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WATER SUPPLY OF LONG-TERM SPACE FLIGHTS ON THE BASIS OF PHYSICOCHEMICAL PROCESSES FOR WATER REGENERATION

Abstract

Due to the energy, volume and mass restrictions the physical-chemical processes of water and atmosphere recovery will be used on the space station in the near future. The use of biological processes a food production are the aims of the future. At the present the structure of complex physical-chemical regenerative life-support systems and so the compositions of water recovery systems have been formed. The regeneration systems need to realize the maximum recovery and regeneration of water and oxygen from human liquids waste, serving the needs of the crew with minimal use of reserves. Based on the research and development works the main methods of water regeneration were formed: sorption-catalytic method for humidity condensate from the crew compartments and greenhouses, the distillate from urine system, water from the CO2 reduction in Sabatier reactor, the condensate of the vapors formed during drying of the waste; - distillation for water reclamation from urine; - reverse osmosis with pre filtration and subsequent sorption and the bacterial purification of the regenerated water. To implement these methods small-sized equipment, working in conditions of space flight is developed. In the case where the oxygen is produced from reclaimed water and food from stocks, selfsufficiency of the complex life-support system is determined by the coefficient of water recovery: the ratio of the regenerated water to the total water consumption. The recovery rate achieved on the space stations were as follows: “Salyut” - 38station ISS (Russian segment) – 38regenerative life support systems – more than 94maximum self-sufficiency and maximum efficiency of the complex systems. The report is based on the operation of space stations ”Mir” and the ISS, the data for water balance for different variants of construction of the LSS complex and regeneration technology, energy-and-mass characteristics of modern and perspective systems of water regeneration and includes recommendations for formation of a complex regenerative water recovery systems for future space stations.