MISSISSIPPI GEOLOGICAL SOCIETY

Volume XLI No. 1 September, 1992

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MISSISSIPPI GEOLOGICAL SOCIETY
1992-93

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* Deceased

PRESIDENT'S MESSAGE

Well, here it is near the end of summer and time for the activities of the Society to get back into full swing. I sincerely hope you have had a good summer, in spite of prevailing conditions that seem to beset us 'round about.

As you may have heard by now, Mike Noone is no longer President of the Society, having resigned to accept gainful employment outside the state. His letter of resignation appears elsewhere in this bulletin. I know we each wish Mike the best in his new position in Atlanta. Due to his resignation and the movement to president of the first vice-president, a vacancy was created in the first vice-president position. As mandated by the Society's bylaws, I have appointed Brian Sims as first vice-president pro tempore until a special election is held at the September 8 Luncheon meeting.

Speaking of the Luncheon meeting, the dates for each of the future regular meetings also appears in this bulletin. Go ahead and mark your calender now lest you forget. In the way of dates, you will also note in this issue the date for the MGS Fall Barbeque. It will be held on Thursday, September 24. at the Reservoir Lodge at Old Trace Park. A map is included in this issue if you need directions. Festivities will begin around 4:30, with chow at 6:00, so make your plans now to come and enjoy good food and fellowship.

You will notice, too, on the front inside cover of this issue are listed your officers and committee chairmen for the coming year. Please call any of us with any suggestions, ideas, or criticisms you may have. If you are called upon by a committee chairman to serve or help on the committee, please strongly consider serving. Our society is only as good as you make it by your participation.

You probably have heard by now that the proposed AAPG environmental section was approved at the AAPG Convention in Calgary in June. During our September noon luncheon we will be given a brief report of the occurrences there by one of our members who attended.

As far as the coming year, several items are on the agenda now. At this point, the upcoming October G.C.A.G.S. convention grabs the most attention. Also on the list of coming attractions are the publication of the latest 'Red Book' update, strengthening the Society's financial footing, and a spring '93 seminar and field trip. Something you'd like to see done? Give me or any of the officers a call and we'll look into it. We need and want your input.

Well, that's enough for this time--I look forward to seeing you at the September 8th luncheon and/or at the Fall Barbeque on September 24th. See you there!

Stanley King

BUSINESS MEETING LUNCHEON SCHEDULE

September 8, 1992
October 13, 1992
November 10, 1992
December 8, 1992
January 12, 1993
February 9, 1993
March 9, 1993
April 13, 1993
May 11, 1993

Fall BBQ: Sept. 24, 1992 Spring Fling, May 20, 1993

BUSINESS MEETING LUNCHEON

September 8, 1992 • 11:30 a.m.
Capitol City Petroleum Club, Smackover Room

MY METHOD OF EXPLORATION
THERON CROCKETT

Born in Shreveport, Louisiana in 1924, Theron then moved and grew up around the oil and gas fields of Stephens, Arkansas. When World War II broke out he joined the Air Force to become a fighter pilot. This resulted in his flying 75 missions over Germany in his P51B Mustang.

Following the war he graduated from the University of Alabama in geology. He then attended three years of graduate school at the Department of Geology, University of Oklahoma.

He went to work for a small independent in South Arkansas for 3 years before becoming a true independent himself. He worked out of Magnolia, Arkansas for ten years, then spent a year in Pampa, Texas. At this point Theron made the decision to move to Jackson, Mississippi. His reasoning for such a move was the potential he saw in Mississippi. He felt that the Arkansas-Louisiana oil & gas trends had been picked over much more than those in Mississippi. He made the move to Jackson in 1960 and has been finding reserves ever since. The intended objective of this presentation is to get Theron to share his thought process for finding oil and gas as exemplified by his last three discoveries.

MID-YEAR ELECTION NOTICE

Due to the vacancy created by former President Mike Noone's moving to Atlanta, (see Mike's resignation letter elsewhere in this Bulletin) Stanley King, as 1st Vice President, has assumed the MGS Presidency. An election will be held for the now vacant office of 1st Vice President. The following members have agreed to be candidates for this office:

BRIAN SIMS

Education: Millsaps, BS Geology, 1982
Experience: Clayton Williams, Jr., 1981-1990
Consulting Geologist 1991-present
Professional Affiliations: AAPG, MGS, HGS, MGS Advertising Committee Chairman 1991-1992

JOHN WARNER

Education: USM, BS Geology, 1982
Experience: Downhole Data, Inc. 1983-1986
The Mudlogging Company, Inc. 1986-1990
DEQ - Mississippi Office of Geology 1990-1992
DEQ - Office of Land and Water 1992
Professional Affiliations: MGS, GCS, MGS Audio-Visual Committee Chairman 1991-1992

The election will be held at the September Business Meeting

MISSISSIPPI GEOLOGICAL SOCIETY
TREASURER'S REPORT
OPERATING YEAR ENDING MAY 31, 1992

REVENUES

Membership Dues	$ 5,125.00	
Earth Enterprises (publication sales)	1,679.00	
Luncheon Receipts	2,695.00	
Bulletin Advertising	1,660.00	
Fall B.B.Q. Contributions (91)	675.00	
Fall B.B. Q. Receipts	745.00	
Christmas Party Receipts	260.00	
Spring Fling Contributions (1991)	500.00	
(1992)	100.00	
Spring Fling Receipts	532.80	
Knox Seminar Receipts	6,452.00	
Knox Seminar Contributions	400.00	
Knox Seminar Book Receipts	280.00	
Chalk Field Trip Guide Book	10.00	
Rebate from Quick Print	50.00	
	23.67	
	$21,187.47	
Transfer of funds from Money Market Account to checking account	$ 2,000.00	July
	2,000.00	December
	2,500.00	May
	6,500.00	
TOTAL	$27,687.47	

Gross Operating Expenditures

Checking Service Fees & New Checks	$ 78.87
Printing (Bulletin, Knox Sem., Etc.)	7,053.27
Reproduction (Ridgways & Jackson Blue)	546.68
Bulletin (Photos, etc.)	420.11
Postage (Bulletin, Knox Sem., Etc.)	796.57
Plaques (Jackson Trophy)	411.89
Luncheons & Christmas Party	4,604.19
Fall BBQ	1,068.81
Spring Fling	1,632.44
Christmas Party (Poinsettias)	75.00
Luncheon Speakers	453.99
Red Book (Drafting)	542.80
Advertising GCAGS (1992 Convention)	325.00
Advertising GCAGS (1991 Convention)	125.00
Income Tax Preparation	250.00
Boland Scholarship Fund	340.03

Tax Return for Boland Scholarship Fund		335.00
SIPES Foundation (½ Knox Proceeds)		315.47
Knox Seminar		5,754.44
Post Office Box		35.00
Advertising Solicitation		10.09
Society Representation to GCAGS		978.40
Compu Mail		1,228.70
	Total	$27,381.75

Checking Account Balance 5/31/91	$ 1,025.52
Savings Account Balance 5/31/91	20,207.21
Cash Balance 5/31/91	$21,232.73

Revenues 6/1/91-5/31/92	$21,187.47
Expenditures 6/1/91-5/31/92	27,381.75
Net Loss from Operations	6,194.28

Transfer of Funds from Savings	$ 6,500.00
	305.72

Checking Account Balance 5/31/92	$ 1,331.24
Savings Account Balance 5/31/92	$14,478.62

Cash Balance 5/31/92	$15,809.86

Lindsey Stewart
Lindsey Stewart
Treasurer

July 21, 1992

Michael A. Noone
President
Mississippi Geological Society

Board of Directors
Mississippi Geological Society

Please accept this letter as my official notice to resign my position as President of the MGS, effective immediately. My reason for resigning is that I have accepted employment in the city of Atlanta. This distance will prevent me from performing my duties.

I thank you for the opportunity to have been the president and wish the board and society a good year.

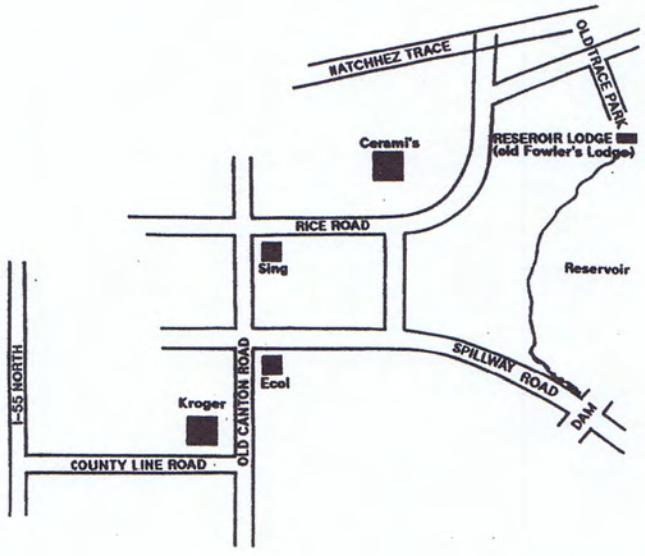
Sincerely,
Michael A. Noone
Michael A. Noone

cc: Stanley King, First Vice President
Jack Moody, Second Vice President
Ed Hollingsworth, Treasure
Larry Baria, Secretary
Steve Ingram, Past President

FALL BBQ

Thursday sept. 24
Reservoir Lodge

Festivities 4:30 p.m.
Dinner 6:00 p.m.



$10.00 per person
$5.00 student

Mississippi Department of Economic and Community Development's (MDECD) Energy Division - Provides Support for the Mississippi Independent Petroleum Producers

Since the beginning of the Industrial Revolution, energy has been the lifeblood of Economic Activity and Growth. To provide a foundation for continuous economic development, it is imperative that our state maintains an available and appropriate supply of energy and services.

Here in Mississippi we have been blessed with an abundant supply of fossil fuel resources, studies tell us that we have approximately seven (7) trillion cubic feet of natural gas, approximately three (3) billion tons of coal and close to six (6) billion barrels of oil located right here in Mississippi reservoirs. Yet it appears that we are basically importers of energy resources, we buy more from other states than we produce.

To off-set this position we must encourage exploration and development of our state's primary energy resources, to the extent that those resources are competitive in energy markets and consistent with environmental requirements. We must encourage efforts to emphasize emerging fields and technology transfer in promising areas to meet immediate and future energy needs. Special attention has to be given to oil and natural gas development.

The economic impact of Mississippi's exploration and production industry is quite a significant part of the total Mississippi economy. Expenditures from exploration and development of crude oil, natural gas and revenues from production provide substantial tax revenues in terms of income, sales and severance.

Cumulatively speaking over $800 million of severance tax revenues have been collected from oil production in Mississippi since 1944. This amount is in addition to other intangible benefits to the State's economy, as well as $350 million of revenues from the production of natural gas. Revenues associated with oil and gas production are the state's third largest source of revenue, after personal income tax and sales tax revenues.

The Mississippi Department of Economic and Community Development, Energy Division is responsible for ensuring the implementation of enacted Mississippi Legislation mandating energy planning, Section 57-39-1 et seq. of the Mississippi Code of 1972 annotated. This legislation mandates the coordination of all energy-related needs and activities in the State of Mississippi, with the objective of providing an efficient and economical energy system through a statewide coordinated plan.

On August 17, 1989, representatives of the oil industry in Mississippi met along with representatives of the MDECD, Energy Division to discuss the proposed Mississippi Energy Plan. That meeting was chaired by Dr Rudy Rogers of the Petroleum Engineering

Department at Mississippi State University (MSU). The forum addressed the general topic of better utilization of the State's oil and gas. Of the many issues addressed by the representatives during the forum, the issue of the frequent transferring of old oil and gas producing properties in Mississippi from major companies to independents was a major concerns. It was pointed out that those small companies usually did not have the means to perform the research that is often needed to prolong production from these properties. It was pointed out that the state would need to promote research endeavors in the future in order to maintain its position in oil and gas development. The recommendation was made to create a database of Mississippi reservoirs that would be accessible to these independent companies.

With that thought in mind, Dr. Rogers of the MSU Petroleum Engineering Department, directed the founding research in the state on the utilization of carbon dioxide in old Mississippi oil fields. As part of that research the first computer data base of reservoir properties of the 1550 oil reservoirs in the state was established, which has provided us with a base from which to build our strategies.

Dr. Rogers research involved five predictive models to determine oil and gas recovery by utilizing steam, fire, carbon dioxide, chemical, and polymer flooding. Criteria for evaluating the reservoirs was determined and the results suggested that some 400+ reservoirs are conductive to carbon dioxide flooding, 300 reservoirs may be conductive to polymer flooding, 100 to chemical flooding and a few to fire and steam flooding.

It has been determined that the most effective method of tertiary recovery for us here in Mississippi is carbon dioxide injection. Carbon dioxide injection projects have been established in the country and as these projects have gone into full scale production the economic viability of these projects have proven to be worthwhile.

Carbon Dioxide may be used in a variety of ways to enhance the production of crude oil reservoirs. This proven technology has not been widely utilized in Mississippi due primarily to the 180 independent Mississippi Oil Companies not having sufficient access to technological information about the economic dimensions of CO_2 enhancement.

Carbon Dioxide - Enhanced Oil Recovery (EOR) is a high-tech process which requires very expensive data. The cost of obtaining much of this data or the maintenance of a laboratory employing highly educated engineers and technicians is out of the question for the independent oilman who operates in Mississippi. The small independent operator does not have the facilities or technical expertise to conduct the research and make the capital investment needed to get into the Enhanced Oil Recovery business. As mentioned, studies have shown that there is more oil to be

recovered by EOR techniques, than has already been produced in the State of Mississippi. But unless we can get the independent operators into the EOR business, the oil will most likely remain in the ground.

The Mississippi Department of Economic and Community, Energy Division in conjunction with Mississippi State University and its Department of Petroleum Engineering has set up an Enhance Oil Recovery Laboratory at MSU. This is the only laboratory of its kind available in the Southeastern United States from Louisiana to Pennsylvania. The purpose of the lab is to supply information which will enable independent producers in Mississippi to begin application of the CO_2 process for the purpose of increasing oil production in Mississippi.

The U.S. Department of Energy (DOE) will award up to $40 million in the second round of its Advanced Oil Recovery Demonstration Program, designed to increase production of declining U.S. Oil Fields. The department realizes that nearly 17,000 U.S. Oil wells are abandoned each year and because of that, access to seventy-five percent (75%) of domestic oil reserves could be lost by 2005.

The round two (2) projects will be targeted toward shallow shelf carbonate reservoirs, those that were formed in shallow marine environments below the influence of tides. There are 382 of this type of reservoir known to exist in fourteen (14) states, Mississippi being one of those fourteen (14). For more information contact:

U.S. Department of Energy
Pittsburgh Energy Technology Center
Attn: Keith Miles
Contract Specialist
Post Office Box 10940
Mail Stop 921-118
Pittsburgh, Penn. 15234
Fax: 412-892-6216

If addition information is needed concerning the use of EOR Technologies and relative Projects in the State of Mississippi, please contact Mr. Chester B. Smith, Associate Director of the Energy Division at (601) 359-6600.

DEQ Library Newsletter Number 2, July 1992

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY / GEOLOGY - LAND AND WATER - POLLUTION CONTROL

NEWSBRIEFS

NEW GENERAL INTEREST REFERENCE BOOKS

Code of Federal Regulations, Title 29 (parts 1910-end) and Title 40 (all parts). 1991 Edition. Office of the Federal Register, National Archives and Records Administration, 1991.

Mississippi Business Directory, 1991-92. American Directory Publishing Company, 1991.

Mississippi Manufacturers Directory, 1991. Mississippi Department of Economic and Community Development, 1991.

Mississippi Statistical Abstract. 23rd Edition. Division of Business Research, Mississippi State University, 1991.

OAG Business Travel Planner: Hotel and Motel Redbook. Published Quarterly. OAG (Official Airline Guides), 1992.

OAG Desktop Flight Guide. Published Monthly. OAG (Official Airline Guides), 1992. (Includes flight schedules, airline reservation numbers.)

Polk 1992 Jackson Mississippi City Directory. R. L. Polk & Co., 1992. (Includes Street Address Directory and Numerical Telephone Directory.)

Rand McNally 1992 Road Atlas. Rand McNally, 1992.

Statistical Abstract of the United States, 1991: The National Data Book. Economics and Statistics Administration, U. S. Department of Commerce, 1991.

The World Almanac and Book of Facts 1992. Pharos Books, 1992.

BOOKS FOR CPM TRAINING COURSE

The library has loan copies of the books on the reading list for the Certified Public Managers Training Course. To date 12 of the 18 titles on the list have been received from publishers and are reserved for staff members enrolled in the CPM Training Course.

FLOOD INSURANCE RATE MAPS

The library has recently updated the Flood Insurance Rate Map collection for all Mississippi counties, cities, and towns participating in the National Flood Insurance Program. These maps can be used to determine the boundaries of 100 year and 500 year floodplains, "special flood hazard areas", and base flood elevations for specific properties. The maps are located in the Mississippi Reports section of the library.

DOE STRATEGIC PETROLEUM RESERVE REFERENCE MATERIALS

The 1992 Mississippi Legislature passed SCR 529, "A concurrent resolution supporting the development of an expansion to the Strategic Petroleum Reserve at the Richton Salt Dome in Perry County and urging the U. S. Secretary of Energy to ensure full consideration of the Richton Salt Dome in Perry County as the site for the Strategic Petroleum Reserve expansion." The DEQ Library has obtained copies of all Department of Energy publicly circulated materials relating to the proposed expansion of the Strategic Petroleum Reserve. The primary reports among these DOE materials are 1) Report to the Congress on Candidate Sites for Expansion of the Strategic Petroleum Reserve to One Billion Barrels, Department of Energy, March 1991; and 2) Implementation Plan for the Environmental Impact Statement on the Strategic Petroleum Reserve Expansion, Department of Energy, March 1992. The library also has copies of the many important DOE sponsored geologic and hydrologic reports on Richton Dome contracted during the 1970's-1980's when Richton Dome was a major candidate site for a national nuclear waste repository.

LIBRARY VOLUNTEER

Indira Bhowal, previously employed as a Senior Technical Assistant at the Indian Statistical Institute Library in Calcutta, India, is working 1-2 days each week as a volunteer in the DEQ Library. Indira and her husband OPC employee Pradip Bhowal came to Mississippi from Calcutta in 1990.

LIBRARY ADDS AV EQUIPMENT

A TV, VCR, AV stand, and overhead projector have been transferred to the library conference room from the Office of Pollution Control. The equipment may be used in the library or signed out for use in other areas of the building. The library conference room is available for small group meetings or work on staff projects. See the librarian to reserve or confirm the availability of the room.

LIBRARY STATISTICS
JANUARY - MAY 1992

1354 persons used the library based on daily counts
1731 journals, books, and reports were circulated
695 new journal issues received
409 new books and government reports received
1449 new maps (includes 1294 Flood Insurance Rate Maps)

BIOREMEDIATION - SELECTED REFERENCES

Several requests for information on bioremediation have resulted in a library file of articles and reports. This list is selected from the library file and from references owned by the DEQ Library.

Biological Treatment of Hazardous Waste. M. F. Torpy et al. Pollution Engineering, v. 21, no. 5, p. 80-86, May 1989.

BIOREMEDIATION - SELECTED REFERENCES (cont'd.)

Bioremediation Comes of Age. Thomas G. Zidrides. Pollution Engineering, v. 22, no. 5, p. 57-62, May 1990.

Bioremediation: Fine Tuning Microbial Strategies, Putting Together a Site Specific Train Requires Consideration of Many Factors. R. D. Bleam and Thomas G. Zidrides. Soils: Analysis, Monitoring, Remediation, p. 22-29, March 1992.

Bioremediation in the Field. EPA 543/N-92/001, no. 5, U.S. Environmental Protection Agency, March 1992.

Bioremediation of a Polluted Subsoil. Hamid Borazjani et al. Interim Technical Reports, FY 1990-1991, Water Resources Research Institute, Mississippi State University, 1991.

Bioremediation of Contaminated Surface Soils. J. L. Sims et al. EPA 600/9-89/073, Robert S. Kerr Environmental Research Laboratory, U. S. Environmental Protection Agency, 1989.

Bioremediation: Potential and Pitfalls. Alan B. Nichols. Water Environment & Technology, v. 4, no. 2, p. 52-56, February 1992.

Bioremediation Removes Gasoline Residues. Kevin G. Robinson et al. Pollution Engineering, v. 22, no. 8, p. 76-82, August 1990.

Determining In Situ Biodegradation: Facts and Challenges. Eugene L. Madsen. ES&T: Environmental Science & Technology, v. 25, no. 10, p. 1663-1679, October 1991.

Enhanced Bioactivity Treats Hydrocarbon-Contaminated Soils. Robert E. Moore. National Environmental Journal, v. 2, no. 1, p. 34-37, January 1992.

Integrating Technologies Enhances Remediation. Richard A. Brown and Kevin Sullivan. Pollution Engineering, v. 23, no. 5, p. 63-68, May 1991.

TCE Bioremediation. William R. Mahaffey. Water Environment & Technology, v. 4, no. 2, p. 48-51, February 1992.

Toxic Cleanups Go "Bugsy": Waste-Eating Organisms Thrive in Bioremediation Market. Debra K. Rubin et al. ENR: Engineering News Record, v. 228, no. 8, p. 34-39, February 24, 1992.

Understanding Bioremediation: A Guidebook for Citizens. EPA 540/2-91/002, U.S. Environmental Protection Agency, 1991.

RECENT ADDITIONS TO THE LIBRARY

The reports selected for this list are chosen from the many publications received by the library for their potential interest to the staff in the various divisions of the Department, and their relevance to current environmental, geological, and hydrological topics.

1991 Annual Book of ASTM Standards, Vol. 00.01, Subject Index and Alphanumeric List. American Society for Testing and Materials, 1991.

1991 Annual Book of ASTM Standards, Vol. 04.08, Soil and Rock, Dimension Stone, Geosynthetics. American Society for Testing and Materials, 1991.

Bioremediation in the Field. EPA/540/N-92/001, No. 5, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, 1992.

Biostratigraphy and Paleoenvironmental Analysis of the Mint Spring Formation and the Marianna Limestone Across Central Mississippi and Southwest Alabama. W. Cecil Pettway. Master's thesis, University of Southern Mississippi, 1989.

Classification of Wetlands and Deepwater Habitats of the United States. Lewis M. Cowardin et al. U. S. Fish and Wildlife Service, Department of the Interior, 1979.

Cross-reference Index of Hazardous Chemicals, Synonyms, and CAS Registry Numbers. The Forum for Scientific Excellence, Inc. J. B. Lippincott Company, 1990.

Ecological Risk Estimation. Steven M. Bartell et al. Lewis Publishers, 1992.

Erosion and Sediment Control: Field Manual. North Carolina Department of Environment, Health, and Natural Resources, 1991.

Field Studies of Radon in Rocks, Soils, and Water. Linda C. S. Gundersen and Richard B. Wanty, Editors. Bulletin 1971, U. S. Geological Survey, 1991.

Floods of December 1982 to May 1983 in the Central and Southern Mississippi River and the Gulf of Mexico Basins. Roy B. Stone and R. H. Bingham. Water-Supply Paper 2362, U. S. Geological Survey, 1991.

Fundamentals of Weather and Climate. Robin McIlveen. Chapman & Hall, 1992.

DEQ Library Newsletter: Number 2

July 1992

Published by the Mississippi Department of Environmental Quality

Editor: Carolyn Woodley

Designer: Marilyn Ellis

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A Geologic Time Scale. W. Brian Harland et al. Cambridge University Press, 1990.

Ground-water Models for Forrest and Lamar Counties, Mississippi. Shihua Harry Zhao. Master's thesis, University of Southern Mississippi, 1990.

Ground Water Modeling of the Miocene Aquifer System, Jones County, Mississippi. Raymond Sturdivant, Jr.. Master's thesis, University of Southern Mississippi, 1991.

The Gulf of Mexico Basin. Amos Salvador, Editor. Geology of North America, Volume J, Geological Society of America, 1991.

Handbook of Incineration Systems. Calvin R. Brunner. McGraw-Hill, 1991.

Hazardous Waste Incineration Calculations: Problems and Software. Joseph P. Reynolds et al. John Wiley & Sons, Inc., 1991.

Index to EPA Test Methods. Margaret R. Nelson, Compiler. EPA 901/3-88-001, U. S. Environmental Protection Agency, 1988.

Innovative Treatment Technologies: Overview and Guide to Information Sources. EPA/540/9-91/002, U. S. Environmental Protection Agency, 1991.

The Knox Group in the Appalachian Fold-thrust Belt and Black Warrior Basin of Alabama: Stratigraphy and Petroleum Exploration. W. Edward Osborne and Dorothy E. Raymond. Circular 162, Alabama Geological Survey, 1992.

A Landowner's Guide to Oil and Gas in Alabama. Strudwick Marvin Rogers and Lisa Lee Mancini. Information Series 70, Alabama Geological Survey, 1991.

National Water Summary 1988-89: Hydrologic Events and Floods and Droughts. Richard W. Paulson et al., Compilers. Water-Supply Paper 2375, U.S. Geological Survey, 1991.

Natural Resources Law in the 1990's: Oil and Gas Operations and Developments - Practical Environmental Practice Applications. Natural Resources Section, The Mississippi Bar, 1991.

Neotectonics of North America. D. Burton Slemmons et al., Editors. Decade Map Volume, Geological Society of America, 1991.

The Occurrence and Distribution of Boracite Group Minerals Associated with the Louann Salt, Wayne County, Mississippi. Tara Leigh Odom. Master's thesis, University of Southern Mississippi, 1991.

Offsite Environmental Monitoring Report: Radiation Monitoring Around United States Nuclear Test Areas, Calendar Year 1990. D. J. Chaloud et al. EPA/600/4-91/030, U. S. Environmental Protection Agency, 1991. (Includes Project Dribble, Tatum Dome area, Mississippi.)

