# Gas/Liquid Membranes For Natural Gas Upgrading

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## *DISCLAIMER*

## *ABSTRACT*

Efforts this quarter have concentrated on design and planning for of a 50 MM scf/d dehydration skid testing at ChevronTexaco's Headlee Gas Plant in Odessa, TX. Potting and module materials testing concluded. Construction of the bench-scale equipment continued and a pre-engineering study on a subsea application of the technology was performed cofunded contracts with Research Partnership for Secure Energy for America and Gas Research Institute. GTI has decreased the effort under this contract pending DOE's obligation of the total contract funding.

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## *INTRODUCTION*

Gas Technology Institute (GTI) is conducting this research program whose objective is to develop gas/liquid membranes for natural gas upgrading to assist DOE in achieving their goal of developing novel methods of upgrading low quality natural gas to meet pipeline specifications.

Kværner Process Systems (KPS) and W. L. Gore & Associates (GORE) gas/liquid membrane contactors are based on expanded polytetrafluoroethylene (ePTFE) membranes acting as the contacting barrier between the contaminated gas stream and the absorbing liquid. These resilient membranes provide much greater surface area for transfer than other tower internals, with packing densities five to ten times greater, resulting in equipment 50 – 70% smaller and lower weight for the same treating service.

The scope of the research program is to (1) build and install a laboratory- and a field-scale gas/liquid membrane absorber; (2) operate the units with a low quality natural gas feed stream for sufficient time to verify the simulation model of the contactors and to project membrane life in this severe service; and (3) conducted an economic evaluation,

based on the data, to quantify the impact of the technology. Chevron, one of the major producers of natural gas, has offered to host the test at a gas treating plant. KPS will use their position as a recognized leader in the construction of commercial amine plants for building the unit along with GORE providing the membranes. GTI will provide operator and data collection support during lab- and field-testing to assure proper analytical procedures are used. Kværner and GTI will perform the final economic evaluation. GTI will provide project management and be responsible for reporting and interactions with DOE on this project.

## *EXECUTIVE SUMMARY*

The cofunding agreement with ChevronTexaco continues under discussion. ChevronTexaco's Chinchaga Gas Plant in Alberta, Canada will not be increasing capacity as planned. Since they do not have a commercial need for the contactor, they have withdrawn that site and are seeking another suitable location. We continue seeking alternative hosts and sites as a backup. A meeting was held with ChevronTexaco in Denver last quarter, 2002 to identify potential locations. Most of their needs are outside the North American market.

Early in 2003, ChevronTexaco identified a potential test site in West Texas. The application here is for a full-scale dehydration unit, similar in size as originally proposed, but for a different natural gas processing application. A meeting was held with ChevronTexaco, GTI and KPS at the Headlee Gas Plant in Odessa, TX, to investigate testing, contract terms, schedules, and responsibilities. A design review meeting (originally planned as a HazOp review, but served more as design) was conducted at KPS offices in Houston, TX during the third quarter, 2003. For this analysis, focus was on issues directly affecting the planned tie-ins.

A meeting was held with Tony Zammerilli, DOE Project Manager, in Morgantown, PA to review status of the project during the third quarter, 2003. This project has been delayed due to the time required to secure an appropriate site after the originally proposed site became unavailable. GTI has slowed down the project so that the original funding would be available. However, the cost of the test has increased. KPS and ChevronTexaco have increased their planned co-funding, but there is still a gap. He indicated that there is no out-year funding for Gas Processing projects in the DOE budget. He indicated that he would be responsive to reasonable changes in the program direction to help ensure the test occurs, within the bounds of the contract. The Contract Administrators must approve any changes to schedule and costs.

GTI was awarded a research contract from Research Partnership for Secure Energy for America (RPSEA) that will provide cofunding for this project. The objective of the proposed project is to develop gas/liquid membrane contactors for deep, offshore processing of natural gas to decrease the overall cost to bring these valuable reserves to the market. The scope of work for this program is to design, construct, install, and operate a 50 million standard cubic feet per day commercial-scale dehydration absorber in a gas plant environment at 900 psi, in conjunction with the DOE Project. This

absorber will be designed to offshore specifications so that it can be moved to platform operations, if successfully demonstrated. Prior to installation, a novel membrane protection system will be tested in the laboratory to study response time under simulated failure modes. An engineering research study will design the dehydration system for a typical deepwater, offshore Gulf of Mexico application and then conceptualize a subsea installation utilizing the technology.

During the first quarter, 2004, GTI requested DOE commit the remainder of the contract funds for the effort. DOE does not have the funds available at this time. It was agreed that the contract would be kept open as additional funding is sought. GTI has, accordingly, decreased the effort.

## *EXPERIMENTAL*

**ChevronTexaco module:**

The design of the test module continues under KPS, CT, and RPSEA funding.

**Potting Testing**

The potting tests were completed under KPS funding.

**Laboratory Testing**

Design work continued on the GTI laboratory apparatus through RPSEA and GRI funding.

## *RESULTS AND DISCUSSION*

None.

## *CONCLUSION*

None.

## *REFERENCES*

None