

Alternative Water Processor Test Development

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The Next Generation Life Support Project is developing an Alternative Water Processor (AWP) as a candidate water recovery system for long duration exploration missions. The AWP consists of biological water processor (BWP) integrated with a forward osmosis secondary treatment system (FOST). The basis of the BWP is a membrane aerated biological reactor (MABR), developed in concert with Texas Tech University. Bacteria located within the MABR metabolize organic material in wastewater, converting approximately 90% of the total organic carbon to carbon dioxide. In addition, bacteria convert a portion of the ammonia-nitrogen present in the wastewater to nitrogen gas, through a combination of nitrogen and denitrification. The effluent from the BWP system is low in organic contaminants, but high in total dissolved solids. The FOST system, integrated downstream of the BWP, removes dissolved solids through a combination of concentration-driven forward osmosis and pressure driven reverse osmosis. The integrated system is expected to produce water with a total organic carbon less than 50 mg/l and dissolved solids that meet potable water requirements for spaceflight. This paper describes the test definition, the design of the BWP and FOST subsystems, and plans for integrated testing.