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Author: Ms. Yu Zhang
Vieira de Almeida & Associados, China, zhangyu@csu.ac.cn

THERMAL CONTROL SCHEME STUDY OF SCIENCE EXPERIMENT RACK OF NEW MANNED SPACE STATION

Abstract

Space technology plays an important role in the field of modern scientific research and engineering application. It has a rapid development of our country in the past few decades. Manned spacecraft can develop more human conscious activity because of participation of astronauts except for completing work that unmanned spacecraft can support. Manned space station can load multiple types of payloads. Scientific experiment rack carries out multiple subject areas and technology experiments, such as space life science, space material science, fluid science, basic physics in new manned space station.

It is necessary for thermal control system of scientific experiments rack to control the temperature changes and distribution of payload and to maintain normal work of electronic components. Thermal control system of scientific experiments rack is an indispensable part of new manned space station. According to difference of temperature requirement, thermal control interface and work mode of scientific experiments rack, thermal control system includes three schemes, that is, micro-channel fluid loop thermal control system, gas-liquid heat exchanger and cold plate thermal control system, air-cooled thermal control system in order to adapt to operate requirements and temperature index of scientific experiments rack.

Comparison result reveals that heat dissipating capability of micro-channel fluid loop is 1500W and it suitable for scientific experiments rack which need to keep lower temperature. Heat dissipating capability of gas-liquid heat exchanger and cold plate thermal control system is 1200W. When temperature index range is large or power consumption is small, air-cooled thermal control system can be used, it can radiating 800W.