Our Soils and Their Management. Roy L. Donahue et al. Interstate Publishers, 1990.

The Petroleum System - Status of Research and Methods, 1992. Leslie B. Magoon, Editor. Bulletin 2007, U. S. Geological Survey, 1992.

Petrology and Hydrocarbon Reservoir Potential of Mississippian (Chesterian) Sandstones, Deep Black Warrior Basin, Mississippi. Steve Byron Hughes. Master's thesis, University of Southern Mississippi, 1988.

Principles of Geology, v. I-III. Charles Lyell. Reprint of 1830 edition. University of Chicago Press, 1990.

Resume 1991: The Complete Annual Review of Oil and Gas Activity in the United States. Petroleum Information Corporation, 1992.

Sea-level Changes: An Integrated Approach. Cheryl K. Wilgus et al., Editors. Special Publication No. 42, Society of Economic Paleontologists and Mineralogists, 1988. (Sequence stratigraphy)

Sequence Stratigraphy, Lithofacies Relationships, and Paleogeography of Oligocene Strata in Southeastern Mississippi and Southwestern Alabama. Berry H. Tew. Bulletin 146, Alabama Geological Survey, 1992.

The Soil Chemistry of Hazardous Materials. James Dragun. Hazardous Materials Control Research Institute, 1988.

Stratigraphic Facies, Depositional Environments, and Petrology of the Lower Tuscaloosa Formation Reservoir Sandstones in the North Hustler and Thompson Field Areas, Southwest Mississippi. Douglas P. Klicman. Master's thesis, University of Southern Mississippi, 1988.

Stratigraphy and Depositional Environments of the Catahoula Sandstones and Associated Facies in Southeast Mississippi. Lee Allen Day. Master's thesis, University of Southern Mississippi, 1987.

Stratigraphy and Environmental Hydrogeology of the Solid Waste Disposal Site, Stennis Space Center, Hancock County, Mississippi. Michael G. Stevens. Master's thesis, University of Southern Mississippi, 1990.

Structure, Sedimentology, Coal Quality, and Hydrology of the Black Warrior Basin in Alabama: Controls on

the Occurrence and Producibility of Coalbed Methane. J. C. Pashim et al. Gas Research Institute, 1991.

The Superfund Innovative Technology Evaluation Program: Technology Profiles. Fourth Edition. EPA/540/5-91/008, U. S. Environmental Protection Agency, 1991.

Tatum Salt Dome Radiological Monitoring: 1991 Annual Report. Jimmy L. Carson. Division of Radiological Health, Mississippi State Department of Health, 1991.

Tectonics of Suspect Terranes: Mountain Building and Continental Growth. David G. Howell. Chapman & Hall, 1989.

Tidal Marsh Plants. Lionel N. Eleuterius. Pelican Publishing Company, 1990.

Water Resources Data Mississippi: Water Year 1990. M. L. Plunkett et al. Water-Data Report MS-90-1, U. S. Geological Survey, 1991.

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The Gulf Coast Association of Geological Societies

GCAGS Convention 1992
P. O. Box 2474
Jackson, MS 39225-2474

42nd Annual Convention
October 21-23, 1992
Sponsored by Mississippi
Geological Society

August 20, 1992

To: The Membership of the Mississippi Geological Society

The Employment Assistance Committee for the 1992 GCAGS Convention which will be held in Jackson this October 21-23rd, plans to have on hand for review by potential employers, the resumes of Geologists interested in possible employment.

The Committee will also try to assist in arranging interviews with possible employers during the Convention and also post notice of open positions which employers may advertise.

If you wish to have your resume available for review, please mail two copies to the GCAGS Convention 1992 at the above address and mark Attn: Employment Assistance Committee.

We hope to have a good turn out for the Convention and look forward to seeing everyone there.

Sincerely,

Chairman, Employment Assistance Committee
GCAGS Convention 1992

MAKING SENSE OF GLOBAL WARMING IN AN ELECTION YEAR

If we believe most of what we read in the media these days, the Earth's temperatures are going to rise in the next century, perhaps by several degrees, spawning worldwide disaster caused by melting polar ice caps. Oceans will rise. Sea coasts and port cities will be flooded. Drought will be commonplace, causing crops to fail. Animals will migrate, adapt to the increased temperatures, or die as a result of the worldwide increase in temperature. The economic and social disruption will be enormous and our lives will forever be changed.

But even as President Bush is being pushed to help negotiate a climate treaty to be signed by world leaders at an Earth Summit Conference in Rio de Janeiro in June, the computer models which are predicting global warming are unraveling.

A new study recently released by the National Oceanic and Atmospheric Administration (NOAA) that analyzed data from nearly 750 weather stations in the U.S., China and the Soviet Union found there has been virtually no increase in average daytime temperatures, and only a slight increase in the average nighttime temperature of the Northern Hemisphere during the past 40 years. The study, which appeared in the GEOPHYSICAL RESEARCH LETTERS, found that from 1950 to 1990 daytime temperatures in the Northern Hemisphere have not warmed at all and that "most of the warming which has occured in these regions over the past four decades can be attributed to an increase of the mean minimum (mostly nighttime) temperatures."

The significance of this research is that the Intergovernmental Panel on Climate Change (IPCC), whose research with computer models on global warming are mostly responsible for the international conference this summer, has said in its studies that, "There is no compelling evidence for a general reduction in the amplitude (range) of the diurnal (daily) cycle." NOAA's Thomas Karl, who co-authored the new NOAA study said this means the "Intergovernmental Panel on Climate Change is saying there's no evidence that global warming would not occur in both the daytime highs and the nighttime lows. Yet our data clearly shows that's not true."

One must understand the significance of NOAA's research and its affect on the IPCC global warming computer models. Most, if not all, of the downside risks on global warming are based on rapidly rising daytime highs. If Karl's research, which encompassed a significant portion of the Northern Hemisphere's land mass, has shown the warming has taken place at night, then the effect would be relatively unharmful, lengthening the growing season (with warmer nights) without creating more evaporation (through hotter days), thus destroying the threat of increased droughts.

The George C. Marshall Institute reports that in 1980, experts were concerned global warming would melt the polar ice sheets and cause sea level to

rise 15 to 25 feet. In 1985 that prediction became 3 feet and by 1989, just 1 foot. A major study in the journal GEOLOGY recently blew another hole in the failing global warming armor by reporting research that could show sea levels would actually fall if global warming were to occur.

Three marine sediment scientists found that during the very warm mid-Holocene period (4,000 to 7,000 years ago), The Antarctic ice sheet expanded substantially. "This event took place in a climate that was a few degrees warmer than present. Therefore, the mid-Holocene period might be a good temporal analogy for the kind of climatic conditions expected during global warming. Our results suggest strongly that the response of the Antarctic glacial system would be an increase in mass balance (that is, an increase in in the polar ice sheet)." That would imply falling sea levels.

And why would the levels of the sea fall? The primary greenhouse gas is water vapor, accounting for two-thirds of the predicted buildup from a doubling of carbon dioxide. Because there would be more water in the atmosphere, more water would be falling to the ground. And because even the greatest temperature rise predicted by the global warming models suggest only a warming of 5 to 10 degrees, below melting levels at the poles, the effect of water vapor accumulation will be more snow and ice.

But the George C. Marshall Institute study of the evidence for global warming suggests that if there is more water vapor in the atmosphere, there will be more clouds. And if there are more clouds, they will block the sunlight, causing a cooling effect of the Earth rather than a warming one.

The Marshall Institute study reports there are some 20 basic and supporting equations programmed for the computer to create a mathematical model of the earth's climate. Some of these values are well known through observation: for others, the modeler must guess the right value.

A government study estimates that restrictions on the burning of fossil fuels may needlessly cost the U.S. $95 billion a year. President Bush is correct to be hesitant concerning our legislative and international stance on global warming when doubts are increasing about the accuracy of such global warming models. If Bush can only "keep his head about him while others are losing theirs," perhaps this country can take a sensible approach to the perceived global warming threat.

an editorial reprinted from the U.S. WATER NEWS, Vol. 8, No. 10, April, 1992, page 6.

FUELING ANGER
NATURAL-GAS PRICES IRK BOTH PRODUCERS, USERS; ARE UTILITIES AT FAULT?
Local Distribution Costs Take A Rising Share of What Average Homeowner pays

A Tough Job for Regulators

By Robert Johnson, staff reporter for The Wall Street Journal

ELK CITY, OKLA.-On a windswept mesa five miles from the nearest paved road, Ron Cade wrestles a wellhead valve control the size of a Mack Truck steering wheel to ease the powerful rush of natural gas from 17,000 feet underground.

Gas hissing daily from this well, Apache Corp.'s Taylor No. 1-22, can warm 4,400 homes through a cold night. But Apache says it is selling some gas below break-even levels, and Mr. Cade, an Apache engineer, complains: "A lot of customers expect us to just give this gas away."

At the other end of the pipeline, 859 miles and three middlemen away, Amy Beckett, a lawyer in Chicago, thinks gas is overpriced. Some of the gas from Taylor No. 1-22 heats her small brick bungalow in the Albany Park neighborhood at more than five times the wellhead price. That "just doesn't seem right,' she complains.

IRKSOME DISPARITY

Although far apart in geography and point of view, both Mr. Cade and Ms. Beckett are irked by the same apparent price disparity: 1,000 cubic feet of gas, enough to heat a typical home for one day, recently brought Apache only $1.10 in Oklahoma but cost Ms. Beckett $5.65 in Chicago.

All across the nation, both the 5,000 gas producers and many of the 50 million residential consumers say they're on the short end of the pipeline. Between 1984 and 1990, wellhead prices plunged 36% nationally, but rates to households slipped only 5%. Many consumers, including some 800,000 in Chicago, actually pay more.

The result: desertions at both ends of the pipeline.

Homeowners in Chicago, seduced by falling electric rates, are abandoning gas at a four-per-week pace while Chicago's electric utility, Commonwealth Edison Co., is signing up some 70 new residential customers a week. Since 1971, nationwide gas consumption has slumped 11%. And since 1950, the 43-to-1 lead once held by gas furnaces over electric models has eroded to 2.5 to 1.

DISGRUNTLED CONSUMERS

In an era of surplus gas, consumers-"burner-tips," gas -industry officials call them- are tired of paying as if there were a shortage. And that could threaten the industry's shaky 24% share of the $240 billion-a-year national energy market-a share already down from 33% in 1970. Meanwhile, high-polluting coal has raised its market share to 23% from 18% in 1970. Oil has held its own.

As for gas producers, their number has plunged 60% since 1985. They are going out of business at the rate of one a week, and the pace is expected to quicken. Already, many gas producers are writing down assets, renegotiating loans and selling off properties they can't afford to explore and drill.

All this will eventually mean less drilling, shorter supplies and still-higher retail prices. Already, drilling for gas has all but stopped in the U.S. Domestic reserves in the lower 48 states are down 2% since 1984 to 160 trillion cubic feet, though that's still a nine-year supply at current consumption levels without drilling any new wells.

BARELY SURVIVING

"We're hanging on with spit and baling wire," says Dixie Mills, bookkeeper of tiny Mexia Gas Co. in Mexia, Texas. "Eight years ago, our small wells brought in $80,000 a

year, and we spent it in our town. Now, we're bringing in $30,000 and there isn't any money for new equipment or new employees, and less all the time for the old employees."

Apache, which has stayed profitable largely because of its oil operations, turned off the tap at Taylor No. 1-22 for two weeks in February, when wholesale prices fell below 1978 levels to 83 cents per 1,000 cubic feet. Prices have moved above $1 since then, but they are expected to fall again soon. Apache, which has laid off more than 100 workers in the last year, is moving much of its exploration abroad.

The 1990s weren't supposed to be like this. Plentiful and relatively clean-burning, natural gas was expected to benefit from ever-tougher anti-pollution laws, federal tax credits refunding up to 70% of exploration costs, and repeated threats of oil shortages. Says Richard O'Neill, chief economist at the Federal Energy Regulatory Commission (FERC): "It's a humble time right now for those of us who bought into the idea that gas prices for producers had nowhere to go but up."

Why haven't consumers benefited much from the low prices being paid to producers?

For one thing, some industrial and commercial consumers are benefiting. Under 1986 federal deregulation rules, large customers can bypass utilities and bargain directly with independent marketers, which buy and sell gas in high volume. So, many of the 275,000 industrial customers and four million commercial businesses that use gas can outbargain homeowners. Some industrial companies have dual-energy systems that can quickly switch from gas to oil or coal as relative prices change.

"The little guy still pays a lot because he doesn't have any negotiating clout," says Daniel Macey, the editor of Gas Daily, an industry publication.

The little guy gets burned for other reasons as well. Many pipelines are still gradually passing along an $8 billion burden stemming from their settlements of so-called take-or-pay contracts. In the 1980s the contracts locked many transmission companies into long-term obligations to pay suppliers fixed rates that turned out to be much too high. A 1987 regulatory ruling allowed some of these costs to be passed through to utilities, which in turn, charge their customers.

MOST PIPELINES PROFITABLE

Thus rescued, most interstate pipelines are profitable even though they have cut their transmission charges 25% since 1984. In addition, FERC targets a 12% rate of return for pipelines; a trade association survey of 23 major companies in 1990 shows a 9.2% collective rate of return on equity. Pipeline officials credit their good fortune to the industry's 36% reduction in costs-excluding the cost of gas-since 1984.

The revenue from getting gas out of the ground and to users is being split far differently from the way it was in 1984, according to the Department of Energy. Producers get about 16% (down from 43%), pipeline operators 21% (about flat), and local utilities get 63% (up from 37%). The department also says the gap between the price paid by utilities and the price paid by households has widened 50% since 1984 to about $3.25 per 1,000 cubic feet.

Utilities say their big share is justified because their costs have risen more than the rest of the industry's. They note that they have added complex webs of lines in growing residential neighborhoods and must do maintenance work in populous areas. They add that the producer's share depends solely on market prices.

The producers certainly know that. Many of them, despite long touting natural gas as the fuel free of volatile sheikdoms that might restrict supplies and long lobbying against government price restrictions, want now to turn down the tap themselves in the hope of raising prices. They are pressing for state laws to curb production. They got one enacted in Oklahoma last week. Texas regulators are scheduled to vote on a similar plan April 27, and Louisiana is expected to act soon.

FTC WARNING

However, the Federal Trade Commission says state curbs on output aimed at raising prices are illegal. State officials say they merely want to prevent gluts.

The industry itself is split. Many large companies want to produce gas in high volume to generate cash flow. Many small ones complain the resulting low prices wipe out profits.

Apache's chairman, Raymond Plank, is so concerned that he recently told Energy Department Officials that if the market keeps sliding, producers should simply give gas away in return for federal tax credits or subsidies. He moans "We're squirrels on a treadmill with no chance to eat acorns, furiously drilling more gas and selling it for less money."

Saya FERC's Mr. O'Neill, "Utilities have monopolies on residential customers. It's up to local regulatory commissions to keep costs under control, and believe me that's difficult."

REGULATORY PROBLEMS

Those regulatory difficulties are apparent in the dealings between Peoples Gas Light & Coke Co., the Chicago utility that supplies Ms. Beckett, and the Illinois Commerce Commission. Peoples is asking the regulatory body for a 5.5% rate rise. It also wants to add $1 to its monthly service charge-essentially a fee for sending customers their bills, whether or not they use any gas. That charge was raised to $7 from $5 just two years ago. An Illinois Commerce Commission spokesman says the agency has "attempted to keep Peoples Gas rates in line." The commission says it dropped the company's allowable rate of return on equity to 13.25% from 15.6% in 1990, although it acknowledges that the returns have occasionally exceeded the limits, partly because of cold snaps. The agency also says Peoples hasn't received a rate increase since a scaled-down one of 2.8% in December 1989. But the main impact of that increase fell on residential customers, raising their rates 6.9% annually.

To see why natural gas gets pricey, follow a molecule of gas from beneath the sandstone under Taylor No. 1-22 near Elk City. Out here, Apache has a near monoply on drilling rights. "For just about as far as you can see, to get gas, you have to see me," says Mr. Cade, the engineer.

Not that Apache's strong position helps it much. Mr. Cade, a ruddy man in a white hardhat digs into a "World Famous Steak" at K-Bob's restaurant beneath framed photographs depicting wellhead blowouts, a major hazard during drilling. "Seems like we take most of the risk on our end of the business, but you'd never know it from the prices," he gripes.

In the early 1980s, finding gas seemed a way to mint money here. Wellhead prices briefly boomed to eight times their current levels, and entrepreneurs sometimes handed out $100 bills at K-Bob's just to break to the front of the line. Some wildcatters slept in Cadillacs bought with minimal down payments, planning to drive home in style the day they struck gas.

HIGH EXPLORATION COSTS

Amid the optimism, Apache had 20-man crews working around the clock to drill Taylor No. 1-22 in 200 days in 1985. When gas finally roared up the tubing, it sold for more than twice the current price.

But the $3.4 million well is surrounded by four dry holes, which cost a total of $8 million. Until recently, that dry-hole expense tripled the production cost of the entire site to $1.50 per 1,000 cubic feet.

Although Taylor No. 1-22 has been profitable lately, Apache risks devaluing the gas from many of its 3,000 or so newer, more expensive wells by accepting prices below the companywide break-even level. Taking a bid of, say, 83 cents at No. 1-22 may impose the same low price at new wells on which millions are still owed. Thus, the temporary closing of No. 1-22. "This gas probably wouldn't even be worth finding today," Mr. Plank says.

At the wellhead, a 12-foot high maze of pipes, valves and controls that gas people call the "Christmas tree," the gas goes from the well's three-inch tubing into black pipe 30 inches in diameter. This slows the surge to about 23 miles an hour; the gas must be

recompressed several times to keep it moving all the way to Chicago in about 35 hours.

The methane flows largely unchanged from the wellhead to the home. The producers chemically strip out corrosive elements to preserve the steel pipe, and the utilities add an odorizing sulfur compound to help detect leaks-a process accounting for less than 1% of the retail price. But although nothing else is done, the price-recently $1.10 per 1,000 cubic feet in Apache's lines at Taylor No. 1-22-rises as the gas moves through different owners' pipes.

THE FIRST TRANSFER

Apache's pipe ends 100 feet away from Taylor No. 1-22. There, it connects with the blue pipe of Natural Gas Clearinghouse, A Houston company that buys gas, transports it short distances, sells it to utilities or industrial users and sends it into interstate pipelines. The price on this shipment rises to $1.25. A Natural Gas Clearinghouse official says its 15-cent charge for the three miles and eight minutes that the gas is in its pipe is standard for the industry. It pays for the high cost of laying pipe in remote areas, he adds.

Within sight of Apache's mesa, the gas passes from Natural Gas Clearinghouse's line into the white-and-blue striped pipe of Coastal Corp.'s ANR Pipeline Co.

ANR's 24-inch pipe zigzags first northwest, through a corner of Texas, then back through Oklahoma to the northeast through Kansas, Missouri, Iowa and Illinois. For the 800-mile trip, ANR's transmission fee varies depending on how full the pipeline is; pipelines cut their fees in the summer and on unseasonably warm winter days. ANR's charges for sending gas to Chicago from Oklahoma have varied from 18 cents per 1,000 cubic feet last February, an unusually warm month in Chicago, to 65 cents in a chillier January 1990.

By the time a recent shipment of Taylor No. 1-22 gas arrives in Manhattan, Ill., 56 miles southwest of Chicago, its price is $1.55. There, by a lonely country road, ANR's pipeline pops out of the ground and interconnects with the gray-painted steel of Peoples Gas-the Utility that sells it to Amy Beckett for $5.65.

Like most utilities, Peoples gas is required by state law to pass along savings when wellhead prices fall, its officials note. "But we also have to go out and read meters, repair lines and maintain our margins to keep our bond ratings." says John Lawrisuk, controller of the Utility's parent, Peoples Energy Corp.

Peoples Energy's profit margin widened to 6.2% in 1991 from 4.2% in 1984, the peak year for wellhead gas prices. Since 1984, because of a general cut in corporate taxes, the company's tax rate has fallen to 34% from 48.7%, and the company has raised the annual dividend on common stock 66% to $1.72 a share. Its stock recently hit its highest price since 1981 on the New York Stock Exchange. Goldman, Sachs & Co. ranks its 12.1% annual rate of return on equity among the best of major utilities.

Like many utilities, Peoples Gas discounts rates to businesses, but it is still often undersold by pipelines and independent marketers. Thus the gap between what households and companies pay for gas is widening. Residential customers paid a 104% higher rate than did industrial users in 1990, the most recent year for which complete figures are available, compared with 45% more in 1984.

Charles Stalon, a former FERC member and now director of Michigan State University's Institute of Public Utilities, says "There is discrimination against residential customers. For them, deregulation and the free market aren't working the way we hoped."

But Peoples Energy's Mr. Lawrisuk says many people just "don't understand our business and its capital requirements." He adds "Costs have gone up. Postage is up."

reprinted from The Wall Street Journal. April 2. 1992

PUBLICATION LIST

1. Mississippi Geological Society Photo Directory, 1981 ..... $ 2.00
2. Wilcox Fields of Southwest Mississippi, Maps and production data on 171 fields, in ring binder, 350 pp., 1969 ..... 28.00
3. Mesozoic-Paleozoic Producing Areas of Mississippi and Alabama. Volume I. Maps and producing data on 57 fields, with 2 composite logs, clothbound, 139 pp., 1957 ..... 10.00
4. Volume II. Maps and producing data on 77 fields, includes Supplement 1, in ring binder, 143 pp., 1963 ..... 15.00
5. Supplements 2 through 7 for Volume II, Maps and producing data on 35 fields, 110 pp. 15.00
6. Supplement 8 for Volume 11, Maps and producing data on 34 fields, 108 pp., 1980 ..... 25.00
7. Volume II, complete with Supplements 2-8, 361 pp., 146 fields 50.00
8. Volume III, 85 pp., 46 fields, 1987 ..... 50.00

FIELD TRIP GUIDEBOOKS

9. Upper Cretaceous Outcrops, Northeast Mississippi and West Central Alabama, Fourteenth Field Trip, 29 pp., May 1959 ..... 4.00
10. Cenozoic of Southeast Mississippi and Southwest Alabama, Fifteenth Field Trip, 52 pp., May 1960 ..... 6.00
11. Cenozoic of Horn Island and the Pascagoula Valley 10th Annual GCAGS Meeting, 24 pp., October, 1960 ..... 2.50
12. The Paleozoics of Northwest Arkansas Sixteenth FGield Trip, 48 pp., May, 1962 ..... 5.00
13. Tertiary Type Localities of East-Central Mississippi, 25th GCAGS Meeting, 133 pp., Octoberr 1975 ..... 5.00
14. Mississippi Rocks of the Balck Warrior Basin, Seventeenth Field Trip, 79 pp., April, 1978 ..... 8.00
15. Tertiary and Upper Cretaceous Depositional Environments, Central Mississippi and West Central Alabama 33rd Annual GCAGS Meeting, 40 pp., October 1983 ..... 7.50

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MISSISSIPPI GEOLOGICAL SOCIETY

Volume XLI No. 3 October, 1992

The Society would like to thank the following sponsors of the 1992 Fall Barbecue

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PRESIDENT'S MESSAGE

Believe it or not, the end of September is upon us, which means the GCAGS 1992 Convention is about three weeks away. If you have not received your announcement brochure by now, you have missed the pre-registration deadline, but you can still register at the door. If you did not receive the announcement/registration brochure, please call or write AAPG in Tulsa and let them know you didn't get one and let them know of your displeasure at same. There seems to have been a monumental foul-up up there in the mailing lists.

Since it is the end of September, that also means the Fall Bar-B-Que is now history. Suffice it to say that if you didn't make it, you missed a good time and some very good food. Thanks again to Jim Files, Stan Thieling, Steve Ingram and Rick Ericksen for getting the food, getting everything set up, and serving. I was encouraged to see a rather large contingent of students from USM and from Millsaps at the BBQ- and yes, they were all geology majors!

As George Vockroth announced at the BBQ, Desk and Derrick will have their annual Industry Appreciation Night on November 9, 1992, beginning at 6:30 PM at the Ramada Renaissance on County Line Road. Lieutenant Governor Briggs will be the featured speaker. The cost is $20.00 per person with November 3 the deadline for reservations. Mail your check for reservations to: Betty Proctor, Hughes Oil, Inc., Suite 800, 200 S. Lamar Street, Jackson, MS 39201.

As many of you are by now aware, fellow geologist and friend Steve Potter was murdered in Shreveport recently. A fund has been set up for his children. If you desire to make a contribution to this fund, the address is: Steve Potter Memorial Children's Fund, c/o Pioneer Bank, 401 Texas Street, Shreveport, Louisiana 71101. The account number for this fund is 2-01-141-53-1.

The October luncheon meeting, as noted elsewhere in this bulletin, will be held on the 13th. The speaker for this event will be our own Bob Schneeflock. Also at this meeting will be draft copies of the proposed "Mississippi Geologists Practice Act" for your perusal and comments. I look forward to seeing you then.

Stanley King

BUSINESS MEETING LUNCHEON SCHEDULE

Spring Fling, May 20, 1993

October 13, 1992
November 10, 1992
December 8, 1992
January 12, 1993
February 9, 1993
March 9, 1993
April 13, 1993
May 11, 1993

BUSINESS MEETING LUNCHEON

October 13, 1992 • 11:30 a.m.
Capitol City Petroleum Club, Smackover Room

MY METHOD OF EXPLORATION
BOB SCHNEEFLOCK

Bob grew up in Foley, Alabama and graduated from Foley High School in 1963. After graduation he spent his summers and holidays roughnecking offshore to finance his college education.

