October 1970

Brief 70-10424

NASA TECH BRIEF



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Division, NASA, Code UT, Washington, D.C. 20546.

Molecular Sieves Control Contamination and Insulate in Thermal Regenerators: A Concept

Incorporation of zeolitic molecular sieves prolongs the lives of cryogenic engines (for development of cryogenic temperatures) by preventing contamination

Cryogenic Cooling Copper or **Platform Brass Cap** Stacked Wire Mesh Disks Porous Metal Cap Compressed Molecular-Sieve Ring Cylinder. Compressed Molecular-Sieve Disk Piston Thermal-Insulation Sleeve Containing Molecular Sieve Seal Ring Porous Metal Container for Molecular-Sieve Pellets Stainless-Steel Connecting Pressure-Containment Tube Rod

Ambient-Temperature Crankcase

of the thermal regenerators on the cold ends of closedcycle engines. Regenerators are composed of stacks of disks of fine wire mesh, usually of copper; contaminants reaching the disks condense and form thermally insulating films. Sieves also serve as thermal insulators by preventing conduction of heat along regenerators through contiguous disks of mesh.

The figure shows a thermal regenerator with the piston of a cold-displacer to produce cryogenic temperatures. The piston reciprocates in relation to the pressure-containment tube which is stationary relative to the engine. At each end of the regenerator a porous metal filter prevents particulate contaminants from entering and molecular-sieve material from leaving it.

In the event that some contaminants pass the molecular sieve and condense on the regenerator's heat-transfer surface, the engine can be stopped and brought to ambient temperature so that the contaminants reevaporate and are absorbed by the sieve. Bypassing around the heat-transfer surface is reduced by the method of fabrication. An imperfect seal between the pressure casing and the piston permits gas containing contaminants to reach the cold end without passing through the regenerator; the molecular sieve at the cold end collects these contaminants, and the porous metal cap keeps out particulate contaminants.

Such sieves may be incorporated in a sterling type cryogenic engine.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer Goddard Space Flight Center Greenbelt, Maryland 20771 Reference: TSP70-10424

(continued overleaf)

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government nor any person acting on behalf of the United States

Government assumes any liability resulting from the use of the information contained in this document, or warrants that such use will be free from privately owned rights.

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

Source: M. G. Gasser Goddard Space Flight Center (GSC-10910)