STEPHEN K. SCHUBARTH

President
SCHUBARTH, INC. & SCHUBARTH SOFTWARE SYSTEMS LLC

AREAS OF EXPERTISE:

. Fracture treatment design, analysis, and supervision
. Formation evaluation through log and core analysis
. Evaluation of "tight" & Unconventional reservoirs
. Pressure transient analysis of oil and gas wells
. Reservoir evaluation and computer simulation

PROFESSIONAL EXPERIENCE:

SCHUBARTH SOFTWARE SYSTEMS LLC
PRESIDENT
April 2011 – Present

Develop & supervise the programing of Terranaut Software Program. This program evaluates the production histories of horizontal, multi-stage completions and characterizes the reservoir properties & completion effectiveness. Using these values the program then forecasts the economic results from changing the completion design and determines the optimum completion design. Using this program and proves completion designs and well performance of horizontal wells have been evaluated and the completions redesigned to increase well profitability and cost.

SCHUBARTH INC.
PRESIDENT
March 2004 – Present

Working with operating companies to improve stimulation effectiveness through evaluation of past performance, monitoring current treatments and altering designs accordingly. Developing evaluation process for multi-layered reservoir completions to determine both stimulation effectiveness and reservoir permeability. Performing petrophysical analysis, fracture treatment design and evaluation on numerous “tight” and unconventional reservoirs. Work with Landmark Graphics to provide completion expertise in International oil & gas field development. Working with Operating companies in “Unconventional” Oil & Gas plays to provide innovative stimulation designs to improve recovery of hydrocarbons, both domestically and internationally. Providing expert witness testimony on a variety of oil & gas legal cases.

NORTON PROPPANTS
DIRECTOR OF PETROLEUM TECHNOLOGY
August 2001 – March 2004

Responsible for communicating the value of ceramic proppant products to Service Companies and Operating Oil & Gas Companies. Developed highly technical presentations demonstrating the benefits of using different ceramic proppants in both oil & gas wells. Designed and developed the concept for a new proppant product, Versaprop, within Norton Proppants. Directed the testing of Versaprop and other products, evaluated the results and prepared marketing campaign for Versaprop.

HALLIBURTON ENERGY SERVICES
TECHNOLOGY LEADER
April 1998 – July 2001

Joined NAL/GOM FBM Solutions team as Technology Leader – Production Enhancement in April 1998. Responsible for implementation of production enhancement initiatives for the NAL/GOM FBM. These initiatives include the combination of multiple PSL services in the production enhancement process. Continued development of the Sigma Process as a Halliburton product. Developed, directed and taught a three-week internal school for engineers which initiated them into the Sigma Process. The school covered log analysis, reservoir evaluation techniques, stimulation design and many case histories of the integration of these processes.

HALLIBURTON ENERGY SERVICES
TECHNICAL ANALYST
August 1995 – April 1998

Joined Halliburton in Denver, Colorado in August 1995. Work involves improving and maintaining the technical level of stimulation services and interpretation provided in the Rocky Mountain region. Improving fracture treatment design, evaluation and implementation along with incorporating the evaluation of production response into the stimulation process are the goals of this position. Participated in the development of the Sigma Process, an integrated approach to stimulation design and evaluation. Transferred to Houston in January 1997. Member of the Houston Business Development Technical Team, responsible for the development of technology process for the improvement of production enhancement procedures.

FALCON PETROLEUM CONSULTANTS, INC.
PRESIDENT
October 1992 - August 1995

Founded company in October 1992. Work was primarily in southwest Wyoming in the Frontier and Dakota formations involving the design of hydraulic fracture treatments, supervision of treatments including quality control assurance, evaluation of reservoir properties through well logs, pre- and post-treatment pressure transient analysis and production decline analysis. Over 150 fracture treatments were supervised during the first twenty-four months. Also work in hydraulic fracture design in west and south Texas and central Oklahoma has been performed. Reservoir analysis of producing south Texas oil sands and testimony as an expert witness involving post-treatment production response.

