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SCALABLE MICROALGAE-BASED LIFE SUPPORT SYSTEM

Abstract

Life Support Systems (LSS) for a crewed lunar base differ from those for Space Stations in Low Earth Orbit (LEO), mainly due to the increased distance, and therefore more expensive resupply possibilities. Microalgae-based photobioreactors (PBR) can help reducing the required resupply mass by closing material mass flows with the help of regenerative elements. By means of photosynthesis, the microalgae use CO_2 , water, light energy and nutrients from waste to provide oxygen and biomass for the astronauts. To determine the dimensions of a PBR in a biological LSS, a scalable test stand is developed to investigate intake rates and quantify and assess the produced biomass. The intake rates of CO_2 and nutrients from an artificial waste water, such as nitrate and phosphate, shall be determined. This paper describes the composition of the artificial waste water, the setup of the test reactor and the adjustable testing parameters. Intake- and growth rates for different microalgae species are presented. Process control parameters, automation and upscaling possibilities are outlined. Interactions with other components of the LSS, such as water conditioning and the effect on the equivalent system mass (ESM) is discussed.