

8-BT

PROGRESS REPORT
No. 9

September 1, 1984 - November 30, 1984

MMS Contract 14-08-001-21169, Mod. 3
(LSU Project No. 127-45-5115)
Effective Date: Aug. 26, 1982
Expiration Date: October 1, 1987

on

THE DEVELOPMENT OF
IMPROVED BLOWOUT PREVENTION SYSTEMS
FOR OFFSHORE DRILLING OPERATIONS

Submitted to
The Minerals Management Service
United States Department of the Interior
Reston, Virginia

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by

Petroleum Engineering Department
Louisiana State University

RESEARCH OBJECTIVES

The primary objectives of the research are:

1. The development of an improved blowout prevention system through the integration of measurements while drilling (MWD) and well control technologies.
2. The development of improved diverter systems for offshore operations.

Funding to date has included the following subtasks:

- 1.1.1 Determine the data requirements (parameters and speed of transmission) for automated well control system. Experimental study, (without secondary kicks) of parameters needed, time urgency, accuracy requirements, redundancy requirements, and trade offs.
- 1.1.2 Determination of additional data requirements for overall well control strategy including surface data.
- 1.2.1 Evaluate electrical telemetry technique as data rate alternative to conventional mud pulse telemetry.
- ✓ 2.1 Review of available technology and current field practices on design and use of diverters on offshore drilling rigs.
- 2.2 Review failures and cause of failures that have occurred in offshore diverter systems.
- 2.3 Use of systems analysis approach to develop computer model of reservoir/well/diverter system.
- 2.6 Literature and experimental study of erosion reduction techniques in diverter system (including bends).

PROGRESS

Work on the various phases of the project has continued as scheduled. The 10,000 ft. buried drill pipe flow loop is nearing completion. Discussion are scheduled with the technical programs coordinators, and will Al Homes of Harry Diamond Laboratories for planning delivery of the fluidic mud pulser to LSU for testing and evaluation.

SIGNIFICANT CHANGES

It is recommended that Dr. Robert Desbrandes be added as a co-principal investigator for this project. Dr. Desbrandes, who has recently joined our staff, has considerable expertise in the MWD area. It is proposed that a portion of the work originally scheduled for Dr. Bourgoyne be performed by Dr. Desbrandes. We would like authorization to proceed with this change by February 1, 1985. A copy of Dr. Desbrandes resume is attached. No change in the total amount of funding would be needed to accomplish this change.

Teaching assignment:

PETE 3036 (1)

PETE 3036 (2) Introductory to Well Logging

Research assignment:

Head of Well Logging Research and teaching facilities

1982-1984

Visiting Professor at the University of Houston,
Department of Electrical Engineering

Teaching assignment:

ELEE 5340: Introduction to well Logging

ELEE 7397: Well Log Interpretation

ELEE 6111: Advanced Well Logging Seminar

Research assignment:

Participation in the Well Logging Laboratory work

1966-1981

Lecturer of well logging at Ecole Nationale
Superieure du Petrole et des Moteurs, France

Teaching of borehole measuring methods and their interpretation.

In charge of training:

10 to 15 economists

20 to 30 geologists-geophysicists

20 to 30 drilling-production engineers

3 to 4 foreign trainees per year

Leading contributions:

Two text books published in 1968 and 1981

Exercise book in 1970

Simplified book in 1970

1960-1966

Head of Direct Prospection Project at the
French Petroleum Institute, France

Fundamental research on direct prospection

Responsibility for two research scientists and two technicians

Contact with two university laboratories

In 1960, appointed Senior Research Scientist

1958-1960

Head of Mud-Logging Laboratory at the French
Petroleum Institute, France

Measurements of parameters during drilling

Directly responsible for:

3 well-logging teams
2 scientists and 2 technicians
development of new equipment

1952-1958

Research Scientist with Schlumberger South
America Corporation in Houston, Texas

Designing and building new well-logging equip-
ment

Chief of Formation Tester project
Project led to commercial success

1947-1952

Field Engineer with Schlumberger Well Surveying
Corporation

Successively:

Field Engineer in Trinidad, Columbia
Chief of Center in Colombia
Chief of Division in Venezuela

1946-1947

Engineer with Etablissements SADER

Miscellaneous construction jobs

PUBLICATIONS

Articles

37 articles in different magazines in the field
of borehole geophysics, physics of solids and
fundamental physics

Books

Five books on borehole geophysics

Patents

Several patents taken out in France and/or
abroad

REFERENCES

Attached.