ELY ASSOCIATES, INC.
PETROLEUM ENGINEER, PARTNER
May 1991 - September 1992

Responsible for all reservoir evaluation work performed by the company. Analysis of both pre- and post-stimulation pressure transient tests and evaluation of reservoir properties from production histories, including history matching using reservoir simulation. Formation evaluation by log and core analysis in several producing regions and various geological formations. Hydraulic fracture design and on-site supervision, including quality control supervision of fracturing fluids. Performed reserves evaluations in preparation for expert witness testimony. Work has been performed on producing formations in Utah, Oklahoma, Mississippi, Wyoming, New Mexico, West Texas, South Texas and East Texas.

S.A. HOLDITCH & ASSOCIATES, INC.
SENIOR PETROLEUM ENGINEER
April 1988 - May 1991

Involved in all aspects of production and reservoir engineering, including hydraulic fracture treatment design and supervision, well completion design, pressure transient test design and analysis, reserve evaluation, reservoir simulation and formation evaluation. Projects included hydraulic fracture treatment design and supervision of oil and gas wells, including coalbed methane wells, in West Texas, South Texas, East Texas, New Mexico and Alabama; reservoir evaluation of "tight" gas fields in Texas and Wyoming, including the preparation of "tight gas sand applications; reserve evaluations in both oil and gas fields; and reservoir simulation of hydraulically fractured oil and gas wells. Has testified before the Texas Railroad Commission as an expert witness in "tight" gas sand applications.

CLAYTON W. WILLIAMS, JR., INC.
ENGINEER
Midland, Texas
October 1985 - April 1988

Performed both production and reservoir engineering duties including evaluation of producing properties and drilling prospects, fracture treatment design and supervision, pressure transient test design and analysis, well completion design, well workover selection and design, reserve evaluation and economic analysis, artificial lift design, log analysis and production facility design. Developed reserves analysis system for presentation to lending banks. Responsible for producing properties in Texas, Louisiana and Montana. Producing formations including Austin Chalk, Travis Peak, Vicksburg, Wilcox, Olmos, Glen Rose of East and South Texas; Bell and Cherry Canyon, Ellenburger and Atoka of West Texas; and the Sparta formation of South Louisiana.

ARCO OIL & GAS
OPERATIONS ENGINEER
West Texas
Midland, Texas
September 1984 - October 1985

Performed both production and reservoir engineering duties for several fields in Southeast New Mexico, including the Empire Abo Unit operated by ARCO. Proposed and initiated reservoir simulation project on Empire Abo Unit. Evaluated workover proposals and recommended drilling prospects. Presented proposals to ARCO management and performed annual reserves analysis of producing properties.

CHEVRON U.S.A., INC.
PRODUCTION ENGINEER
Mid-Continent Division
Midland, Texas
June 1981-September 1984

Performed production and reservoir engineering duties for several producing fields in West Texas and Southeast New Mexico. Producing properties included waterflood units, primary oil recovery, deep gas production and hydraulically fractured oil and gas wells. Served on the unitization committee for the Eunice-Monument South Unit. Involved in hydraulic fracture treatment design and supervision, pressure transient test design and analysis, reserve evaluation, economic evaluation of drilling prospects and well workovers, artificial lift design and formation evaluation. Presented proposals and evaluation to management.

EDUCATION:

Texas A&M University - B.S. Petroleum Engineering (1980)
Texas A&M University - M.S. Petroleum Engineering (1983)

PROFESSIONAL AFFILIATIONS:

Society of Petroleum Engineers (member: 1978 to present)
- '83 – '84 Midland Production & Operations Study Group - Chairman
- '95 – '96 Denver Production & Operations Study Group - Chairman
- '96 – '98 Career Guidance / Student Development Committee - Member
- '98 – '01 Continuing Education Committee – Member
- '04 - Westside Study Group – Committee Member
- '04 – '10 Co-Chairman SPE Stimulation TIG

Pi Epsilon Tau

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PUBLICATIONS:

Ely, J.W., Wolters, B.C., **Schubarth, S.K**., Sommers, G.E., and Jacoby, M.A.: *"High Proppant Concentration/Low Volume Fracture Treatment Combined with Forced Closure Yields Success in the Clearfork Formation,"* paper presented at the 1991 Southwest Petroleum Short Course, Lubbock, Texas.

