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# EXERGY APPROACH TO THE EFFECTIVENESS EVALUATING OF INTEGRATED LIFE - SUPPORT SYSTEMS FOR CREW OF INTERPLANETARY SPACEFLIGHTS

**Abstract**

The implementation of long-term space missions to the planets of the solar system determines the need for im-provement of all onboard systems and, above all, Integrated Life-Support Systems (ILSS). The ILSS design is based on the permanent solution of decision problems, correctness of which depends largely on the effectiveness adopted model. Formation of the effectiveness models (EM) used is based on the use of such basic concepts as 'mass', 'energy' and 'time'. The 'mass' and 'energy' follow the laws of conservation, making it difficult to use these concepts to correctly estimate the inputs of the operation of the designed system. This report focuses on the use on the ILSS EM invariant energy 'exergy' which is non-equilibrium with respect to the external environment with specified properties function of the state. PURPOSE of this paper is to examine the exergy approach to analyzing the effectiveness of ILSS. APPROACH is based on using of a unified description of technologies that form the ILSS structure and the objective function of the thermal/mass optimization. It is shown that the degree of thermodynamic perfection (exergy efficiency) should be considered as a critical parameter in the design. Results of the analysis of the objective function of the termal/mass optimization, as well as the values of this function for the technologies on the basis of physico-chemical and bio-engineering processes of transformation products of crew' metabolism in the initial components of environment. CONCLUSIONS. 1. Unified description of the ILSS technologies based on the concept of 'exergy conductivity' at the interface between process streams (or reaction volume) is given.. 2. Results of the analysis of the objective function with respect to the termal/mass optimization of the ILSS.