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"An Interfaced System for Production  
of  
Glycerol from Methane in a Spacecraft"



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# FABRICATION OF A GLYCEROL FROM CO<sub>2</sub> REACTION SYSTEM

by

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## Abstract

The parts of the glycerol hydrogenation unit shipped to Worcester Polytechnic Institute from Esso Research and Development Corporation were fabricated into an operational unit and tested. The CO<sub>2</sub> hydrogenation - CH<sub>4</sub> partial oxidation unit from General American Research and Development Corporation (GATX) was installed but not brought on stream.

## REPORT

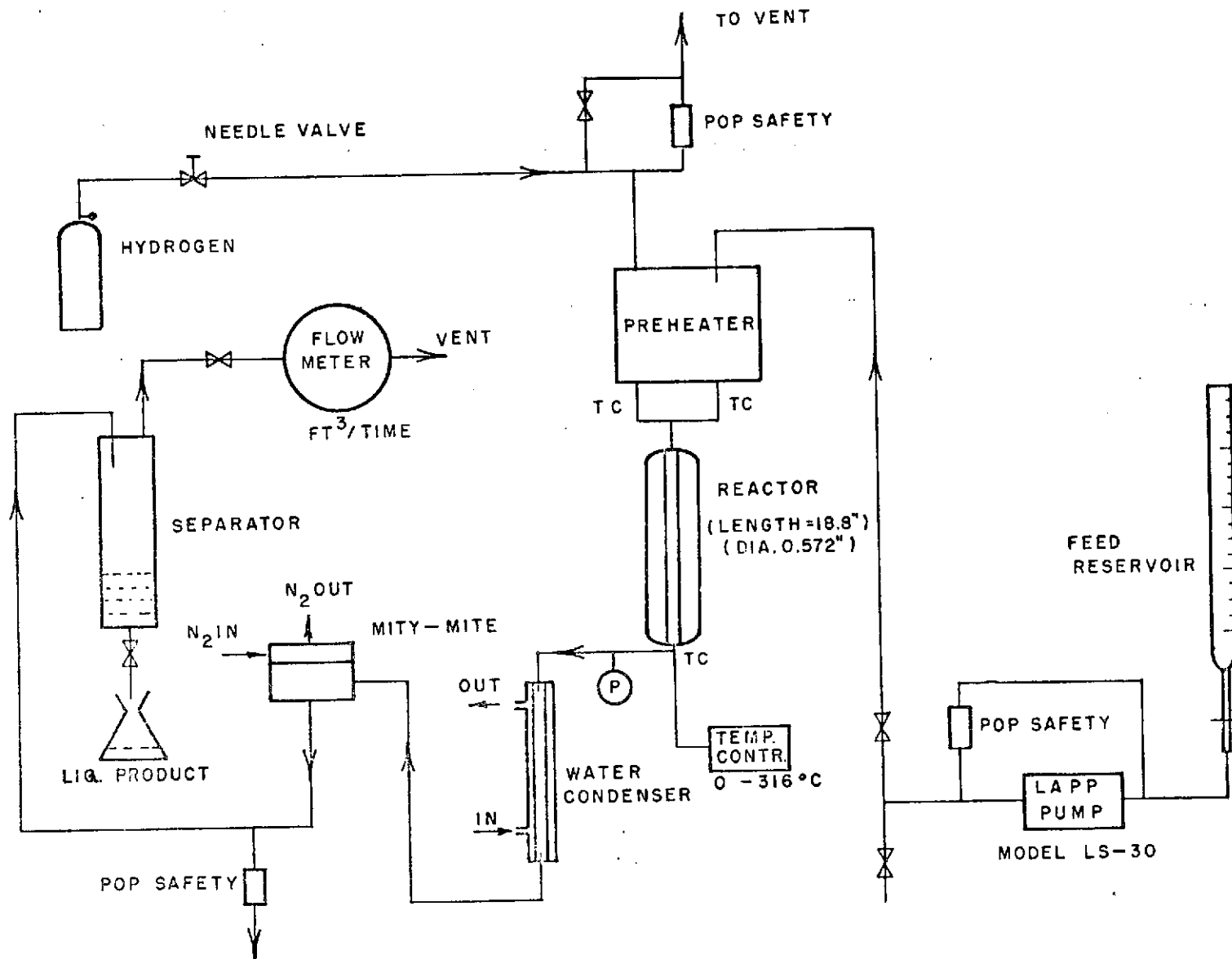
The glycerol hydrogenation unit that was received from ESSO Research and Development Corp. was shipped disassembled to Worcester Polytechnic Institute. The unit included insulated tubing, preheater, reactor, product collection systems, thermocouples, pressure gauge, and a Mighty-mite pressure regulator. It was our task to refabricate the parts into a usable continuous hydrogenation unit. To achieve this, an instrument rack was used to provide a permanent, but movable housing for the assembled unit; and on this rack a control panel was fabricated for variacs, temperature controllers, additional valving, and a calibrated feed reservoir. A Lapp pulsafeeder pump was then mounted on the rack to permit liquid feeding. Gas rotameters, as well as a thermal conductivity gas flow detector with recorder, were installed on the panel. A Kenics static mixer to insert in the trickle-bed reactor to prevent by-passing was purchased.

With this extensive labor and material input completed, the unit was leak tested, debugged, and found to be operational using cyclohexane and hydrogen. Figure 1 is a diagram of the hydrogenation unit, which is now available at Worcester Polytechnic Institute as an operational device.

The CO<sub>2</sub> hydrogenation - CH<sub>4</sub> partial oxidation unit from General American Research and Development Corporation (GATX) was received at Worcester Polytechnic Institute, assembled, instrumented,

and in apparently good order. However, this is far from the installation, debugging, and bringing on-stream of so complex a continuous unit. Project funding did not permit assigning a graduate student to this aspect of the problem, but at no cost to the grant, an undergraduate Chemical Engineering Senior expressed interest in pursuing the work as a thesis. The student was assigned the project of bringing the CH<sub>4</sub> partial oxidation part of the system on-stream. He tested the electrical and mechanical systems, but subsequently dropped the project.

# HIGH PRESSURE TRICKLE BED REACTOR



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Figure 1