

QUARTERLY PROGRESS REPORT

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

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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 precommissioning 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 their 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 Duke Energy gas processing plant in Milfay, Oklahoma.

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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.

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 will be built and operated.

Experimental

No experiments were performed during this reporting period.

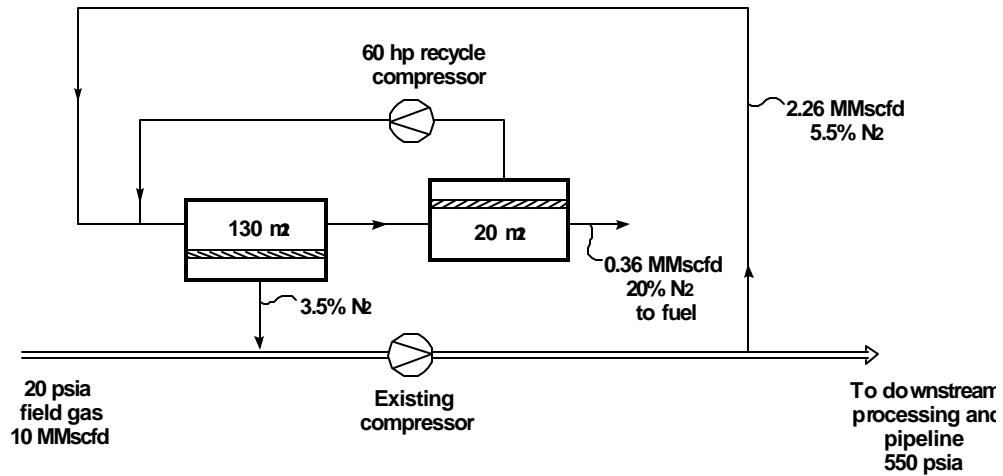
Results and Discussion

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 precommissioning 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 test 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, MTR has signed a marketing partnership with ABB Lummus Global, a large multinational corporation. We will be working with their 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 Duke Energy gas processing plant in Milfay, Oklahoma.

The Milfay plant processes approximately 10 MMscf of gas. The plant has received a waiver from the pipeline to deliver gas containing up to 6% nitrogen (which is the average nitrogen content of the gas produced). Additional gas could be produced by the plant, but this gas contains 8-10% nitrogen. The MTR-ABB membrane system will treat a 5.5 % nitrogen high-pressure gas from the plant, producing a 20% nitrogen-rich residue gas that will be used to fuel the plant's compressors and a 3.5 % nitrogen stream that will be mixed with the gas sent to the pipeline. This system will allow the Milfay plant to deliver an additional 0.5 MMscfd of gas without infringing its current waiver. Duke Energy and ABB will provide the materials share required for this project.

A simplified flow diagram of the proposed system is shown in Figure 1. A two-step membrane process is used to treat the 2.3 MMscfd gas containing 5.5% nitrogen into a 0.36 MMscfd residue gas containing 20% nitrogen and a permeate containing 3.5% nitrogen. A 60 hp compressor will be required to recycle the second stage permeate to the feed.



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Figure 1. A two-step membrane separation system to process 2 MMscfd of gas to produce 3.5% nitrogen gas.

Conclusion

The membrane system shown in Figure 1 will be designed and fabricated by ABB. MTR will provide the membranes and modules. The system is expected to be ready for installation by July.

References

None cited.