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HYGIENE WATER PROCESSING ABOARD PROSPECTIVE SPACE STATIONS

Abstract

Water procedures and washing clothes are supposed to be presumed on board during long-term interplanetary and planetary missions and will be carried out by special hygiene equipment. A significant volume of water is required for carrying out water procedures and washing. Therefore, a hygiene water processing system is required.

To solve the current task we can use a considerable experience of the ISS where water regeneration systems from humidity condensate and urine successfully function.

The previous generation of the hygiene water processing system was tested at the "Mir" space station. The system operation was based on filtration and sorption purification. Such a system was able to operate only with dissociating into ions detergents.

Now the hygiene water processing system development with high rates of water purification using conventional detergents is very actual. Theoretical and experimental research of the hygiene water processing methods and technologies providing the necessary water quality and a high degree of the water return have been conducted. The low-pressure reverse osmosis has been selected as the key method for water processing. The original scheme of the water regeneration process has been developed. The types of contaminated water used in experiments were a hygiene water imitator and truly contaminated water obtained as a result of washing hands, taking a shower and washing clothes.

As a result, the efficiency of low-pressure reverse osmosis and developed scheme for hygiene water processing has been confirmed. Experimental studies have confirmed the possibility of returning 97% of water to the hygiene water closed loop. The operating pressure of reverse osmosis water processing was 0.8 MPa. The membrane selectivity in terms of detergent exceeded 99%.

The proposed method and scheme of hygiene water processing will help to reduce hygiene and clothing supplies on board space stations and planetary bases and will provide the crew with good quality water. An important task is to conduct further research on the hygiene water processing issues including the problem of development and suppression of bacterial flora.

The prospects of introducing the closed loop of hygiene water supply on board and essential sanitary and hygienic equipment designing for the crew are shown in this paper.