

II. OBJECTIVE AND SCOPE OF WORK

This final report covers the work completed by Chem Systems from July 1, 1976 through November 30, 1978 under DOE Contract #EX-76-C-01-2036. Under this contract, the Liquid Phase Methanation Pilot Plant, constructed in accordance with the requirements of Phase III of Contract #E(49-18)-1505, shall be moved to at least two of the existing coal gasification pilot plants and test-operated on the synthesis fuel gas generated at each such facility. Such tests are a necessary step in the continued development of this technique of methanation. The work is divided into the following areas as described below:.

A. Operational Tests at the HYGAS Pilot Plant

The Liquid Phase Methanation (LPM) Pilot Plant was constructed as a skid-mounted unit in Texas City, Texas. The first phase objectives are:

- Relocate the LPM Pilot Plant to the HYGAS Facility in Chicago, Illinois.
- Install the pilot plant at the proper location on the site of the HYGAS Pilot Plant.
- Plan and supervise the experimental test program. This includes fluidization tests, process variable scans, axial diffusion tests and a short-term continuous run.
- Prepare the LPM Pilot Plant for relocation.

B. Operational Tests at a Second Coal Gasification Pilot Plant Site

The second phase includes the testing of the LPM Pilot Plant at a second coal gasification site. The objectives are:

- Relocate the pilot plant to a second site to be designated by DOE.
- Install the pilot plant at the proper location at the site of the second coal gasification pilot plant.
- Plan and supervise the experimental test program. This includes fluidization tests, process variable scans, and a short-term continuous run.
- Prepare the LPM Pilot Plant for relocation and/or storage, such option to be designated by DOE.

C. Correlation of Data and Economic Evaluation Process

Throughout the performance of the experimental test program at the first and second coal gasification pilot plant sites, all experimental data shall be collected, reduced and correlated, as necessary to:

- Make appropriate adjustments in the test program.
- Evaluate the technical feasibility of this methanation technique.
- Prepare design correlation suitable for use in the construction of a commercial-scale unit
- Perform an economic evaluation of the process as it might be implemented in a commercial coal gasification facility.

D. Laboratory Support Work

Throughout the performance of the test program, a bench scale unit and a process development unit shall be available and ready for use. These

units will be utilized as required in order to assist in solving problems that may be encountered during start-up and operation of the Liquid Phase Methanation Pilot Plant. This will include testing of new hydrocarbon liquids and catalysts that might be suitable or required for pilot plant operation.

E. Studies on Rates of Carbon Formation in Methanators

Support studies will be conducted to determine the significance of several different factors upon the thermodynamics and rate-controlled mechanisms of carbon formation in methanators. Five parallel methanation units will be constructed, and an experimental test program will be performed. These tests will use synthesis gases which span the range of compositions normally encountered. The test runs will include variable scans, catalyst scans, time tests, activity tests, and regeneration tests. The data gathered will be used to establish empirical models and prepare a final report.