After graduating from the University of Southern Mississippi with a degree in geology, he went to work for Chevron as a geologist in New Orleans in 1969. Bob returned to school at the University of Alabama in 1971 and received his Master of Science degree in geology in 1972. That same year, he went to work for Tenneco in Lafayette, LA and later in Bakersfield, CA where he picked up a degree in Economics at California State University.

Bob came to Jackson in 1978 with Hunt Energy and later Clayton Williams. He struck out on his own in 1981 and co-founded Paramount Petroleum Co., Inc. with Robert Chaney in 1986.

The intended objective of this presentation goes along the same favor as Theron Crockett's...to get Bob to share his thought process for finding oil and gas as exemplified by his latest discovery.

Johnson

WENDELL B. JOHNSON

retired geologist

The geologic community of Mississippi recently lost one of its most well known, noted members. The following is excerpted from the Clarion-Ledger of August 31, 1992.

Wendell Berdette Johnson, 69, of Canton Club Circle, retired chairman of the geology department at Millsaps College, died of Cardiac arrest Sunday at St. Dominick/Jackson Memorial Hospital.

A Falun, Kan., native, Mr. Johnson was a member of Briarwood Presbyterian Church, where he served several terms as a member of the church's ruling body.

Mr. Johnson joined the faculty of Millsaps in 1954, having previously worked for the Army Corps of Engineers. He held bachelor's and master's degrees in geology from Kansas State University and pursued further graduate work at the University of Missouri and the Missouri School of Mines, where he taught for two years.

Mr.Johnson headed the geology department at Millsaps from 1972 to 1987. Throughout his career, he spoke to many churches and civic organizations on geology, and founded the Mississippi Gem and Mineral Society in 1957. He was awarded an honorary lifetime membership in the Mississippi Geological Society in 1989. He also served for many years on advisory committees at the University of Mississippi Medical Center.

"He started the Gem and Mineral Society to get kids interested in geology as a hobby," said his daughter, Janice M. Johnson of New York City.

Johnson said the society holds an annual gem show featuring gems from all over the country.

"He was excited about geology and loved to impart to others what he learned," Janice Johnson said.

"He was the most honest and caring human being many have ever met, and he had a real close relationship with his students," Johnson said. "His students called him 'Uncle Wendell.'"

"He cared enormously about the Millsaps geology department and kept up with hundreds of his students," said Johnson. "His retirement party filled up the Capital Petroleum Club with students."

Other survivors include: wife, Martha.

Memorials may be made to the geology department at Millsaps College.

By Shannon Robinson, special to the Clarion-Ledger

STATE OF MISSISSIPPI
DEPARTMENT OF ENVIRONMENTAL QUALITY
JAMES I. PALMER, JR.
EXECUTIVE DIRECTOR

September 10, 1992

SIGNIFICANT OIL AND GAS POOLS AND
FORMATIONS OF MISSISSIPPI

The Mississippi Office of Geology announces the publication of a chart entitled "Significant Oil and Gas Pools and Formations of Mississippi," by Rick L. Ericksen and Sandra Dowty.

This chart presents the oil and gas producing formations of the state in columnar form by geologic age and group. The number of fields is given for each of the producing formations. Also given are the first productive pool and field of first production, the significant zones or pools for each formation, the dominant reservoir lithology, and a type field for each zone. This chart will be particularly useful for those directly involved in the oil and gas industry as well as landowners and others interested in oil and gas production within the state. The size of the chart is 11.2 x 34.5 inches.

The chart "Significant Oil and Gas Pools and Formations of Mississippi" may be purchased from the Office of Geology at Southport Center, 2380 Highway 80 West, Jackson, for $2.00 per copy. Mail orders will be accepted when accompanied by payment ($2.00, plus $.50 postage and handling). Send mail orders (with check or money order) to:

Office of Geology
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RCRA (1976) RESOURCE CONSERVATION AND RECOVERY ACT

Jack S. Moody, Office of Geology

As an explorationist turned bureaucrat I thought it only proper that I get up to speed on what good things the government has done for the oil and gas industry in the way of environmental regulations. So I signed up for the recently held Workshop on Developing Area-Specific Waste Management Plans for Exploration and Production Operations. The enrolled group was made up of mainly drilling and production engineers, company environmental specialists, government regulators and a few consulting types, one company pilot, and one exploration geologist-bureaucrat.

First came the reading of a labyrinth of regulatory empowering acts that go by acronyms like RCRA, SPWA, CWA, CERCLA, NEPA and so on. Each of these reaches out and regulates various areas of life. After you sit and listen to them as they go through these acts and describe their areas of authority, which sometimes overlap, one begins to wonder if you need a permit to breathe. If you go into a course like this with an industrial bias, I can almost guarantee you will experience frustration when wave after wave of regulatory authority breaks on your head. When I was growing up I spent many a day surfing. Sometimes the waves would get so big that it made it impossible, or at best extremely difficult, to get out past the break. One would begin paddling out and then see it coming on the horizon, a set of waves. So you paddle for all you are worth. If you just make it past the first wave in the set you might be immediately faced with number 2 wave which could be bigger yet. After number 2 comes number 3, 4, 5. If these really big waves break and catch you while you are paddling out you may loose all the ground you have gained, or your board, or both. These regulations seem to me to be similar in nature to real waves. If you manage your end right, which takes a good deal of effort, then the ride can be worth the effort. However, if you get caught inside the break or fall while riding, these giants things will get out of hand and unpleasant in a hurry. If you add the dimension of a few nasty dispositioned sharks in the area the level of anxiety rises exponentially.

Immediately after experiencing this surfing flashback I was forced to grasp a reality check. These rules and regulations were not being presented for discussion, debate, and reasonable formulation. That had long since taken place somewhere beyond my circle of awareness. What I was hearing was the law of the land, like it or not, this is the way it is.

Speaking of sharks, about this time our instructor wanted to give us some idea of the disposition of the Justice Department towards those individuals or companies upon which the Justice sets its sights. For instance, if a company violates any of these regulations and the Justice Department decides to go after the

accused people, the Justice Department wants to go for the people at the top of the organizational chart, not the field level. On top of that they want those people, the people as high as they can get, to serve time in prison rather than pay fines, which cost is passed on as the cost of doing business. Obviously, they are trying to make an impression on top management that they will be held responsible for the implementing, training, and performing of their company's compliance with the regulations.

Here I would like to give credit where credit is due. What comes to my mind deals with the effectiveness of the environmental lobby. I cannot think of anyone who has done a better job of getting their agenda in place. On the other hand, you would probably have to look pretty hard to find anyone who has a poorer public image than the oil and gas industry.

Thankfully, the workshop direction shifted to dealing with examples of how to handle exploration and production waste products in an acceptable fashion. Some of them seemed like a bit of an overkill, i.e. bird nets over pits, but by and large it seemed to be reasonable. The end is to have as little negative impact on the natural setting as possible. I am sure all of us are familiar with many old fields which are a testimony of how not to conduct production operations. These are real black eyes to our industry and those situations will not be tolerated in the future. I had to admit that the how-to-do-it-right portion of the workshop was agreeable in general with common sense and responsible use of the land. In order to drill today's and tomorrow's wells an operator needs to be aware of these many rules and regulations and plan his operations out so everything is given its proper weight of consideration. The workshop stressed the value of being informed of existing regulations and planning ahead. I felt like the course would benefit geologist from the point of view that when they are trying to sell a prospect if they are at least somewhat familiar with these requirements that might convey some level of comfort to an environmentally nervous buyer. If the buyer realizes that the geologist is aware of the environmental implications and is proceeding according to the rules he may feel some relief about this very scary environment liability.

Congress exempted a number of "wastes" normal to E & P activities from EPA's Regulatory Determination which was submitted to congress in June 1988. This includes such things as produced water, drilling fluids, drill cuttings, etc. There are those in the regulatory and environmental community who would like to really tighten the screws on these exemptions.

As the contents illustrate, it is not my intention to tell you what these regulations are and how they work. I do want you to realize that they are out there and you need to be familiar with their implications. If you are operating or have a working interest, you need someone in the operation to be very familiar with all that is required.

It's Not Business as Usual Anymore

C.W.Brown Jr., SPE, Oxy U.S.A. Inc.

Summary. In 20 years, a complex body of environmental laws, regulations, and decisions has been established in the U.S. Basic knowledge of environmental laws, regulations, and management techniques is now necessary for design, construction, and operation of oilfield facilities. Environmental permits are on the critical path and could significantly affect project viability or the cost of doing business. In California and many other states, resource development projects face complex and voluminous environmental regulations. Because of these permitting obstacles and the competition for the available permits, early environmental planning is necessary if a project is to be successful and if costs and future liabilities are to be minimized. This paper reviews eight federal environmental laws, significant events that affect our daily business, and the reasons why environmental management must be integrated in our "business as usual" work decisions to minimize future (hidden) liabilities.

Introduction

Line managers and operating personnel are responsible for environmental protection in a company's operations. To carry out this responsibility effectively, these personnel must have a good working knowledge of all environmental laws, regulations, and policies that apply to their activities. Eight federal laws may affect our daily oilfield operations in the U.S.

Most of these laws provide civil and criminal penalties for noncompliance. If you ignore the law, you risk personal fines and possibly a prison term. Therefore, what you don't know will most likely end up hurting you and your company. This paper discusses several examples of the possible monetary consequences when a cleanup remedy is imposed by outside parties.

Any waste generation or discharge of contaminants into the environment has the potential for future liability. Environmental management programs reduce the potential for undesirable surprises and minimize this hidden liability. These environmental programs consist of assessments, waste minimization, record keeping, documentation, and up-to-date training. These programs are briefly reviewed.

The assessment program will help ensure that personnel at each operating facility know and are meeting their obligations and responsibilities under the law. If you are

responsible for environmental protection, it is in *everyone 's* interest for you to do a good job.

Important Environmental Statutes

Most corporations' environmental policies charge line managers with the responsibility for environmental performance of their activities. The policies also state that every employee is expected to carry out the spirit and the letter of these policies. Knowledge of environmental laws and regulations is necessary for line managers and engineers who control the operations and installations. In some cases, state requirements can be even more restrictive than federal regulations.

Resource Conservation and Recovery Act (RCRA) of 1976. RCRA regulates the management of hazardous waste from its generation to final disposal. Two of the statute's nine subtitles create significant regulatory programs. Subtitle C authorizes a comprehensive federal program to regulate hazardous wastes. Subtitle D addresses the disposal of nonhazardous solid waste. "Solid waste" is defined broadly to include garbage, refuse, and other discarded materials. It includes solid, liquid, and gaseous materials.

Sec. 3001 requires the U.S. Environmental Protection Agency (EPA) to set criteria for identifying the characteristics of hazardous waste. In Code of Federal Regulations 40 (CFR) Parts 260 and 261 (1980), the EPA specifies wastes identified as hazardous and has set general "characteristics" (corrosivity, reactivity, ignitability, and toxicity) by which other solid wastes would be judged as hazardous.

The 1980 amendments to RCRA exempt wastes from oil, gas, and geothermal E&P activities from Subtitle C hazardous waste requirements. The exemption is specifically for drilling mud, produced waters, and other wastes associated with E&P operations. In July 1988, the EPA issued a regulatory determination concluding that the wastes should retain the exemption from Subtitle C regulation and should continue to be regulated by state agencies using Subtitle D authorities. Whenever any Subtitle C waste is mixed with Subtitle D waste, regardless of whether the waste loses its hazardous nature or characteristics, it is governed by Subtitle C.

The EPA and individual states can bring several types of enforcement or corrective actions under RCRA, including administrative orders and civil and criminal penalties. If a person or company violates Subtitle C of RCRA, the EPA either can order compliance immediately or within a specific time period or can

seek injunctive relief against the violator through a civil action filed in a U.S. District Court. Any person who violates any requirement of Subtitle C is liable for a civil penalty of up to $25,000 for each day of violation, regardless of whether the person has been served with a compliance order. People subject to RCRA cannot rely on the EPA to tell them when they are in violation, then take the required corrective action, and thus avoid a penalty. RCRA also imposes criminal liability of up to $50,000, 2 years of imprisonment, or both for persons who "knowingly" commit certain violations, including anyone transporting hazardous waste without a manifest.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. CERCLA (also known as Superfund) authorizes the federal government to clean up toxic contaminants at closed and abandoned hazardous waste dumps or sites where the owner/operator is unable or unwilling to perform such a cleanup where there is a release or threatened release of hazardous or toxic substances. It allows the government to recover the cost of this cleanup and other "response costs" by suing the parties who may have contributed the hazardous or toxic materials. CERCLA also covers operating facilities with an imminent or potential discharge that could adversely affect the environment. In certain cases, cleanup may be funded by taxes on chemicals and hazardous wastes.

In most "Superfund site" cases, potentially responsible parties try to locate all parties who contribute waste to the site. CERCLA funds (Superfund) are used in cases where emergency actions are deemed necessary or where the potentially responsible parties fail to take appropriate action. The EPA has successfully exercised the "joint and several liability" provisions of the law. If the EPA can identify only one individual or company that contributed hazardous material to a site, that party may be held liable for the entire cleanup cost. It will then be that party's responsibility to locate other potentially responsible parties to share the cost of studies and/or remedial action. Because of the broad definition of hazardous or toxic material (remember the mixture rule under RCRA), the waste generator can be held liable for the hazardous waste site if the site goes bankrupt. Therefore, *you should know where your waste goes* because the waste generator's financial responsibility could be proportioned to the generator's ability to pay (deep pockets).

Superfund Secs. 102 and 103 require the reporting of the release of hazardous substances into the environment unless the release occurs in accordance with a permit. CERCLA's Reportable Quantities List (40 CFR, Sec. 302.4) currently names more than 700 chemicals and gives a reportable quantity for each. Any

release of a chemical in excess of the reportable quantity must be reported to the Natl. Response Center and, under the recently adopted Emergency Planning and Community Right to Know Act, must be reported to the state Office of Emergency Services and to the local emergency planning committee established under that act.

Title III Superfund Amendments and Reauthorization Act (SARA) of 1986. The Emergency Planning and Community Right to Know Act of 1986 is a stand-alone portion of the 1986 reauthorization of CERCLA. It requires four separate but related programs designed to inform local communities about hazardous chemicals produced or used at facilities and about releases of these chemicals to the environment. Nothing in SARA supersedes or amends the CERCLA Secs. 102 and 103 reporting program. Because of such disasters as Bhopal and problems in West Virginia, this program was developed to provide a federal/state infrastructure to ensure that releases will be responded to better and that potential disasters can be averted better.

The four major programs required by this act are (I) emergency planning, (2) emergency release notification, (3) community right to know and hazardous chemical reporting requirements, and (4) toxic chemical release reporting/emissions inventory. Any release of a reportable quantity triggers the same reporting requirements as in CERCLA. The list of extremely hazardous substances with both a reportable quantity and a threshold planning quantity can be found in 40 CFR Part 300, Appendix D.

Clean Water Act (CWA) of 1977. In 1972, Congress enacted the first significant federal Water Pollution Control Act. This act, which addresses federal water pollution control and requires Natl. Pollutant Discharge Elimination System discharge permits, was modified significantly in 1977 to deal with toxic water pollutants. It was renamed the CWA. This act has been amended several times; the most recent is the Water Quality Act of 1987.

The CWA generally controls discharges of effluent from point sources into waters of the U.S. Five main elements in the act are (I) a permit program, (2) a system of minimum national effluent standards for each industry, (3) water quality standards, (4) provisions for such special problems as oil spills and toxic chemicals, and (5) a construction grant program for publicly owned treatment works.

The Natl. Pollutant Discharge Elimination System imposes precise and detailed discharge requirements: numerical limits on discharges based on technology-based guidelines and water quality standards, compliance schedules for construction of

new pollution control equipment, and monitoring and reporting requirements.

Sec. 311 prohibits discharges of oil or hazardous substances in "quantities as may be harmful" into U.S. waters. This section requires immediate notice to the appropriate federal agency of any spill of a reportable quantity. The discharge itself carries criminal penalties. Sec. 311 provides for cleanup of the spill and imposes liability for the cost of removing the discharge. It also requires the preparation of spill prevention, control, and countermeasure plans.

Oil discharges are defined as harmful when they cause a sheen, sludge, or emulsion in the receiving water or upon adjoining shorelines (40 CRF, Sec. 110.3, 1980). Hazardous substances are treated differently. About 300 substances have been designated as hazardous by 40 CFR, Sec. 116 (1980). Note that this designation differs from that of the RCRA hazardous wastes.

Each hazardous substance has a "reportable quantity" defined by 40 CFR, Sec. 117 (1980). Discharge of more than the reportable quantity of oil or any of the hazardous substances requires notification of the EPA. The Natl. Pollutant Discharge Elimination System permits for storm-water run-off that may come into contact with contaminated material, including machinery and trucks, are now required.

A statutory immunity from criminal prosecution is available for the person in charge who notifies the EPA as required by Sec. 311 . There is no immunity from civil penalties that may be attached. Failure to notify is punishable by a fine of up to $10,000 and imprisonment for up to I year. The maximum civil penalty is $5,000 for "ordinary negligence," but up to $250,000 can be imposed for "willful negligence or willful misconduct."

Safe Drinking Water Act (SDWA). Enacted in 1974 and most recently amended in 1986, the SDWA mandates that the EPA must establish regulations to protect human health from contaminants in drinking water or potential drinking water supplies. The legislation authorizes national drinking water standards and a joint federal/state system for ensuring compliance with those standards. Maximum contaminant levels and treatment techniques ensure the quality of public drinking water supplies.

Part C of Title XIV authorizes establishment of a permit program and two resource planning programs designed to prevent contamination of underground sources of drinking water: the Underground Injection Control permit program, the Sole Source Aquifer program, and the Wellhead Protection program.

Owners and operators of underground injection wells must obtain permits or be

authorized by rule under the Underground Injection Control program to operate the wells. The permit applicant must prove to the state or federal permitting authority that the underground injection will not endanger drinking water sources.

An aquifer identified as the sole or principal source of drinking water for an area may be designated a "sole-source aquifer" under Sec. 1424 (e) of the SDWA. No commitment of federal financial assistance may be made for any project that may contaminate a sole-source aquifer so as to create a significant public health hazard.

The 1986 amendments to the SDWA established a Wellhead Protection program that the states may use to protect public drinking wells and springs " . . . within their jurisdiction from contaminants which may have any adverse effects on the health of persons..." The EPA issued guidance on the procedures for determining wellhead protection areas in June 1987. States have the option of using this guidance.

Clean Air Act (CAA). Under this act, the EPA establishes air quality standards (the Natl. Ambient Air Quality Standards) in terms of allowable, health-based concentrations of designated pollutants. The states are to achieve these standards through State Implementation Plans. The EPA also directly sets two types of national emission standards: New Source Performance Standards and Natl. Emission Standards for Hazardous Air Pollutants. The EPA has also developed special programs for prevention of significant deterioration in clean air areas and for stringent controls in nonattainment areas.

Emission offsets are required if a proposed source will have emissions exceeding the new source review levels for nonattainment areas. Emission offsets from existing sources in the area must be obtained. In these cases, the source must obtain enforceable agreements to reduce emissions either from other sources in the nonattainment areas or from its own facilities within the nonattainment areas to emit levels less than those permitted by the State Implementation Plan before applying for the permit.

In Nov. 1990, 700 pages of detailed new amendments to the CAA were signed into law. The new amendments required creation of 75 major rules over the next 2 years. Traditional command and control regulations are being phased out with market-based incentives or other innovative strategies. The act addresses several problems encountered in the 35-year history of the CAA. The 1990 amendments made several significant changes to the Natl. Ambient Air Quality Standards and revised the nonattainment programs. The impact of the 1990 CAA amendments on the oil industry will not become clear until well into the 1990's.

Natl. Environmental Policy Act (NEPA) of 1969. The NEPA requires all federal agencies to use a systematic, interdisciplinary approach to protection of the human environment to ensure the integrated use of the natural and social sciences in any planning and decision-making processes that may affect the environment. The NEPA requires preparation of a detailed environmental impact statement on any major federal action that may have a significant impact on the environment or any adverse environmental effects that cannot be avoided or mitigated. Included in the report are alternatives to the proposed action, the relationship between short-term uses and long-term productivity of the environment, and any reversible and irretrievable commitment of resources involved in the project.

In 1979, the Council on Environmental Quality published regulations that established a uniform basis for implementing procedural provisions of the NEPA.

Endangered Species Act (ESA) of 197. As amended, the ESA establishes a national policy designed to protect and conserve threatened and endangered species and ecosystems on which they depend. The act is administered by the U.S. Fish and Wildlife Service and the Natl. Marine Fisheries Service. The "taking" of an endangered species, which includes harassment or forcing it to alter its natural habits, is specifically prohibited.

Sec. 7 of the related Fish and Wildlife Coordination Act, governing interagency cooperation, requires federal agencies consult formally with the Natl. Marine Fisheries Service and the Fish and Wildlife Service when there is reason to believe that the species that is listed (or proposed to be listed) as endangered or threatened may be affected by a proposed action. Agencies must ensure that proposed actions are not likely to jeopardize the continued existence of threatened or endangered species and/or result in adverse modification or destruction of their critical habitat.

Significant Environmental Events. Certain "significant environmental events" have polarized public attitudes regarding protection of the environment and have caused major environmental legislation. The three most famous were the 1969 oil spill offshore Santa Barbara, CA; the Love Canal (NY) hazardous waste disposal site; and the 1989 *Exxon Valdez* tanker spill offshore Alaska. These events and others have been very costly to the oil industry in terms of cleanup costs and annual compliance costs. These significant environmental events and their impact on our industry are described below.

The following statements were made in the Aug. 7, 1988, *New York Times*.

1. "Last February, A Federal judge rule that the *Occidental Chemical Corporation*

rest are being processed."

The EPA stated in a Jan. 15, 1988, memorandum that "Ashland's Spill Prevention control and Countermeasures plan...does not adequately address spill prevention and control specific to the facility." This major spill caused a detailed review of the Spill Prevention Control and Countermeasures regulation. On May 13,1988, an EPA interim report made 19 recommendations for strengthening the EPA's regulation of aboveground storage tanks. Some of the proposals that affect our operations include a national survey of all aboveground tanks, including design, construction, and spill history; increased federal inspections of spill prevention plans; development of a formal penalty policy; employee training programs; increased secondary containment; and increased contingency planning requirements.

During April 1988, about 9,400 bbl of San Joaquin Valley crude oil spilled from a storage tank at Shell Oil Co.'s Martinez refinery in California and drained into a nearby marsh and eventually into San Francisco Bay. This major oil spill was the result of "a day-to-day practice that apparently deviated from the established procedure [spill prevention]." According to the *Oil spill Intelligence Report TM,* Shell's cleanup and punitive costs will exceed several million dollars.

These two major oil spills are excellent reminders for companies to review all spill prevention plans and to update them as necessary not only to respond to the increased inspection activity but also to ensure that we have adequate plans for protection of the environment.

The EPA's June 1988 report to Congress was a major victory for the oil and gas industry. The EPA found that existing state and federal regulations under the CWA and SDWA are generally adequate to manage oil and gas E&P wastes. According to the EPA, the regulation of oil and gas drilling and production wastes as hazardous under Subtitle C of RCRA is unnecessary and impractical. It said that strict regulations could reduce U.S. oil production by 22% by the year 2000 and cost consumers $10 billion/yr. However, the report states that certain gaps do exist in the state and federal regulations and that enforcement of existing regulations in some states is inadequate. As a result, the EPA plans to fill the regulatory gaps by (1) developing regulations for states under the nonhazardous waste authorities provided by RCRA and improving existing federal and regulatory programs under the CWA and SDWA for surface-water discharges and underground injection; (2) working with states to encourage changes in their regulations and enforcement to improve their programs where necessary; and (3) working with Congress to develop any additional statutory authority that may be required.

In Dec. 1990, the Interstate Oil Compact Commission published its initial report to help the states and the EPA improve E&P waste management programs. The EPA has agreed that this report will be useful for developing effective regulations, guidelines, and/or standards for state-level management of oil and gas production waste.

Hidden Liabilities

In 1986, the pages of federal environmental regulations increased more than ever (20%). The 1986 total of 8,500 pages was growing at the rate of 10,000 pages/yr, according to R. Lyn Arscott, general manager of health, environment, and loss prevention for Chevron Corp. These regulations added about $100 billion/yr in 1990 to the costs of products, government, and industry in the U.S. Pending or new legislation could push the cost past $150 billion/yr by the end of the decade. Virtually all the environmental statutes provide sanctions for noncompliance. These can include civil penalties, criminal fines, and revocations. There is a growing trend toward criminal prosecution. Environmental laws apply to all people. Purposeful failure to investigate or deliberate ignorance has been interpreted as knowledge for purpose of criminal liability. Therefore, what you don't know will most likely end up hurting you.

Environmental Management

Most oil companies have gone through major changes and significant staff reductions. Companies seem to expect employees to do more work with fewer people. Each company wants to become the lowest-cost producer to remain competitive and to increase profit margins. However, being the lowest-cost producer does not mean producing at no cost. Our society expects and demands environmentally responsible petroleum operations.

To protect the environment, API members have pledged to manage their businesses according to *Guiding Principles for Environmentally Responsible Petroleum Operations* (see the Appendix).

Environmental management, education, and training are the best tools to protect the environment while reducing exposure to long-term liability. Three key programs will reduce legal exposure and surprises: waste minimization, environmental assessment (audit), and environmental compliance training.

This paper only lists the benefits of these programs. Refer to the General References for details.

Waste Minimization. Waste reduction is the only way to reduce some of the escalating costs of the current waste management system. A ton of hazardous waste that once cost $10 to manage can now cost $500. According to a recent EPA study of 28 firms that have undertaken waste reduction measures, 54% found that their investment paid for itself in less than a year, 21% found that it took I to 2 years, and only 7% found it took more than 4 years. To cut waste, don't waste, perform waste audits, do better process design, improve your housekeeping (don't spill), reuse chemicals when possible, recycle waste where applicable, reduce waste volume by dewatering, and minimize the mixing of hazardous and nonhazardous waste.