Ely, J.W., Wolters, B.C., **Schubarth, S.K**. and Bethard, D.R.: *"New Fracture Design Effectively Place Proppant in Many Permian Basin Formations,"* paper presented at the 1992 Permian Basin Oil & Gas Conference, Midland, TX March 18-20, 1992

Ely, J.W., **Schubarth, S.K**., Wolters, B.C. and Kromer, J.C.: *"New Tools Attack Permian Basin Stimulation Problems,"* Oil & Gas Journal, June 8, 1992, pp. 66-70

Schubarth, S.K., Chabaud, R.E. and Einhorn, R.B.: *"Moxa Arch Frontier Formation Development Success Through Increased Fracture Conductivity," paper* SPE 28610 presented at 1994 SPE Annual Meeting, New Orleans, Louisiana, September 26-28, 1994

Schubarth, S.K., Chabaud, R.E. and Penny, G.S.: *"Moxa Arch Frontier Formation Development Success Through Increased Fracture Conductivity - Part 2," paper* SPE 30717 presented at 1995 SPE Annual Meeting, Dallas, Texas, October 23-25, 1995

Hopkins, C.W., Voneiff, G.W., **Schubarth, S.K**. and Chabaud, R.E.: *"Advanced Stimulation Technology Deployment Program, Bannon Energy, Inc., Frontier Sand, Moxa Arch Area, Western Wyoming,"* Gas Research Institute Topical Report GRI-96/0112 published January 1996

Schubarth, S.K., Cobb, S.L. and Jeffery, R.B.: *"Understanding Proppant Closure Stress,"* paper SPE 37489 presented at 1997 Production/Operations Symposium, Oklahoma City, Oklahoma, March 9-12, 1997

Schubarth, S.K., Yeager, R.E., Murphy, D.W.: *"Advanced Fracturing and Reservoir Description Techniques Improves Economics in Utah, Green River Formation Oil Project,"* paper SPE 39777 presented at 1998 Permian Basin Oil and Gas Recovery Conference, Midland, TX, March 25-27, 1998

Schubarth, S.K., Mullen, M.J., Seal, C.A., Woodall, S.: *"Reservoir Description Techniques Improves Completion Economics in Piceance Basin Mesa Verde Project,"* paper SPE 39918 presented at 1998 Rocky Mountain Regional Meeting/Low-Permeability Symposium, Denver, CO, April 5-8, 1998

Schubarth, S.K., Chabaud, R.E.: *"Reservoir Description Techniques Improves Completion Economics in Moxa Arch Frontier Development Project,"* paper SPE 40037 presented at 1998 SPE Gas Technology Symposium, Calgary, CN, March 15-18, 1998

Dusterhoft, R., Parker, M., McCabe, M., **Schubarth, S**.: *"Controlled Viscosity Reduction and Increased Fracture Conductivity Using a High-Temperature Breaker System,"* paper SPE 39896 presented at 1998 International Petroleum Conference and Exhibition of Mexico, Mexico City, Mexico, March 3-5, 1998

Schubarth, S., Mullen, M. and Kessler, C.: "*Successful Prediction of Well Productivity from Openhole Logs Improves Profitability in Several Rocky Mountain Formations: Case Histories,"* paper 1998AA presented at the SPWLA Annual meeting, Keystone, CO, May 22-25, 1998

PUBLICATIONS (continued):

Schubarth, S.: "*Increasing Marginal Play Profitability*," Hart's Oil & Gas World, August 1998, pp. 29-31

Schubarth, Stephen and O'Shea, Peter: *"NMR-derived permeability aids frac design,"* Oil & Gas Journal, February 1, 1999, pp. 52-53

Barden, Dick, Smith, Chuck and **Schubarth, Stephen**: *"Coupling Reservoir Simulation Technology with the Internet to Provide Realtime Reservoir Management,"* paper SPE 66392 presented at 2001 SPE Reservoir Simulation Symposium, Houston, Texas, February 11 – 14, 2001.

