging of fluid loop management lessons-learned from the International Space Station (ISS). A bed design that was developed for a UTAS military application, and considered for a potential ISS application with the Urine Processor Assembly, provided a low pressure drop means for water maintenance in a recirculation loop. The bed design is coupled with high capacity ion exchange resins, organic adsorbents, and a cyclic methodology developed for the Extravehicular Mobility Unit (EMU) Transport Water loop. The maintenance cycle included the use of a biocide delivery component developed for ISS to introduce a biocide in a microgravity-compatible manner for the Internal Active Thermal Control System (IATCS). The leveraging of these water maintenance technologies to the SWME recirculation loop is a unique demonstration of applying the valuable lessons learned on the ISS to the next generation of manned spaceflight Environmental Control and Life Support System (ECLSS) hardware.