LIST OF TEXTBOOKS
Authored or Co-Authored by
Dr. Robert DESBRANDES

1. Petroleum Dictionary: Well Logging, Drilling and Production Techniques; Russian, French, English and German. Desbrandes R., Dupuy M., Ketchian S., and Pfanukuch, Editions Technip, 1955, Paris
2. French Dictionary of Technical Terms Used in the Petroleum Industry, Moureau and Rouge, Editions Technip, 1963, Paris
(Dr. Debrandes contributed Well Logging terms).
3. Theory and Interpretation of Well Logs, Desbrandes R., I Vol., 578 pages, 483 Figures. Editions Technip, 1968, Paris
4. Principles of Well Logging, Desbrandes R. and Dadone R., I Vol., 55 pages, Edition Technip, 1968, Paris
5. Collection of Well Log Examples, Desbrandes R., I Vol., 20 examples and solutions, Edition technip, 1970, Paris
6. Teorija i interpretacija resul'tatov geofizicheskikh metodov issledovanija skvazhin, Desbrandes R., I Vol., 288 pages, Editions "Nedra", Moscow, 1972, Russian translation and adaptation of "Theory and Interpretation of Well Logs".
7. Ce jin li luh he jie shi, Desbrandes R., In print, Petroleum Exploration and Exploitation Research Institute Peking, China
Chinese translation and adaptation of "Theory and Interpretation of Well Logs".
8. Well Logging in Boreholes, Desbrandes R., I Vol., 550 pages, 450 figures, Editions Technip, 1982, Paris
9. Encyclopedia of Well Logging, Desbrandes R., I Vol., 600 pages, 500 figures, Editions Technip/Gulf Publishing, 1985, Paris/Houston.

LIST OF PUBLICATIONS
 Authored or Co-Authored by
 Dr. Robert DESBRANDES

1. "Contribution to the Study of the Speed of Seismic Waves", Co-authors: X. Reverdy and A. Lagarde IFP Journal (Revue), Vol. XIV, No. 4-5, April-May, 1959.
2. "On the Reaction of Ionized Rare Gases to Brief Impulse", Co-authors: G. Norel and Y. Morineau, C.R.A.S., Vol. 252, p. 2393-2395, April 17, 1968.
3. "Coupling between Network Vibration and Dielectric Absorptions", Proceedings of the XII AMPERE Sym., Bordeaux, September, 1963, North Holland Publishing Co., Amsterdam.
4. "Correlation Between the Bands of Dielectric Absorption and the Attenuation of Brief Impulses Along Coaxial Lines"., C.R.A.S., Vol. 257, p. 2829-2832, Nov., 1963.
5. "Measurement of the Speed of Acoustic Waves in Coal", Co-author: T. Schwaetzer, IFP Journal, Vo. XX No. 1, January, 1965.
6. "New Technique Showing Electrons-Phonons Interaction Type: Application to Hydrocarbons". Ph.D. Thesis, Faculty of Science, University of Lyon, France, February, 1965.
7. "Characterization of Hydrocarbons by Phonon Spectrum", IFP Journal, Vol. XX No. 5 May, 1965.
8. "Vibrational Interactions of Dielectric-Metal Contact", Revue Generale d'Electricite' Vol. 74, No. 12, December, 1965.
9. "Quantum Emitter of Gravitational Radiation". Paper presented at the 1966 Contest of the Gravity Foundation, New Boston, Conn., paper classified "Outstanding" by the Jury.
10. "Future Perspectives of Well Logging", IFP Journal, Vol. XXII No. 6, June, 1967 p. 935.
11. "Experimental and Theoretical Study of the Propagation of Electromagnetic Pulse of Short Duration Through the Earth, co-authors: R. Gabillard, J. Marchant, Conference on M.F., L.F., and V.L.F., Radio Propagation, I.E.E. London, November, 1967.
12. "Experimental and Theoretical Study of Electromagnetic Propagation in a Geological Waveguide, co-authors: R. Gabillard, F. Louage, J. Fontaine, Conference on M.F., L.F., and V.L.F., Radio propagation, I.E.E. London, November, 1967.
13. "Study of Gravitons-Phonons Interactions", co-author: J. L. Grossiord, paper presented to the French Association for the Advancement of Sciences, Nancy, France, July, 1968.