Environmental Assessments (Audits). Assessment programs help in organizing and managing effective environmental programs. They provide benefits relating to financial planning, Securities and Exchange Commission reporting, personnel development, public and employee relations, expansion planning, legislative and regulatory strategy, and evaluation of acquisitions and divestitures. They also reduce the risk of liability by avoiding civil and criminal liability for noncompliance.

Environmental Compliance Training. Environmental compliance training should be provided to aU employees routinely by qualified instructors and affirmed by senior management. A compliance manual should be prepared to facilitate environmental protection. This manual should contain all documents essential to managing the facility's environmental programs: (1) copies of laws, regulations, permits, corporate policy statements, and other guidelines applicable to the business of the facility or the division; (2) copies of important correspondence related to the environmental program; and (3) records of monitoring and inspection activities.

It is necessary to stress the continued monitoring and documentation of E&P waste to prove that this large-volume, low-toxicity waste should continue to be exempt from RCRA Subtitle C.

Conclusions

Good environmental management programs have several advantages.

_ Benefit everyone.

_ Help protect the environment.

_ Make managers' jobs easier._ Even save money, although it may not be apparent in the short term.

_ Are mandatory.

_ Reduce company's liability exposure.
_ Sharpen our competitive edge.
_ Correct operational problems before they become compliance problems.

The oil business in the 1990's will not be "business as usual." However, with properly managed environmental programs, I believe that we will not only survive but also make money. If you are responsible for environmental protection, it is in *everyone's* interest for you to do a good job.

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Acknowledgment

I thank T.M. Dominguez of Oxy U.S.A. Inc:

Appendix—Guiding Principles for Environmentally Responsible Petroleum Operations

1. To recognize and to respond to community concerns about our raw materials, products, and operations.
2. To operate our plants and facilities and to handle our raw materials and products in a manner that protects the environment and the safety and health of our employees and the public.
3. To make safety, health, and environmental considerations a priority in our planning and in our development of new products and processes.
4. To advise promptly the appropriate officials, employees, and customers and the public of information on significant industry related safety, health, and environmental hazards, and to recommend protective measures.
5. To counsel customers, transporters, and others in the safe use, transportation, and disposal of our raw materials, products, and waste materials.
6. To develop and produce natural resources economically and to conserve those

resources by using energy efficiently.

7. To extend knowledge by conducting or supporting research on the safety, health, and environmental effects of our raw materials, products, processes, and waste materials.

8. To commit to reduce overall emissions and waste generation.

9. To work with others to resolve problems created by handling and disposal of hazardous substances from our operations.

10. To participate with government and others in creating responsible laws, regulations, and standards to safeguard the community,workplace, and environment.

11 . To promote these principles and practices by sharing experiences and offering assistance to others who produce, handle, use, transport, or dispose of similar raw materials, petroleum products, and wastes.

This paper is SPE 23456. Distinguished Author Series articles are general, descriptive presentations that summarize the state of the art in an area of technology by describing recent developments for readers who are not specialists in the topics discussed. Written by individuals recognized as experts In the area, these articles provide key references to more definitive work and present specific details only to illustrate the technology. Purpose: To inform the general readership of recent advances in various areas of petroleum engineering. A softbound anthology, *SPE Distinguished Author Series: Dec. 1961-Dec.1983* is available from SPE's Book Order Dept.

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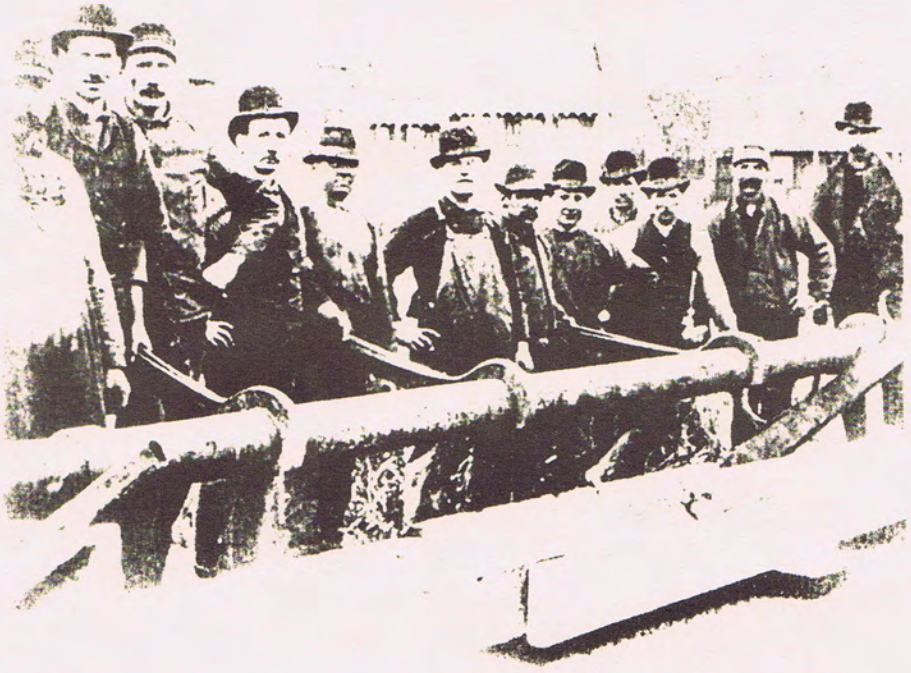

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PRESIDENT'S MESSAGE

In case you recently heard what you thought was the sound of a mighty, rushing wind, take heart. It was only the collective sigh of relief of all involoved in the GCAGS Convention. The Convention, from all the comments I've received personally and heard from others, was a success. Although the attendance was under what we had hoped for and the bottom line was not a cheery as had been hoped for, we have received nothing but positive comments about the whole affair. Hats off to you who worked so long and hard to make it a successful meeting.

In case you missed it at the convention or didn't get to attend, your Society has released the latest update to the 'Redbook' Volume III. It is available through Earth Enterprises for $25.00. This is just another of our ongoing efforts to further the goals and ideals of the Society.

Just a reminder--as has been previously announced in this column, the Desk and Derrick Club of Jackson will have their annual Industry Appreciation Night on Monday, November 9th, beginning at 6:30 PM at the Ramada Renaissance on County Line Road. Lieutenant Governor Eddie Briggs will be the featured speaker. The cost is $20.00 per person and the deadline for reservations is November 3rd, so mail your check for reservations to: Betty Proctor, Hughes Oil, Inc., Suite 800, 200 S. Lamar Street, Jackson, MS 39201.

Our next regular monthly luncheon is scheduled for November 10, in the Smackover Room in the Petroleum Club at 11:30 AM. Our speaker will be David Sawyer, professor of Petroleum Engineering at Mississippi State University, who will discuss results of CO2 enhanced recovery projects in the state. As this state's fields get older and older, secondary and tertiary projects will be more the norm than the exception, with obvious consequences to the industry. I for one am looking forward to this discussion regarding the future of this segment of the industry.

I look forward to seeing you there!

Stanley King

BUSINESS MEETING LUNCHEON SCHEDULE

Spring Fling, May 20, 1993

November 10, 1992
December 8, 1992
January 12, 1993
February 9, 1993
March 9, 1993
April 13, 1993
May 11, 1993

ABOUT THE COVER: Pipeline Crew: Samuel Van Syckel built, in 1865, the first oil pipeline from Pithole to Oil Creek. Soon many lines were laid throughout Oil Creek Valley and across the state, opening the oil region to further economic growth.

BUSINESS MEETING LUNCHEON

November 10, 1992 • 11:30 a.m.
Capitol City Petroleum Club, Smackover Room

Dr. David Sawyer
Department of Petroleum Engineering
Mississippi State University

Laboratory results and implications for field work for CO2 injection into oil from the Eutaw Formation of East Yellow Creek Field, Wayne County, Mississippi.

Abstract unavailable
Dr. Sawyer will present results of the recent testing of East Yellow Creek oil for feasibility of tertiary recovery utilizing CO2.

TECHNIQUES OF WELL LOG
SEQUENCE STRATIGRAPHY
WORKSHOP

with

James L. Coleman, Jr.
Amoco Production Company

December 1st, 1992
Mississippi State University

$45.00
Per person, includes lunch and materials
Limited to 20, 9:00 A.M. to 4:00 P.M.

Outline of Topics

I. Introduction and purpose
II. History of sequence stratigraphy
III. Principles of well log sequence stratigraphy
IV. Principles of well log stratigraphic correlation
V. Summary of depositional environments and log curve response
VI. Stratigraphic correlation, with various data
VII. Application of techniques

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Department of Geology and Geography
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Do you see the word geologist mentioned here?
Hopefully we are one of the qualifying "natural sciences".

ENVIRONMENTAL REGULATION NEWS BRIEFS*

QUALIFIED GROUND-WATER SCIENTIST DEFINED: ALTERNATE WELL LOCATIONS SPECIFIED*

EPA has issued in the December 23, 1991 *Federal Register* (56 *FR* 66365) final RCRA regulations defining a "qualified ground-water scientist" and procedures for demonstrating that a hydraulically downgradient monitoring well may be be placed at an alternate location.

Qualified Ground-water Scientist

Qualified ground-water scientist is defined in 40 CFR 260.10 to mean "a scientist or engineer who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in ground-water hydrology and related fields as may be demonstrated by state registration, professional certification, or completion of accredited university courses that enable that individual to make sound professional judgements regarding groundwater monitoring and contaminant fate and transport". A qualified ground-water scientist is needed to certify three RCRA documents:

(1) demonstrations of the need for an alternate downgradient monitoring well location,
(2) demonstrations for waiver of groundwater monitoring requirements, and
(3) groundwater assessment plans submitted by interim status facilities.

EPA intends to revise other groundwater regulations so that certification by a qualified groundwater scientist is consistently required.

reprinted from the "RCRA/CERCLA Newsletter" printed by Groundwater Technology, Inc.

Waste Minimization for Land Based Drilling Operations

Neal E. Thurber, SPE, Amoco Production Co.

Summary. This paper discusses engineering variables that should be addressed to minimize waste-toxicity and -generation while drilling landbased wells. Proper balance of these variables provides both operational and environmental benefits.

Introduction

Increasing public awareness of environmental issues has focused attention on methods to improve the environmental performance of land-based drilling operations. Waste minimization, a concept that may be used to accomplish this goal, motivates waste generators to minimize waste volumes and/ or waste toxicity before disposal. This paper describes effective techniques for waste minimization, emphasizing the reduction of drilling-related waste toxicity and volumes.

The higher level of environmental performance achieved by the reduction of waste toxicity and volumes involves further operational benefits of potential cost savings from reduced drilling-fluid dilution requirements, waste-disposal costs, reserve-pit construction, and reclamation costs.

Drilling Waste Characterization

Drilling waste comprises about 2% of the U.S. E&P waste stream.l API estimated that 62% of drilling fluids are freshwater based, 24 % salt based, 6% oil based, and the remainder of various compositions 1. Both the U.S. Environmental Protection Agency (EPA) and API studied the drilling-waste stream extensively and identified arsenic, benzene, sodium, cadmium, chromium VI, boron, and chloride as the constituents that pose the greatest human health and environmental risks 2. Other constituents, such as barium, lead, and pentachlorophenol, were identified; however, low concentrations and mobility considerations suggested low risks. Drilling-waste densities can vary widely, from about 8.5 to 16 lbm/gal [1018 to 1916 kg/m3]. Drilled cuttings may be generated at rates as high as 38 ton/hr [9.58 kg/s].

The drilling-waste stream principally includes drilled cuttings, excess or spent drilling fluid, rig wash, precipitation that enters the reserve pit, water from such rig activities as pump lubrication, and wastes from cementing operations I. In addition, time plays a significant role in drilling- waste generation; deeper or slower drilling operations tend to create greater variability in waste-stream quantity and complexity. The operational role and chemical composition of drilling fluids are covered in Ref. 3.

Volume Reduction. The importance of reducing drilling-fluid waste volumes to minimize the environmental impact of a drilling operation is well-recognized. Industry efforts have focused on closed-loop systems to minimize drilling- fluid discharge and, more recently, on downsizing wellbore sections where cement integrity and production processes are not adversely affected. The use of closed-loop systems usually involves increased use of equipment and emphasis on its proper installation.

In the past, closed-loop mud systems were not always effective in minimizing fluid discharge to the environment. Goals were not met because drilled-solids-removal equipment was not always properly chosen and operated or was not capable of removing sufficient drilled solids. Moreover, water used by other wellsite activities and water influxes from nature contributed to the fluid volumes in the reserve pit. The role of drilling-fluid chemistry was seldom recognized. A lack of understanding of these factors caused dubious success and wide ranging opinions on the effectiveness of closed-loop mud systems.

Proper design of closed-loop systems for drilling-waste minimization should therefore address three factors.

1. Drilling-fluid systems should be designed to minimize drilled-solids degradation.
2. Drilled-solids-removal equipment should be properly chosen and installed.
3. Water contacting the drilling operation from nature and other wellsite activities (e.g., storm-water run-off, rig wash, drillpipe handling, water lubrication, or pumps) should be diverted and/or minimized and reused.

Proper drilling-fluid design can minimize the tendency of drilled solids to degrade to smaller particle sizes. Large particle sizes (greater than roughly 10 to 15 llm) are relatively easy to remove from the drilling fluid with only mechanical separation equipment. Smaller solids are increasingly difficult to remove. (A buildup of smaller particle sizes, in the colloidal range, often results in undesirable drilling-fluid properties and a subsequent increase in waste.) In practice, more inhibitive drilling fluids can be designed over a broad range of complexity, depending on the drilled formations. Geologic areas of low formation reactivity may require only drilling-fluid enhancement by polyacrylamides. Geologic areas with a greater tendency to react with drilling fluid might require inhibition enhancements ranging from addition of more polymers and salts to the use of mineral-oil-based drilling fluids.

Alternatively, mechanical solids separation can be enhanced through centrifuge flocculation technology, first introduced to E&P operations in 1982, 7. The process completely separates water-based drilling fluid into its liquid and solid components, thus eliminating the need to discard drilling fluid because of a colloidal solids buildup.

Performance and cost analyses with the proper combination of drilling-fluid inhibition and flocculation technology or other solids-separation technology and the fundamental problem of an inability to predict drilled-solids particle sizes a *priori* make modeling difficult. In 1988, however, Lal 8 made an important contribution that quantifies the solids-separation performance of available equipment when a given particle size distribution is processed and the relation of that performance to site-specific well economics.

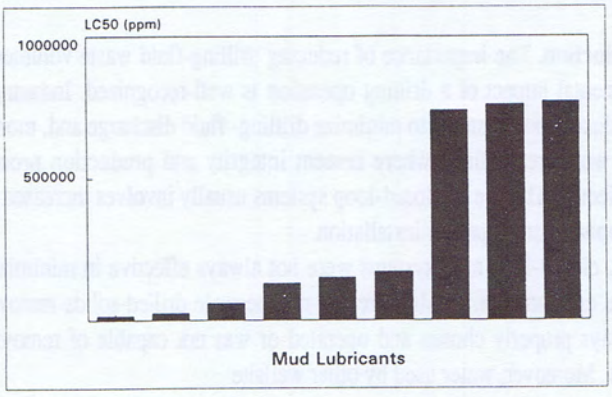

Fig. 1—Toxicity database, mud lubricants.[5]

TABLE 1—DRILLING-FLUID ADDITIVES

General Additive	Toxicity	Use	Substitute
Chrome lignosulfonate/lignite	Chromium	Thinner	a
Sulfomethylated tannin/dichromate	Chromium	Thinner	a
Sodium dichromate/chromate	Chromium	Corrosion control	b
Zinc chromate	Chromium	H_2S control	c
Pentachlorophenol	Pentachlorophenol	Biocide	d
Paraformaldehyde	Formaldehyde	Biocide	d
Arsenic	Arsenic	Biocide	d
Lead-based pipe dope	Lead	Thread sealant/lubrication	e
Barite	Cadmium/mercury/ barium/lead	Densifier	f

[a] Polyacrylate and/or polyacrylamide polymers.
[b] Sulfites, phosphonates, and amines.
[c] Nonchromium H_2S scavengers.
[d] Isothiazolins, carbamates, and gluteraldehydes.
[e] Nonlead pipe dope for casing and drillpipe (use metal-free additives where available).
[f] Choose barite from sources low in cadmium, mercury, and lead.

Drilling Fluid Waste Minimization Toxicity Reduction. Data from the EPA and API indicate that water-based drilling wastes typically exhibit low toxicity 1,2. Several constituents of concern were identified, however, and may be traced to either drilling-fluid additives or on-site waste-management practices. The constituents often can be reduced or eliminated by substituting different additives that do not contain any constituents of concern.

Table 1 lists several generic drilling-fluid additives, the constituents of concern, and possible substitutes 4. The waste-minimization practice of toxicity reduction may be accomplished by not using additives with a toxic or hazardous constituent. Therefore, the drilling-fluid vendor should be consulted before a drilling project so that less toxic or less hazardous drilling-fluid additives may be chosen. For example, polymer additives, such as polyacrylamides, are suggested to replace chrome-based fluid-thinning additives. As shown by Brays in Gulf of Mexico operations, substantial progress in drilling fluid toxicity reduction has been brought about by the EPA Region VI requirements for bioassay testing of drilling fluids and an LC50 of 30,000 ppm or greater for discharge. Careful screening and product substitution by Bray resulted in fluid LC50's that commonly approach 1 million ppm. Fig. 1 shows a typical additive screening, while **Figs. 2 and 3** show overall progress in reducing fluid toxicity on a per-well basis. While bioassay testing of every drilling fluid additive with every potentially exposed organism is not feasible, drilling-fluid vendors have sufficient data to identify additives of concern and to recommend those with the least toxicity. Once these additives have been selected, additional additives should be used only when their effect on the waste stream has been determined. Careful additive selection also reduces the demand for existing toxic additives, which in turn can reduce the pollution associated with the toxic product's manufacture and its mismanagement during transportation and storage.

The importance of reducing or eliminating the use of toxic or hazardous components is underscored by the concentration of components that occurs as drilling-waste volumes are reduced by closed-loop mud systems and proper wellsite water management.

Care should be taken when the site-specific use of oil-based drilling fluids is evaluated. The use of oil-based fluids, particularly mineral-oil-based fluids, has many important waste-minimization advantages. For example, formation/fluid interactions are minimized, which can reduce wellbore washout by 60% or more 6. Less washout reduces the volumes of both drill cuttings brought to the surface and the drilling fluid required to dri]l the hole. Reduced formation/fluid interaction maximizes drilled-solids-separation efficiency because solids do not readily degrade to particle sizes that are difficult to remove. Drilling-fluid dilution requirements are therefore minimized. The high cost of oil-based fluids encourages good housekeeping, which in turn minimizes spills. Oil-based fluids also have good stability, which, when coupled with their high cost, greatly encourages recycle and reuse. Peripheral benefits are obtained when oil-based fluids contribute to increased drilling performance. In general, the more quickly a well is drilled, the less the environmental impact.

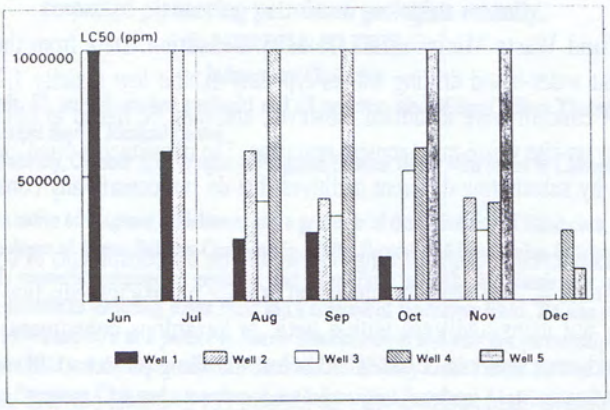

Fig. 2—Drilling-fluid bioassay test results, Gulf of Mexico, 1988.[5]

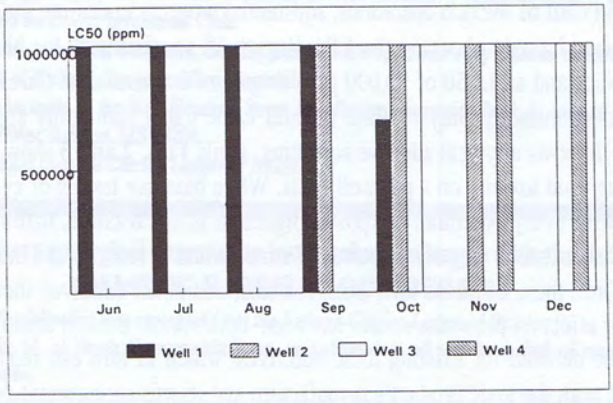

Fig. 3—Drilling-fluid bioassay test results, Gulf of Mexico, 1989.[5]

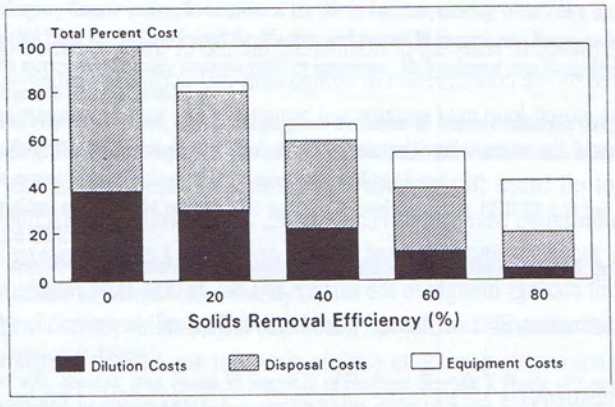

Fig. 4—Solids-removal economic analysis, normal dilution/disposal costs.[5]

The model also predicts the equipment required to achieve a closed-loop condition and its associated economics, including the economics associated with other solids-separation efficiencies. The following practical insights may be drawn from Lal's work.

1. The closed-loop goal of discarding "dry" solids can be met with less than 100% drilled-solids-removal efficiency. Fluid absorption by cuttings, drilling fluid left behind casing, and site-specific fluid density increases allow reduced removal efficiencies. 2. Currently, the economics of a closed-loop system is justified when the combination of drilling fluid, drilling-fluid dilution, and fluid-disposal costs exceed roughly $6 to $10/bbl [$38 to $63/m3]. (Pit construction and reclamation costs are included in the fluid-disposal costs.)

Fig. 4 shows the typical decrease in overall costs associated with minimizing drilling-fluid waste, as predicted by the model. **Fig. 5** shows a case where very low drilling-fluid dilution and disposal costs do not quite justify additional solids-removal equipment. Costs include only direct operational costs and not potential costs arising from the long-term liability associated with waste disposal. The model's performance has been field verified. 9 One key to achieving the closed-loop condition and a "dry" drilled-solids discharge is the proper selection of drilled-solids removal equipment. (The term "dry" refers to the absence of free liquid on the drilled solids. **Fig. 6** shows the limiting condition, ranging from about 48 wt% to 86 wt% solids, depending on the solids characteristics. 10) A closed-loop condition cannot be achieved without proper equipment and system design 9,11 Optimum drilled-solids-separation equipment involves use of linear-motion shale shakers, which maximize fluid/screen throughput capacity and allow finer-mesh screens to be run for a given flow rate. (Shakers used for precleaning or scalping to remove gumbo do not require linear motion.) Hoberock and Lal 12 discuss shaker performance in detail.

Young 13 discusses hydrocyclone use. Proper combinations of hydrocyclones should be used, with emphasis on the smaller cones. Decanting centrifuges should be used for both unweighted and weighted drilling-fluid solids separation. Installation methods and high-G-force centrifuges should be used, as discussed by Thurber 10.

Centrifuge/flocculation systems are available from several companies. A performance comparison between various shaleshaker capacities and hydrocyclone and centrifuge separation performance is shown in **Figs. 7 through 9.**

It is critical that the drilled-solids-removal equipment be properly plumbed. A 1982 study showed that many drilling rigs did not have proper equipment configuration, including fluid routing and centrifugal pump/impeller designs 14. Steel tanks should also be reconfigured to minimize drilling-fluid surface volumes. The use of 1,000-bbl [159-m3] surface systems should be re-evaluated for the specific drilling operation, particularly when most drillpipe tripping operations require less than 150 bbl [24 m3] of fluid to fill the wellbore.

The last important aspect of drilling-fluid waste minimization covers water use management at the drillsite. Improper water management can negate any waste volume reduction obtained from closed-loop mud systems. **Table 2** gives the magnitude of some water influxes 9. In many cases, these influxes contribute more than the drilling fluid and cuttings waste stream. **Fig. 10** shows an inexpensive practical method for capturing and

"Industry efforts have focused on closed-loop systems to minimize drilling-fluid discharge and, more recently, on downsizing wellbore sections where cement integrity and production processes are not adversely affected."

