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DOE/10446-1

**WELLBOTTOM FLUID IMPLOSION SYSTEM TO
STIMULATE EXISTING WELL FLOW**

Semi-Annual Report for the Period
August - October 1999

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IMPLO TREAT SYSTEMS

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Date Submitted - November 1999

**PREPARED FOR THE UNITED STATES
DEPARTMENT OF ENERGY
UNDER COOPERATIVE AGREEMENT
No. DE-FG36-99GO10446**

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STATEMENT REGARDING

DOE FORM 241.1

TITLED

**ANNOUNCEMENT OF U.S. DEPARTMENT OF ENERGY
SCIENTIFIC AND TECHNICAL INFORMATION**

This project, which is identified on the cover sheet, began August 1, 1999. This semi-annual report covers only a three month period through October 31, 1999.

There has been no release of information, publications, or patent application. Therefore Form 241.1 is not applicable at this time.

SEMI ANNUAL REPORT #1

August through October 1999

Grant DE-FG36-99G010446

This grant became effective August 1, 1999, and work began that date. This project involves an oil/gas well treatment. An overview is provided later in this report. My basic plan has been, and still is, to design, build and surface test the "downhole" hardware. After that is done, then find candidate service companies to conduct initial field tests, with the option of a license agreement with me (my company) to market/operate the service.

An important requirement of my system is that standard oil field "locking mandrels", which are manufactured primarily by Baker Hughes and Halliburton, must be attached to my device for the field operation. My experience in design/development of oil well service equipment did not include these devices, therefore I had only a limited knowledge of them. I did, in fact, believe (incorrectly) that it would be necessary for me to purchase and provide this equipment along with my other special hardware. My first step in this project was to contact a knowledgeable person on this subject to gather all the information I needed. The person I have worked with on locking mandrels is Mr. Kirk Staggs, president of Pro Well Testing and Wireline in Hobbs, New Mexico. He also has a subsidiary company, Spartek, which provides downhole pressure recording gauges. Mr. Staggs' company uses locking mandrels routinely and also sells them. I paid him a consulting fee of \$60.00 per hour for his time. The information he provided me has been very helpful - even essential.

First of all, I learned that the type of service companies that will operate my system normally have locking mandrels available as they use them in other services. Therefore I will not need to purchase these items. Hopefully this will reduce my estimated cost of the downhole hardware. However, I must still provide "cross-overs" (an oil field term for adapters) between my tools and the locking mandrels. These are single, different parts having three different thread/seal configurations at the bottom to fit my three tool sizes, and many different thread/seal configurations on top to fit the many various locking mandrels. I learned from Baker and Halliburton that they do not release details of their thread/seal configurations. They will, however, do the machining in their company shops. I also learned from Mr. Staggs that there are independent machine shops who know the details of these connections, and will do this machining. This is legal since patents ran out long ago on locking mandrels. Mr. Staggs uses a shop in Odessa, Texas, which is the one I will probably use (at least for the cross-overs).

A second important outcome of my working with Mr. Staggs is the use of his pressure recording gauge as an optional part of my system. I believe this will be an important added feature to this service. This is discussed in the overview, which I will

refer to later in this report. Mr. Staggs has agreed for me to include use of his gauge as a claim in my patent application. (Actually, I could do it legally without his permission as his gauge is standard field equipment.) His gauge will be identified in the patent as a specific example of the type gauge to be used. Mr. Staggs will receive his standard fee from the service company for using his gauge each time it is run. I will require a royalty from the service company each time my system is run. The royalty will be increased when a pressure gauge is used, with Mr. Staggs receiving the additional amount, and mine remaining the same. I will get legal assistance in specifying all this in a future agreement with Mr. Staggs and in future patent license agreements with service companies.

I have made considerable progress in the design of downhole hardware; including design calculations, configuration layouts, assembly drawings, detail drawings of parts (for machining) and instruction documents including a chart and schematic block drawing. The schematic drawing A-801 is attached. It shows the general arrangement of the downhole "tool string" (another oil field term). This is the same drawing that was included in the status report for the period 9-8-99 through 9-30-99. It is included again here for convenience to the reader. Following is a list of all items completed as of 10-31-99. It will be helpful to refer to the attached schematic drawing A-801.

- All cross-over drawings are complete.
- All actuator assembly drawings and details drawings are complete.
- All implosion valve assembly drawings and detail drawings are complete.
- Schematic A-801 is complete.
- The following documents shown on A-801 have been done and are ready for final preparation or word processing.

A-802 Chart of actuator vs. pressure

A-803 Tool assembly procedure

A-804 Outline of field operations.

Copies of any of the above items (some of which are confidential) will be provided to DOE upon request.