- 14. "A Model of the Gravitational Radiation of Solids," co-author: L. E. Halpern, Ann. Inst. Henri Poincare. Section A. Vol. XI, n° 3, 1969, p. 309-329.
- 15. "Telelog, an Electromagnetic Method of Directional Exploration at Great Distance from Borehole," co-authors: R. Gabillard, R. Louage, Z. Bassiouni, SPWLA - 12th Annual Logging Symposium, Dallas, May 2-5, 1971.
- 16. "Telelog Spots Oil Strata 3,000 ft. from Wellbore," co-authors: R. Gabillard, F. Louage, Z. Bassiouni, World Oil, September, 1971, p. 60.
- 17. "Thirty-seven Ways to Improve your Well Completions," World Oil, April, 1972, p. 71.
- 18. "A New application of Telelog: Locating Oil or Gas Field Limits," Co-authors: A. Bassiouni, R. Gabillard, E. de Gelis, SPWLA-13th Annual Logging Symposium, Tulsa, May 1972.
- 19. "Comparative Interpretation of Instantaneous and Delayed Well Logs":, SAID 1st Annual Symposium, Paris, April, 1972.
- 20. "Specific Surface of Rocks and NMR Logs", co-authors: Y. Crosnier, R. Gabillard, and J. Citerne, SAID 1st Annual Symposium, Paris, april, 1972.
- 21. "Telelog, New Exploration Method at Great Distance from Borehole":, Petrole Information, March, 1972, p. 16.
- 22. "Principles, Operation and Application of the Telelog", Petroleum Industry in Europe, No. 430, May, 1972, p. 9-19.
- 23. "What Is New in Downhole Operating Technology," World Oil, June, 1973, p. 74.
- 24. "New Well Logging Technique by Ultrasonic Reflection", co-author: G. Norel, IFP Journal, July-August, 1973, p. 587.
- 25. "Possibilities Offered by Modern Electronics in the Field of Electric Well Logging," 24th International Geophysical Symposium. Cracovie 4-7, September, 1979.
- 26. "Sub-Sea Telecommande and Remote Measurements" Part I and II", FORAGE (Drilling), No. 83, April-June, 1979 and No. 84, July-September, 1979.
- 27. "Electric Cable Formation Tester", FORAGE, No. 85, October-December, 1979.
- 28. "Control of Directional Boreholes by the AZINTAC Tool", FORAGE, No. 87, January-March, 1980.

- 29. "Production Well Logging Part I and II", FORAGE, No. 88, April-June, 1980 and No. 89, July-September, 1980.
- 30. "Tubing Perforations", FORAGE, No. 90, January-March, 1981.
- 31. "Logging of Relief Wells", FORAGE, No. 91, April-June, 1981.
- 32. "Well Logging Technique for the Evaluation of Mineral Resources" FORAGE, No. 92, July-September, 1981.
- 33. "Well-Site Recording and Interpretation of Well Logs", FORAGE, No. 84, July-September, 1979.
- 34. "Geothermal Well Logging", FORAGE, No. 93, Oct.-Dec., 1981.
- 35. "Borehole Orientation Measurement by Inertial Measurements, Part I and II", FORAGE, No. 96, July-Sept., 1982 and No. 97 Oct.-Dec., 1982.
- 36. "New Developments in Directional Drilling", Petrole Informations, No. 1561, January, 1982.
- 37. "Advances in remote-controlled drilling", Co-author P. Morin, Journal of Canadian Petroleum Technology", Nov.-Dec., 1982, Montreal.

LIST OF PATENTS
Dr. Robert DESBRANDES

1. "Helicoidal ply packer" U.S. n° 2 872 230, 1959.
2. "Short Duration Pulse Energy Measuring Device Using a Gas Tube Whose Degree of Ionization is Varied by the Pulse Itself" U.S. n° 3.173.090 (March 1965), France n° 1.313.726, W. Germany 1 261.598, Austria 22 750, Canada 714 719, Brazil 71 710, (Nov. 1962).
3. "Method of Corps Identification", French Patent 1.458.060, July 31, 1963.
4. "Method and Equipment for Hydrocarbon Detection" co-author: C. Bene, French Patent 1.459.739, October, 1963.
5. "Method and Equipment for the Detection of Subsurface Discontinuities of Electric Resistivity: co-author: R. Gabillard, French Patent #1.529.584, October 27, 1966 and May 13, 1968.
6. "Transmitter-Receiver of HF Gravitational Waves" French Patent 1.557.617, May 26, 1966 and Certificate of addition 94.503, October 25, 1966.
7. "Magneto-Electric Tool for the Detection of Subsurface Discontinuities of Electric Resistivities" France 1.603.023, June, 1968, France n° 1.578.713, U.S. n° 3.609.521, Canada n° 843.552, Iran n° 7 639, Venezuela n° 22 359, July 14, 1969.
8. "Prospection Method for Formations Surrounding a Wellbore", co-authors: R. Gabillard and F. Louage, French Patent 1.602 303, June 24, 1968, addition certificate 96 956, addition certificate 96 508.
9. "Methods and Equipment to Conduct Sensitive and Exact Measurements of Rock Properties Around a Borehole", co-authors: M. M. Lebreton, Morlier, Sarda, France n° 1592 555, July 22, 1968, Canada n° 942 211 July 69, U.S.A. 3 613 072 July 69, France 2 055 511, May 11, 1969.
10. "Method and Equipment for the Detection of Discontinuities in Formations Around Boreholes", co-authors: Lebreton, Morlier and Sarda, French patent 2 057 511, May, 1969.
11. "Method and Equipment of Subsurface Prospection", co-authors: Gabillard and Louage, French patent 2 151 428, April 1971, Canada 829 580, Dec. 1971.
12. "Method and Equipment for the Determination of the Characteristics of Geologic Formation by Acoustic Signals", France 2 145 100, July 1971, U.S.A. 3 781 784, May, 1972.
13. "Method and Equipment of Exact Determination of the Acoustic Impedence of Geologic Formations Around a Wellbore", co-author: M. Norel, France: 2 172 808 February, 1972, U.S.A. 3 883 841, February, 1973, Canada 974 081, February, 1973, France 2 270 602, May, 1974.