TABLE 2—COMMON SOURCES OF WATER DISCHARGE TO RESERVE PITS

Source	Average Discharge B/D	Average Discharge m^3/d
10-in. [0.25-m] rainfall in 40,000-ft^2 [3716-m^2 area[	6,000	953
Location run-off/near-surface aquifers	0 to 4,000	0 to 636
Water hoses	0 to 250	0 to 40
Jetting mud pits	0 to 300	0 to 48
Pump rod lubrication	0 to 200	0 to 32
Desanders or desilters discard	150 to 700	24 to 111
Shaker fluid discard	0 to 50	0 to 8
Centrifuge solids slide	20 to 100	3 to 16
Water lubrication of centrifugal pump	10 to 50	1.6 to 8

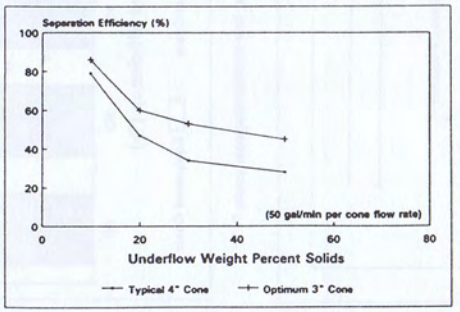

Fig. 8—Hydrocyclone separation performance.[13]

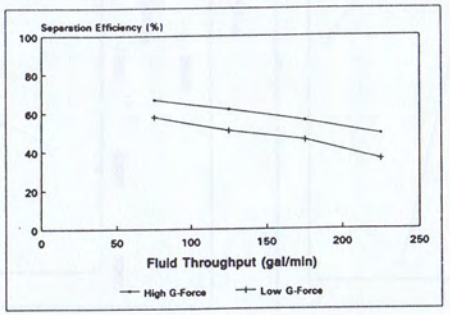

Fig. 9—Centrifuge solids-separation performance.[10]

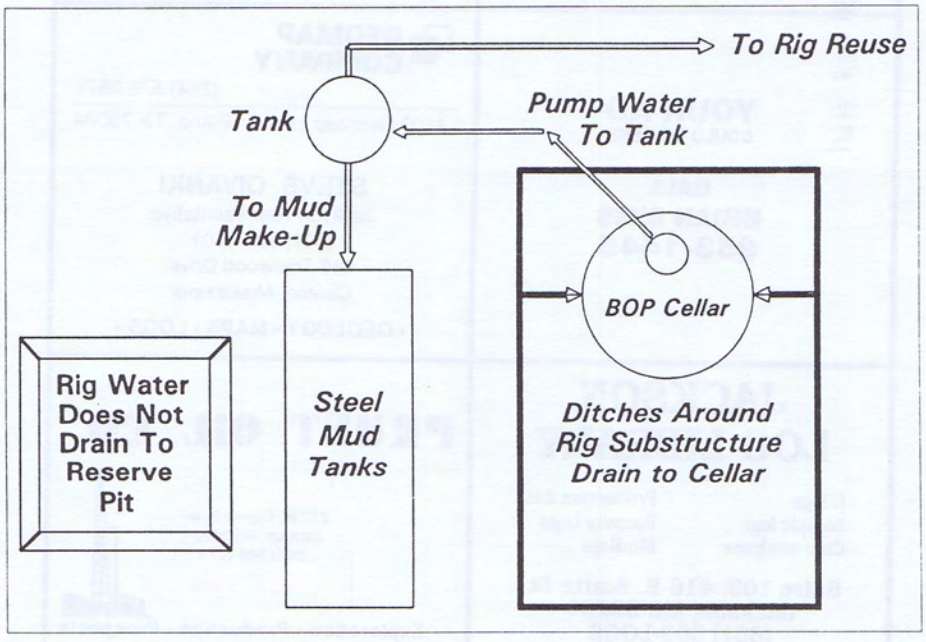

Fig. 10—Rig-water reuse system.[10]

reusing water that is normally used in the drilling operation.

Ideally, attention should be given to reducing or eliminating the water sources by recycling pump lubrication water or using grease pump seals; by using high-pressure low-volume water hoses; by proper use of drilling-fluid containment devices, such as mud brackets, pipe wipers, kelly mud-saver valves, and drip pans, which return drilling fluid to the active system; by designing drillsites to divert run-off; and by reducing the areal extent of pits and their susceptibility to natural water influxes.

Waste-Management Practices

Reserve-pit constituents of concern that are not directly attributable to drilling-fluid additives may often occur from or be exacerbated by improper waste-management practices.

Wastes other than drilling fluids, cuttings, cement-contaminated drilling fluid, and rig wash should not be routed to the reserve pit. Furthermore, dissimilar reserve-pit fluids, such as those resulting from use of freshwater, saltwater, or oil-based fluids, should be segregated. Such separation can reduce the volume of more toxic fluids that require disposal, thus reducing both costs and waste volume.

Conclusions

The concept of waste minimization can be successfully adapted to land-based drilling operations and can result in improved environmental performance and reduced well costs. The benefits are obtained by careful selection of the lowest-toxicity drilling additives, high-performance drilled-solids removal equipment, proper arrangement of equipment, and proper wellsite water management.

Acknowledgments

The referenced authors have made extensive contributions toward solving the many technical and operational difficulties associated
with improving the environmental performance of drilling operations. Their work is greatly appreciated. I thank the management of Amoco Production Co. for permission to publish this work and for support of research to address
environmental issues.

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Provenance
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Revised manuscript received Feb. 11, 1992.
Paper accepted for publication Feb. 11, 1992. Paper (SPE 23375) first presented at the 1991 SPE Intl. Conference on Health, Safety and Environment held in The Hague, Nov. 10-14.

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THE OFFSHORE BARRIER ISLANDS OF MISSISSIPPI AND ALABAMA

The six barrier islands which skirt the mainland shores along a distance of 110 km (about 70 mi) play a major role in determining the character of Mississippi-Alabama coastal lands and waters. They are located 5-20 km (3 1/2 to 12 1/2 mi) from the mainland, further offshore than similar islands along the Atlantic and Gulf coasts of the United States.

Dauphin Island, Alabama presently is about 23 km long (14 mi) and is the largest, while the smallest of the six is East Ship which is only 4 km long (2 1/2 mi). Most of the islands are covered by low dunes, 4-6 m (13 to 20 ft) at the highest. The only exception is the eastern end of Dauphin Island (named early in the eighteenth century for the crown prince of France), where large dunes reach 14 m (47 ft) above sea level.

Only a short time back in the geological evolution of the coast, there was no sea where the long, narrow barrier islands stretch today and the gentle waves of Mississippi Sound roll. Waters from melting ice sheets of the last ice age pushed the oceans gradually over the land, and the area of the present islands came under water about 6,000 to 7,000 years ago. The chain of islands was already established when the sea reached its present shores about 3,500 years ago.

Barrier islands need an adequate sand supply to maintain themselves. Littoral current and drift supply the sediment material, enabling the islands to survive. On the north central Gulf coast, waves generally approaching from the south-southeast supply the force which sets into motion the process of sand drifting toward the west. The immediate source of the sand is Mobile Point Peninsula which affords a path for the sand grains to travel from the Alabama mainland shores across the mouth of Mobile Bay. Originally, all sand was derived from the southern Appalachian Mountains which are drained by a number of south-flowing rivers that reach the Gulf of Mexico in present-day Florida and Alabama.

How did the islands appear? Opinions are divided as to the ways barrier islands form. Some think they evolve when storms and tides cause the segmentation of narrow, elongated coastal tongues or "spits" of sand. Others believe the engulfment of mainland beach dune ridges, during times of encroaching seas, turns such ridges into islands by surrounding them.

Another view credits barrier islands with original formation a long distance seaward from their present positions, where they have been shifted by the slow landward movement of the invading seas. According to this view, barrier islands might have travelled over 100 miles in a time span of perhaps 14,000 years.

We know now that some of the coastal islands (Deer, Round and eastern Dauphin) started from already existing, higher ridges which the invading seas have found at their present positions. Remnants of older ridges on Dauphin Island acted as a core for the further westward expansion of the island. Segmentation of long spit-peninsulas is unlikely in the area as a way for island formation. Strong tidal currents which move the waters in and out of Mississippi Sound and Mobile Bay to the Gulf of Mexico would limit the growth of spits.

More likely, several of the islands formed from the extensive sand shoals which are found around and between the islands. Once a shoal can grow slightly over sea level and establish itself as an island, dune vegetation will anchor itself in the surface sand and prevent the island from being washed back into the sea.

One example of the emergence of such an island was the Isle of Caprice, or Dog Key, a small islet between East Ship and Horn Islands. The island, which emerged around the turn of the century, was a favorite excursion resort in the 1920's. Storm erosion, probably aided by the commercial harvesting of sea oats which once stabilized the dunes, finally cut back the island which disappeared completely with the 1947 hurricane.

Continued on page 21

Hurricanes often cut barrier islands into smaller ones. This happened to Ship Island in 1947 and again in 1969. Dauphin Island underwent similar changes. Storms permanently eliminate the eastern ends of the islands, which are eroding even in fair weather, and supply the western ends of the islands with sand needed to grow. Drastic changes within the last 120 years resulted in a 4.5 km (2.8 mi) westerly growth of Petit Bois ("small woods") Island. Several miles of Petit Bois belonged to Alabama in the eighteenth century but westerly growth "moved" the whole island into Mississippi by the 1950's.

Environments are varied on the barrier islands. Some of the islands, such as Horn, eastern Dauphin and East Ship are heavily wooded (mostly pines, some live oak) and all contain salt and brackish marshes in depressions between dunes and ridges. More open lakes are also found on the islands, as well as narrow water bodies or lagoons connected with the adjoining Sound. Unusual vegetation covers the dune ridges, and "precipitation ridges" on southeastern Dauphin Island are still moving inland, covering fences and buildings on their way.

The contrast between the north (Mississippi Sound) and south (Gulf of Mexico) beaches is striking. The greater wave energies on the south shores created wide beaches with finer sands than those of the narrow northern beaches. Walking along these beaches reveals evidence of ongoing coastal erosion. Shore dunes are being cut back by wave action and peat beds are exposed underwater at the foot of the beaches. These dark peat beds formed at times when the present beaches were locations of inland marsh ponds, isolated by strips of dunes from the beaches of that time. The retreating shores brought the location of the present beaches within the realm of wave action. Radiocarbon age data show that this usually occurred within the past few hundred years.

Cat Island, the westernmost of the six, reveals an interesting life history. Over 3,000 years ago, sand drifted freely westward of this island into the present Orleans Parish area of Louisiana which was mostly under sea and bay waters at the time. Cat Island has grown southward by sand ridge accretion until a delta of the Mississippi River has encroached around it from present-day St. Bernard Parish and cut the route of westward-directed sand drift. The island started to erode strongly on its eastern end and the eroded sand was pushed into sand spits pointing north and south, giving the island its unusual and characteristic mushroom shape. The sea is steadily intruding into the depressions between the northern ridges of the slowly sinking island, creating long, narrow embayments along its Mississippi Sound shores. St. Bernard delta stopped its active discharge around 1,800 years ago and since that time, the island is being heavily "cut back" and destroyed by the erosion of the sea.

The Mississippi-Alabama barrier islands create a special, protected, low-salinity, high nutrient habitat in Mississippi Sound, so important for coastal marine life. By providing shallow areas in Mississippi Sound, they also afford a certain measure of protection against hurricanes striking the coast. Their economic and recreational values are increasingly being protected; at present four of the islands (Horn, East and West Ship and Petit Bois) belong to the National Park Service's Gulf Islands National Seashore. (Revised, S. Walker, 5/89)

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115 Beach Blvd., Biloxi, MS 39530
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Future Meetings of Selected Earth Science Organizations

	1992	1993	1994	1995
AAPG Annual	June 21–24 Calgary, Alberta	April 25–28 New Orleans, LA	June 12–15 Denver, CO	Mar. 5–8 Houston, TX
AAPG Eastern Section	Sept. 20–22 Champaign–Urbana, IL	Sept. 19–22 Williamsburg, VA	To Be Announced	To Be Announced
AAPG Gulf Coast Section (GCAGS)	Oct. 21–23 Jackson, MS	Oct. 20–22 Shreveport, LA	To Be Announced	To Be Announced
AAPG Mid–Continent Section	Not Held	To Be Announced Amarillo, TX	Not Held	To Be Announced
AAPG Pacific Section	April 29–May 1 Sacramento, CA	May 5–7 Long Beach, CA	To Be Announced	To Be Announced
AAPG Rocky Mountain Section	Sept. 13–16 Casper, WY	Sept. 12–15 Salt Lake City, UT	Concurrent with AAPG	To Be Announced
AAPG Southwest Section	April 12–14 Midland, TX	Feb. 21–23 Fort Worth, TX	April 24–26 Ruidoso, NM	To Be Announced
AAPG International Conference/Exhibition	August 2–5 Sydney, Australia	Oct. 17–20 The Hague, Netherlands	Aug. 21–24 Kuala Lumpur, Malaysia	To Be Announced
AAPG/SVG Int'l. Congress/Exhibition	Not Held	March 14–17 Caracas, Venezuela	Not Held	Not Held
Int'l. Geographical Congress (IGC)	August 9–14 Washington, DC	Not Held	Not Held	Not Held
Soc. of Professional Well Log Analysts (SPWLA)	June 14–17 Oklahoma City, OK	June 13–16 Calgary, Alberta	June 19–22 Tulsa, OK	To Be Announced
Geological Society of America (GSA)	Oct. 26–29 Cincinnati, OH	Oct. 25–28 Boston, MA	Oct. 24–27 Seattle, WA	Nov. 6–9 New Orleans, LA
Offshore Technology Conference (OTC)	May 4–7 Houston, TX	May 3–6 Houston, TX	May 2–5 Houston, TX	May 1–4 Houston, TX
Soc. of Exploration Geophysicists (SEG)	Oct. 25–29 New Orleans, LA	Sept. 26–30 Washington, DC	Oct. 23–27 Los Angeles, CA	Nov. 5–9 Denver, CO
Society of Petroleum Engineers (SPE)	Oct. 4–7 Washington, DC	Oct. 3–6 Houston, TX	Sept. 25–28 New Orleans, LA	Oct. 1–4 Anaheim, CA
Soc. for Sed. Geology (SEPM) Theme Mtg.	Aug. 17–19 Fort Collins, CO	Aug. 8–12 Univ. Park, PA	Not Held	To Be Announced
European Assoc. Explor. Geophysicists (EAEG)	June 1–5 Paris, France	June 7–11 Stavanger, Norway	June 6–10 Vienna, Austria	May 29–June 2 Glasgow, Scotland
Canadian Society of Petr. Geologists (CSPG)	Concurrent with AAPG	Aug. 15–19 Calgary, Alberta	To Be Announced	To Be Announced
American Inst. of Prof. Geol. (AIPG) Annual	Sept. 27–30 Lake Tahoe, NV	Oct. 13–16 Springfield, MA	Oct. 12–15 Flagstaff, AZ	To Be Announced

03/20/92

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13. Tertiary Type Localities of East-Central Mississippi, 25th GCAGS Meeting, 133 pp., Octoberr 1975..... 5.00
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MISSISSIPPI GEOLOGICAL SOCIETY

Volume XLI No. 5 December, 1992

MISSISSIPPI GEOLOGICAL SOCIETY
1992-93

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PRESIDENT'S MESSAGE

Can it be that the holidays are upon us? Can it be that Christmas is less than a month away? Can it be that 1992 is almost spent? Can it be that better times are ahead for the oil patch? The answers to these questions are yes, yes, yes, and I sure hope so. This year has been an interesting one, to put it mildly, but I believe that we all can look around and find many things for which we can count our blessings, especially during this time of the year when our thoughts seem to focus on the year past and the year ahead.

Speaking of the year ahead, January will start the new advertising year for the Society. If you have been advertising in the monthly bulletin, we appreciate your continued support. If you have not been advertising in the bulletin, or once did but no longer do, I urge you to consider putting an ad in there. I believe you will find it money well spent to support your Society. And besides, where else will you find rates that have not increased since 1977? Contact Todd Hines at 944-4700 to place your ad in the bulletin.

Our December meeting will be held on the 8th of December on the 20th floor of the Petroleum Club, from 4:00 to 6:00 P.M. This will be our annual Christmas Social with hors-d'oeuvres and such. I look forward to seeing you there!

It's hard to believe it's time to say this, but

HAPPY HOLIDAYS !!

Stanley King

BUSINESS MEETING LUNCHEON SCHEDULE

Spring Fling, May 20, 1993

January 12, 1993
February 9, 1993
March 9, 1993
April 13, 1993
May 11, 1993

The following three articles, pages 3-8, 9-11, and 15-21 are information from the Department of Energy (DOE). The MIPRO sponsored meeting on 10-29-92 between DOE and local industry was very informative. If you weren't there you should have been. DOE is passing out $ 40 million again, application deadline is 1-15-93. These articles contain history, contacts with addresses and phone numbers and general details of the program. Local people can do it - just ask Hughes Eastern. If you have an innovative idea, get with it and apply now, there is still time.

DOE NEWS

NEWS MEDIA CONTACT:
Joey Lucas, 202/586-5810

FOR IMMEDIATE RELEASE
April 22, 1992

DOE PICKS 14 WINNERS IN FIRST PHASE OF PROGRAM TO DEMONSTRATE WAYS OF ENHANCING U.S. OIL PRODUCTION

The Department of Energy (DOE) has selected its first set of demonstration projects in a new effort to prolong the economic life of many of the U.S.'s aging oil fields and slow the decline of domestic oil production.

DOE said today it has chosen 14 projects, proposed by teams of independent oil producers, universities, state agencies, and major oil companies, to carry out the first phase of a federal program cited as one of the highest domestic energy supply priorities of the President's National Energy Strategy.

The organizations will receive federal matching funds to test advanced technologies as well as commercially available approaches that could increase the output of many U.S. oil fields currently in danger of being abandoned. If successful, the demonstrations are expected to begin benefitting the Nation's oil industry, particularly the smaller independent producers, within the next five years.

"Today's selection marks a major milestone in one of the many National Energy Strategy initiatives we can implement administratively," said Energy Secretary James D. Watkins. "This is a program designed to give U.S. oil field operators the best this country has to offer in terms of new ideas and approaches for keeping oil flowing from domestic fields."

(MORE)

7. University of Oklahoma

The Oklahoma Geological Survey, with the Geological Information Systems Department and the School of Petroleum and Geological Engineering at the University of Oklahoma, will conduct a systematic and comprehensive collection and multi-disciplinary evaluation of information on Oklahoma fluvial dominated deltaic reservoirs to identify conventional recovery technologies that have been (or could be) applied with commercial success. The project will implement a technology-transfer program targeted to the operators of studied reservoirs.

8. University of Texas at Austin, Bureau of Economic Geology

The Bureau of Economic Geology proposes to study the Frio fluvial/deltaic sandstones associated with the Vicksburg Fault Zone in South Texas. The project proposes to combine interwell scale geological facies models with reservoir engineering assessments and geophysical evaluations. This will identify compartments containing volumes of unrecovered mobile and residual oil that can be recovered by recompleting existing wells and infill drilling. Technology transfer will be coordinated through producer organizations.

9. University of Tulsa

The proposed project in Glenn Pool Field, Tulsa County, Oklahoma, addresses the producibility problems of lack of reservoir continuity and poor injectivity, and attempts to improve secondary recovery performance through the use of reservoir characterization studies and horizontal water injection technology. The project will compare the cost/benefit of using state-of-the-art data over conventional data for waterflood optimization and horizontal well placement. The technology transfer plan will target regional independent operators for workshops.

10. Utah Geological Survey

This project will develop a multi-disciplinary reservoir characterization approach to overcoming poor productivity caused by poor completion practices in fractured, clayey reservoirs in the Bluebell Field, Uinta Basin, northeast Utah. A well recompletion, a well redrill, and drilling and completing a new well will demonstrate multi-disciplinary geological and engineering techniques that can improve production and increase reserves. The technology transfer plan will include workshops and database distribution.

(MORE)

The midterm projects are:

1. Amoco Production Company

Amoco proposes to use the double displacement process (gas displacement of a water-invaded oil column) and production by gravity drainage using down-structure wells to produce remaining oil in a watered out reservoir in the West Hackberry Field, Cameron Parish, Louisiana. The proposer plans to use an innovative process, which will be cheaper and allow increased applicability of the process in either remote or environmentally sensitive areas. Louisiana State University will conduct technology transfer activities.

2. Columbia University

Columbia University's Lamont-Doherty Geological Observatory proposes a field demonstration of their "Dynamic Enhanced Oil Recovery Technology." The proposer will test the concept that the growth faults in a Gulf of Mexico field, operated by Pennzoil, are conduits through which the producing reservoirs are charged and that enhanced production can be developed by producing from the fault zone. The field demonstration will be accomplished by drilling and production testing of growth fault systems associated with the Eugene Island Block 330 in Federal waters offshore Louisiana. The technology is potentially applicable to dozens of Gulf Coast fields.

3. Hughes Eastern Corporation

This project teams Hughes Eastern with Mississippi State University in a proposal is designed to test the ability of indigenous microorganisms to preferentially plug the more porous zones of previously waterswept areas of the Carter sandstone in North Blowhorn Field, Lamar County, Alabama, thereby increasing oil recovery during waterflood. The project differs from other microbial enhanced oil recovery projects by using inorganic nutrients (fertilizers) to stimulate the microbes to use oil as their carbon source rather than an injected source such as molasses.

4. Texaco Exploration and Production Company

This project proposes to use a combination of a CO_2 miscible flood and horizontal drilling to increase production in a watered-out salt dome reservoir. The site of the proposed project is the Port Neches Field in southeastern Texas. The process will be compared in two adjacent fault-block reservoirs, one producing under partial waterdrive conditions and the other post-waterflood.

-DOE-

R-92-106

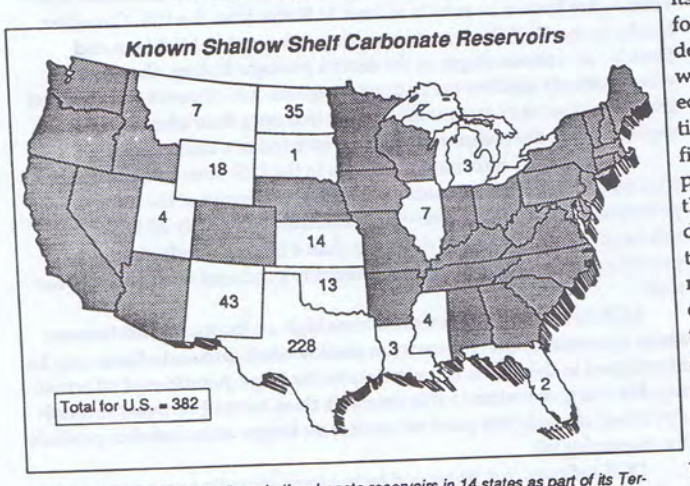
TechLine Automated Fax Service
U.S. Department of Energy, Office of Fossil Energy — (202) 586-4300

Issued on: September 8, 1992

DOE Issues Call For Proposals To Assist Operators In 2nd Class Of Endangered Domestic Oil Reservoirs

The Department of Energy (DOE) began issuing final guidelines this week to oil field operators and other petroleum organizations interested in seeking Federal matching funds for projects that might prolong production from endangered U.S. oil reservoirs.

DOE today released two *Program Opportunity Notices* for its second priority class of domestic reservoirs. The notices solicit proposals from the private sector for projects in "shallow shelf carbonate reservoirs." DOE has designated this geologic category of oil-bearing formations as its next priority for projects that demonstrate ways to increase economic production from U.S. oil fields. Many oil producers are on the verge of abandoning operations in this reservoir class despite the fact that large amounts of potentially recoverable crude oil remain.



DOE has identified 382 shallow shelf carbonate reservoirs in 14 states as part of its Tertiary Oil Recovery Information System maintained by DOE's Bartlesville (OK) Project Office. It is likely that the reservoir class also exists in several other states.

One of the program opportunity notices calls

Continued

for near-term projects that could help producers remain active in this reservoir class over the next five years, largely by applying better technologies that are commercially-available but underused. The other requests mid-term projects that would demonstrate more advanced but less proven production methods.

Deadline is January 15, 1993

DOE set a deadline of January 15, 1993, for proposals and said it expected to announce winning projects next April. The department is making $40 million available to fund up to 50 percent of selected projects. Five to 10 near-term projects and up to four mid-term projects are expected to be selected.

The call for proposals is the second in DOE's restructured oil recovery demonstration program. Last April the department concluded its Class I competition by selecting 14 proposers to conduct projects in "fluvial dominated deltaic sandstone reservoirs." The first Federal funding is expected to awarded this month as negotiations conclude with the first round of proposers.

The second priority reservoir class — shallow shelf carbonate reservoirs — are known to exist in at least 14 States from the U.S.-Canadian border to the Gulf Coast and extending as far east as Michigan and Florida. At various stages in the earth's geologic history, these areas were relatively shallow water coastal regions. Oil deposits were formed from the remains of ancient marine life that once flourished in these regions before the oceans receded to create today's land masses.

Shallow shelf carbonate reservoirs in the U.S. once contained more than 68 billion barrels of crude oil, about one-seventh of the total petroleum found in the lower-48 states. Although nearly 20 billion barrels have been produced to date, less than 4 billion barrels remain as proved reserves which can be economically produced with current practices.

DOE has ranked the reservoir class high on its priority list because many operations now underway in shallow shelf carbonate fields may be abandoned in the next few years despite the large quantities of oil remaining. For many operators in this reservoir class, current recovery technology is fast reaching the point where it is no longer economical to produce the remaining oil.

DOE believes that improved technology, including some commercially available techniques used successfully in other, similar geologic formations, may prolong the life of these threatened fields. Widespread use

Continued

of these technologies, DOE believes, could nearly triple the amount of oil produced from shallow shelf carbonate reservoirs, adding perhaps another 7.5 billion barrels to domestic reserves.

For near-term proposals, DOE hopes to attract projects that would improve the understanding of the geological makeup of the reservoirs and demonstrate better reservoir managment and production techniques. Possible approaches might include two- and three-dimensional seismic surveys to locate missed or bypassed crude oil, in-fill drilling (drilling between current wellbores), carbon dioxide flooding, or various reservoir management techniques that employ pressure maintenance and/or artificial lift. Field demonstrations are eligible but not required for this category.

For mid-term projects, DOE is looking for advanced technologies that overcome a specific problem that, to date, has prevented production of greater amounts of crude oil from the carbonate reservoirs. Proposals in this category are expected to focus on technologies that demonstrate significant improvements over currently available technologies, or in some cases, may involve a new technology that has never been successfully demonstrated in an actual oil field.

