NT

NAS 8-2696-TM-00024

TECHNICAL MEMORANDUM

November 19, 1964

To: Louis W. Sandow

From: Paul D. Hess

Subject: Vent Subsystem - Development Plan, Activity 175

Distribution: J. L. Platner, D. P. Ghere, R. E. Lochen, J. R. Hurley, J. E. Ward, C. R. Martin, G. Johnson

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1. Assignment

The individual to whom this memorandum is directed is assigned the design effort responsibility of evolving the design specification, drawing (s), and/or functional diagrams of the subject subsystem, (Activity 175 - 370). In addition any tests evolved will follow the path from Event 175 through 405 on to 580 shall be performed and reported on, along with periodic subsystem design reviews. A concerted attempt should be made to meet all dates set forth in the Part III PERT Program Plan.

2. Function

The Vent Subsystem (reference Paragraph 3.1.8, Centerline Specification NAS 8-2696-S-00024) will consist of such electromechanical devices, tubing, connections, relief valves, safety devices, and hardware to vent the FCA as required. The functions presently required for venting are:

(a) Reactant venting in case of over-pressurization within the FCA.

(b) Reactant purge for discharging inert gas buildup or contaminates from the fuel cell module.

(c) Water vapor vent for discharge of the product water.

(d) Contaminated water dump for expelling any water in the WRS with a pH above 9.0.

(e) Secondary coolant purge in the event of contamination, overpressurization, and for start-up and/or shutdown.

3. Status

A minimum of design effort and definition has been expended on the vent subsystem. The following discussion illustrates present thinking on vent subsystem.

The reactant venting in case of overpressure will be accomplished by means of a relief valve downstream of the reactant pressure regulators and will be a part of the reactant control subsystem. The reactant purge will also be a part of the reactant control subsystem. The water vapor vent requirement is being considered as a part of the moisture removal subsystem. The contaminated water dump will be incorporated into the water recovery subsystem.

The status of the secondary coolant purge will depend upon whether helium or hydrogen is used as the secondary coolant. Helium is the present selection for the secondary coolant. It will be maintained in the canister at a pressure 2 to 3 psi greater than either reactant pressure. A leak which would result in a loss of helium will be replenished from a storage tank through a regulator. No automatic venting will be required.

If hydrogen should subsequently be selected as the secondary coolant, it will require some safety devices and a suitable purge system. The hydrogen

pressure in the canister will be maintained at a balanced condition with the oxygen reactant pressure in the module by means of a balancing regulator. An oxygen sensor will be provided in the hydrogen secondary coolant and actuate a controller to vent a small amount of hydrogen in the event of a low level of oxygen present. In the case the oxygen present in the canister would continue to increase and exceed a safe limit, the controller would initiate an automatic shutdown of the FCA and vent the secondary coolant.

4. Development Area

The development effort for the vent subsystem will consist of the design and analysis work necessary to evolve the design specification, drawing (s), and/or schematic diagrams of the vent subsystem.

5. Test Plan

Testing the oxygen sensor and the controller will be required if hydrogen is used, to establish its accuracy, reliability and life. The details of the test program will depend on the development plan requirements.

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