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MICROBIAL CONTROL OF MANNED SPACECRAFT CABIN IN THE GROUND ASSEMBLY
STAGE

Abstract

microbes in the space environment have caused varying degrees of impact for manned spacecraft and aerospace astronauts. However, the microbial resource of manned spacecraft mainly comes from ground assembly, in addition, spacecraft must be subjected to various testing before launching. therefore, how to control the concentration of microorganisms, in which of the manned spacecraft in the final ground assembly stage, has become the primary topic of microbial control of manned spacecraft. There is no standard of microbiological control that can be referenced by the AIT (Automatic Inspection Technology) during manned spacecraft in the assembly plant. Firstly, in this paper, we propose a variety of microbial control programs, including ventilation purification, ultraviolet disinfection and ozone disinfection. Secondly, four sets of comparative trial was designed in order to verify the effectiveness of microbiological control measures and compare the effects of several programs, four groups of test status consist of manned spacecraft reference state, spacecraft ventilation purified state, after UV light irradiation state and state after ozone fumigation. By comparing the test results, we find that ventilation purification, UV disinfection and ozone disinfection have different levels of control results for cabin airborne microbes. Ventilation purification as a passive air displacement technology cannot kill microorganisms in the cabin air, it can only dilute the concentration of microorganisms in the cabin. While, the ultraviolet and ozone disinfection measures as the active sterilization technology can kill microorganisms in the cabin air, because it can inactivate microorganisms. However, there are many factors affecting the effects of UV radiation, such as Shelter and irradiation distance, therefore, its anti-virus effect is low than Ozone. On other hand, active sterilization technology may result in part of materials aging. The purpose of the manned spacecraft atmospheric microbial detection is to investigate pollution status and source of the cabin air. the study will focus on the physiological and psychological effects of pollution on the astronauts in order to build-up pathological data of manned spaceflight. With these results, it will provide a scientific basis for the engineering design of purification system. In addition, it will provide information for the revision of the standard allowable concentration of cabin air as well. Through the implementation of this project, it not only completed the microbiological testing of manned spacecraft cabin, and compared the effect of different microbial control measures. Finally, it is obtained experimental data and research methods for engineering purification of manned.