Examples might include borehole-to-borehole (or "cross borehole") tomography, advanced measurement-while-drilling technology, three dimensional computer simulations, the use of horizontal drilling, injection of foams to direct recovery techniques to bypassed sections of a reservoir, and advanced reservoir management techniques such as fracture stimulation. Field demonstrations are required for all mid-term projects.

In all selected projects, the proposer must agree to undertake an aggressive technology transfer effort to convey the technology and techniques used in the project to other oil field operators.

DOE will hold a "pre-proposal conference" in Dallas on October 22, 1992, to answer questions from prospective proposers.

Copies of the solicitations are being mailed this week to all organizations that have asked to be placed on DOE's Class II Oil Recovery mailing list.

Those who may not be on the mailing list can request a copy of the documents from the U.S. Department of Energy, Pittsburgh Energy Technology Center, Attn.: Keith R. Miles, Contract Specialist, P.O. Box 10940, Mail Stop 921-118, Pittsburgh, PA 15234. Requests can also be faxed to the department at 412/892-6216.

-End of *TechLine*-

Program Information Contact:	Robert C. Porter, 202/586-6503 Fossil Energy Communications

STATE OF MISSISSIPPI
DEPARTMENT OF ENVIRONMENTAL QUALITY
JAMES I. PALMER, JR.
EXECUTIVE DIRECTOR

October 12, 1992

A GUIDE TO THE FRANKSTOWN VERTEBRATE FOSSIL LOCALITY (UPPER CRETACEOUS), PRENTISS COUNTY, MISSISSIPPI

The Mississippi Office of Geology announces the publication of Circular 4, "A Guide to the Frankstown Vertebrate Fossil Locality (Upper Cretaceous), Prentiss County, Mississippi," by Earl M. Manning and David T. Dockery III.

Construction of the Highway 45 bypass around Frankstown in 1991 exposed an abundance of shark teeth and other fossils that lived in the sea that covered the area during the Campanian Epoch of the Cretaceous Period about 75 million years ago. These fossils attracted collectors from all over Mississippi and other states. Booneville High School obtained a National Science Foundation grant to utilize the site as a laboratory for teaching their students about natural history. The collecting expedition by the students was filmed and broadcast nationally on the ABC Sunday evening news (June 16, 1991).

Circular 4 was developed from a handbook prepared for high school students to use in studying their fossil collections and learning about geology. The authors have written the text to be interesting and educational for the non-scientist and also of use to the professional scientist wishing to identify most vertebrate fossils likely to be found in the Cretaceous of Mississippi. Earl Manning has many years experience as a vertebrate paleontologist at the American Museum of Natural History and the Louisiana State University Museum of Geoscience. David Dockery is chief of the Surface Geology Division of the Mississippi Office of Geology. The vertebrate fossils are illustrated in 12 plates by professional artist David White.

Circular 4 may be purchased from the Office of Geology at Southport Center, 2380 Highway 80 West, Jackson, for $4.00 per copy. Mail orders will be accepted when accompanied by payment ($4.00, plus $1.50 postage and handling for the first copy and $.50 for each additional copy). Send mail orders (with check or money order) to:

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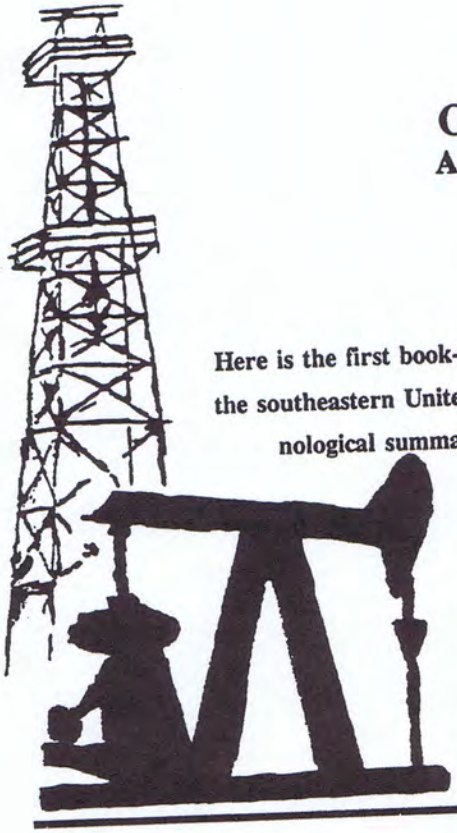

Oil in the Deep South

A History of the Oil Business in Mississippi, Alabama, and Florida, 1859-1945

Dudley J. Hughes

Here is the first book-length history of the oil business in the southeastern United States. This statistical and chronological summary of the evolution of the petroleum business in Mississippi, Alabama, and Florida is highlighted by the personal stories of the companies, entrepreneurs, promotors, investors, and workers who played major roles in the development of the oil business from its inception in the early 1900s to 1945.

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Oil Recovery Technology Partnership

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(505) 844-2302

THE PARTNERSHIP CONCEPT

Initiated in October 1988, the Oil Recovery Technology Partnership is an alliance between the Department of Energy, Los Alamos National Laboratory, Sandia National Laboratories, and the petroleum industry to increase domestic oil production. (The petroleum industry as defined here includes the independents, majors, service companies, and universities).

The Partnership's mission is to stimulate, facilitate, and/or coordinate the development and transfer of technology to the U.S. oil industry through technical interactions and collaborations with the National Laboratories. Its goals are to:

- Transfer the technologies derived from DOE-funded weapons and energy research and make the capabilities, expertise, equipment, and facilities of the National Laboratories available to the petroleum industry.
- Develop new, innovative mechanisms for interactions with industry that will expedite this transfer.
- Utilize industry guidance to ensure that the industry needs are being addressed in the development, transfer and implementation of new technologies.

FEATURES OF THE PARTNERSHIP

The purpose of the Partnership is to provide the petroleum industry with a mechanism to access Los Alamos and Sandia expertise, equipment, facilities, and technologies that could have near-term applications in improved oil recovery processes. These multi-program laboratories have unique technologies in electronics, instrumentation, materials, computer modeling, engineering and systems analysis, physics, expert systems, and other related areas. Many of the technologies have been developed through defense-related research and therefore are not readily available through petroleum industry or university research. This Partnership is consistent with other initiatives that encourage close involvement between industry and the National Laboratories. The Partnership features:

- An organizational structure and project management mechanism that includes the petroleum industry "up front."
- The near-term spin-off of defense and energy-related technologies to significant problem areas in the petroleum industry.

- Flexibility in the type of collaborative agreements between industry and the Laboratories in order to overcome the traditional barriers that have hindered collaboration in the past. (New DOE policies are evolving regarding patents, protection of intellectual property, and agreements featuring cost reimbursement, funds-in agreements, and royalty or equity positions. Groups exist at the Laboratories to assist in industry interactions and the development of collaborative agreements. Most projects to date have featured "in-kind cost-sharing" where no funds are transferred between the laboratories and industry; this feature significantly facilitates cooperative projects.)

- A Partnership Steering Committee, an Industry Review Panel, the Crosswell Seismic Forum, and interfaces with industry organizations to ensure that industry has an effective voice in the direction of the Partnership and in the review and evaluation of candidate and ongoing projects.

- The ability to respond to inquiries from industry on specific technical questions and problems.

- A management structure that operates through the existing DOE Fossil Energy framework under the programmatic guidance and control of the DOE Bartlesville Project Office and the administrative guidance of the DOE Albuquerque Operations Office.

PARTNERSHIP ACTIVITIES

The Partnership has received increasing funds from DOE's Office of Fossil Energy: from $1.0 million in FY89 to over $3 million in FY92. Technical emphasis has been directed initially (1) at providing assistance to independent oil producers who have been particularly hard-hit by the recent low oil prices and (2) at crosswell seismic investigations that can improve the characterization of known oil reservoirs. There are several projects in different stages.

Los Alamos conducted a collaborative project with Murphy Operating Corporation, Roswell, NM to improve the efficiency of waterflooding operations in their fields. Conductive fractures in this formation channeled waterfloods, resulting in unswept portions of the reservoir. Downhole microseismic mapping techniques were used to locate major fractures, and this information guided the location of water injection wells for more effective sweeping of the reservoir oil. Studies were conducted in the Chaveroo and Tomahawk fields in SE New Mexico.

Sandia conducted a collaborative project with Harvey E. Yates Company, another independent oil producer, to improve the oil recovery from low permeability, possibly naturally fractured reservoirs, which historically have had very limited production from a significant

resource. Investigations were to determine if natural fractures exist in the Bone Spring Sandstones and to define their effect on production. While results show very few fractures in this formation, a wealth of new data on in situ stresses, well log response, sedimentology, and production have been obtained for operators in SE New Mexico.

The Partnership has formed a Crosswell Seismic Forum, currently consisting of representatives from 16 oil companies and 8 service companies. This Forum meets periodically to review, evaluate, and prioritize proposed projects and topics related to crosswell seismic surveying. Industry response has been enthusiastic and positive. The Forum has catalyzed unprecedented industry interaction: on several occasions, companies and the national labs have evaluated various tools at a common site with the full data set being made available to Forum members.

Three collaborative seismic hardware projects are being conducted under the auspices of the Crosswell Seismic Forum. One, is the Sandia-OYO Geospace development of an advanced, multistation, borehole receiver which will improve the efficiency of conducting crosswell seismic surveys. The project has produced significant improvements in receiver technology: smaller size (16 in. long, 30 lbs.), absence of resonances over 10-1800 Hz, and an order of magnitude gain in resolution. This technology, recently demonstrated in a 4-level system, is now available for sale or lease through OYO Geospace. The other is a Los Alamos-Exxon project to adapt a binary explosive concept for use as a borehole seismic source. The challenge is to operate under temperatures, pressures, and firing requirements for a repetitive impulsive borehole source. A joint Chevron-Sandia-Los Alamos project for development of an advanced, 3-component vibratory seismic borehole source was initiated in 1992.

The Partnership Steering Committee and Industry Review Panel have been formed and are active. A workshop was held with independent oil producers to identify the technical problems associated with low production wells. As a result of these interactions, 4 projects were initiated in 1991: (1) Los Alamos and Exxon Co. USA are conducting fracture mapping surveys in fractured chalk formations in Texas which are of interest to independent producers. (2) Los Alamos and the University of Texas at Austin are studying the application of ultrasonic energy for reduction of wellbore deposits and formation damage. (3) Sandia and Petrolite Corporation are working with several independents to quantify chemical changes occurring during hot oiling in order to improve this procedure which is commonly used nationwide to promote production in stripper oil wells. (4) Los Alamos is applying its massive computing capabilities to investigate flow phenomena in rock at the pore scale.

The Partnership also has a specific focus on drilling and production. A link was recently established that will involve industry's on-going Completion Engineering and Drilling Engineering Associations in the formation, review and evaluation of collaborative

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projects. Projects underway include: geomechanics of horizontal wells in fractured reservoirs (Sandia and Oryx Energy), expandable metal liners for horizontal well completions (Los Alamos and Oryx Energy), and advanced diamond drill bit technology (Sandia and several companies). Also, Sandia and Los Alamos will participate directly in selected CEA and DEA projects.

Finally, the Partnership also responds to inquiries from industry, such as was done in a metallurgical and fatigue analysis of drill string and sucker rod failures. Another response yielded an improved high temperature logging tool for industry. The results from such response studies could form the basis for future collaborative projects.

PARTNERSHIP ACTIVITIES IN THE FUTURE

In the future, significant emphasis will continue to be on short-term results for technological payoffs in reservoir characterization and enhanced recovery but other areas of research and development will be added. Environmental concerns of the oil industry and improvements in reservoir engineering are anticipated to become future activities for the Partnership.

Industry participation will continue to be stressed and collaborative projects with industry will be the normal operating mode of the Partnership. If collaborations are successful, an increasingly larger contribution is expected to come from industry funding. Such industry support provides a measure of the importance with which industry views this program.

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(09/92)

ECONOMIC AND REGULATORY CONSTRAINTS

James E. Russell
Russell Petroleum Company

Opportunities to Improve Oil Productivity in Unstructured Deltaic Reservoirs, hosted by the Department of Energy (DOE), January 1991, in Dallas, Texas. DOE Publication DOE/BC - 91/6/SP DE91002237.

Instability in the price of oil and unrestricted imports of foreign oil are the most devastating factors in solving our domestic energy dilemma. During the 1970s and 1980s, oil prices fluctuated between a low of about $3.00 per barrel prior to the oil embargo in 1973 to a high of $40.00 a barrel in 1981. After a gradual decline to about $25.00 in 1985, OPEC shocked the world in 1986 by flooding the world with oil and driving the price down to less than $10.00 per barrel. Subsequent to this, many oil companies and service companies went out of business. Oil properties were shut-in or abandoned, domestic oil production started to decline, and oil imports began to increase. By the end of 1990, the U.S. had lost nearly 2,000,000 barrels per day in producing capacity, and imported oil now stands at nearly 50% of our needs -- an alarming situation!

Other factors that have impacted the survival of the domestic industry are restrictive environmental regulations and unfavorable tax treatment. With the advent of EPA many rules and regulations have been written and implemented that adversely affect the oil and gas industry. A clean and healthy environment is essential to the public domain and should be preserved. The oil industry is very cognizant of this and it has taken great strides in correcting many of the "sins" of the past. On the other hand, over regulation and discriminations against certain segments of the oil industry may not be in the long term best interest of our society. For example over 16,000 wells were abandoned in 1989, representing 10,000 more wells abandoned than in 1980. Certainly many of these wells needed to be abandoned, but far too many were abandoned because of economic and regulatory constraints. It is recognized that many of these, once abandoned, can never be used in any type of EOR program and that much of the potential reserve will be lost. If this trend is not reversed, we could lose more than 50% of our reserve base in the next decade. Some relief should be built into the regulations for appeal from mandatory plugging and automatic fines. Far too many wells are being abandoned because of tough regulations even though they are not a threat to the environment. There must be a way for industry, the environmentalists, and regulatory bodies to work together in a reasonable and realistic manner that will preserve the environments, but not cripple domestic production.

During President Carter's administration (1976-1980), the byword was that this Nation was running out of oil, that most oil fields had been discovered and were rapidly being depleted, so there was no need to grant incentives to find new oil or improve efficiency of recovery. At the same time, prices were rising and a "boom" in drilling was occurring. President Carter thought oil companies were making too much money, and he referred to it as "obscene profits". As a result, a windfall profits tax was passed by Congress, percentage depletion allowances were reduced or eliminated, expensing of intangible drilling costs was reduced, and other restrictive taxes and regulations were imposed. All of these factors together with the oil price collapse in 1986, the tragic failure of banks and S&L's, real estate evaluation, bankruptcies, etc. have taken their toll on the domestic oil industry.

Oil prices have improved since 1986 and some signs of a partial recovery have appeared, but we are still a long way from reestablishing a viable domestic industry particularly for the independent producer. Many studies have been made by various institutions (DOE, AAPG, University groups, ICF, and others) over the past several years that indicate we do have significant undiscovered oil and gas reserves in the lower 48 states and Alaska. Also, some 350 billion barrels of unrecovered oil will remain in known reservoirs that could be a target for advanced recovery technologies. The purpose of this symposium is to concentrate on the "Unstructured Deltaic Reservoirs" that are a significant part of this unrecovered reserve.

The DOE should be commended for the work it is doing and the new approach to transferring known technology to industry to improve productivity in the near term. A partnership between government and industry is essential if we are going to recover these known reserves in a reasonable time frame. A stabilized pricing scenario, tax incentives, and methods of funding projects are all integral parts of the equation to accomplish this important goal.

The DOE has recently submitted to President Bush recommendations for a meaningful National Energy Strategy. This report points out much of the strategy needed to coordinate all energy sources such as oil, gas, coal, hydroelectric and so on to maintain adequate energy supplies for this Nation for many years ahead. The Texas Independent Producers and Royalty Owners Association (TIPRO), has long advocated a "core supply" energy policy that would maintain supply at a minimum of 20 million barrels of oil or equivalent per day from all energy sources for many years. However, adequate and stabilized pricing and favorable regulations will be necessary to do this.

support these regulations and proper implementations.

Other incentives included in the tax package cover changes in the Alternative Minimum Tax (AMT) and extension for 2 years of the tight sand (Sec. 2a) credit for tax years after 1-1-91.

Because transfer of technology and application to field projects are of utmost importance to our improving oil recovery, basic means of funding such projects have been a problem in the past for many small- to medium-sized independents. Capital requirements usually are high "up-front" with deferred returns over a longer period of time than primary production. However, in most cases, the risk is much lower. Price stabilization at levels between $25 and $30 per barrel and the tax incentives in the Budget Act should be beneficial in developing these projects. However, in order to ensure that qualified projects are continued and fully developed to maximize recovery, the ability to finance such projects properly is an important consideration. Perhaps some relationship between the operator, government, and financial institutions for guaranteed loans could be developed.

It is apparent that we may have improved our position on tax incentives included in the Budget Reconciliation Act of 1990, but we still need to achieve a reasonable stabilized price high enough to stimulate and accommodate the cost of development and application of technology to recovery the oil we know is out there. Without this, much of the technology transfer will not be economically available to the independent segment.

I disagree with those in government and our Administration, as well as some economists, that $25 - $30 oil ($0.60-$0.70/gal.) would be devastating to our GNP when a gallon of Coke or a gallon of milk costs two to three times more. When you factor in the cost of protecting our foreign supplies, the hidden cost to our taxpayers per gallon of gasoline is unbelievably high (according to Kent Hance, former Texas Railroad Commissioner). Mac Wallace (also a former Texas Railroad Commissioner). Mac Wallace (also a former Texas Railroad Commissioner) once said, "If it's worth fighting for, it's worth drilling for."

Actions necessary to stimulate production and reduce the number of well abandonments:

1) Establish an appeal mechanism for abandoned wells and other regulation issues.
2) Work with the EPA to reduce environmental regulation restraints which contribute to premature abandonment of wells. Leniency on shut-in times would reduce the need to plug and abandon wells and allow the option of re-entry and application of EOR processes.
3) Avoid windfall profits tax that could devastate many oil producers and would be counter to DOE's objectives of implementation of known technology.
4) Stabilize oil prices at $25 to $30 per barrel by imposing an import fee. This stability is necessary for oil companies to invest in producing oil from domestic oil fields rather than foreign production and would ignite industry into domestic activity.
5) Offer tax incentives for 15% of qualified costs such as property and equipment, drilling costs, workover costs, use of new technology such as seismic methods, EOR implementation costs, and other enhanced recovery techniques such as improved waterflood methods, infill drilling, and horizontal drilling. The following processes are considered EOR processes: miscible, steam, micellar, in situ, polymer-augmented waterflood, cyclic steam, alkaline flood, CO_2 waterflood, CO_2 miscible. Also, a plea was submitted for relief from depletion allowance.
6) Change the public perception that low oil prices are good for the economics of the country and increase awareness of what is involved in the production of a barrel of oil.

Key Points of the Discussion

1) Problems for the oil producer are: the costs of oil production and the subsequent refining to gasoline are high, a fact not appreciated by the public. Since gasoline is not subsidized, (the United States is one of the few countries where it is not) the public is subjected to the full cost of the energy resource and feels that oil companies are making "obscene profits." If the media and government would work with the oil companies, they could correct this public misperception.
2) Many of the participants claimed they were free market advocates and did not think that price regulation is a long-term solution to the problem. However, U.S. operators are at a disadvantage in the world market because they are competing against government subsidized companies.

It is doubtful that a variable import fee is being considered at this time. Such a fee has long been advocated by the Texas Independent Producers and Royalty Owners Association (TIPRO). Most of the other oil and gas associations throughout the U.S., including Independent Producers Association of America (IPAA), support such a fee. However, the Administration and Congress have not approved such a fee in the past. In order to develop and supply this Nation with adequate oil, we cannot rely entirely on the free market to work when in fact the international energy market is almost exclusively government driven, particularly in the Middle East. An import fee, or other similar options, should be implemented immediately to stabilize oil prices in the range of $25 - $30 per barrel. This should cause more drilling and the implementation of improved oil recovery processes that will help lessen dependence on uncertain foreign supplies. Such a price range adjusted for inflation should be fair and reasonable for both the industry and consumers.

As discussed above, the industry has been restricted by certain regulations that amount to disincentives for exploration and initiation of advanced or EOR projects. Recently the Congress passed the Budget Reconciliation Act of 1990. In this act are newly enacted energy-incentive provisions that should be beneficial toward the goals that DOE and industry are trying to achieve. These incentives are as follows:

Tax Credit for Enhanced Oil Recovery

Enhanced Oil Recovery Credit. A credit equal to 15% of qualified costs attributable to qualified enhanced oil recovery (EOR) projects. The qualified EOR costs include: 1) tangible property which is an integral part of the project and with respect to which depreciation or amortization is allowable; 2) intangible drilling costs (IDC); and 3) the costs of tertiary injectants with respect to which a Section 193 deduction (relating to the expensing of tertiary injectants) is allowable.

Qualified EOR Methods. Qualified EOR methods include the nine tertiary recovery methods listed in the June 1979 DOE energy regulations. The nine tertiary recovery techniques are: 1) miscible fluid displacement, 2) steam drive injection, 3) microemulsion or micellar emulsion flooding, 4) in situ combustion, 5) polymer augmented flooding, 6) cyclic steam, 7) alkaline, 8) carbon dioxide augmented waterflooding, and 9) immiscible carbon dioxide displacement. In addition, immiscible non-hydrocarbon gas displacement is considered a qualifying method even if the gas injected is not carbon dioxide. The Secretary of Treasury may also add to the list of qualifying methods. Some of these that are being advocated include 1) in-fill drilling, 2) major workover and/or recompletion, 3) improved waterflooding by pattern change to correct for heterogeneity, 4) new seismic methods and techniques, 5) horizontal drilling, and 6) microbial.

Effective Date. The EOR credit is effective for taxable years beginning after December 31, 1990, with respect to costs paid or incurred in EOR projects begun or significantly expanded after that date. It is not clear what "significantly expanded" really means and needs further definition.

Phase-Out of Credit. The amount of the credit is reduced in a taxable year following a calendar year during which the average national price of oil exceeds $28 (adjusted for inflation). The credit is reduced over a $6 phase-out range (between $28 and $34).

Amendment of Percentage Depletion Rules for Independent Producers

The Act makes three modifications to the percentage depletion rules under Section 613A.

Net Income Limitation. The prior law limitation on the allowance of percentage depletion to an amount not in excess of 50% of the taxpayer's new income from the property is increased to 100%.

Transferred Property Limitation. The prior law denial of percentage depletion for properties transferred after they have been proven is repealed.

Percentage Depletion for Marginal Production. Increase in percentage depletion for marginal production and marginal production are covered here. The statutory percentage depletion rate of 15% is increased by 1% (limited to a maximum increase of 10%) for each whole dollar that the domestic wellhead price of crude oil for the immediately preceding calendar year is less that $20 per barrel (not adjusted for inflation).

Marginal production is defined as:

a) crude oil and natural gas produced from a domestic stripper well property. A stripper well property is any property which produces a daily average of 15 bbl or less per producing well on such property in the calendar year during which the taxpayer's taxable year begins. The determination whether a property is a stripper well property is to be made separately for each calendar year. This apparently repeals the "once a stripper always a stripper" rule.

b) Oil from a domestic property substantially all of the production of which is heavy oil (having a weighted average gravity of 20° API or less).

Effective Dates. The amendments relating to the net income limitation and the percentage depletion rate for marginal properties are effective for taxable years beginning after December 31, 1990. The amendment repealing the transfer rule is effective for transfers of property occurring after October 11, 1990.

The IRS is currently reviewing and will be writing regulations on these incentives in the near future. Correspondence with the IRS in Washington, D.C. is invited to

PUBLICATION LIST

1. Mississippi Geological Society Photo Directory, 1981 ..... $ 2.00
2. Wilcox Fields of Southwest Mississippi, Maps and production data on 171 fields, in ring binder, 350 pp., 1969 ..... 28.00
3. Mesozoic-Paleozoic Producing Areas of Mississippi and Alabama. Volume I. Maps and producing data on 57 fields, with 2 composite logs, clothbound, 139 pp., 1957 .....10.00
4. Volume II. Maps and producing data on 77 fields, includes Supplement 1, in ring binder, 143 pp., 1963 .....15.00
5. Supplements 2 through 7 for Volume II, Maps and producing data on 35 fields, 110 pp.....15.00
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FIELD TRIP GUIDEBOOKS

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13. Tertiary Type Localities of East-Central Mississippi, 25th GCAGS Meeting, 133 pp., Octoberr 1975..... 5.00
14. Mississippi Rocks of the Balck Warrior Basin, Seventeenth Field Trip, 79 pp., April, 1978 ..... 8.00
15. Tertiary and Upper Cretaceous Depositional Environments, Central Mississippi and West Central Alabama 33rd Annual GCAGS Meeting, 40 pp., October 1983 ..... 7.50

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BUSINESS MEETING LUNCHEON

January 12, 1993

Capitol City Petroleum Club, Smackover Room

PRODUCER FINANCING IN THE 1990'S

Michael V. Ronca

Tenneco Gas Ventures

An overview of the Tenneco Gas Ventures Group, including financing options through Tenneco Gas Ventures programs, and other financing vehicles for the independent producer in the 1990's.

Michael Ronca is the General Manager of Tenneco Gas Ventures, a unit of Tenneco Gas, responsible for oil and gas exploration and production activity. Ventures was formed to provide Tenneco Gas and its customers the benefit of integration and to stimulate natural gas exploration and development activity in the Gulf Coast Region. Ventures has recently raised $50 million from institutional investors and another $25 million from an industrial group of utilities and municipalities. The funds are to be invested over the next three years in acquisitions, development, and low risk exploratory drilling.

