

CapiBRIC – Capillary-Based Brine Residual In-Containment for Secondary Water Recovery

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HAT: 6.1.a, 6.1.b – Closed-Loop High Reliability Life Support

TA: 6.1.2.2 Wastewater Processing

TRL: start 3 / current 4

OVERVIEW

One of the goals of the AES Life Support Systems Project is to achieve 98% water loop closure for long-duration human exploration missions. Brine water recovery is the primary technology gap that must be bridged to realize this goal. In response to an Agency call for technologies to compete in an October down-select, Capi-BRIC was chosen through a JSC down-select as the strongest candidate to go forward. This resulted in a period of intense development to increase its TRL in preparation for the Agency down-select. This was achieved through rapid prototype design, fabrication, and test at JSC and in a zero-g drop tower at Portland State University.

INNOVATION

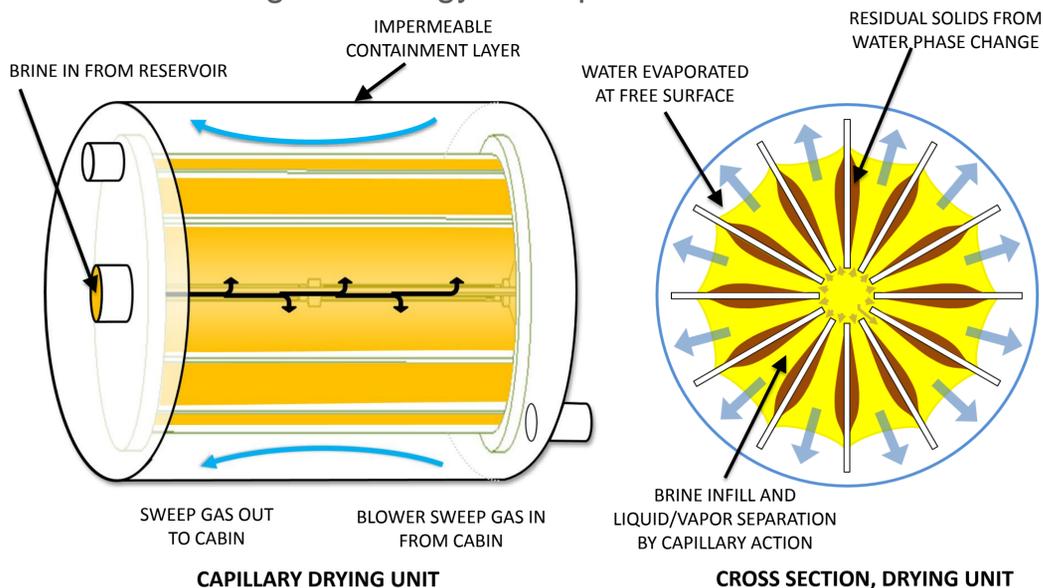
CapiBRIC takes a novel approach of optimizing the containment geometry to support capillary flow and static phase separation to enable evaporation in a microgravity environment.

OUTCOME

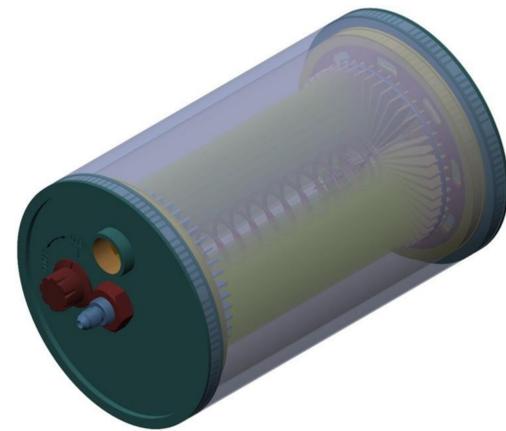
- TRL was advanced from 3 to 4, and was selected for continued funding through the AES program.

INFUSION SPACE / EARTH

- CapiBRIC is poised for development into an ISS technology demonstration, proving its viability as an enabling technology for exploration.



CAD MODEL OF DRYING UNIT FLIGHT CONCEPT, INCLUDING COLLAPSE/EXPANSION MECHANISM, CONTAINMENT LAYERS, FLUID CONNECTORS AND SHUTOFFS



FULL SCALE PERFORMANCE TESTING UTILIZING A DRYING TRAY ADAPTED TO 1-g TERRESTRIAL ENVIRONMENT

PARTNERSHIPS / COLLABORATIONS

CapiBRIC has benefitted from collaboration with capillary fluidics experts at Portland State University and IRPI LLC. Concepts and experience gained through development of the CoBRA (Coiled Brine Recovery Assembly) funded by CL IR&D was also leveraged in the development of CapiBRIC.

PAPERS / PRESENTATIONS

CapiBRIC predecessors, collectively referred to as BRIC, have been published in multiple papers through the International Conference on Environmental Systems (ICES) and have been the subject of at least three NASA New Technology Reports. The concept has also been presented at several different JSC venues and technology showcases. Most recently, a system-level concept for a CapiBRIC was presented to a panel of life support technology experts as part of an Agency down-select.

FUTURE WORK

CapiBRIC will continue to be funded by AES as a potential technology for a future payload demonstration on ISS. If successful as payload, CapiBRIC could be developed into a flight system and integrated into the Station's regenerative ECLS system with a long-term goal for use as a brine water recovery system on a future exploration spacecraft.

