

JOHN P. SPIVEY, PhD, P.E.

Phoenix Reservoir Engineering

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EDUCATION

- B.S., Physics, Abilene Christian University, 1977
- M.S., Physics, University of Washington, 1979
- Ph.D., Petroleum Engineering, Texas A&M University, 1984

PROFESSIONAL PROFILE

- 30+ years of industry experience
- Pressure transient design and interpretation
- Production data analysis and rate transient analysis
- Reservoir simulation studies
- Gas storage studies
- Fluid properties, PVT correlations, and equations of state
- Expert witness for litigation and regulatory commissions
- Software design and development
- Six peer-reviewed journal articles, 13 trade publication papers, 37 technical paper presentations, one patent, five technical books

WORK EXPERIENCE

PHOENIX RESERVOIR SOFTWARE, LLC., College Station, Texas

- (November 2005-present) **Owner**

Designed, developed, and marketed software package for history matching production and production log data from and forecasting performance for multilayer unconventional gas reservoirs. Developed custom DLLs for calculation engine to be integrated into third-party software. Designed and developed pressure transient analysis and equation of state software packages.

PHOENIX RESERVOIR ENGINEERING, College Station, Texas

- (January 2004-present) **Owner**

Analyzed pressure transient data. History-matched production and production log data to estimate individual layer properties for multilayer tight gas reservoirs. Conducted reservoir simulation studies. Expert witness for litigation and regulatory hearings. Developed and taught well test design and analysis short course and taught gas reservoir management short course for PetroSkills.

S.A. HOLDITCH & ASSOCIATES/SCHLUMBERGER DATA & CONSULTING SERVICES,
College Station, Texas

▪ (June 1990-January 2004) **Principal Reservoir Engineer**

Conducted single-well and field-wide reservoir simulation studies. Performed pressure transient design and interpretation. Developed and applied advanced methods for rate transient analysis. Conducted gas storage studies. Designed and developed software for pressure transient testing, production data analysis, bottomhole pressure calculations, and fluid property correlations.

SOFTSEARCH, INC./DWIGHTS ENERGYDATA, Abilene, Texas

▪ (June 1984-May 1990) **Manager of Engineering Services**

Designed and developed software for interactive decline curve analysis, gas material balance, and oil- and gas-in-place. Wrote a number of software utilities for use by the software development group, including utilities to display and compare text files and to perform file directory management activities such as viewing, moving, copying, deleting, or printing files.

ABILENE CHRISTIAN UNIVERSITY, Abilene, Texas

▪ (September 1983-May 1985) **Assistant Professor**

Taught physical geology, historical geology, groundwater geology, introductory computer science, and university physics

PROFESSIONAL MEMBERSHIPS

- Society of Petroleum Engineers
- American Physical Society
- American Chemical Society

PROFESSIONAL REGISTRATION

- Licensed Professional Engineer, Texas # 74331

TECHNICAL BOOKS

1. Spivey, J. P., and Lee, W. J.: Applied Well Test Interpretation, SPE, 2013.
2. McCain, W. D., Jr., Spivey, J. P., and Lenn, C. P.: Petroleum Reservoir Fluid Property Correlations, Pennwell, 2010.
3. Lee, W. J., Rollins, J. B., and Spivey, J. P.: Pressure Transient Testing, SPE, 2003.

4. Editor, Pressure Transient Testing, Reprint Series, SPE, 2004.
5. Editor, Gas Reservoir Engineering, Reprint Series, SPE, 1999.

TECHNICAL PAPERS

PROFESSIONAL JOURNALS

1. Spivey, J.P., Valko, P.P., and McCain, W.D., Jr.: "Applications of the Coefficient of Isothermal Compressibility to Various Reservoir Situations With New Correlations for Each Situation," SPEREE (February 2007). [SPE 96415-PA]
2. Spivey, J.P., Brown, K.E., Sawyer, W.K., and Frantz, J.H., Jr.: "Estimating Non-Darcy Flow Coefficient From Buildup Test Data With Wellbore Storage," SPEREE (August 2004). [SPE 88939-PA]
3. Spivey, J.P., McCain, W.D., Jr., and North, R.: "Estimating Density, Formation Volume Factor, Compressibility, Methane Solubility, and Viscosity for Oilfield Brines at Temperatures from 0 to 275°C, Pressures to 200 MPa, and Salinities to 5.7 mole/kg," JCPT (July 2004). [PETSOC 04-07-05]
4. McVay, D.A., and Spivey, J.P.: "Optimizing Gas-Storage Reservoir Performance," SPEREE (June 2001) 173-178. [SPE 71867-PA]
5. Fan, L., Lee, W.J., and Spivey, J.P.: "Semi-analytical Model For Thermal Effect on Gas Well Pressure-Buildup Tests," SPEREE (December 2000) 480-91. [SPE 68020-PA]
6. Spivey, J.P., and Lee, W.J.: "New Methods for Estimating the Pressure Transient Response for a Horizontal or a Hydraulically Fractured Well at an Arbitrary Orientation in an Anisotropic Reservoir," SPEREE (October 1999). [SPE 58119-PA]