While walking down this very dark tunnel called the career path of an oil and gas geologist, I thought I saw a pin point of light. This light of hope, which we all used to take for granted, appeared through a small article in the Oil & Gas Journal. To be specific, a group at Tenneco Pipeline had raised $50 MM for oil and gas activity, including exploration. Part out of shock and unbelief, and part by hope against hope, I called the group to see if there had been some kind of printing error. Not so, real money was raised in these times for oil and gas activities beyond reserve purchases! We discussed their approach and I felt that here was some news that needed to be heard. Not only will Michael Ronca, our speaker, be able to tell about the $75 million they have raised, but he can relate their findings as to the bigger picture. He and Catherine Sliva did a great deal of research about the present state and future outlook for the industry, prior to embarking on their capital raising venture. Judging by their results, I believe we all would like to hear what that research showed.

I hope that Jackson's geologists, engineers, and landmen, who still hold out hopes of future activity, will come to hear our January speakers.

Jack Moody

CARBON DIOXIDE CAN REVITALIZE THE PLANET

by Dr. Sherwood B. Idso

Among the many competing theories as to what is happening to the Earth's climate, is the persuasive idea which is described below by ***Dr. Sherwood B. Idso****, that rather than posing a danger to the inhabitants of the globe, the greenhouse effect could in fact turn out to be beneficial.*

As mankind burns ever-increasing quantities of coal, gas, and oil, Earth's atmospheric carbon dioxide (CO_2) content continues to climb, fueling widespread speculation that we soon may experience a catastrophic warming of the globe due to a climatic change known as the 'greenhouse effect'. Little appreciated outside of botanical and agricultural circles, however, is the fact that carbon dioxide is a tremendously effective aerial fertilizer and anti-transpirant, which stimulates plant growth and development while it reduces evaporative water loss. Moreover, unlike the doom-and-gloom scenarios painted by certain climate theorists, the reality of these desirable consequences of atmospheric CO_2 enrichment is based upon the firm foundation of hundreds of laboratory and field experiments.

Gaseous CO_2 is the primary raw material used by plants in producing food, via photosynthesis. Throughout the history of life on Earth, it almost always has been present in the atmosphere in much greater concentrations than exist today. Hence, over the course of geological time, plants have become accustomed to air considerably more enriched with CO_2 than ours is. Whenever they are 'fed' more atmospheric CO_2,they grow bigger and better, much like the plants of past geological epochs of biological prominence. With a 330-660 parts-per-million (ppm) doubling of the air's CO_2 content from 0.033 per cent to 0.066 per cent, the productivity of all plants increases, in the mean, by about one-third.

At the same time that atmospheric CO_2 enrichment enhances plant productivity, it reduces the apertures of the small pores in leaves through which water is transpired and lost to the atmosphere. The savings in water thereby effected is also about one-third for a 330-660 ppm doubling of the air's CO_2 content. Consequently, the efficiency with which plants use water to produce organic matter essentially doubles with a doubling of the atmospheric CO_2 concentration. Moreover, for a tripling of the amount of CO_2 in the air, it nearly triples!

Biological implications

As the plants become more efficient in their utilization of water, they will help to offset growing demands on our dwindling supplies of pristine groundwater. They also will thrive where they previously have been excluded for lack of this vital resource. Earth's increasingly more capable vegetation thus should win back lands previously lost to desertification, with forests regaining much of their former expanse and vigor. With increasing ground cover, soil erosion, due to the ravages of wind and rain, should be reduced substantially.

Even more exciting transformations will take place below ground. There, as vegetative productivity grows ever greater with each passing year, more organic matter will gradually accumulate. With more organic matter in the soil, there will be increased levels of microbiological activity. Some of the organisms thus stimulated will accelerate weathering processes and soil formation. Some will remove larger quantities of much-needed nitrogen from the atmosphere and convert it into forms that are utilized directly by plants. Still others will intensify their detoxification of polluted water moving through the soil and thereby improve the quality of this important natural resource.

Soil fungi will also be stimulated by this phenomenon. As they grow outward from the roots of the plants they will absorb and transport back to their hosts greater quantities of essential trace nutrients, simultaneously protecting them from the deleterious effects of soil toxins. Greater fungal activity additionally will lead to more inter-plant root contacts, enhancing the sharing of nutritional resources among all ecosystem members and fostering a co-operation among different species that promotes biological diversity.

The significance of earthworms

One of the more intriguing aspects of atmospheric CO_2 enrichment has to do with earthworms. By eating and processing plant residues, these creatures speed the incorporation of litter into the soil matrix, redistribute important nutrients, and make them more readily available to growing vegetation. Their burrows provide inlets to the soil for water that accumulates on the surface during intense rainfall, as well as an entry point for needed oxygen from the air. They also enable roots to explore deeper soil layers by creating channels for them to follow. In the words of one of their most perceptive observers, C. A. Edwards of Ohio State University: "Earthworms play a major role in improving and maintaining the fertility, structure, aeration, and drainage of agricultural soils."

Where is the connection with CO_2? It is to be found in the fact that the single most important criterion for maintaining good earthworm populations is that there

the past few decades. Moreover, large woody plants currently are invading lands that have supported little more than sparse clumps of grass for hundreds of years.

Perhaps the most striking evidence for this dramatic greening of the Earth is in the CO_2 content of the atmosphere. Each spring, as the new flush of Northern Hemispheric vegetation begins to come forth, CO_2 is extracted from the atmosphere by this great blanket of photosynthesizing plant life in such copious quantities that its concentration in the atmosphere measurably declines. In the fall, when much of the seasonal growth senesces (grows older) and dies, releasing its stored carbon back to the atmosphere, the CO_2 content of the air rebounds to a new high. Hence, a seasonal oscillation is superimposed upon the rising CO_2 content, the amplitude of which primarily is determined by the seasonal growth characteristics of terrestrial vegetation. Each year since 1958 — when such measurements began—the amplitude of this cycle has been getting larger and larger, indicative of the ever increasing photosynthetic activity of the world's vegetation.

The basis for concern about CO_2 -induced global warming arises solely from the predictions of complex mathematical constructs known as general circulation models of the atmosphere, or GCMs. While it is clear that these computer models are the most sophisticated ways known of considering the bulk of atmospheric physics simultaneously over the entire globe, climatologist Reid Cryson rightly states that they are "rather crude imitators of reality."

In the words of two modelers, M. E. Schlesinger and J. F. B. Mitchell, for example, current GCMs "frequently employ treatments of dubious merit, including prescribing the oceanic heat flux, ignoring the oceanic heat flux, and using incorrect values of the solar constant." Hence, according to them, "the models are physically incomplete and/or have errors in the included physics." Noting further that CO_2 -induced climate changes simulated by different GCMs show many quantitative and even qualitative differences," they conclude that "not all of these simulations can be correct, and perhaps all could be wrong."

That the latter of these alternatives is the more correct is borne out by a recent study. It found the mean difference between modeled and measured net solar radiation at the planet's surface to be approximately 25 per cent, the mean difference between modeled and measured outgoing solar and thermal radiation at the top of the atmosphere to be fully 400 per cent. In fact it has been demonstrated that, merely by utilizing different horizontal grid resolutions in a standard GCM, predicted base climatic states differ by more than what is predicted to result from a doubling of the atmospheric CO_2 content.

Such deficiencies clearly demonstrate that current GCMs are totally incapable of adequately representing real-world climate dynamics. One area in which they are deficient is that of possible cloud responses to incipient warming. In the models, interactive clouds cover generally amplified the initial warming produced by CO_2 In the real world, however, cloud cover almost always is found to increase when the climate warms, and recent satellite studies have show conclusively that clouds exert a net cooling effect on the climate. Hence, the intensification of the hydrologic cycle tends to counteract the warming influence of the steadily rising atmospheric CO_2 content.

Earth's living thermostat

Perhaps the most interesting aspect of clouds is that they appear to function as the key element of a powerful global thermostat that is biologically modulated. This intriguing aspect of climate regulation has only been elucidated within the past few years and is well outside the domain of current GCM stimulations, which presently deal only with physical and chemical processes.

The biological modulation of climate begins with an initial impetus for warming, such as would be provided by an increase in the CO_2 content of the atmosphere. As warming is experienced by the microscopic algae of phytoplankton that live in the surface waters of the world's oceans, they begin to grow faster. As they photosynthesize at increasingly greater rates, they produce as a by-product of their metabolism, increasingly greater quantities of a substance called dimethylsulphonio propionate, which ultimately is released to the sea, when they either die or are eaten by zooplankton. There, a portion of it decomposes to form a compound known as dimethylsulphide that diffuses into the atmosphere, where it is oxidized and converted into sulphuric and methane-sulphonic acid particles, which then function as cloud condensation nuclei.

Some of these nuclei produce new clouds, while others increase the droplet number concentrations of pre-existent clouds, making them more highly reflective of incoming solar radiation. Both of these effects tend to cool the planet dramatically, acting as a brake on the initial impetus for warming. It has been estimated that this negative feedback is of about the same strength as the primary CO_2 greenhouse effect.

The nature of real-world warming

The primary climate expectancy of the CO_2 greenhouse effect is, thus, a small upward trend in the mean surface air temperature of the globe. However, the concomitant increase expected in low-level cloud cover greatly should modify the

primary impetus for warming. Specifically, more low-level cloud cover should reduce, negate, or possibly even overwhelm any tendency for daytime warming, but will augment the greenhouse effect at night. Hence, it is likely that greenhouse warming will be marked by a decrease in the amplitude of the mean daily temperature wave.

Such a trend has been observed in the historical climate records of many parts of the Northern Hemisphere. Climatologist Tom Karl has noted that this decreased temperature range is "one of the few pieces of evidence ... that is consistent with the potential impacts of increased greenhouse gases."

The only reason rising temperatures are believed to be detrimental to the biosphere is that they are assumed to increase the severity and frequency of maximum temperature events which define the upper thermal limits of various plants and animals' life zones. Hence, if almost all of the CO_2-induced temperature rise is confined to minimum temperatures, there will be little change in stress conditions at the high end of the thermal adaptability spectrum, but a great reduction in stress conditions at the low end. In addition, several studies have demonstrated that the direct biological benefits of atmospheric CO_2 enrichment grow ever larger as daily mean temperatures rise. Both of these consequences are desirable.

In light of these several observations, I suggest that, rather than posing a clear and present danger to the inhabitants of the globe, the CO_2 greenhouse effect significantly will enhance the direct biological benefits of atmospheric CO_2 enrichment and thereby help to thrust the planet into a new era of enhanced biospheric productivity, creating a clear and present benefit for all the many species with which we share the Earth.

What does the future hold?

As the CO_2 content of Earth's atmosphere continues its return to the high levels characteristic of past ages of biological prominence, the biosphere gradually should awaken from the great lethargy it has experienced over the past two millennia of near-CO_2-starvation. In so doing, it should reverse the long-term trend of species extinction brought about by the gradual lowering of the air's CO_2 content over the geological history of the planet. It also should provide the help we so desperately need to feed and clothe the burgeoning world population adequately, alleviating the severe pressures humanity currently is exerting on natural ecosystems the world over. Furthermore, what little greenhouse warming may occur could be just what is necessary to forestall the next "scheduled" glaciation of the globe, which geologically speaking, lies just around the corner .

We thus find ourselves at a significant crossroads in Earth's history, with an important choice to make. On the one hand, we seem poised on the threshold of a veritable rebirth of the biosphere. On the other, in many parts of the world, we appear to be balanced on the brink of ecological collapse. We owe it to ourselves and to generations yet unborn, as well as to all the other species with which we share the planet, carefully to investigate the many and varied aspects of atmospheric CO_2 enrichment before we cast our vote in the developing debate on global warming. It well could be that the rising CO_2 content of Earth's atmosphere is actually a blessing in disguise and one of the better things that could happen to mankind and nature.

SHERWOOD B. IDSO—Biographical Sketch

Dr. Idso, a research physicist with the U.S. Water Conservation Laboratory, Phoenix, Arizona, and adjunct professor in the departments of botany and geography, Arizona State University, Tempe, is the author of 'Carbon dioxide and global change'.

Reprinted with permission of The OPEC Bulletin, March, 1992.

King Kahn Shakes Regulators

Many state public utility commissions (PUCs) are considering major revisions to their traditional regulatory role by adopting environmental externality costs not actually incurred by the utilities.

However, PUCs have been warned by Dr. Alfred Kahn, a renowned economist, that states "must pay heed to the dangers of piecemeal environmentalism, which inevitably is raised if the actions are taken by its utility regulatory commission."

Kahn urged PUCs to seriously consider what regulated utilities' contribution in energy conservation should be. The commissions' basic and original responsibility is to ensure a reliable supply of electricity at the lowest possible cost.

Kahn, who held high positions in the Carter Administration and is a professor emeritus of political economy at Cornell University, made his comments in a paper at a conference on demand-side management.

Free markets in the real world are imperfect but the mechanism is more efficient than any other for processing complex and variegated information necessary for economically efficient decision making. Kahn said.

He noted the breakdown of Eastern Europe's and the Soviet Union's economies demonstrate the inability of government and central planners to process all that information, to take into account the diversity and to produce acceptable results.

While some government action might be necessary to take into account environmental cost not reflected in the market, state PUCs must consider that high probability of distortions and inefficiency, Kahn emphasized.

Public utility regulation does not embrace driving automobiles or burning fuels of all kinds directly rather than indirectly in the purchase of electricity, or power generation and production of fuels by non-utility entities, all of which can adversely impact the environment, Kahn asserted.

"Imposing environmental costs on only (one industry and not another) will inevitably tend inefficiently to distort the choice between them," he said. "It could even by raising the price of electricity while leaving unaffected the direct consumption of fossil fuels at the point of use, impede the process of electrification."

Reprinted from Coal Voice, September/October 1992

Call for Papers and Posters

1993 GULF COAST ASSOCIATION OF GEOLOGICAL SOCIETIES AND THE GULF COAST SECTION OF SEPM
43rd Annual Convention
Shreveport, Louisiana
October 20-22, 1993
Hosted by the Shreveport Geological Society

TECHNICAL PROGRAM

You are invited to submit abstracts for oral presentations, poster sessions, or core presentations. The following are suggested topics:

- Salt Dynamics & Tectonics
- Sequence Stratigraphy & Basin Analysis
- New Plays in Mature Basins
- Diagenesis in Gulf Coast Sediments
- Geochemistry of Source Rocks
- Enhanced Recovery/Development Geology
- Seismic Stratigraphy/3-D Seismic Applications
- Depositional & Structural History of Gulf Coast Sediments
- Environmental Geology

January 15, 1993 is the final deadline for receipt of abstracts.
Send abstracts to the following address:
1993 GCAGS Convention
P.O. Box 979
Tulsa, OK 74101-0979

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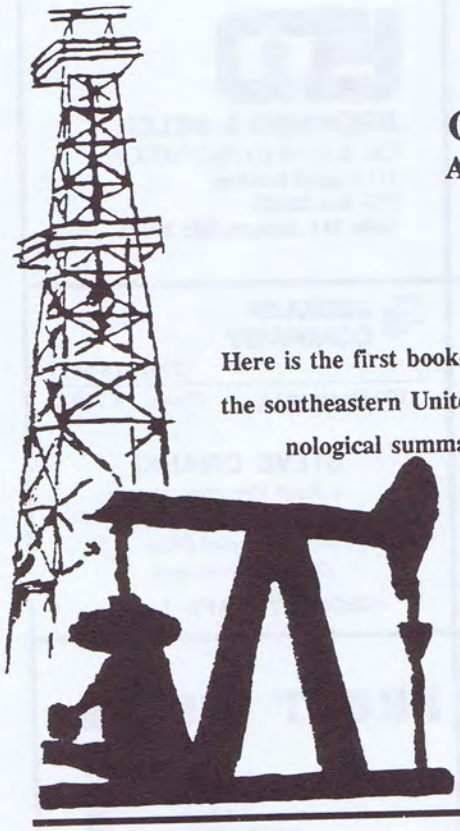

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Dudley J. Hughes

Here is the first book-length history of the oil business in the southeastern United States. This statistical and chronological summary of the evolution of the petroleum business in Mississippi, Alabama, and Florida is highlighted by the personal stories of the companies, entrepreneurs, promotors, investors, and workers who played major roles in the development of the oil business from its inception in the early 1900s to 1945.

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Call for Papers

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TECHNICAL PROGRAM

I. Energy resources and the environment
   Coastal processes
   Eastern water resources
   Peat and coal: sulfur models

II. Appalachian basin petroleum resources
   Black Warrior basin energy
   Developments in Early Mesozoic basins
   Paleozoic geochemistry of eastern North America

Poster sessions follow the themes of the oral sessions but also will include Appalachian and Black Warrior basin geology (AAPG), coal geology (EMD), and environmental geology (DEG).

The deadline for abstracts is Friday, January 15, 1993

Send abstracts to the following address:
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P.O. Box 979
Tulsa, Oklahoma 74101-0979

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KENTUCKY BOARD of REGISTRATION
for PROFESSIONAL GEOLOGISTS

228 Mining and Mineral Resources Bldg.
University of Kentucky
Lexington, KY 40506-0107

October 13, 1992

TO WHOM IT MAY CONCERN:

Kentucky's new law for registration of professional geologists became effective July 14, 1992. This law was enacted to regulate the public practice of geology in the state. The law requires the registration of all geologists offering their professional services to the public in Kentucky.

Requirements and provisions of this new law may be important to members of your association/society who now practice or may practice geology in Kentucky. Please inform your membership of this matter in your next newsletter, or by other means. The suggested announcement is enclosed.

Sincerely,

David C. Scott

David C. Scott, Chairman
KY Board of Registration
for Professional Geologists

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KENTUCKY IMPLEMENTS GEOLOGY REGISTRATION LAW

October 13, 1992

Pursuant to the provisions of KRS 322A.020, Governor Brereton Jones has appointed members to the Kentucky Board of Registration for Professional Geologists. These appointments were received in early August.

The Board is in the process of setting up the necessary State Government accounts, promulgating administrative regulations, and composing the application forms relating to the "Grandfather" period. The "Grandfather" period as set forth in the statute is from January 10, 1993, through January 9, 1994.

Qualifications required of the "Grandfather" applicants are as follows:

(a) Baccalaureate degree in geology, geophysics, geochemistry, or geological/geotechnical engineering from an accredited college or university plus five (5) years of professional geologic work. The board may give one (1) year of credit each for a master's or doctoral degree in the above disciplines in counting years of experience. During the twelve (12) month period January 10, 1993, through January 9, 1994, the Board shall waive the examination requirement for applicants qualified by education and experience.

(b) THE BOARD MAY WAIVE THE EDUCATION REQUIREMENTS FOR PERSONS WHO DERIVE THEIR LIVELIHOOD FROM THE PUBLIC PRACTICE OF GEOLOGY WHO DO NOT MEET THE EDUCATION REQUIREMENTS, BUT WHO CAN DEMONSTRATE TO THE SATISFACTION OF THE BOARD THEIR COMPETENCY AND WHO HAVE AT LEAST EIGHT (8) YEARS OF EXPERIENCE IN PROFESSIONAL GEOLOGIC WORK.

In order to qualify for registration after January 9, 1994, an applicant shall meet all of the requirements in part (a), plus successfully complete an examination designed by the Board to demonstrate the applicant's knowledge and skill required to exercise the responsibilities of the public practice of geology.

Starting January 10, 1994, it shall be unlawful to engage in the public practice of geology or to offer to publicly practice geology in this Commonwealth without being duly registered as a professional geologist.

The nonrefundable application fee is $200. Renewal will not be required prior to January 10, 1995, regardless of registration date. Application forms for registration may be obtained only by writing the address below. Requests will not be taken by phone.

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David C. Scott

David C. Scott, Chairman
KY Board of Registration
for Professional Geologists

WASTE MINIMIZATION PROGRAM CAN REDUCE DRILLING COSTS

Charles R. Hall and Richard A. Spell Oryx Energy Co.Houston

By systematically eliminating the sources of drilling wastes, waste management programs can reduce the costs of location cleanup and restoration.

Stiffer environmental regulations, "cradle to grave" responsibility for wastes, public concern for the environment, increased landowner restrictions, and changes in corporate philosophy all result in higher costs of handling drilling wastes.

Effective waste minimization has become a critical part of drilling operations.

Waste management must involve all aspects of a drilling operation. During each phase of a well, the goals must include reducing waste volume.

The main purpose of waste minimization is to reduce waste volumes through prevention or recycling.

This can be accomplished by managing drilling operations intelligently by finding alternative uses on site for materials, segregating wastes to prevent further contamination, and using materials less damaging to the environment.

Waste minimization has one key rule: "Don't make a big problem out of a small one."

The waste minimization process is primarily driven by limiting liquid wastes. The liquid portion of a drilling fluid is generally the most abundant waste and is usually the easiest to control. Solid waste from the drilling operation often requires more effort to control.

Historically, oil and gas drilling operations have been conducted with little concern for the amount of waste produced. Wells were drilled as quickly and cheaply as possible. Typically, the cleanup of drilling sites was the responsibility of production personnel.

Because drilling personnel had little to do with the waste cleanup, they did not have a clear picture of the costs and difficulties involved.

Locations were often constructed larger than needed because it was "always done that way," or it was easier to build a big location than to design a compact location based on specific rig dimensions and layout. Usually one reserve pit was built, and it was large and always full. Most of the on site waste was placed in the reserve pit during or just after drilling. At the end of drilling, wells were tested into the reserve pit. The pit was then closed in place with the cleanup and reclamation considered complete.

Those days are gone.

It is now essential to leave a drillsite in an environmentally acceptable and aesthetically pleasing condition. Oil and gas operators must address the remediation of the drillsite. This process actually begins during the planning of the drilling operation and continues through the location construction, drilling, and completion or plugging of the well. The minimization process requires an interactive, dedicated team of field, technical, environmental, and clerical personnel.

The waste minimization process has four main parts:

- Drilling program
- Drillsite construction
- Drilling and completion operations
- Cleanup operations.

Drilling program

Waste minimization begins with the design of the well bore and mud system. Factors in well design, such as hole size, casing seat depths, mud programs, hydraulics, and solids control efficiency, impact the success of waste minimization.

Obviously, the larger the hole, the more solid wastes generated. Note the volume differences between an 8 3/4-in. hole, a 9 7/8-in. hole, and a 12 1/4-in. hole. The 8 3/4-in. hole produces 0.4176 cu ft/ft of drill solids while the 97/8-in. hole produces 0.5319 cu ft/ft (27% more) and the 12 1/4-in. hole produces 0.8185 cu ft/ft (96% more). Thus, it is important to drill the smallest hole practical to reduce the volume of drill solids. This should be a common practice in well planning simply because of the cost savings associated with smaller pipe and equipment.

Well bores are not always large by design. High annular velocities can cause excessive hole washout which, over a long interval, can produce vast quantities of solid waste. Adequate hole cleaning must be balanced with preventing well bore washout. If possible, the mud system should be designed to reduce the effects of hole washout.

The mud system should be environmentally sound. Many mud additives contain chromium, barium, or chlorides. Contaminants and certain mud properties can prevent recycling of the mud or on site disposal of the cuttings. Thus, large amounts of liquid or solid material may need to be hauled to commercial waste disposal sites, and this option is often expensive.

Casing programs may also affect the waste generation process. An intermediate casing string or liner isolating a salt section or high pressure zone may become cost effective if such zones can contaminate the reserve pit. In areas where drilling along salt domes is common, parts of Mississippi for example, salt cuttings could contaminate entire reserve pits. It is important to perform economic analyses comparing costs of extra casing strings to the costs (transportation, disposal, and remediation) of the contaminated mud.

Location design

The construction of the drillsite must take into account several factors:

- Topography
- Rig size and equipment layout
- Anticipated volume of cuttings
- Possibility of contaminated cuttings
- Mud program
- Lease, regulatory, and surface owner restrictions.

The location planning includes a site evaluation to analyze the layout for water runoff problems. The site evaluation should include a visual inspection of the surrounding areas for drainage patterns on neighboring properties, proximity to bodies of water, and proximity to residences and buildings.

After staking the location, the drilling foreman or the environmental coordinator should indicate the least disruptive access route, the orientation of the site, the drainage patterns, the availability of areas for on site waste treatment, and possible existing contamination.

Trees cleared from the location and access roads become a waste that must be handled. Location crews should remove as few trees as possible.

If it appears that the site was used previously for disposal, oil field activities, or other industrial activities, an in-depth evaluation should be conducted. At a minimum, this should include a visual evaluation and soil sampling of suspect locations. If problems are anticipated, a Phase I or II site assessment can prevent many claims for damages from previous contamination .

Such a costly disposal operation in South Louisiana resulted from the construction of a reserve pit on an old drilling site with excessively high barium levels. The reserve pit material from the drilling operation became contaminated from the background levels of barium left by the previous operator. As a result, a large volume from the reserve pit had to be expensively disposed. A Phase I or II assessment may have detected the high barium levels before commencing operations, giving the operator the opportunity to relocate or repair the site.

If landfarming will take place on site, the proposed area should be sampled to determine the background conditions. The soil conditions determine the waste loading capacity for the site. Water table data also determine the suitability of the site for waste treatment.

Identification of the soil type aids in the planning of pit construction and waste management techniques. County soil surveys give information about the engineering properties of the soil to determine its suitability for levee or pit construction.

The size of the location must be as small as feasible. There is no reason to build a 400 x 400-ft location when a 300 x 300-ft location will suffice. The smaller location disrupts surrounding areas less and is cheaper to build.

The location should be designed to keep rainwater runoff away from both the reserve pit and the rig to prevent contamination of the rainwater. This is especially important in areas of high rainfall. For example, a l-in. rain on a 300 x 300-ft location will generate over 1,300 bbl of water. If that water enters the reserve pit or becomes contaminated in any way, it will become an expensive waste to manage.

