Contribution ID: **931** Type: **Contributed Oral Presentation**

C3Or2C-06: A two-condenser pulsating heat pipe for use as a passive thermal disconnect in redundant cryocooler implementations

Wednesday 24 July 2019 15:15 (15 minutes)

A proof-of-concept, two-condenser nitrogen pulsating heat pipe (PHP) has been developed for use in applications with redundant cryocooler installations. The PHP design presented here comprises two independent PHP condensers, each thermally sunk to an independent cryocooler cold head, with the two associated PHP evaporators attached to a common heat load. With two installed cryocoolers this PHP design allows the heat load to be continuously cooled even when one cryocooler is shut down. This is accomplished by leveraging dryout in the associated PHP to passively create a sufficient thermal resistance from the ambient environment to minimize the parasitic load on the PHP evaporators (and, therefore, on the remaining operating cryocooler). The design is completely passive and requires no mechanical system to isolate the idle cryocooler. Instrumentation has been included in the proof-of-concept device to measure heat transfer into each of the cryocooler cold heads, allowing the effective conductivity of the PHPs to be measured during conditions of both normal PHP operation and dryout. The design of the two-condenser nitrogen PHP system is presented in detail, along with effective thermal conductivity measurements of the PHPs both during both normal PHP operation and dryout. Additional performance characteristics of the thermal disconnect design are also presented, including the relative effective thermal conductivity of the PHP during dryout to that during normal operation, the absolute parasitic load on the PHP evaporators during dryout, and the parasitic load on the evaporators during dryout relative to the applied heat load.

Author: MUELLER, Bryant (University of Wisconsin - Madison)

Co-authors: MILLER, Franklin (University of Wisconsin - Madison); Prof. PFOTENHAUER, John (University of Wisconsin - Madison)

Presenters: MUELLER, Bryant (University of Wisconsin - Madison); MILLER, Franklin (University of Wisconsin - Madison)

Session Classification: C3Or2C - Compressor Expanders and Other Components