



Habitat Water Wall for Water, Solids, and Atmosphere Recycle and Reuse

NASA has created a unique approach to water, solids, and atmosphere recycle and reuse. The membrane water wall concept includes a system for membrane-based water, solids, and air treatment functions that is embedded into the walls of inflatable or rigid habitat structures. It provides novel and potentially game changing mass reuse and structural advantages over current mechanical life support hardware. It also provides radiation protection, building materials and structural elements. This approach potentially reduces the cost of human space flight by replacing the mass, power, and volume of conventional life support hardware. It removes air, water, and waste treatment hardware from the usable habitat volume. It provides a mechanism to recover and reuse water and waste treatment residuals (solids). Also, it provides structural elements to strengthen the habitat shell, provide thermal control, and provide radiation shielding.

This technology is available for licensing from NASA's space program to benefit U.S. industry.

Technology Details

This approach allows water recycling, air treatment, thermal control, and solids residuals treatment and recycle to be removed from the usable habitat volume and placed in the walls of a radiation-shielding water wall. It also provides a mechanism to recover and reuse water treatment (solids) residuals to strengthen the habitat shell. Water-wall treatment elements are a much-enlarged version of the commercially available X-Pack hydration bag. Some water bags have pervaporation membranes facing inward that provide the capability to remove H₂O, CO₂, and trace organics from the atmosphere.

Ideally the water wall is composed of a series of membrane bags packed as dry elements integrated into an inflatable habitat structure wall. After launch and deployment, it is filled with water and maintained as both a freshwater supply and radiation shield. As the initial water supply is consumed, the depleted treatment bags are filled with wastewater and take on a dual role of active forward osmosis (FO) water treatment and water-wall radiation shielding.

Patent

This technology is protected by a pending U.S. Non-Provisional Patent Application. (Reference No. ARC-16733-1)

Benefits

- Achieves a high water recovery ratio
- Provides structural elements to the habitat shell
- Provides thermal control
- Provides radiation shielding



Water Wall bag elements in the inner liner layer

Commercial Applications

- Aerospace
- Planetary Exploration
- Waste Water Treatment Plants