DIAGNOSTICS FOR THE HEALTH OF YOUR WELL

Medical diagnostics and completion diagnostics have one thing in common—in each process, knowledge is critical. Whether it’s your health or your well, it’s worth it to know what’s going on.

When we feel poorly or have a nagging ailment, most of us don’t hesitate to book an appointment with a physician for an immediate diagnostic examination. We know there’s value in getting an early jump on a serious problem.

The same holds true with another valuable asset you own—your well. An early understanding of why your completion succeeded or failed is critical to the health of your well (and future wells). Near-wellbore completion diagnostics are the only direct measurements for many important aspects of completion performance.

As the accompanying graphic depicts, a successful completion is an iterative process that requires three steps: Plan Strategically, Engineer Success and Measure Results.

Planning strategically requires gathering all the necessary geological, petrophysical, geomechanical, and reservoir data. True 3D planar fracture models then use this data to simulate the best-engineered completion procedure to achieve the most economic outcome.

Then without warning or notification, Mother Nature takes over and the laws of physics reign supreme. Throw the human-error factor and Murphy’s Law into this equation and you have all the ingredients needed for your completion to underperform expectations.

When this happens, the third step in the iterative process—Measure Results—becomes invaluable. If you don’t understand what’s happening in your completion, you don’t have the knowledge to build on best practices or fix problems that may have occurred.

Without completion diagnostics, post-production performance is typically the only measurement you have to determine if the completion went as planned—it either made a well or it didn’t.

Completion diagnostics provide the necessary direct measurements that help you understand what you’re doing right. These measurements validate many of your engineering assumptions and resulting fracture design models, including:

- Perforation strategy
- Zonal coverage/staging strategy
- Fluid system selection (how well did the fluid perform and—equally important—how well did it clean up?)
- Wellbore/fracture connectivity (is there high proppant concentration across all perforated intervals?)
- Mechanical integrity (both outside and inside the wellbore)
- Production estimations

Completion diagnostics are also invaluable in determining what didn’t go as planned. Of the long list of potential problems, completion diagnostics provides quantifiable information about many of the key culprits, including:

- Unrestricted frac height growth
- Unanticipated frac height barriers (restricted height growth)
- Failed staging device performance
- Poor cement containment
- Well mechanical failures
- Perforating off depth
- Perforating effectiveness
- Excessive proppant flowback issues
- Ineffective treatment fluid cleanup
- Close-spaced offset well interference

ON THE FOLLOWING PAGES, IMAGES FROM REAL JOBS SHOW HOW PROTECHNICS COMPLETION DIAGNOSTICS BRING LIGHT TO AN OTHERWISE DARK HOLE.
There are plenty of reasons why that well didn’t meet its potential — and a lot of them have nothing to do with its potential design — there are too many ways things can go wrong. Here are some ways you can know what went right, confirming your design was perfect:

The surrounding tracer logs highlight real-time performance of the options available to the operators. Equally important, the center tracer and completion logs show what went right, confirming your design was perfect.

Good news or bad, with measured results from PBP logs, you now have a strategy or a plan so you can plan strategically and engage in proactive design and planning.

**PERFORATION EFFECTIVENESS**

Did you know the perforations we planned for the reservoir never got treated?

**RESULT:**

The reservoir never got treated.

**ACTION:**

Squeeze, re-perforate the target zone.

**CEMENT CHANNEL**

Did you know that the cement job didn’t isolate the formation?

**RESULT:**

Ineffective stimulation of target interval.

**ACTION:**

Squeeze and restimulate.

**FRAC HEIGHT CONTAINMENT**

Did you know that fracture height growth was contained?

**RESULT:**

Lost reserves due to unstimulated pay initial zone.

**ACTION:**

Isolate lower perforations, perforate missed pay and re-fracture.

**PERFORATED OUT OF TUBING**

Did you know that the frac went through an uphole DV tool?

**RESULT:**

Ineffective stimulation of intended pay zone.

**ACTION:**

Refrac the well down-tubing.

**DV Tool (4700’ Uphole)**

Target Zone

Did you know the frac went through an uphole DV tool?

**RESULT:**

Ineffective stimulation of intended pay zone.

**ACTION:**

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**ACTION:**

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EXCESSIVE UNCONTAINED FRAC HEIGHT

Did you know that there was extensive downward frac growth?
RESULT: Ineffective stimulation with shorter than planned frac length
ACTION: Use tracer data to recalibrate 3D frac model for the next well

STAGE ISOLATION FAILURE

Did you know that the stage isolation device failed during pumping of Stage 2?
RESULT: Ineffective stimulation of Stage 2 and possible damage to Stage 1 fracture
ACTION: Re-frac Stage 2

PROPPANT FLOWBACK

Did you know that the wellbore connection flowed back?
RESULT: Damaged connection to the wellbore resulting in decreased production potential
ACTION: Refrac the well down-tubing

GROWING TO MEET DEMAND

PROMOTIONS AND MOVES
Steve Reeder – promoted to Q/A Training Supervisor, Houston, TX
Ken Bullard – promoted to Sales Representative, Fort Worth, TX
Kelly Bryson – promoted to District Manager, Oklahoma City, OK
Tim Oswald – promoted to District Manager, Rock Springs, WY
Brian Goulette – promoted to District Manager, Sidney, MT
Darrell Nelms – promoted to Sr. Technology Services Manager, SpectraChem product line
Scott Justice – named SpectraScan Group Leader
Mark Warren – named CompletionProfiler Group Leader
Dick Kingery – named Special Projects Group Leader
Derrick George – promoted to Log Analyst
Darla Fogie – promoted to Senior Chemist

NEW ADDITIONS
ProTechnics continues to increase service capabilities and add to its technology prowess.

