QUARTERLY PROGRESS REPORT

Report Title: Field Demonstration of a Membrane Process to Separate Nitrogen from Natural Gas: Sixteenth Quarterly Progress Report

Type of Report: Quarterly progress report

Reporting Period: July 1, 2005 through September 30, 2005

Contact: Dr. Kaaeid Lokhandwala
Tel: (650) 328-2228 ext. 140
e-mail: kaaeid@mtrinc.com

Date of Report: December 15, 2005

DOE Award Number: DE-FC26-01NT41225

Submitting Organization: Membrane Technology and Research, Inc.
1360 Willow Road, Suite 103
Menlo Park, CA 94025

Tel: (650) 328-2228
Fax: (650) 328-6580
www.mtrinc.com

Subcontractors: None

Other Partners: ABB Lummus Global

Project Team: Project Officer: Anthony Zammerilli
Contract Specialist: Keith L. Carrington

Disclaimer

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Abstract

The original proposal described the construction and operation of a 1 MMscfd treatment system to be operated at a Butcher Energy gas field in Ohio. The gas produced at this field contained 17% nitrogen. During pre-commissioning of the project, a series of well tests showed that the amount of gas in the field was significantly smaller than expected and that the nitrogen content of the wells was very high (25 to 30%). After evaluating the revised cost of the project, Butcher Energy decided that the plant would not be economical and withdrew from the project. Since that time, Membrane Technology and Research, Inc. (MTR) has signed a marketing and sales partnership with ABB Lummus Global, a large multinational corporation. MTR is now working with the company's Randall Gas Technology Group, a supplier of equipment and processing technology to the natural gas industry.

Randall's engineering group first found a new site for the project at a North Texas Exploration (NTE) gas processing plant. The plant produced about 1 MMscfd of gas containing 24% nitrogen. The membrane unit was built to bring this gas to 4% nitrogen for delivery to the pipeline. The membrane skid was built by ABB. NTE ordered the required compressor and MTR made the membrane modules for a December 2004 delivery. However, the gas supply was not steady enough for field testing, and MTR/ABB have now located other sites for field testing and commercial development.

Table of Contents

Introduction.....	2
Experimental	2
Results and Discussion	2
Additional Field Sites	2
Other Commercialization News.....	3
Conclusion	3
References.....	3

Introduction

The natural gas specification for inert gases is less than 4%. On this basis, about 17% of known U.S. reserves of gas are subquality due to high nitrogen content. Some of this gas can be brought to pipeline specifications by dilution with low-nitrogen-content gas; some is treated by cryogenic condensation and fractionation. Nonetheless, about 1.0 trillion scf of known reserves are currently shut in.

This project covers the first demonstration of a new membrane technology to treat this otherwise unusable gas. The objective of this project is to develop a membrane separation process to separate nitrogen from high-nitrogen-content natural gas. To demonstrate the process, a proof-of-concept plant was built at a North Texas Exploration (NTE) gas field in Texas/Oklahoma.

Additional test sites are also being explored.

Experimental

The NTE installation was stopped and the system was removed from the site due to constant gas production issues from the client. The unit is stored in Houston. A large gas utility company has expressed an interest in acquiring the unit for another site in North Texas. Negotiations on this are expected to last through Q1 2006 since different producers are involved, and there may be a contractual requirement from the utility to drill additional wells to ensure gas flows.

Results and Discussion

Test results accumulated during the short period of time when the unit was operational at NTE were encouraging. Longer-term data will be collected as we identify and deploy the unit at the next location.

Additional Field Sites

Our second commercial installation at Twin Bottoms, KY has been operational since November 2004. The system has consistently performed at or better than guaranteed and has demonstrated unequivocally that the nitrogen/methane membrane separation process works and is commercially viable. Due to the very flexible design of this unit, the client has been able to “dial-in” the nitrogen content in the produced gas and thereby has maximized the total production and revenues generated.

The membrane unit has been online virtually 100% of the time since it started up. The first unit related to this project, the Omaha Public Power District (OPPD) unit was installed in Omaha, NB, and has operated with virtually no downtime whatsoever for about 3 years.

Other Commercialization News

A new order for a unit in a similar duty to the OPPD unit was received this quarter. The total commercial sales-to-date in the nitrogen/methane membrane separation area are US\$1.46 million; product sales are expected to reach US\$2 million by Q4 2005.

Conclusions

MTR has successfully tested the nitrogen/methane separation process in a commercial unit and demonstrated its performance at one wellhead site in Kentucky. The successful demonstration has resulted in the sales of several commercial units. All installed commercial units are operating at or better than guarantee conditions and our clients have given us several good references for further development of this business. Total commercial sales-to-date of US\$1.46 million have been made for the product line developed from this project. Further sales are expected in 2005.

References

None cited.