

I. EXECUTIVE SUMMARY

Commissioning and shakedown of the LaPorte LPMEOH* Process Development Unit (PDU) represented the culmination of a 2-year effort encompassing the following tasks under DOE Contract Number DE-AC22-81PC30019:

- Task 2 - Engineering and Design Specifications
- Task 3 - Equipment Procurement
- Task 4 - Liquid Phase Methanation Unit Relocation/Inspection
- Task 5 - LaPorte LPMEOH PDU Renovation, Installation and Shakedown

This report discusses the final 4 months (December 1983-March 1984) of this 2-year period, during which the results of these efforts were realized. Following the resolution of an exotherm problem in the preheat train, PDU operation was initiated in the Liquid-Fluidized mode for a shakedown operational test (Run F-1). Due to rapid attrition of the most promising ebullated bed catalyst candidate, developed prior to this DOE contract, 8 days of this operation provide the only data under true Liquid-Fluidized conditions that are available at the LaPorte PDU scale. Operation continued without interruption for 2 additional days in the liquid-entrained mode.

During this operation, a wide range of process variables was examined. Gas throughputs ranged from 660 to 3,550 Nm³/h (25,000 - 135,000 scfh), which correspond to gas superficial velocities of 2.1 to 12.5 cm/s (0.07 - 0.41 ft/s). Oil circulation rates varied from 3.96 to 6.10 cm/s (0.13 - 0.20 ft/s). Balanced (H₂/CO=2.89) and CO-rich (H₂/CO=0.69) feedstocks were used, and normal reactor conditions of 225°C (437°F), 250°C (482°F), 5,270 kPa (765 psia), and 6,310 kPa (915 psia) were employed. CO conversions of 9-50% were achieved, and methanol production ranged from 1,636 to 7,271 kg (1.8 to 8.0 tons) per day.

This run demonstrated the mechanical integrity of the LaPorte LPMEOH PDU. Although the attrition resistance of the liquid-fluidized catalyst was poor, catalyst activity was maintained, and the flexibility of PDU operation in both liquid-fluidized and liquid-entrained modes without interruption was proven.

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