QUARTERLY PROGRESS REPORT

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

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 will be 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 has found a new site for the project at a North Texas Exploration (NTE) gas processing plant.

The plant produces about 1 MMscfd of gas containing 24% nitrogen. The membrane unit will bring this gas to 4% nitrogen for delivery to the pipeline. The membrane skid is being built by ABB. NTE has ordered the required compressor and MTR is making the membrane modules. The membrane skid is scheduled to be completed by December 29. Our target is to have the unit installed and optimized by mid-January.

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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, due to high nitrogen content.

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 is being built at a North Texas Exploration (NTE) gas field in Texas/Oklahoma.

Additional test sites are also being explored.

Experimental

The membrane system was installed and started up at the NT Exploration site. The client was expecting to get a minimum of 1 MMscfd of inlet gas but has been only able to produce about 0.6 MMscfd thus far. In addition, the inlet gas is water saturated which has resulted in other issues with the operation of the compressor.

The field site issues including lack of gas available for processing in the membrane unit and production of oil-water emulsions in the compressors were addressed. The latter issue is now fully resolved and the membrane system is seeing essentially no emulsion carryover from the compressors. However, the former issue of lack of adequate gas to process still continues. The client (NTE) is pursuing various well treating alternatives to stabilize the well production. Results of these efforts will become apparent in November 2004.

Results and Discussion

During the reporting period, the membrane unit operated at the NTE facility. The results obtained from analysis by the pipeline company indicated that during the day of operation, the membrane system was producing spec quality gas. We are still awaiting stabilization of the production flows at the site to obtain a complete set of test results.

Additional Field Sites

MTR installed a small semi-commercial demonstration system at a client site (Twin Bottoms, LLC) in Louisa, KY. The proposed flow scheme is shown in Figure 1.

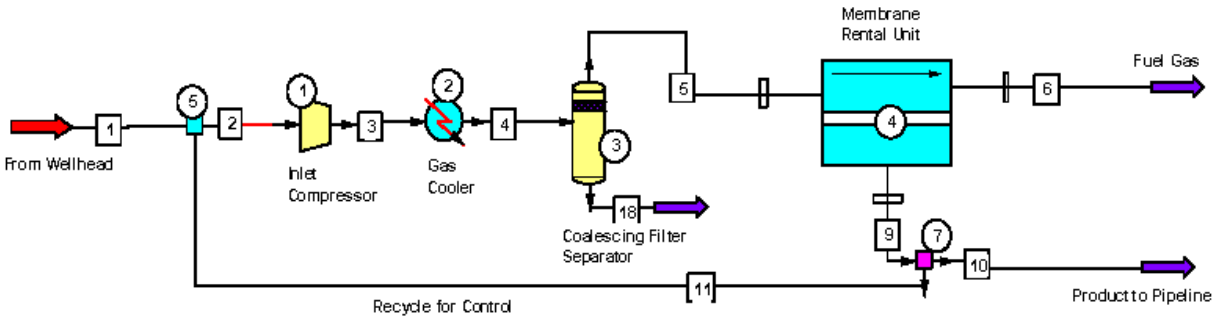

Figure1. Process flow diagram for treating high-nitrogen-content natural gas.

The membrane system was installed into the facility in 8 hours and the startup of the unit was attended by MTR personnel. The startup of the system and stabilization of the system took about 2 hours. MTR provided a quick onsite gas analysis capability to the client and the gas compositions of the feed, residue and permeate were tested. The system was deemed to meet the expected system performance and pipeline-quality gas (< 4 mol % N_2) was being produced after some adjustment on the second day.

The Louisa, KY, test system has been continuously operating since installation in July 2004 and has been producing pipeline-quality gas.

In September, the client, Twin Bottoms, LLC placed a commercial order for a unit to replace the test unit at the site. The commercial unit is being designed to handle up to a maximum of 0.4 MMscfd, with an initial capacity of 0.2 MMscfd. The system will be shipped to the client in November, 2004. A picture of this commercial unit is shown in Figure 2.

Figure 2. Photograph of the commercial unit to be shipped to Twin Bottoms, LLC.

Conclusions

MTR successfully tested the nitrogen removal membrane unit and demonstrated its performance at one site in Kentucky. The successful demonstration resulted in the sale of a commercial unit which will be installed and brought online in November 2004. The demonstration unit at the NTE facility in North Texas is installed but awaiting complete continuous operation due to limitations imposed by lack of gas.

References

None cited.