

**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 underperforming wells with remediation potential. We have enhanced and streamlined our software and are using it with the latest versions of Microsoft's™ Access and Excel programs. During the last quarter of 2002, Great Lakes provided us with additional data for approximately 2,200 wells located in their Cooperstown field situated in northwestern Pennsylvania. We identified approximately 130 potential remediation candidates, and Great Lakes' personnel are currently reviewing this list for viable remediation. Within the last few weeks, a list of five candidates have been chosen for refract, in addition to two alternate wells. 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 have determined 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, primarily Great Lakes Energy Partners, LLC (Great Lakes), and to a lesser extent, 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 ± 501 wells situated in Venango and Warren counties, Pennsylvania. We have used this data to test and improve our Microsoft™ Access/Excel software, and recognize underperformers.

As an enhancement to our analysis, Great Lakes provided us with production data for 2,200 additional wells for the Cooperstown Field, which is located in Crawford, Venango, and Indiana Counties, Pennsylvania. Final evaluation of this field has been finished and candidate review is in process, and has been accelerated, by Great Lakes. Within the past few weeks, Great Lakes has chosen five wells to be refraced, in addition to two alternate wells. Anticipated expenditures have been budgeted and field operations are expected to begin within the next four to eight weeks.

## **EXPERIMENTAL**

We utilized our new software tools to conduct a rapid, first-pass search for wells possessing enhancement/remediation 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. > = 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 is being considered for any candidates selected.

## **RESULTS AND DISCUSSION**

DOE has successfully beta-tested the SWARM software. A user-friendly interface has been designed 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 testing and evaluation.

From our experience in the Appalachian Basin, we are confident that several stripper wells with enhancement potential have been found in this data set, subject to review for economic viability. Our software is working properly and we are confident that the methodologies developed to date can quickly and economically identify stripper wells with 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.