

**ADVANCED TECHNOLOGIES FOR  
STRIPPER GAS WELL ENHANCEMENT**

**QUARTERLY REPORT**

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## **ABSTRACT**

As part of Task 1 in Advanced Technologies for Stripper Gas Well Enhancement, Schlumberger Data & Consulting Services (DCS) joined with two Appalachian Basin producers, Great Lakes Energy Partners, LLC, and Belden & Blake Corporation to develop methodologies for identification and enhancement of stripper wells with economic upside potential. These industry partners previously provided us with data for more than 700 wells in northwestern Pennsylvania.

Phase 1 goals of this project are to develop and validate methodologies that can quickly and cost-effectively identify wells with enhancement potential. We have enhanced and streamlined our software, and we are using the final version of our new Microsoft<sup>TM</sup> Access/Excel programs. During the last quarter of 2002, we received additional data for approximately 2,200 wells from Great Lakes. This information pertains to their Cooperstown field located in northwestern Pennsylvania. We recognized approximately 130 potential remediation candidates, and Great Lakes' personnel are currently reviewing this list for viable remediation. This field has provided a rigorous test of our software and analytical methods.

We have processed all the information provided to us including the Cooperstown data. Great Lakes also provided supplemental data listing the original operator of the wells. We are also determining whether a statistically significant number of underperformers correlate to specific operators and/or their associated completion/stimulation methods. In addition, the DOE has reviewed a draft version of a final report.

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## INTRODUCTION

During this report period, we continued to work with our two industry partners, Great Lakes Energy Partners, LLC (Great Lakes), and Belden & Blake Corporation (B&B). As mentioned in our last update, Great Lakes supplied data for approximately 205 wells located in Warren, Venango, and Crawford counties, Pennsylvania, and B&B provided information for  $\pm$  501 wells situated in Venango and Warren counties, Pennsylvania. We have used this data to test and improve our Microsoft<sup>TM</sup> Access/Excel software, and recognize underperformers.

As an enhancement to our analysis, Great Lakes has provided us with production data for more than 2,200 additional wells for the Cooperstown Field which is located in Crawford, Venango, and Indiana Counties, Pennsylvania. Final evaluation of this field is underway.

## EXPERIMENTAL

We have utilized our new software tools to conduct a rapid, first-pass search for wells possessing enhancement potential. To begin the process, we generated a single Production Indicator (PI) capable of representing the entire production life of a well. The software has the ability to calculate two PI's (x-year cumulative versus Date of First Production (DOFP), and normalized rate versus DOFP). The first indicator is obtained by determining the cumulative gas production over a user-specified input period (e.g. 3 yr, 5 yr, 8 yr, etc.) versus a well's DOFP, and the second PI is determined by calculating the normalized (i.e. the average monthly production rate for the desired year) gas production rate for the chosen year of production.

We then compared the PI's of a target well relative to the average of its offsets within a chosen radius (e.g. 5,000 ft), and identified target wells that are underperforming.

The software compares the PI of a target well to the average indicator of its offsets. A user chooses a percentage (e.g.  $\geq$  50%) that a target well's PI must be below the wells within its domain in order to be recognized as a low-performer. The entire well list is processed and all qualifying target wells that meet the chosen criteria are listed. This provides a rapid, efficient, and automated method to identify wells that are underperformers and that may have potential for production enhancement.

Our first pass of the original data is finished and we identified a list of wells with promising enhancement potential. We discussed these results with B&B and Great Lakes and reviewed the completion, geologic, and production data in detail. We have further refined our list with the Cooperstown data to establish a good basis for a Phase II field demonstration. Economic viability will need to be considered for any candidates selected.

## **RESULTS AND DISCUSSION**

DOE has successfully beta-tested the SWARM software. A user-friendly interface has been included as this is of major importance in making the program relatively easy and inexpensive to use by the operators. Enhanced features such as generating applicable location maps and rate-time plots have been added.

## **CONCLUSION**

We received data for almost 3,000 wells from which wells with possible production enhancement potential were recognized. We tested the software and it provides an easy and rapid way to identify wells that may have upside potential.

We will prepare a Final Technical Report upon completion of the Cooperstown field evaluation.

From our experience in the Appalachian Basin, we are confident that a several stripper wells with enhancement potential have been found in this data set, subject to review for economic practicality. Our software is working properly. We are also confident that the methodologies developed to date can quickly and economically select stripper wells with economic upside potential. By accomplishing this, we will provide producers throughout the U.S. a means of increasing existing gas production and increase the U.S. natural gas reserve base.