NASA TECH BRIEF

Large-Capacity Pump Vaporizer for Liquid Hydrogen and Nitrogen

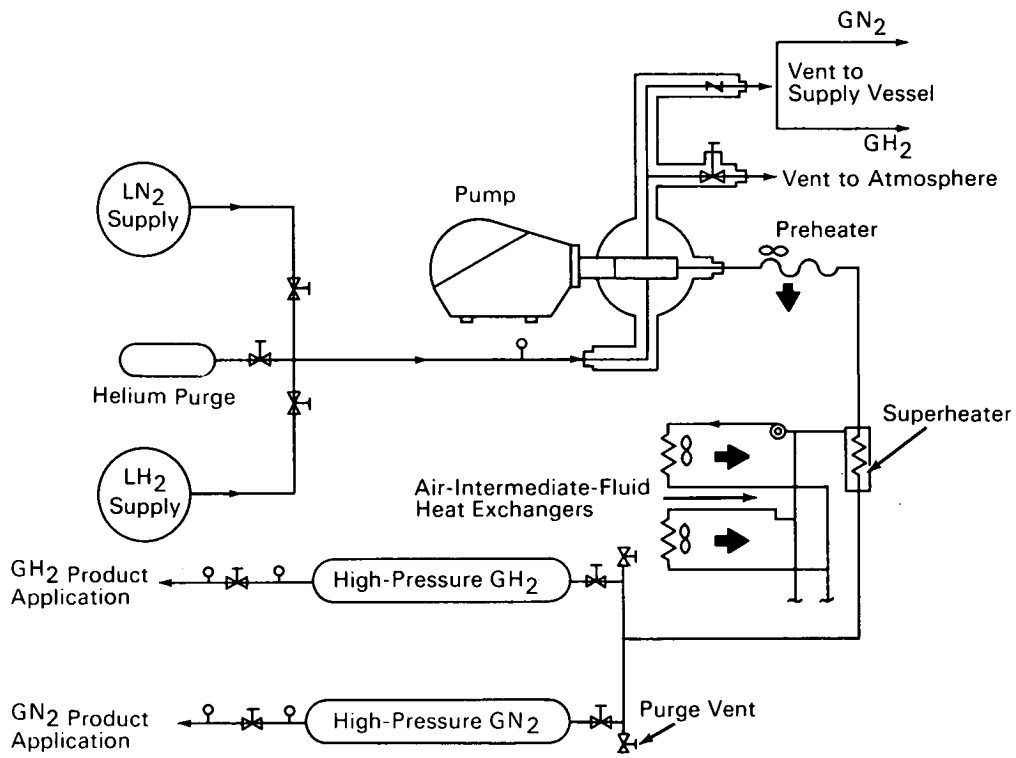

Diagram of the Pump Vaporizer

At pressures up to 12,000 psig a new pump vaporizer system (see fig.) delivers 5000 scfm (standard cubic feet per minute) of hydrogen or nitrogen; the one system serves for both. A vacuum-jacketed pump having three horizontal cylinders discharges liquid hydrogen or liquid nitrogen at 50 gal/min into a vaporizing system heated by ambient air. A preheater uses air directly as the heat source; a superheater uses an intermediate fluid to transfer heat from the atmosphere to the high-pressure gas.

The pump's designed time between overhauls is 2500 hours on the liquid end and 20,000 hours on the power frame. The in-line cylinders are close to the ground and easily accessible for maintenance. The crankshaft's speed is only 300 rpm, and parts are few.

Between handlings of nitrogen and hydrogen the "wetted" pumping surfaces must be purged with gaseous helium. The ability to deliver two gases rather than one does away with one pump and its crew, simplifies maintenance, and minimizes space required and stocks of spare parts.

(continued overleaf)

Principal Characteristics

System	
Flow	
Liquid	50 gal/min
Gaseous H_2	5180 scfm
Gaseous N_2	4650 scfm
Discharge	
Continuous pressure	10,000 psig
Intermittent pressure	12,000 psig
Temperature	≤20°F below ambient
Pump	
Cylinders	
Number, type	3, in line, horizontal, vacuum-jacketed
Bore	2.68 in.
Stroke	3.00 in.
Revolutions	300/min
Power input	450 hp at 1750 rev/min
Vaporizer	
Rate of heat transfer	4,500,000 Btu/hr
Source of heat	ambient air
Type	direct-indirect
Air flow	513,000 cfm
Approach temp. difference	≤20°F
Heat-transport fluid flow	3,360 gal/min
Area	
Gas side	635 ft^2
Air side	62,250 ft^2

Note:

Requests for further information may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
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Patent status:

No patent action is contemplated by NASA.

Source: J.A. Hauser
Marshall Space Flight Center
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