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A NOVEL PCM HEAT SWITCH FOR FUTURE SPACECRAFT MISSIONS

Abstract

Heat switches are widely used in spacecraft thermal management systems to automatically decouple payloads from cold external environment in order to save energy. Few have been developed in the last century and differ in performance, size and weight. Miniaturized heat switch (MHS) with actuator driven by phase change material (PCM) is a research project at Brno University of Technology, a new entrepreneur in space. An innovative concept of heat switch can be dedicated to generic thermal control for various near Earth, deep space or Mars missions.

Metal additive manufacturing and non-conventional technologies were implemented fostering a new revolution in development of the small thermal equipment. The additive ultimately brings new benefits in terms of optimization methods, but related issues with robustness of processes, reliability of parts and overall cost efficiency. A concurrent engineering method was adopted to accelerate development and verification of parts. The paper aims to present the development of a passive heat switch in the preliminary design phase and the trade-off between conventional and additive design. Novel solutions, lessons learned and knowledge gaps within the heat switch project are presented.