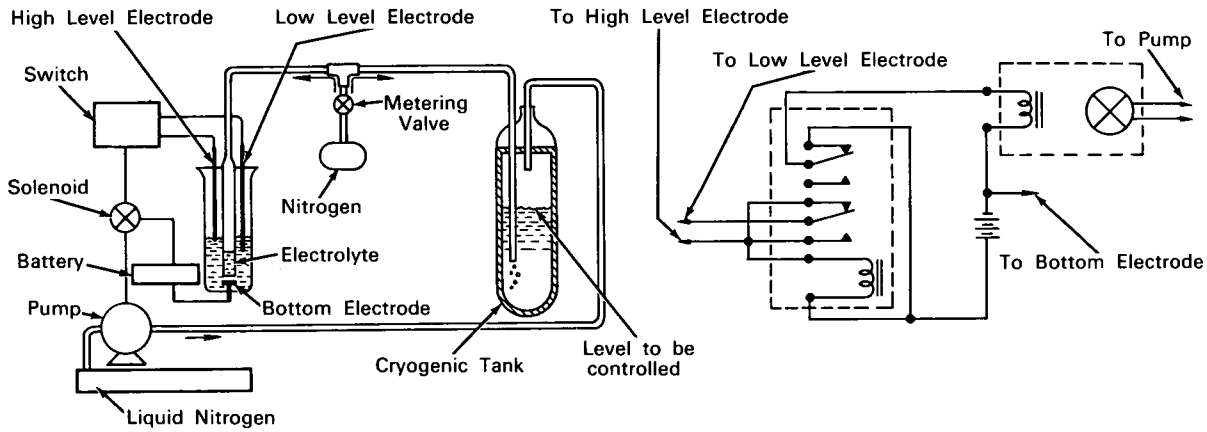
March 1964

Brief 63-10250

NASA TECH BRIEF

This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the NASA space program.

Level of Super-Cold Liquids Automatically Maintained by Levelometer



The problem: Maintaining the desired level of a liquid at cryogenic temperatures, or of a liquid which tends to boil off at normal temperatures. The required system must be automatic and dependable so it can be left unattended for long periods of time.

The solution: A levelometer system in which the level of cryogenic liquid to be controlled affects the level of an electrolyte, or of a diaphragm, and automatically switches a pump on or off.

How it's done: Two tubes lead into a tank containing the liquid at cryogenic temperature. One comes from the pump which operates on demand to pump in more fluid, in this case liquid nitrogen. The second tube goes well below the surface of the liquid and acts as a demand sensor for another vessel containing an electrolyte and three electrodes. In the tubing between the two vessels there is a metering valve and a gas supply container. Gas pressure is set to permit continuous, moderate bubbling from the submerged end of the tubing in the tank.

If the level rises or falls in the cryogenic tank, it can be seen that this change in hydraulic pressure will be transferred back to the vessel with the electrolyte. When the liquid level drops, for example, the electrolyte will rise in the enlarged end of the tube and cause the electrolyte level to drop.

Lowering of the electrolyte level will uncover the shorter of the two top electrodes, actuate the pump and liquid will be pumped into the tank. Raising the liquid level in the cryogenic tank reverses the action causing the longer electrode to be uncovered and stopping the pump.

Another device can be utilized in place of the electrolyte vessel. A diaphragm can be connected to the tubing so that changes in the nitrogen gas pressure cause a single throw microswitch to start or stop the pump. The diaphragm is attached to a lever pressing against the microswitch. Movement of the diaphragm will open or close the switch.

(continued overleaf)

This document was prepared under the sponsorship of the National Aeronautics and Space Administration. Neither the United States Government, nor NASA, nor any person acting on behalf of NASA: A. Makes any warranty or representation, express or implied, with respect to the accuracy, completeness, or usefulness of the information contained in this document, or that the use of any information, apparatus, method, or process disclosed in this document may not infringe privately-owned rights; or B. Assumes any liabilities with respect to the use of, or for damages resulting from the use of, any information, apparatus, method, or process disclosed in this document.

Note:

These devices for keeping a liquid level at a desired point would be useful in many manufacturing processes where a constant amount of fluid must be kept in a tank. Chemical plants and others using liquid chemicals or solutions could find the levelometer of value.

Patent status: NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Wallis M. Tener
Jet Propulsion Laboratory (JPL-397)