TRADE MAGAZINES

1. Ehlig-Economides, C.A. and Spivey, J.P.: "Learn to Trust Your Intuition", Hart's E & P (October 2000) 59-64.
2. Spivey, J.P. and Lee, W.J.: "Effects of Errors in Input Data on Well Test Interpretation", Pet. Eng. Intl. (April 1998) 106-110.
3. Spivey, J.P., Aly, A.M., and Lee, W.J.: "Effects of Permeability Anisotropy and Layering on Well Test Interpretation," Pet. Eng. Intl. (February 1998) 60-65.
4. Spivey, J.P. and Lee, W.J.: "Effects of Flow Rate Variations and Producing Time on Well Test Analysis," Pet. Eng. Intl. (January 1998) 93-104.
5. Spivey, J.P., Ayers Jr., W.B., Pursell, D.A., and Lee, W.J.: "Selecting a Reservoir Model for Well Test Interpretation," Pet. Eng. Intl. (December 1997) 83-88.
6. Spivey, J.P. and Lee, W.J.: "Well Test Interpretation in Bounded Reservoirs," Pet. Eng. Intl. (November 1997) 81-89.

7. Spivey, J.P. and Lee, W.J.: "Identifying Flow Regimes in Pressure Transient Tests," Pet. Eng. Intl.(October 1997) 66-70.
8. Jochen, V.A. and Spivey, J.P.: "Using the Bootstrap Method to Obtain Probabilistic Reserves Estimates from Production Data," Pet. Eng. Intl. (September 1997) 55-59.
9. Spivey, J.P. and Lee, W.J.: "Fundamentals of Type Curve Analysis," Pet. Eng. Intl. (September 1997) 63-71.
10. Spivey, J.P. and Lee, W.J.: "Introduction to Applied Well Test Interpretation," Pet. Eng. Intl. (August 1997) 41-46.
11. Spivey, J.P.: "Production Data: Advanced Analysis Methods," Petro Systems World (May 1995) 26-28.
12. Holditch, S.A., and Spivey, J.P.: "Estimate Recovery From Tight Gas Formation Wells," Pet. Eng. Intl.(August 1993) 20-23.
13. Ivey, R.C., Spivey, J.C., Wyman, R.C., and Hayes, L.: "Computer-Aided Petroleum Engineering--A Necessity for the Competitive Edge", Oil & Gas J. (May 1985) 112-116.

PRESENTED PAPERS

1. Spivey, J.P., and McCain, W.D. Jr.: "Estimating Reservoir Composition for Gas Condensates and Volatile Oils From Field Data," paper SPE 166414 presented at the 2013 SPE ATCE, New Orleans, 30 September-2 October.
2. Akande, J.A., and Spivey, J.P.: "Considerations for Pore Volume Stress Effects in Over-pressured Shale Gas under Controlled Drawdown Well Management Strategy," paper SPE 162666 presented at the 2012 SPE Unconventional Resources Conference, Calgary, 30 October-1 November.
3. Lietard, O., and Spivey, J.P.: "Revisiting Pressure Transient Testing of Hydraulically Fractured Wells : A Single, Simple and Exact Analytical Solution Covering Bilinear, Linear, and Transition in Between Flow Regimes," paper SPE 139508 presented at the 2011 SPE Hydraulic Fracturing Technology Conference, The Woodlands, Texas, 24-26 January.
4. Spivey, J.P.: "Production Data Analysis for Commingled Multilayer Gas Reservoirs- Graphical Aides for Flow Regime Identification and History Matching," paper SPE 106305 presented at the 2007 SPE Hydraulic Fracturing Technology Conference, College Station, Texas, 29-31 January.
5. 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 Gas Technology Symposium, Calgary, 15-17 May.
6. Spivey, J.P.: "Estimating Layer Properties for Wells in Multilayer Low-Permeability Gas Reservoirs by Automatic History Matching Production and Production Log Data," paper SPE 100509 presented at the 2006 Gas Technology Symposium, Calgary, 15-17 May.

