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A MODIFIED MBR SYSTEM CONFIGURING POST ADVANCED PURIFICATION USED AS
WATER SUPPLY PROCESS IN 180-DAY CELSS: SYSTEM CONSTRUCTION, POLLUTANTS
REMOVAL EXAMINATION AND WATER ALLOCATION

Abstract

In order to investigate the key technology of life support in the deep space exploration and interplanetary mission, a Closed Ecological-Cycle Experiment Platform was established in Shenzhen, China. Based on this platform, MBR system configuring post advanced purification, including primary MBR, secondary MBR, nanofiltration, reverse osmosis, ion exchange and oxidized disinfection stages, used as a water supply system to guarantee crew's daily life was constructed. The performance of this system to treat the real plant cabin's condensate water was examined during continuously 180-day integrated experiment. The long-term operation results showed that, though the influent pollutant load changed as the experiment progressed, the system exhibited stable performance on chemical pollutants removal with average effluent TOC < 0.5 mg/L, NH₄⁺-N < 0.02 mg/L, NO₃⁻-N < 0.25 mg/L, NO₂⁻-N < 0.001 mg/L and displayed good capacity to control the metal ions and microbiological indicator, which met the aerospace medicine standards. The effluent through such modified MBR system was allocated to three categories, including water for drinking, water for life and water reused for plant nutrient solution. The obtained results demonstrated that such purified water satisfied the demand quantity of crew and showed no adverse impact on crew's health.