I feel confident and optimistic about what I have done so far, and that my progress and expenditures are on schedule. I know from past experience that one of the most difficult and time consuming parts with introducing a new oil field service is in finding service companies to agree to conduct field tests, and in finding oil companies to allow the service companies to conduct the field tests in their wells. Therefore I began early to plan this. I am accumulating a list of candidate service companies from trade journals and by other means, and have ordered a directory of service companies. I have prepared a three-page overview (plus a cover sheet) of my system. This overview is attached. It

will help the DOE officer reading this report to have a somewhat better understanding of this project, and where I plan to go with it. DOE has my approval to use this overview document in any way considered beneficial.

In about January or February of 2000, I will contact by phone or by e-mail, when necessary, an appropriate person in each candidate service company which I have chosen. I will tell this person very briefly about this development, mentioning that it was DOE funded, and request permission to mail or fax to him or her a copy of the attached overview document. Additionally, I will place an ad in the trade journals: World Oil and Harts E&P (formerly Petroleum Engineer). A copy of the ad I plan to use is attached following the overview document.

My next work will be in approximately the following sequence:

- 1) Put chart A-802 in final form.
- 2) Have documents A-803 & A-804 word processed.
- 3) Complete plans, design, detail drawings and procedure for surface testing the downhole hardware.
- 4) Complete nomenclature A-805 including list of all drawings, purchased items and documents.
- 5) Check dimensions and tolerances on all drawings.
- 6) Have a patent attorney proceed with the patent application and assist as necessary.
- 7) Get price quotations on all downhole hardware and testing equipment.
- 8) Place orders for all hardware.
- 9) Plan and have trailer built for storage/workshop/transport/demonstration purposes, and have trailer hitch put on my minivan.
- 10) Proceed with ad, phone calls to service companies, and fax/mail outs.
- 11) Receive and assemble parts, and make modifications if necessary.
- 12) Proceed with surface tests.
- 13) Proceed with presentations and demonstrations with objective to get service companies to "sign on" for field testing.

All of the work under this grant applies to type "A" tool described in the application. I will probably apply for additional funding to go forward with the type "A" tool (including assistance in field testing and purchase of additional hardware), and to develop the type "B" and/or the type "C" tool described in the application.

Prepared by: Emmet F. Brieger

This document is dated November 2, 1999

LOCKING MANDRELS

SEE NOTE 1

CROSS-OVERS

SEE NOTE 2

IMPLOSION

VALVES

ACTUATORS

SEE NOTE 3

BOT. PLUG

& GAGE
ADAPTER

PRESSURE GAGES

SEE NOTE 4

SUPPLIED BY CO.
RUNNING TOOLS

SUPPLIED BY IMPLOR TREAT SYSTEMS

SUPPLIED BY
SPARTEK CO.

NOTE 1

H - HALLIBURTON TYPE

B - BAKER TYPE

PN - PROFILE NIPPLE REQ'D IN
TUBING TO FIT LOCK. MAND.

TJ - LOCKING MANDREL
SEATED IN TUBING JOINT

NOTE 2

CROSS-OVERS CAN BE MADE
SPECIAL FOR LOCKING MANDS.
NOT SHOWN. SEE PARTS LIST
A-805 FOR BLANKS.

NOTE 3

SEE CHART A-802 FOR ACTUATOR
TO USE AT GIVEN SHUT-IN PRES.
& DESIRED IMPLOSION PRES.
SEE DOCUMENT A-803 FOR
ASSEMBLY PROCEDURE.

NOTE 5

SEE DOCUMENT A-804 FOR
OUTLINE OF GENERAL FIELD
OPERATING PROCEDURES.

NOTE 4

CALL 1-505-397-3590
FOR GAGES AND
INSTRUCTIONS.

SCHEMATIC OF TOOL
ARRANGEMENT FOR
IMPLOR TREAT SERVICE

BY: EFB DATE: 9-24-99

SCHEMATIC A-801

ATTENTION OIL/GAS WELL SERVICE COMPANIES

THE U.S. DEPARTMENT OF ENERGY

HAS FUNDED DEVELOPMENT OF A

WELLBOTTOM FLUID IMPLOSION SYSTEM

NAMED

I M P L O T R E A T

WHICH IS

A DIFFERENT APPROACH USING ESTABLISHED TECHNOLOGY

TO

IMPROVE EXISTING WELL FLOW

AND

EXTEND PROFITABLE WELL LIFE.

The purpose of the following three-page overview is to provide basic background information on this subject and to invite inquiries from service companies regarding participation in marketing this service.

OVERVIEW OF IMPLO TREAT

THE PROBLEM: Up to 85% of the total number of existing shaped charged penetrations (perforation tunnels) in oil and gas wells have remained plugged and non-producing since the original completion, with the total well production coming from only 15% of the total number of existing perforations. These wells are producing at a fraction of their capability. The number of such wells is estimated to be in the 10's of thousands in the USA, 100's of thousands worldwide.