7. Spivey, J.P., Brown, K.G., Sawyer, W.K., and Gilmore, R.G.: "Identifying the Timing and Sources of Damage in Gas Storage Wells Using Smart Storage Technology," paper SPE 97070 presented at the 2005 SPE ATCE, Dallas, 9-12 October.
8. Huckabee, P., Vincent, M.C., Foreman, J., and Spivey, J.P.: "Field Results: Effect of Proppant Strength and Sieve Distribution Upon Well Productivity," paper SPE 96559 presented at the 2005 SPE ATCE, Dallas, 9-12 October.
9. Spivey, J.P., Valkó, P.P., and McCain, W.D.: "Applications of the Coefficient of Isothermal Compressibility to Various Reservoir Situations with New Correlations for Each Situation," paper SPE 96415 presented at the 2005 SPE ATCE, Dallas, 9-12 October.
10. Rivera, N., Jensen, J.L., and Spivey, J.P.: "Economic Comparisons of Multilateral and Horizontal Wells in Water-Drive Reservoirs," paper SPE 80927 presented at the 2003 SPE Production and Operations Symposium, Oklahoma City, 22-25 March.
11. Li, H., et al: "A Case Study: Field Development Plan for a Highly Overpressured Gas Reservoir in China by a Multidisciplinary Consulting Team," paper SPE 77668 presented at the 2002 SPE ATCE, San Antonio, Texas, 29 September - 2 October.
12. Spivey, J.P., Brown, K.G., Sawyer, W.K., and Frantz, J.H. Jr.: "Estimating Non-Darcy Flow Coefficient from Buildup Test Data With Wellbore Storage," paper SPE 77484 presented at the 2002 SPE ATCE, San Antonio, Texas, 29 September - 2 October.
13. Spivey, J.P., Frantz, J.H. Jr., Williamson, J.R., and Sawyer, W.K.: "Applications of the Transient Hyperbolic Exponent," paper SPE 71038 presented at the 2001 SPE Rocky Mountain Petroleum Technology Conference, Keystone, Colorado, 21-23 May.
14. Hudson, J.W., Jochen, J.E., and Spivey, J.P.: "Practical Methods of High-Grade Infill Opportunities Applied to the Mesaverde, Morrow, and Cotton Valley Formations," paper SPE 68598 presented at the 2001 SPE Hydrocarbon Economics and Evaluation Symposium, Dallas, 2-3 April.
15. Reeves, S.R., Bastian, P.A., Spivey, J.P., Flumerfelt, R.W., Mohaghegh, S., and Loperna, G.J.: Benchmarking of Restimulation Candidate Selection Techniques in Layered, Tight Gas Sand Formations Using Reservoir Simulation, paper SPE 63096 presented at the 2000 SPE ATCE, 1-4 October.
16. Spivey, J.P. and Lee, W.J.: "Pressure Transient Response for a Naturally Fractured Reservoir With a Distribution of Block Sizes", paper SPE 60294, presented at the 2000 SPE Rocky Mountain Regional/Low Permeability Reservoirs Symposium, Denver, 12-15 March.
17. McCain Jr., W.D. and Spivey, J.P.: "Extrapolation of Laboratory Measured Black Oil and Solution Gas Fluid Properties for Variable Bubblepoint Simulation," paper SPE 56746 presented at the 1999 SPE ATCE, Houston, TX, 3-6 October.
18. Spivey, J.P., and Lee, W.J.: "Application of the Diagnostic Plot Using a Derivative Based on Shut-In Time," paper SPE 56424 presented at the 1999 SPE ATCE, Houston, Texas, 3-6 October.

