Implementation of a Non-Metallic Barrier in an Electric Motor

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Electric motors that run in pure oxygen must be sealed, or "canned," for safety reasons to prevent the oxygen from entering into the electrical portion of the motor. The current canning process involves designing a metallic barrier around the rotor to provide the separation. This metallic barrier reduces the motor efficiency as speed is increased. In higher-speed electric motors, efficiency is greatly improved if a very thin, non-metallic barrier can be utilized. The barrier thickness needs to be approximately 0.025-in. (≈0.6-mm) thick and can be made of a brittle material such as glass. The motors, however, designed for space applications are typically subject to high-vibration environments.

A fragile, non-metallic barrier can be utilized in a motor assembly if held in place by a set of standard rubber O-ring seals. The O-rings provide the necessary sealing to keep oxygen away from the electrical portion of the motor and also isolate the fragile barrier from the harsh motor vibration environment. The compliance of the rubber O-rings gently constrains the fragile barrier and isolates it from the harsh external motor environment. The use of a non-metallic barrier greatly improves motor performance, especially at higher speeds, while isolating the electronics from the working fluid with an inert liner.

This work was done by George M'Sadoques, Michael Carra, and Woody Beringer of Hamilton Sundstrand for Johnson Space Center. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809.

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act {42 U.S.C. 2457(f)} to Hamilton Sundstrand. Inquiries concerning licenses for its commercial development should be addressed to:

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Refer to MSC-24876-1, volume and number of this NASA Tech Briefs *issue, and the page number.*

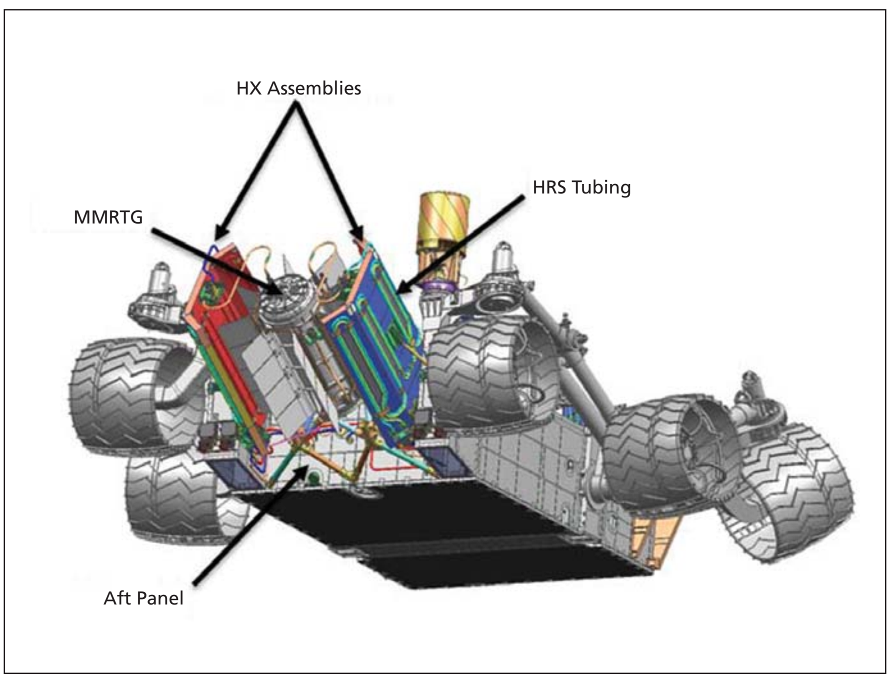
Multi-Mission Radioisotope Thermoelectric Generator Heat Exchangers for the Mars Science Laboratory Rover

These heat exchangers can be used in any application in which heat loads must be simultaneously collected and rejected from opposite sides of the same structure.

NASA's Jet Propulsion Laboratory, Pasadena, California

The addition of the Multi-Mission Radioisotope Thermoelectric Generator (MMRTG) to the Mars Science Laboratory (MSL) Rover requires an advanced thermal control system that is able to both recover and reject the waste heat from the MMRTG as needed in order to maintain the onboard electronics at benign temperatures despite the extreme and widely varying environmental conditions experienced both on the way to Mars and on the Martian surface (See figure).

Based on the previously successful Mars landed mission thermal control schemes, a mechanically pumped fluid loop (MPFL) architecture was selected as the most robust and efficient means for meeting the MSL thermal requirements. The MSL heat recovery and rejection system (HRS) is comprised of two Freon (CFC-11) MPFLs that interact closely with one another to provide comprehensive thermal management throughout all mission phases. The first loop, called the Rover HRS (RHRS), consists of a set of pumps,



MSL Rover in Stowed Cruise Configuration showing HXs positioned on both sides of finned MMRTG.