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A STUDY OF HYDROCARBONS ASSOCIATED WITH BRINES
FROM DOE GEOPRESSURED WELLS

COOPERATIVE AGREEMENT: DE-FC07-90ID12945

1992 ANNUAL REPORT
(12/17/91 to 12/31/92)

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REPORTING PERIOD

The nature of the work being performed under the existing cooperative agreement is of such a nature that the period covered in this 1992 Annual Report extends from December 17, 1991 through December 31, 1992.

HYDROCARBONS ASSOCIATED WITH BRINES
FROM GEOPRESSURED WELLS

Summary of Research Goals:

The objective of the work is to study the production of aromatic hydrocarbons, the mechanism by which they are produced in the reservoir, and their collective properties. The research will be accomplished by collecting samples from DOE design wells, analyzing the hydrocarbons, and monitoring the production of the hydrocarbons from the gas and brine.

Task 1: DOE DESIGN WELL SCRUBBER ANALYSIS

Statement of task

The University of Southwestern Louisiana (USL) shall prepare gas scrubber bottles and leave them for well-site personnel to insert and exchange each day in the USL designed collection apparatus (already installed at the Pleasant Bayou Well and under construction for installation at the Hulin Well). USL shall recover all daily samples on its regular well visits and return them to their laboratory for gas chromatographic analysis for benzene and toluene.

Report Period

Between 12/17/91 and 12/31/92, two hundred ten (210) scrubber samples were collected by Pleasant Bayou Well personnel and brought back by USL personnel to our laboratory for analysis.

Task 2: DOE WELL SAMPLING

Statement of task

USL shall collect the cryogenically condensable hydrocarbons from the gas streams and brine streams at the Pleasant Bayou Well and Hulin Well monthly. All necessary sample treatment and preparation will be done at the site to ensure the validity of subsequent analytical results.

Report Period

The only well continuously in operation during the past year has been the Pleasant Bayou well. The well was cryogenically sampled as follows:

<u>Date</u>	<u>Flow Rate</u> (bbls/day)
1-24-92	23,030
2-28-92	12,680
5-8-92	17,270
6-10-92	23,790
7-16-92	23,510
8-20-92	23,120
9-11-92	11,040

Samples were taken each month that the well flowed for a significant period of time.

Task 3: ANALYSIS OF WELL SAMPLES

Statement of task

USL shall analyze the samples taken from wells by gas chromatography to determine the type and amount of cryocondensate hydrocarbons in the formation brine. Monitoring of variations in these hydrocarbons concentrations as a function of the production volume will be performed.

Report Period

The regular cryocondensate samples and the scrubber samples were returned to the laboratory and analyzed by gas chromatography and the yield of the products determined. Table I summarizes the total cryocondensate concentration as well as the concentrations in the brine and the gas after passing the separator system. Figure 1 displays the total cryocondensate yield, from the cryogenic measurement, as a function of production volume. The graph includes data from the beginning of the current long-term test on the Pleasant Bayou Well. Figure 2 displays the same data for the time period covered by this report. The total daily cryocondensate yield determined from the scrubber samples up to September 11, 1992 is shown in Figure 3. Figure 4 displays the same data for the period of this report. The filled circles in both Figures 3 and 4 indicate dates on which the daily samples were normalized to the cryocondensate samples.

Table I. Cryocondensate Concentrations as a Function of Production Volume.

<u>Date</u>	<u>Cumulative Brine Volume (Mbbl)</u>	<u>Cryocondensate</u>		
		<u>Total</u> $\mu\text{L/L}$	<u>Gas</u> $\mu\text{L/L}$	<u>Brine</u> $\mu\text{L/L}$
1-24-92	21.53	41.19	21.90	19.29
2-28-92	22.19	37.73	18.83	18.90
5-8-92	22.46	39.55	19.23	20.32
6-10-92	23.24	40.03	19.64	20.39
7-16-92	24.08	40.56	20.47	20.09
8-20-92	24.87	45.68	19.05	26.63
9-11-92	25.27	39.83	20.76	19.07

Task 4: Review of Theoretical Models of Geopressured Reservoir Hydrocarbons

Statement of task

USL shall develop a review of theoretical models of geopressured reservoir hydrocarbons from the published literature. This review will serve as a foundation for the development and extension of theoretical models planned in Task 5.

