# Advancements in Spacecraft Brine Water Recovery: Development of a Radial Vaned Capillary Drying Tray

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Technology improvements in the recovery of water from brine are critical to establishing closed-loop water recovery systems, enabling long duration missions, and achieving a sustained human presence in space. A genre of 'in-place drying' brine water recovery concepts, collectively referred to herein as Brine Residual In-Containment (BRIC), are under development which aim to increase the overall robustness and reliability of the brine recovery process by performing drying inside the container used for final disposal of the solid residual waste. Implementation of in-place drying techniques have been demonstrated for applications where gravity is present and phase separation occurs naturally by buoyancy induced effects. In this work, a microgravity compatible analogue of the gravity-driven phase separation process is considered by exploiting capillarity in the form of surface wetting, surface tension, and container geometry. The proposed design consists of a series of planar radial vanes aligned about a central slotted core. Preliminary testing of the fundamental geometry in a reduced gravity environment has shown the device to spontaneously fill and saturate rapidly creating a free surface from which evaporation and phase separation can occur similar to a 1-g like 'cylindrical pool' of fluid. Mathematical modeling and analysis of the design suggest predictable rates of filling and stability of fluid containment as a function of relevant system dimensions, e.g., number of vanes , vane length, width, and thickness. A description of the proposed capillary design solution is presented along with preliminary results from testing, modeling and analysis of the system.

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