

RPSEA-0019-04

GRI-04/0213

**DEEP, OFFSHORE NATURAL GAS DEHYDRATION
USING
GAS/LIQUID MEMBRANE CONTACTORS**

FINAL TECHNICAL REPORT

November 1, 2003 – September 30, 2004

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13. ABSTRACT (Maximum 200 words) Gas/liquid membranes have the potential for significant savings for dehydration of offshore natural gas. However, this emerging technology must be demonstrated onshore before it is applied offshore. ChevronTexaco has provided a test site at their Odessa, TX Headlee Gas Plant for an onshore test. Additional design and equipment necessary for offshore application has been identified and purchased for the laboratory and demonstration test. Kvaerner Process Systems has expanded the application for subsea, where the dehydration would take place on the sea floor with qualitative advantages. The results of the Headlee testing will be published at their conclusion in 2005.			
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3. RESEARCH SUMMARY

- TITLE:** Final Technical Report, "Deep, Offshore Natural Gas Dehydration Using Gas/Liquid Membrane Contactors"
- CONTRACTOR:** Gas Technology Institute, Des Plaines, Illinois
- PRINCIPAL INVESTIGATOR:** Howard S. Meyer
- REPORT PERIOD:** November 2003 – September 2004
- OBJECTIVE:** The objective of this project was to evaluate and support gas/liquid membrane contactor testing for dehydration of natural gas.
- TECHNICAL PERSPECTIVE:** All offshore natural gas production requires dehydration to prevent hydrates, reduce corrosivity, and reduce production costs. This may be performed a number of times from the subsea well head, on the production platform, and onshore. This is typically performed in one of two ways, namely, glycol injection and glycol absorption. Both practices add to the cost of gas production. The gas/liquid membrane technology offers size, weight and cost savings compared to conventional contacting towers or columns that can decrease the cost of producing natural gas.
- RESULTS:** A 50 MM scf/d, onshore, commercial demonstration of natural gas dehydration unit is being designed to offshore specifications. Compactness, reliability, and maintainability considerations have been factored into the design of the system. Subsea use of the technology was found to have qualitative advantages over glycol injection and onshore dehydration. Laboratory equipment was prepared for systematic testing of the technology for these new resources.
- TECHNICAL APPROACH:** This project was performed as part of a cofunded effort with Kvaerner Process Systems, ChevronTexaco, US Department of Energy, and the Gas Research Institute to support the development of the gas/liquid membrane contactor through a demonstration test at ChevronTexaco's Headlee Gas Plant in Odessa, TX.

The purpose of the demonstration at Headlee is to operate the commercial-sized unit at conditions similar to those expected for an anticipated future offshore gas development, and at an onshore location to reduce the cost and simplify the logistics for the testing. This demonstration testing is a prudent way to show the robust operation of this new technology in a real operating environment, without exposing a new operation to the economic risk inherent in trying something new. The Headlee site was chosen because it had an existing TEG unit of appropriate size, and an operating configuration that allowed testing without jeopardizing saleable product specs.

Field experimentation of the gas/liquid membrane technology was previously performed at the 1 MM scf/d scale at Duke Energy Field Services' Marla Compressor Station near Denver, CO. The testing at Headlee represents a scale-up of a factor of 50 in throughput. Scale-up and offshore use issues required new design approaches for essentially every part of the technology.

KPS performed process and overall system design and fabrication as well as the engineering study, performed at their own cost. W.L. Gore and Associates had responsibility for membrane fabrication. SGL, Inc. was responsible for the membrane canister. OBS was responsible for the Membrane Protection System. GTI was responsible for preparation of the laboratory unit and overall project management.

**PROJECT
IMPLICATIONS:**

RPSEA, along with funds from Kværner Process Systems, ChevronTexaco, US Department of Energy, and the Gas Research Institute, is supporting an overall program for the development of gas/liquid membrane contactors for natural gas processing. The demonstration will be conducted in mid-2005. The work here was critical for the ultimate success of that test. The technology offers the potential to help economically recover natural gas from offshore and marginal resources that would otherwise not be brought to market.

**PROJECT
MANAGER:**

Mr. Howard S. Meyer, Manager, Gas Processing