THE CAUSE: The shaped charge jet particles traveling at 20,000 feet per second crush the formation into compacted low permeability fines surrounding the penetration (perforation tunnel). Additionally, the perforation tunnel is filled with compacted low permeability fines from the shaped charge itself. A finite differential pressure is necessary to start flow from the perforations. Some may require less than 200 psi, some more than 500 psi. As casing pressure is reduced, some start flowing. The casing pressure then increases, the formation pressure decreases to a flowing pressure, hence the differential is reduced. Thus the majority of the perforations are never subjected to sufficient differential pressure to start flow, and they remain plugged and non-producing forever.

THE SOLUTION: These wells are identifiable and are serviced without pulling tubing. Formation fluid is made to "implode" into the casing, carrying with it debris and compaction from the plugged perforation tunnels within the formation, thus causing these perforations to start flowing for the first time. Thus the well production rate is dramatically increased. Explosives or chemicals are not involved. It is all mechanical and hydraulic.

HOW DONE: The closed downhole tool named "implosion valve" is run in through the tubing and sealed and locked inside the tubing. Pressure above the implosion valve is reduced by several alternate techniques. At the pre-set differential pressure, the valve suddenly opens, causing fluid below to implode into the tubing above, thus causing a sudden pressure drop in the casing fluid. This causes the formation fluid to suddenly implode into the casing. Tubing pressure and casing pressure can be recorded before, during and after the operation.

FIELD RESULTS: Prototype tools gave results beyond expectations in terms of production increases, even in a zero production well, in already high production wells, and in injection rate increases--even in a zero injection well. Results outside the USA (in Trinidad) by others with a related system further validates the "fluid implosion" technique to improve well flow--even in wells up to thirty years old.

WHERE APPLICABLE: This system applies to areas having consolidated formations (stone as opposed to loose sand), with low to good porosity/permeability (producible

without fracturing), both oil and gas wells. The best candidates are wells which were perforated balanced or overbalanced. A production packer must be in place. The wells can be old or new, deep or shallow, high or low formation pressure, low to high production, gas lift wells, water or CO₂ flooding areas, land or offshore--worldwide.

MARKET: A market study done at Texas A&M University and paid for by the U.S. Department of Energy indicates large potential activity and significant energy impact.

PUBLICATIONS: "World Oil" Magazine articles of December 1989 and July 1991.

ADDITIONAL POTENTIAL (in addition to that already cited) :

- Reduced water intrusion when producing perforations are near the water/oil interface, by providing uniform flow across the zone
- Improved acid injectivity for more uniform coverage out into the formation from the wellbore, to reduce clay swelling, etc.
- Extended well production prior to need for artificial lift (in addition to extended profitable well life after being put on artificial lift)
- Application in existing pumping wells where installation of a packer is economically feasible
- Application in conjunction with balanced or overbalanced wireline perforating in new completions
- Reduced migration of fines and formation plugging near the wellbore, by reducing fluid velocity within the formation in providing uniform flow across the zone
- The downhole pressure recordings provide useful build-up and draw-down information and determine tubing pressure necessary in subsequent operations.
- Experiments will be conducted to evaluate the feasibility of this system in packerless wells.

STATUS: A grant from the U.S. Department of Energy provided funds for the final design, construction and surface testing (under simulated well conditions) of second generation tools in three sizes. These will soon be ready for field evaluation and data accumulation.

PATENTS: The original basic U.S. patent on the first generation prototype device (not commercially viable) has expired. Broad patent coverage is anticipated on the apparatus, methods, and claims on this second generation system. Patent infringement cases regarding this patent will be prosecuted by the U.S. Department of Energy.

INQUIRY SOLICITATION: We are now ready to receive inquiries from, and begin preliminary negotiations with interested service companies related to field testing, marketing, and operating the service or marketing and coordinating field operations. Even very small companies can market the service and coordinate field operations between oil companies and other service companies.

License agreements are subject to approval by the U.S. Department of Energy. DOE requires reasonable effort in evaluating the service and in making it known and available. Foreign patent applications to be initiated by the service company active in the particular country. An exclusive license is possible if widespread availability of the service is provided by sub-licenses or other means. Demonstrations will be provided prior to final execution of license agreements.

Marketing assistance and operational training will be provided. Field results will be accumulated from and shared with participating companies.

A limited quantity of implosion valves will be available at no cost for initial field tests.

CONTACT: The following named company should be contacted for a group presentation and discussion or for private discussions. An appropriate confidentiality agreement will be necessary prior to review of design details until such time as the patent application is final.

IMPLO TREAT SYSTEMS
Emmet F. Brieger, Owner
HC 67, Box 58
Nogal, NM 88341
(Located near Ruidoso, New Mexico, USA)
call/ fax (1-505) 354-2522

This document is dated January 17, 2000

Attention Service Companies, small or large:

The U. S. DEPARTMENT OF ENERGY funded development of a 2nd generation well bottom fluid implosion system which **IMPROVES EXISTING WELL FLOW** and **EXTENDS PROFITABLE WELL LIFE**. Field results with 1st generation prototypes were beyond expectations.

Call/fax 1-505-354-2522

for a three page overview which invites your inquiries relative to marketing this service - USA and foreign.