Welcome aboard:

HOUSTON LABORATORY SERVICES
Arthur Bettis – Laboratory Manager
Phin Dinh – Chemist

SALES REPRESENTATIVES
Scott Renfro – Denver, CO
Brian Arnold – Houston, TX

LOGISTICS COORDINATORS
Cole Hutchings – Houston, TX

SENIOR TECHNICAL SERVICE ENGINEER,
COMPLETION PROFILER
Maynard Johnson – Houston, TX

FIELD SERVICE REPRESENTATIVES
Darrin Minett – Kilgore, TX
Russell Wolf – Kilgore, TX
Tim Schmitz – Oklahoma City, OK
Dustin Brolon – Oklahoma City, OK
Chad Daniken – Oklahoma City, OK
Loren Healy – Farmington, NM
Douglas Gumfory – Grand Junction, CO

IMAGING SERVICE ENGINEERS
Jeff White – Grand Junction, CO
Aaron Wostrel – Rock Springs, WY

INTERNATIONAL SERVICE ENGINEERS
Eric Elrod
Kyle Talley

Congratulations and Good Luck In Your New Positions!
NEW LOG PROCESSING FOR GOHFER 2007

Improve your reservoir characterization with GOHFER 2007 software’s new log processing package. You’ll have infinite flexibility in generating mechanical grid properties, whether you have a little data or a lot. The latest version of the venerable 3D fracture stimulation software supports easy integration of core data, and multiple LAS and CSV files. If data is sparse, multiple built-in correlations help maximize the information you have, so you’ll have greater confidence in your reservoir parameters, less tuning and better fracture designs.

GOHFER Hydraulic Fracturing Courses

In October, join industry experts (including GOHFER author Dr. Bob Barree, Barree & Associates) for hydraulic fracturing courses in Calgary, Alberta, and Houston, Texas. Designed to provide an in-depth understanding of hydraulic fracturing, the courses examine state-of-the-art fracturing concepts from theory to design strategies from a GOHFER perspective, with hands-on training applied to individual stimulation projects.

VISIT WWW.GOHFER.COM FOR MORE INFORMATION, OR CALL KEVIN SVATEK AT 713-328-2304.

TIGHT GAS STUDY SETS NEW SIGHTS ON INTERNATIONAL RESERVOIRS

International tight gas sands are the next objective of the popular multi-client geo-engineering study being conducted by Core’s Integrated Reservoir Solutions division.

For the past four years, the division’s Fracture Stimulation Optimization technical teams have been analyzing and evaluating tight gas sands in North America to develop a very large and comprehensive database. This database consists of the characterization and evaluation of numerous conventional cores taken from multiple, tight gas sand formations and integrates these data with the stimulation design and production characteristics. The resulting case histories serve as analogs and performance benchmarks for future wells.

Each company joining the project contributes conventional cores from wells for analysis, evaluation and inclusion into the project. The conventional cores must be through a tight gas sand reservoir and can be from existing wells, as well as cores from future exploration and/or development wells.

The project will provide international operators with valuable information not only on their own contributed wells, but also on other operator’s wells in tight gas sand formations worldwide.

FOR MORE INFORMATION, PLEASE CONTACT WAYNE SEALEY, SENIOR TECHNICAL ADVISOR AT WAYNE.SEALEY@CORELAB.COM OR RANDALL MILLER, DIVISION PRESIDENT AT RANDY.MILLER@CORELAB.COM.

NORTH AMERICAN SUCCESS STORY

The international study expands a highly-successful database developed for North American tight gas sands. That study, in its fourth year, includes the following participants:

- BP
- Cabot Oil and Gas
- Devon Energy
- El Paso Production
- ExxonMobil
- Marathon Oil Company
- Swift Energy
- Kerr McGee
- Burlington Resources
- ChevronTexaco
- Dominion E&P
- EOG Resources
- Forest Oil
- Noble Energy
- Talisman Energy
- Encana Oil and Gas
- Samson Resources
- Anadarko Petroleum
- Pioneer Natural Resources
- Canadian Natural Resources
- Vintage Petroleum
- Ultra Resources
- ConocoPhillips
- Newfield Exploration
- Occidental Oil & Gas
- Bill Barrett Corporation
- Williams E&P
- Questar E&P
- J-W Operating Company
- Apache Corporation
- Whiting Petroleum
- ENI Petroleum