19. Spivey, J.P., and Lee, W.J.: "Variable Wellbore Storage Models for a Dual-Volume Wellbore," paper SPE 56615 presented at the 1999 SPE ATCE, Houston, Texas, 3-6 October.
20. Fan, L., Lee, W. John, and Spivey, J.P.: "Semi-Analytical Model for Thermal Effect on Gas Well Pressure Buildup Tests," paper SPE 56612 presented at the 1999 SPE ATCE, Houston, Texas, 3-6 October.
21. Fan, L., Lee, W.J., and Spivey, J.P.: "Thermal Effects on Gas Well Pressure Buildup Tests: Field Application," paper SPE 55645 presented at the 1999 SPE Rocky Mountain Regional Meeting, Gillette, Wyoming, 15-18 May.
22. Lee, W.J., and Spivey, J.P.: "Numerical and Analytical Well Test Analysis: A Case History," paper SPE 50946 presented at the 1998 SPE ATCE, New Orleans, 27-30 September.
23. Frantz, J.H. Jr., Spivey, J.P., and Hopkins, C.W.: "Practical Production Data Analysis," paper SPE 39927 presented at the 1998 SPE Rocky Mountain Regional/Low Permeability Reservoirs Symposium, Denver, 5-8 April.
24. Spivey, J.P. and Pursell, D.A.: "Errors in Input Data and the Effect on Well-Test Interpretation Results," paper SPE 39773 presented at the 1998 SPE Permian Basin Oil & Gas Recovery Conference, Midland, Texas, 23-26 March.
25. Hopkins, C.W., Frantz, J.H., Jr., Flumerfelt, R.W., and Spivey, J.P.: "Pitfalls of Injection/Falloff Testing in Coalbed Methane Reservoirs," paper SPE 39772 presented at the 1998 SPE Permian Basin Oil and Gas Recovery Conference, Midland, Texas, 23-26 March.
26. Frantz, J.H. Jr., Spivey, J.P., Voneiff, G.W., and Jacot, H.: "Practical Production Data Analysis for the Appalachian Basin," paper SPE 37347 presented at the 1996 SPE Eastern Regional Meeting, Columbus, Ohio, 23-25 October.
27. Jochen, V.A., and Spivey, J.P.: "Probabilistic Reserves Estimation Using Decline Curve Analysis with the Bootstrap Method," paper SPE 36633 presented at the 1996 SPE ATCE, Denver, 6-9 October.
28. Spivey, J.P. and Semmelbeck, M.E.: "Forecasting Long-Term Gas Production of Dewatered Coal Seams and Fractured Gas Shales," paper SPE 29580 presented at the 1995 SPE Rocky Mountain Regional/Low Permeability Reservoir Symposium and Exhibition, Denver, 19-22 March.
29. Gao, C., Lee, W.J., Spivey, J.P., and Semmelbeck, M.E.: "Modeling Multilayer Gas Reservoirs Including Sorption Effects," paper SPE 29173 presented at the 1994 SPE Eastern Regional Meeting, Charleston, West Virginia, 8-10 November.
30. Spivey, J.P. and Frantz, J.H. Jr.: "History Matching Production Data Using Analytical Solutions for Linearly Varying Bottomhole Pressure," paper SPE 29167 presented at the 1994 SPE Eastern Regional Conference & Exhibition, Charleston, West Virginia, 8-10 November.

31. McVay, D.A. and Spivey, J.P.: "Optimizing Gas Storage Reservoir Performance," paper SPE 28639 presented at the 1994 SPE Annual Technical Conference & Exhibition, New Orleans, 25-28 September.
32. Spivey, J.P. and Lee, W.J.: "Production Data Analysis For Wells Which Have Been Subject to Periodic Curtailment," paper SPE 26182 presented at the 1993 SPE Gas Technology Symposium, Calgary, Alberta, Canada, 28-30 June. Also presented at the 1994 SPE Permian Basin Oil & Gas Recovery Conference, Midland, Texas, 16-18 June.
33. Spivey, J.P., Gatens III, J.M., Semmelbeck, M.E., and Lee, W.J.: "Integral Type Curves for Advanced Decline Curve Analysis," paper SPE 24301 presented at the 1992 SPE Mid-Continent Gas Symposium, Amarillo, Texas, 13-14 April.
34. Holditch, S.A., Lin, Z-S, and Spivey, J.P.: "Estimating the Recovery From an Average Well in a Tight Gas Formation," paper SPE 21500 presented at the 1991 SPE Gas Technology Symposium, Houston, 22-24 January.
35. Spivey, J.P. and Lee, W.J.: "A Comparison of the Use of Pseudotime and Normalized Time for Gas Well Buildup Analysis in Various Geometries," paper SPE 15580 presented at the 61st SPE ATCE, New Orleans, Louisiana, 5-8 October.
36. Spivey, J.P.: "A New Algorithm for Hyperbolic Decline Curve Fitting," paper SPE 15293 presented at the 1986 SPE Symposium on Petroleum Industry Applications of Microcomputers, SilverCreek, Colorado, 18-20 June.
37. Spivey, J.P. and Lee, W.J.: "Use of Pseudotime: Wellbore Storage and the Middle Time Region," paper SPE 15229 presented at the SPE Unconventional Gas Technology Symposium, Louisville, Kentucky, 18-21 May.