

Quarterly Technical Progress Report

Reporting Period: 1st Quarter FY 2000 (Oct. - Dec. 1999)
Project: Syngas Upgrading - A Low temperature Approach - Phase 1
DOE Contract: DE-AC26-99EE40248
Bechtel Job: 24353

USDOE-FETC

Technical Activities Performed During the Reporting Quarter:

The following paragraphs summarize the technical activities conducted during the reporting period.

The NEPA questionnaire was duly filled out and submitted to DOE/NETL on November 30, 1999. This submission fulfilled the milestone deliverable titled "NEPA Questionnaire/Documentation" under this WBS (Task 1.1).

We visited Dr. Wheeler North's laboratory at Cal Tech to review the test methodology and physical disposition of his experimental setup. It was arranged with Dr. North that his experimental setup would be "loaned" and relocated to LANL. The nucleation reactor was then relocated to LANL.

Johnson Family Enterprises was selected as the supplier of hydrate venturi reactors. This sole-source selection was made based on Johnson's unique experience in fabrication of venturi reactors applicable to CO₂ hydrate experiments. Johnson had previously supplied this kind of reactor to Cal Tech for similar experiments.

The specification for the 1st hydrate reactor was forwarded to Johnson for fabrication of the 1st hydrate venturi reactor.

Technicians at Los Alamos began to determine precisely what high pressure equipment exists in-house which may be used in support of the project. This includes vessels, pumps, tubing, fittings, and chillers/heat exchangers. This effort identified which equipment items must be purchased prior to system assembly. Preliminary design work was done on both static and flow systems, with special attention to the required instrumentation, safety features, and sampling ports. LANL also obtained quotes for vessels and instrumentation needed for the phase equilibrium studies and nucleation reactors.

Effort was put into systematic review of published equilibrium data. Systematic comparisons were made with the phase behavior predicted by an available hydrate equilibrium code. This will provide some guidance as to the expected accuracy of the codes should they be used for design or analysis purposes. The experimental test plan and key measurements to be made were also refined.

LANL initiated the preparation for the screening tests of the nucleation reactor.

LANL has initiated and finished specifying the gas chromatograph.

Shifted synthesis gas compositions were reviewed on both weight and volumetric

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bases from a high pressure Dynegy gasifier, particularly the methane concentration in the shifted synthesis gas stream. Calculated and noted that the methane weight percent is only 6% from the high pressure Dynegy gasifier, which represents only 2.1% by volume.

Held extensive discussions between Dwain Spencer and Robert Currier regarding both the planned experimental program and details associated therewith, as well as new concepts and ideas regarding methods to enhance CO₂ separation from a shifted synthesis gas, as well as other mixed gas streams containing CO₂.

LANL has done design work on both static and flow systems for the hydrate production. Assembly of test systems has begun in the laboratory. This includes systems for both the hydrate production reactors for the phase equilibria stills.

Consultations with LANL ES&H personnel indicate that the planned high flow of hydrogen and H₂S may be problematic (at the highest flows given in the experimental plan). Those hydrogen quantities may lead to potentially explosive concentrations within the fume hood system. The quantities of H₂S technically exceed limitations given by the state permit. LANL is exploring other options such as catching the hydrogen for a slower release, or alternatively, using helium as a hydrogen surrogate. They are in the process of determining if they are permitted to integrate the H₂S emissions over longer periods of time. If so, then short duration runs may be permissible at the high flow rates without violation of the permit.

At the request of Dr. Dorchak, NETL Project Manager, Mr. Dwain Spencer prepared a non-proprietary response to the criticisms prepared by Mr. Goldthorpe of Woodward-Clyde regarding the SIMTECHE CO₂ Hydrate Separation Process. This letter was forwarded to Dr. Dorchak on 9 December, 1999

At LANL, local NEPA paperwork was submitted and is under review. The Laboratory -mandated hazard control plan was submitted for review and approval by ES&H subject matter experts.