Schubarth, S.K., Bazan, L.W., Becnel, J.L., Wagner, A.L. and Manrique, J.E.: "*Increasing Well Productivity in the Wilcox Lobo Trend*," paper SPE 75677 presented at the 2002 SPE Gas Technology Symposium, Calgary, Alberta Canada, April 30 – May 2, 2002.

Schubarth, S.K., Byrd, A.C. and Wickham, J.F.: *"U.S. Natural Gas Market: Recent Dynamics and Future Concerns,"* paper SPE 80949 presented at the 2003 SPE Production and Operations Symposium, Oklahoma City, Oklahoma, March 23 – 25, 2003.

Lolon, E.P., McVay, D.A. and **Schubarth, S.K**.: *"Effect of Fracture Conductivity on Effective Fracture Half Length,"* paper SPE 84311 presented at the SPE Annual Technical Conference and Exhibition, Denver, Colorado, U.S.A., 5 – 8 October 2003.

Schubarth, Stephen and Milton-Tayler, David: *"Investigating How Proppant Packs Change Under Stress,"* paper SPE 90562 presented at the SPE Annual Technical Conference and Exhibition, Houston, Texas, September 27 - 29, 2004

Schubarth, S.K., Byrd, A.C. and Wickham, J.F.: *"U.S. Gas Market: Updating the Status and Looking Toward the Future,"* paper SPE 93985 presented at the 2005 SPE Production and Operations Symposium, Oklahoma City, Oklahoma, April 17 – 19, 2005.

Norman, W.D., Pourciau, R.D., Dusterhoft, R. and **Schubarth, S.K**.: *"Understanding the Effects of Reservoir Changes in Sand-Control Completion Performance,"* paper SPE 96307 presented at the 2005 SPE Annual Technical Conference and Exhibition, Dallas, Texas, October 9-12, 2005.

Schubarth, S.K., Spivey, J.P. and Huckabee, P.T.: *"Using Reservoir Modeling To Evaluate Stimulation Effectiveness in Multilayered "Tight" Gas Reservoirs: A Case History in the Pinedale Anticline Area,"* paper SPE 100574 presented at the 2006 SPE Gas Technology Symposium, Calgary, Alberta, Canada, May 15-17, 2006.

Stephens, W.T., **Schubarth, S.K**., Rivera, D.I., Snyder, E.M. and Herndon, D.C.: *"Statistical Study of the Crush Resistance Measurement for Ceramics Proppants ,"* paper SPE 102645 presented at the 2006 SPE Annual Technical Conference and Exhibition, San Antonio, Texas, September 24-27, 2006.

Stephens, W.T., **Schubarth, S.K**., Dickson, K.R., Snyder, E.M., Doles, K.J. and Herndon, D.C.: *"Behavior of Proppants Under Cyclic Stress ,"* paper SPE 106365 presented at the 2007 SPE Hydraulic Fracturing Technology Conference, College Station, Texas, January 29-31, 2007.

Schubarth, Stephen K., Bazan, Lucas W., Whitehead, W.S. and Larry, J.D.: *"US Gas Market: The New Trends,"* paper SPE 120623 presented at the 2009 SPE Production and Operations Symposium, Oklahoma City, Oklahoma, April 4-8, 2009.

Dickins, M.I., McVay, D.A. and **Schubarth, S.K**.: *"The Impact of Gravity Segregation on Multiphase Non—Darcy Flow in Hydraulically Fractured Gas Wells,"* paper SPE 116748 presented at the SPE ATCE, Denver, Colorado, September 21-24, 2008.

Schubarth, S., Holditch, S. and Chabaud, R.: *"Optimizing Unconventional Completion Designs: A New Engineering- and Economics-Based Approach"* paper URTeC 2019-1142-MS presented at URTeC 2019, Denver, Colorado, July 22-24, 2019.