- 14. "New Subsurface Electric Prospection Method", co-authros: Gabillard and Bassiouni, France 72.08.33, Canada 983 577, March, 1972.
- 15. "Method and Equipment for the Measurement of Electric Resistivity of Formations Around Metalic Casing in a Borehole", co-author: Mangez P., France 2.207.278, July 1977.
- 16. "Method and Equipment for the Determination of Fluid Properties Contained in Geologic Formations", co-author: Chaize, L., France 2.215.628, January, 1973.
- 17. "Method and Equipment for the Determination of the Geometric Configuration of the Submerged Part of Icebergs", France 2.379 823, February, 1977, USA 4 208 731, January, 1978.
- 18. "Dispositif de Forage Mettant en Oeuvre un Organe de Pompage Assurant l'Irrigation Centripete due Front de Taille", co authors: Cholet, Norel, France 2.414.614, January, 1978.
- 19. "Noveau Dispositif de Mesure des Contraintes s'Appliquant a une Garniture de Forage en Service", co-author: Grolet, P., France 2.439.291, October, 1978.
- 20. "Remote Measurement Using Pressure Impulses", France 98 009, January, 1979.
- 21. "Sonde a Patin Rotatif pour Effectuer des Mesures dans un Sondage", co-author: Norel, G., France 2.448.621, February, 1979, U.S.A. 4.289.025, September, 1981.
- 22. "Dispositif Assurant le Deplacement d'un Element dans un Conduit Rempli de Fluide", co-author: Cholet, Norel, France 79/31 561, December, 1979.
- 23. "Methods and Equipment for Measurements in High Temperature Wells", co-author: Berthelot, F. C., France 80 15 585, July, 1980.
- 24. "Methods for the Determination of the Dip of Geologic Formations Around a Borehole", co-author: Norel G., France 80 15 587, July, 1980.
- 25. "Improved Method and Devices for Measuring the electric Resistivity of Geological Formations", France 79 21 030, August, 1979, U.S.A. patent application 178 421.

ACADEMIC ACTIVITIES
Dr. Robert DESBRANDES

- 1958-65 University of Geneve, Switzerland
Profs. Bene and Freeman
NMR Petroleum Application Research
Participation in AMPERE Symposiums
- 1960-70 University of Lille, France
Prof. Gabillard
Electromagnetic Prospection Research
- 1965-72 Member of six Ph.D. and M.S. Committees
- 1966-81 Lecturer of Well Logging at Ecole Nationale Superieure du
Petrole et des Moteurs
- 1979 Colorado Mountain College
Coordination of Summer School
- 1979 University of Houston
Conference on new acoustic and electric well logging techniques.
- 1979-80 Algerian Petroleum Institute
Three month seminar on new well logging techniques.
- 1982-84 University of Houston
Visiting Professor
Teaching and research in the area of well logging.

REFERENCES IN ACADEMIA
Dr. Robert DESBRANDES

France:

University of Paris 6 (Prof. Cagniard, Petiau, Vignes and Marle).
University of Paris 11 (Prof. Sauzade)
University of Paris 13 (Prof. Norel)
University of Lyon (Prof. Janin and Laforgue)
University of Lille (Prof. Gabillard)
University of Nancy (Prof. Hadni)

Switzerland

University of Geneve (Prof. Bene)

U.S.A.

University of Houston, Texas (Prof. Shen)
University of Boulder, Colorado (Prof. Wait)
University of Tallahassee, Florida (Prof. Halpern)
Salk Institute, La Jolla, California (Prof. Guillemin, Nobel Prize of
Medicine)
Baylor University, Houston, Texas (Dr. Walker-Claus, Member of the
Academy of Sciences, New York)

Canada

University of Montreal, Quebec (Prof. Pham Van Ngoc)
University of Calgary, Alberta (Prof. Mungan)
University of Edmonton, alberta (Prof. Pascal)

Poland

University of Cracovie, (Prof. Plewa)

Japan

University of Osaka, (Prof. Yokouchi)
University of Tohoku, (Prof. Chiba)