Current Reporting Period

Work on this task is continuing.

Task 5: Monitor for Aliphatic Hydrocarbons

Statement of task

USL shall continue to study and to monitor the brine streams of geopressured wells for the production of aliphatic hydrocarbons. Hydrocarbon yields will be correlated with well operating parameters. This information will be used to develop and extend theoretical models of reservoir hydrocarbons. Experimental tests will be suggested to verify or reject the theoretical models.

Current Reporting Period

Other than for the exsolved gas from the brine no heavier aliphatic hydrocarbons were produced by the Pleasant Bayou Well during 1992.

Task 6: Removal and Disposition of Gas Scrubber Equipment at Pleasant Bayou Well

Statement of task

Upon termination of brine production , USL personnel will remove the gas scrubber equipment at the Pleasant Bayou well site.

Current Reporting Period

USL personnel removed the gas scrubbing equipment from the Pleasant Bayou well site on 10/10/92 as per the task requirement.

Task 7. Disposition of Archived Brines

Statement of task

USL will dispose of archived brine samples from several DOE geopressured wells, which are currently stored at USL, in a manner consistent with state and Federal regulations.

Current Reporting Period

USL personnel transported ninety-nine gallons of archived geopressured brine to the Pleasant Bayou well site on December 18, 1992 where it was combined with similar brine from that well which will be disposed of in a manner consistent with state and Federal regulations.

USL still possesses four gallons of condensate and a large number of well cores which will need to be disposed of.

Other comments

1. Dr. Keeley met regularly with Dr. Jane Negus-de Wys to review the technical progress on the contract tasks.
2. In a separate but related research effort, in that it involves aromatic compounds similar to those that are present and exsolved from geopressured brines, Dr. Keeley has observed and measured the magnitude of the multilayer physical adsorption of such aromatic compounds on iron surfaces.

The results suggests that care should be exercised by anyone involved in the handling of steel pipe used at geopressured well sites, particularly gas transmission pipe.

The nature and magnitude of the physical adsorption is such that visible evidence of the presence of adsorbed aromatic compounds may not be apparent. The amount of adsorbed material will be dependent not only upon the partial pressures of the aromatic compounds in the gas, but also upon the temperature, the inner surface area of the pipe and upon the surface properties of the pipe, e.g., the presence of microscopic holes, cracks, and other surface irregularities.

Figure 1. Plot of the total, gas, and brine yields of cryogenic hydrocarbons as a function of cumulative brine production at the Pleasant Bayou Well. Data is from samples cryogenically collected from exsolved gas and from extracted brine samples. Data covers the period 6/17/88 to 9/10/92.

Figure 2. Plot of the total, gas, and brine yields of cryogenic hydrocarbons as a function of cumulative brine production at the Pleasant Bayou Well. Data is from samples cryogenically collected from exsolved gas and from extracted brine samples. Data covers the period 12/17/91 to 9/10/92.

Figure 3. Plot of total cryocondensate yield as a function of date as obtained from scrubber samples collected by Pleasant Bayou Well personnel and analyzed by USL personnel. Samples are normalized to the cryocondensate yields obtained from samples collected by USL personnel (closed circles). Data covers the period 4/22/89 to 9/11/92.

Figure 4. Plot of total cryocondensate yield as a function of date as obtained from scrubber samples collected by Pleasant Bayou Well personnel and analyzed by USL personnel. Samples are normalized to the cryocondensate yields obtained from samples collected by USL personnel (closed circles). Data covers the period 12/17/91 to 9/11/92.