April 1974

B73-10472

NASA TECH BRIEF

Marshall Space Flight Center

A Methanol/Air Fuel Cell System

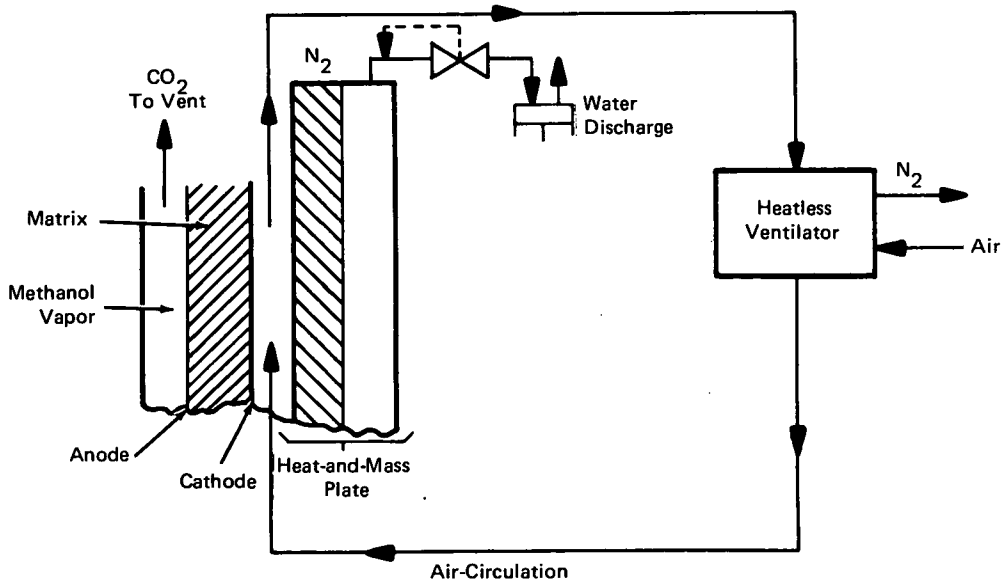
A new, high power-density, self-regulating fuel cell develops electrical power from a catalyzed reaction between methanol and atmospheric oxygen. In principle, other fuels such as gasoline could be used in place of the methanol. Cells such as these are of particular interest, because they may one day offer an emission-free, extremely efficient alternative to internal-combustion engines as a power source.

A cross section of one unit of this system is shown in the illustration. The methanol is vaporized and contacted with the anode. Air, containing oxygen, is forced past the cathode. The anodes and cathodes of the system are about 0.1 micrometer thick and are deposited on the surface of a matrix of about 100 micrometers thick (see NASA Tech Brief 10473).

In some fuel systems, chemical oxidation of the fuel lowers the efficiency of the system by oxidizing (to give thermal energy) fuel that could have yielded electrical energy. In this cathode-catalyzed system, the methanol must travel only about 0.15 micrometer to enter the electrolytic reaction; but it must travel over 100 micrometers to reach the cathode catalyst that could oxidize the fuel chemically.

In this system, there are several problems to be considered. The reaction yields CO_2 and water; the CO_2 must be removed, and the water content in the cell must be kept at a functional level. Furthermore the temperature of the cell must be controlled.

The heat and the water are kept in balance by a heat-and-mass plate (see NASA Tech Brief 10489). A



Fuel-Cell System

(continued overleaf)

heatless ventilator keeps the heat and water vapor, in each zone of the system, at a level at which the heat-and-mass plate can regulate the temperature and water inventory by a simple pressure control. The CO_2 accumulation may be prevented by either an acid or a base electrolyte. In most cases, simple venting keeps the CO_2 level sufficiently low.

Notes:

1. The development of a fuel-cell system is further described in the following NASA Tech Briefs:
   B73-10475, Vapor-Deposited Platinum as a Fuel-Cell Catalyst
   B73-10489, Fuel-Cell Heat and Mass Plate
   B73-10473, An Electrochemical Engine
2. Requests for further information may be directed to:
   Technology Utilization Officer
   Marshall Space Flight Center
   Code A&PS-TU
   Marshall Space Flight Center, Alabama 35812
   Reference: B73-10472

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:

Patent Counsel
Marshall Space Flight Center
Code A&PS-PAT
Marshall Space Flight Center, Alabama 35812

Source: W. J. Asher of
Exxon Corp.
under contract to
Marshall Space Flight Center
(MFS-22541)