To segregate drainage, the location should be sloped, or "turtle backed." Rainwater from around the rig, mud tanks, fuel tanks, and chemical storage areas is then separated from uncontaminated rainwater from other areas of the location.

This article will be continued in a future Bulletin

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Volume XLI No. 8 March , 1993

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1991-92

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PRESIDENT'S MESSAGE

March is upon us already and it simply doesn't seem right-- wasn't Christmas and New Year's just a couple of weeks ago? Oh well. If March is upon us, then that means it will soon be time to elect a new slate of officers to lead your Society for the next year. Steve Ingram, our immediate past president, is chairman of the nominating committee. If he calls and asks you to allow your name to go in the hat for one of the offices, please give it careful consideration. Our Society works only when everyone participates. I can see that the coming year will be one of challenges for our Society as well as one of excitement and opportunities.

Speaking of opportunities, our March luncheon meeting will afford you the opportunity to find out "everything you ever wanted to know" about North Frisco City Field. John Cox and Mark Stephenson will present 'A Geologic Study of North Frisco City Field' on March 9th, in the Petroleum Club Smackover Room. Doors open at 11:30 AM, so plan to attend and get the scoop on what has become quite a 'hot play' in recent months.

You may have noticed that for the last several months we have included in each monthly bulletin an order form for Dudley Hughes' book, Oil in the Deep South. We are told by the publisher, University Press, that the book should be out around the end of March. Your Society and the University Press are marking the occasion with a 'Book Premiere Party' on April 1st, from 4:30 to 6:30 PM in the Petroleum Club Lounge/Lounge Extension on the nineteenth floor of Capital Towers. Elsewhere in this bulletin, probably within the next couple of pages, you will find an announcement. Make your plans to attend.

See you at the luncheon !

Stanley King

BUSINESS MEETING LUNCHEON SCHEDULE

Spring Fling, May 20, 1993

April 13, 1993
May 11, 1993

ABOUT THE COVER: William A. Smith (top left), known as "Uncle Billy", a resourceful blacksmith and Drake's driller, made by hand the first set of drilling tools. Edwin L. Drake (top right) and his well. "Colonel" Drake was convinced he could recover oil by drilling. He did just that on August 29, 1859 at 69 1/2 feet, the beginning of the petroleum industry.

BUSINESS MEETING LUNCHEON

11:30 A.M. March 9, 1993
Capitol City Petroleum Club, Smackover Room

A SUBSURFACE STUDY OF THE NORTH FRISCO CITY FIELD, MONROE COUNTY, ALABAMA

John G. Cox, Mark A. Stephenson
Paramount Petroleum Co., Inc

The 1991 discovery of North Frisco City Field has led to a resurgence of industry activity in the updip Jurassic trend of Monroe County, Alabama. Six wells in the field are presently delivering 6,000 BOPD and 5 MMCFGPD out of the Frisco City Sand Member of the lower Haynesville Formation.

The North Frisco City Field is a combination structural-stratigraphic trap associated with Paleozoic basement topography. A geological and geophysical exploration model for Haynesville production in Alabama was developed from existing subsurface and seismic control. The model predicted hydrocarbons generated from Smackover carbonates migrated through an incompetent or absent Buckner Anhydrite seal into the overlying Frisco City Sand. The Frisco City Sand is vertically sealed by overlying Haynesville shales and anhydrites.

The sedimentary strata of the Frisco City Sand Member at North Frisco City Field are interpreted to have accumulated as fluvial deposits. The predominate lithology is a coarse-to fine-grained sandstone deposited in a sandy braided stream environment. The sandy braided stream deposits occur in stacked fining upward sequences and have excellent reservoir character. Some of these sequences are very gravel rich and may have accumulated in braided streams associated with alluvial fans. A nonconformity exists locally between the Jurassic sediments and the underlying crystalline metamorphic basement rock. Comparison of petrographic data from the metamorphic rock and the sandstones clearly indicates the local metamorphic rock could not be the sole clastic source for the Frisco City Sand.

A 3-D seismic survey was acquired after the discovery well was drilled. The survey covered 8 square miles of surface area with a bin size of 82.5 feet. This provided excellent structural control across the prospective area and resulted in better drilling decisions. Also, once 3-D acquisition was complete the field was developed at an accelerated pace, which has had a positive impact on cash flow and field economics.

John G. Cox is a senior prospect generating geologist with Paramount since 1988. Before joining the company he spent a combined 10 years with Coastal Oil & Gas Corp. and Champlin Petroleum Co. as a senior geologist. Cox holds a BS from Milsaps College, Jackson Miss., and a masters in geology from the University of Mississippi.

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A CORE PROGRAM FOR OPTIMUM CHARACTERIZATION OF CLASTIC RESERVOIRS

Don Goddard
Basin Research Institute

INTRODUCTION

Traditionally, the decision to obtain a conventional core from a well in a new exploration play was made by the geologist. Seldom could a core be justified on the first prospect in a new area and was therefore recommended for the second or third well drilled. There are many reasons for this; however, operational, as well as economical, constraints are the most valid. Generally, such exploration cores were used for detailed geological descriptions of the subsurface, and depending on the complexity, an entire well may be cored (stratigraphic test over thousands of feet of section). This initial use of cores could provide information needed for future exploration and development decisions.

During the past decade, there has been an obvious decline in exploration activity because of the economic climate of the petroleum industry. This has produced a concurrent, gradual shift to more development drilling. Many geologists feel there are only a few large fields that remain to be found in remote, harsh environments. Therefore, for economic and practical reasons, optimum recovery from producing fields has become a main thrust of the petroleum industry. Because production has become the primary activity in the industry, the reservoir engineer has moved to the forefront, with the development geologist taking a vital but secondary role. A multidisciplinary approach to reservoir characterization, combining engineering and geological expertise, should provide the best results for optimizing production. It seems the more successful operating companies are applying this method. Apparently, it has become obvious to most petroleum engineers that a coring program is indispensable in providing the necessary data for simulation accuracy, which contributes to the economical success of secondary and tertiary recovery.

In the past, a core was an important source for defining the geological conditions within the subsurface of a region. Today, a core in combination with logs, production history and detailed net sand, stratigraphic analysis, and structural mapping can provide the necessary data for understanding reservoir complexities.

CORE HANDLING FIELD PROCEDURES

Coring operations are the responsibility of the coring contractor and drilling engineer. However, careful monitoring of the drilling parameters (ROP, WOB, RPM, TORQUE) and mud properties should not be overlooked because these may influence the total core recovery. Advantages or disadvantages of using rubber, plastic, or fiberglass sleeves for unconsolidated material, aluminum tubes for fractured sandstone, or carbonate reservoirs are not

discussed in this article. Nevertheless, the technique used should be decided well in advance of the operation to ensure maximum recovery.
The major interest is the handling of a conventional core at the surface as it is removed from the core barrel.

Geologist's Role

There are several core handling procedures, each designed to meet the needs of a company; however, certain standard proven procedures exist that are used by most. An experienced geologist is best qualified to retrieve and box the core. Foremost in this operation is the preliminary geological description and the correct positioning and labeling of the core. If this procedure is carefully carried out at the well site, time-consuming rearranging at the storage facility can be avoided. Perhaps the most important point is to never lose sight of the base and top of the core as it is recovered from the core barrel. The core should be placed from the base to the top in each box, with the first box corresponding to the base and the last box to the top of the core.

Safety

Safety precautions should always be an integral part of the coring procedure, and are usually standard practice for most companies. Proper foot and head gear must be worn at all times. Employees should never place their hands below the core barrel because dropping this heavy equipment or the core could cause a serious accident. The core barrel should be held no higher than 1.5 feet above the derrick floor; this will help to prevent the core from scattering should it suddenly slip out of the barrel.

Core Preservation

Representative sand intervals for special analysis should be preserved as soon as the core surfaces. Commercial materials and techniques are available that maintain original conditions of the core up to two years. These materials include sealed plastic containers, paraffin waxes over aluminum foil, and special epoxies. Most preservation techniques have been proven effective, but immediate special analysis generally provides the best results.

THE LOGGING PROGRAM

A complete, practical suite of logs should accompany a core program. Operational costs notwithstanding, the additional expense of an adequate logging program can be justified because it is the only way to obtain maximum benefit from the core and provide invaluable in-situ data from the cored interval. Detailed correlation of the cores with petrophysical data not only illustrates how depositional features may control production but also the effects of diagenesis on reservoir quality (Sinha et al. 1989). By comparing electric logs and cores, reservoir properties and environments can be extrapolated to areas where cores are unavailable. There are, however, some limitations, especially in deltaic systems where

lateral continuity varies between facies.

Thin-bedded deltaic reservoirs such as those described in the Wilcox Group in Louisiana (Echols 1991; Tye et al. 1991) can only be evaluated to their fullest by integrating core and well-log data. Advanced interpretation techniques using high-resolution logging instrumentation (Lawrence et al. 1990; Fertl and Nice 1990; Sinha et al. 1989) are becoming common place in the Gulf Coast area. Major logging companies, such as Atlas Wireline Services, Schlumberger, and Halliburton Logging Services, provide excellent services and have similar, state-of-the-art, high-resolution logging instrumentation.

Perhaps the most popular tool used to accompany coring is the borehole televiewer. Each logging company uses a slightly different trade name for the tool. For example, Schlumberger calls the televiewer the Formation Micro Scanner (FMS); Atlas Wireline's tool is the Circumferential Borehole Imaging (CBIL) Tool; and Halliburton's name uses Circumferential Acoustic Scanning Tool (CAST). The televiewer is useful for detecting fractures, delineating thin beds, and determining bedding plane, orientation, and bed thickness.

The new thin-bed, high-resolution resistivity tool is another important instrument and is recommended because its vertical resolution is inches. It also can investigate deeper into the formation than conventional induction tools.

The standard SP-gamma ray should be included in logging. Permeability and shaliness estimates provide important lithologic reservoir parameters and enable netcand estimation and ultimate reservoir mapping. The netsand geometry and detailed core parameter descriptions provide the most favorable data for characterizing the depositional facies of the reservoir. Finally, density, neutron, and sonic logs are vital to relating formation porosity, and the ideal suite of logs that should accompany coring in thin-bedded deltaic reservoirs are

Borehole Televiewer (FMS, CBIL, CAST)
High-Resolution Resistivity Log
(TBRt or Similar)
Gamma ray/SP/Caliper
Density/Neutron/Sonic (FDC/CNL/LSS)

CORE ANALYSIS

Conventional cores are analyzed and interpreted to provide necessary geological, geochemical, petrophysical, and engineering data for the geologist and engineer, who can describe the cored interval and plan optimal reservoir exploitation (figure 1). Today, the technology and instrumentation exist with analytical capabilities for answering most questions about the reservoir rock and its fluids. The correct application of laboratory results to secondary and tertiary recovery should contribute to the economic success of a project. However, because of extreme vertical and horizontal variations, especially within deltaic reservoirs, expectations of reservoir behavior do not always correspond to the core analytical results.

Geologic Parameters

Various analytical techniques are available for providing geological properties of the reservoir and associated source rocks. For example, the shaly intervals may contain sufficient fossil remains (e.g., pollen or foraminifera) for biostratigraphic and chronostratigraphic evaluations. The results will assist in enabling the investigator to reconstruct the depositional environments, interpret global sea-level events, arrive at sequence stratigraphic models, and determine age relationships, all of which improve correlations locally and regionally

Detailed visual description of the core, photography, and its examination using x-ray radiography, provide the information for understanding the sedimentological processes responsible for sediment deposition. Lithology, internal structures, and sand body geometry derived from the core and combined with the wireline data enhance the geologist's ability to differentiate various facies within the depositional environment and thus locate those facies that provide the optimum reservoir characteristics.

Well-known analytical techniques, such as thin section petrography, scanning electron microscopy (SEM), and x-ray diffraction (XRD), are used for looking at small-scale internal properties of the reservoir. Properties, such as pore space, texture, and clay mineralogy, are related to the diagenetic processes, which can greatly affect reservoir quality.

Geochemical Parameters

Organic Geochemistry

Organic geochemistry for many years has played a secondary role in petroleum exploration (Chinn 1991; Barker 1986). As an exploration tool, it has been overshadowed by geophysics, particularly seismic methods. The importance of applying organic geochemistry to crude oils and source rocks to obtain a better understanding of Gulf Coast reservoirs has been demonstrated recently (Kaufman et al. 1990, Wenger et al. 1990).

The common analytical techniques, such as rockeval, vitrinite reflectance, total organic carbon (TOC), kerogen description, and gas chromatography, lead to the characterization of source rocks and crude oils. Previously, the typical approach of the geochemist was to interpret the results on a regional scale to try to understand source rock maturation and migration of fluids between fields. Present day and future emphasis should be on a more local scale for detailed understanding of the reservoirs. Fingerprinting of the reservoir fluids using gas chromatograph techniques and standard analysis of shale intervals of a conventional core permit reliable interpretations of reservoir continuity, source rock availability, and migration within a field (Kaufman et al. I 990)

The correlation of TOC data obtained from core analysis with well logs has enabled Passey et al. (1990) to develop a practical method for determining organic richness. Their technique shows that the porosity log combination with the gamma and resistivity curves can accurately predict TOC over a wide range of maturities.

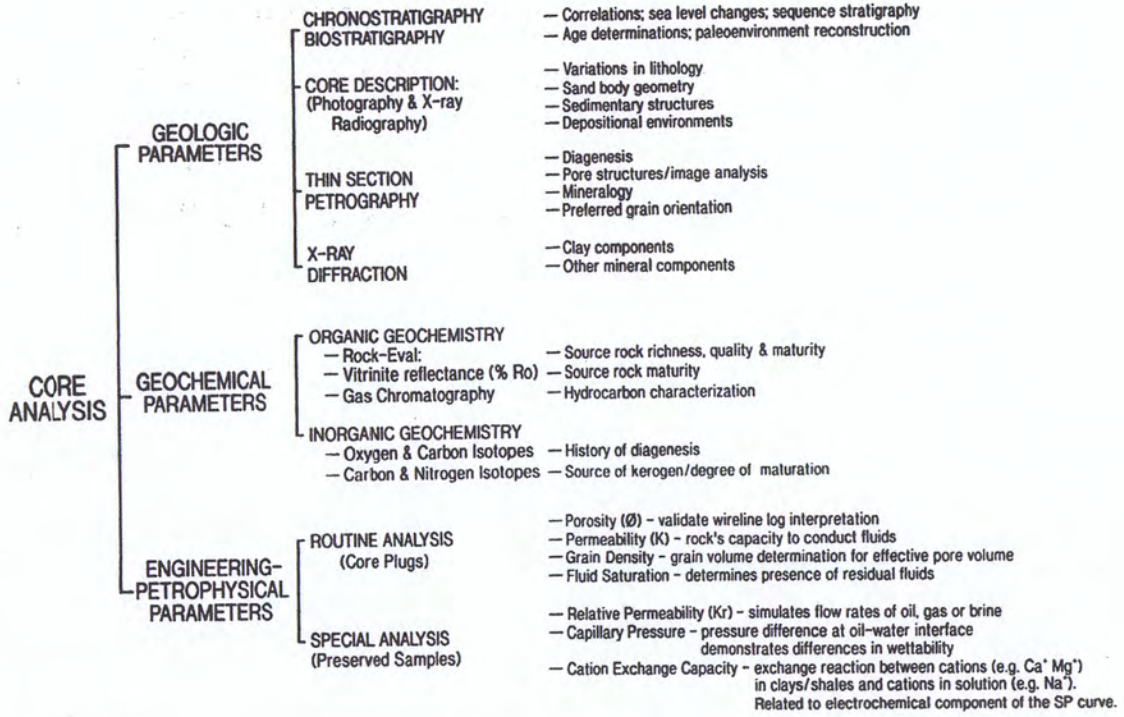

Figure 1. Analytical techniques and resulting data for reservoir characterization.

Inorganic Geochemistry

Although not as prevalent as organic geochemistry, isotope geochemistry has been used successfully for many years for characterizing the hydrocarbons and their source rocks (Silverman and Epstein 1958; Sofer 1984; Tanner and Fuex 1990). Carbon and oxygen isotopic signals can be related to stratigraphic, depositional, and diagenetic history of an area of interest (Williams et al. 1990). Carbon and nitrogen isotope analysis provide the data for determining source of kerogen and degree of maturation (Aharon personal communication).

Engineering and Petrophysical Parameters

Apart from obtaining the important properties of reservoir rocks, core analysis results, which reflect approximate in-situ conditions, can be used to calibrate the response of wireline logs (Anderson 1975). Routine analysis on plugs taken from the conventional core allows the investigator to determine among other things a) the variation of porosity and permeability as a function of position and depth within the well, b) residual fluid saturation by a combination of techniques, and c) grain density (Archer and Wall 1986).

Porosity interpretations obtained from the formation density and neutron and sonic logs can be validated with porosity measurements from the core plugs. Formation lithology and saturations, interpreted from gamma ray, spontaneous potential, and induction logs, can also be correctly adjusted according to results from the core plugs. Finally, in known producing fields where only old electric logs (SP-shallow investigative resistivity) are available, these can be correlated to the updated more precise data sets obtained from a few strategically located conventional cores and their accompanying suite of state-of-the-art logs. This procedure may locate remaining hydrocarbons in thin-bedded sand intervals that appear to be low-resistivity water sands on the older logs.

Special analysis on preserved representative samples of the core are usually requested by the reservoir engineer. Some of the more important parameters of interest to the engineer are a) relative permeability, which is the measure the ability of fluid (oil, gas, or brine) to pass through the rock depending on the degree of saturation in the fluid phase; b) capillary pressure, the pressure difference at the interface between two immiscible fluids (oil, water) and therefore the controlling factor in the fluid distribution within the reservoir; and c) the cation exchange capacity, a measure of the exchange reaction between cations in the shale and those in solution. Details relating to laboratory equipment, the measurements of these parameters and their relationship to the reservoir are well documented in the literature (Archer and Wall 1986; Anderson 1975).

CORE STORAGE

Boxing of conventional cores in 3-ft sections has been found to be ideal for handling and storing. A functional core storage facility should consist of four principal areas: 1) an area containing sufficient, well spaced, high-quality, strong shelves capable of sustaining the

weight of the cores; 2) an area with long tables for laying out and describing the cores; 3) an enclosed area for slabbing, cutting, and taking of plugs from the core; and 4) office space that includes photographic equipment and offices for curators who are responsible for organizing the cores and coordinating the visits of the investigators.

Obtaining conventional cores is costly; therefore, they should be stored in good condition for ongoing studies. The materials used for storing the core should prevent contamination with nearby cores or outside dust. It is difficult to prevent drying out or crumbling of certain types of rocks over time. However, if well stored they may still be of use for lithologic or biostratigraphic descriptions. In the past, after detailed geologic descriptions were made, many companies had no more use for the cores, which were stored in such a way that 10 or 20 years later they could not be found or, if found, were unusable. Today, with the need to go back into old producing fields, these cores could still provide useful data for optimizing production of remaining hydrocarbons. The availability of more sophisticated analytical techniques and new ideas relating to sedimentary processes and depositional environments make old cores a valuable source of useful data. Therefore, proper storage of cores for possible long term use should be an important consideration.

CONCLUSIONS

With increasing cost of developing a field and the need for operators to produce the maximum amount of remaining hydrocarbons, detailed reservoir conditions must be understood. Probably the best way to obtain the necessary information for this task is to carry out a well-planned coring program, accompanied by an adequate suite of modern wireline logs. State-of-the-art core analytical techniques provide reliable geological, geochemical, petrophysical, and engineering data that approximates in-situ reservoir conditions. Results of the coring program can be used by the development geologist to detect the best infill drilling sites and by the reservoir engineer to guarantee the production expected in secondary recovery.

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A CORE HOLE DRILLED TO EVALUATE THE PENNSYLVANIAN COALBED METHANE POTENTIAL IN CLAY COUNTY, MISSISSIPPI

by
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Energy Section, Mississippi Office of Geology

INTRODUCTION

A wireline, 2 1/2 inch diameter, continuous core was cut in the undifferentiated, Pennsylvanian age Pottsville Formation in the western portion of the Black Warrior Basin, northeastern Clay County, Mississippi. The core hole well, the Plantation Petroleum, No. 1 Allen, located 160 feet from the west line and 1,460 feet from the north line of Section 27, Township 16 South, Range 6 East, Clay County was begun on April 4, 1992, and reached a total corrected depth of 3,382' on April 25, 1992 . The well was drilled and cased with 4 1/2" casing to a depth of 1,860' by a Midsouth Drilling Company rotary rig. At this point the rotary rig was moved and a Longyear core hole rig was moved in to drill and core the well to total depth. The core hole was conceived, proposed and operated by Plantation Petroleum Corporation (Mr. Robert Stroud, President), Shreveport, Louisiana. It was drilled as a cooperative effort with several government and private agencies including the Mississippi Department of Economic and Community Development, which paid for a portion of the project with a grant from the federal oil overcharge fund. Other agencies and companies which were involved in the coring project included the Mississippi Office of Geology, Mississippi State Oil & Gas Board, Midsouth Drilling Company, Longyear, and Geomet. The purpose of the core hole was to investigate the cumulative thickness of the coal seams and determine the quantity and quality of methane found within the coal seams of the West Point Coalbeds of the Pottsville Formation in the southwestern portion of the Black Warrior Basin. The coal seams of the Pottsville Formation in Tuscaloosa and Jefferson Counties, Alabama, located in the southeastern portion of the Black Warrior Basin are currently the site of several coal degasification projects.

By determining thickness and quality of the coal, the feasibility of commercial coalbed methane production in this portion of Mississippi may be ascertained. The core hole penetrated the West Point Coalbed coal seams found within the coal groups termed the West Point, Sand Creek, and Houlka (Henderson and Gazzier, 1989, and Rodgers, 1991). The total thickness of the Pottsville section cored was 1,522 feet.

PURPOSE

The production of natural gas from coal seams contained within the Pennsylvanian age Pottsville Formation of the Alabama portion of the Black Warrior Basin, located approximately sixty (60) miles east of the Mississippi core hole project, has been developed over the past several years. Similar potential also appears to exist within the Mississippi portion of the Black Warrior. A core hole project was proposed to evaluate the West Point, Sand Creek, and Houlka Creek coal groups by Plantation Petroleum Corporation. The

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October 13, 1992

TO WHOM IT MAY CONCERN:

Kentucky's new law for registration of professional geologists became effective July 14, 1992. This law was enacted to regulate the public practice of geology in the state. The law requires the registration of all geologists offering their professional services to the public in Kentucky.

Requirements and provisions of this new law may be important to members of your association/society who now practice or may practice geology in Kentucky. Please inform your membership of this matter in your next newsletter, or by other means. The suggested announcement is enclosed.

KENTUCKY IMPLEMENTS GEOLOGY REGISTRATION LAW October 13, 1992

Pursuant to the provisions of KRS 322A.020, Governor Brereton Jones has appointed members to the Kentucky Board of Registration for Professional Geologists. These appointments were received in early August.

The Board is in the process of setting up the necessary State Government accounts, promulgating administrative regulations, and composing the application forms relatin to the "Grandfather" period. The "Grandfather" period as set forth in the statute i from January 10, 1993, through January 9, 1994.

Qualifications required of the "Grandfather" applicants are as follows:

(a) Baccalaureate degree in geology, geophysics, geochemistry, or geological/geotechnical engineering from an accredited college or university plus five (5) years of professional geologic work. The board may give one (1) year of credit each for a master's or doctoral degree in the above disciplines in counting years of experience. During the twelve (12) month period January 10, 1993, through January 9, 1994, the Board shall waive the examination requirement for applicants qualified by education and experience.

(b) THE BOARD MAY WAIVE THE EDUCATION REQUIREMENTS FOR PERSONS WHO DERIVE THEI LIVELIHOOD FROM THE PUBLIC PRACTICE OF GEOLOGY WHO DO NOT MEET THE EDUCATION REQUIREMENTS, BUT WHO CAN DEMONSTRATE TO THE SATISFACTION OF THE BOARD THEIR COMPETENCY AND WHO HAVE AT LEAST EIGHT (8) YEARS OF EXPERIENCE IN PROFESSIONAL GEOLOGIC WORK.

In order to qualify for registration after January 9, 1994, an applicant shall meet all of the requirements in part (a), plus successfully complete an examination designed by the Board to demonstrate the applicant's knowledge and skill required to exercise the responsibilities of the public practice of geology.

Starting January 10, 1994, it shall be unlawful to engage in the public practice of geology or to offer to publicly practice geology in this Commonwealth without being duly registered as a professional geologist.

The nonrefundable application fee is $200. Renewal will not be required prior to January 10, 1995, regardless of registration date. Application forms for registration may be obtained only by writing the address below. Requests will not b taken by phone.

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David C. Scott

David C. Scott, Chairman
KY Board of Registration
for Professional Geologists

Pennsylvania Coalbed Methane Potential, continued from Page 15

purpose of the core hole was many fold. Critical to determining the feasibility of coal degasification are:

(1) the total thickness of the coal seams;
(2) the gas content of the coals;
(3) the relative permeability of the coals; and
(4) the depth of the seams.

As a result of the drilling of this core hole, all of the above factors were determined. Correlation of the visually observed lithology in the core, in particular the coal, with that interpreted by the examination of petrophysical log responses was examined. Additional considerations which were not addressed in this project were: (1) the salinity and quantity of the water which would be produced in association with the production of coal gas; and (2) the coal rank by vitrinite reflectance.

STRATIGRAPHY

The Pennsylvanian age Pottsville Formation of Mississippi consists of an undifferentiated sequence of shales, siltstones, sandstones, limestones, and conglomerates, as well as at least one differentiated sequence of coal groups, the West Point Coalbeds. It appears that this undifferentiated sequence represents deposition within an interdistributary basin in a marginal, fluvial-marine-delta complex (Tarbutton, 1980). Sediment influx was the result of several mechanisms including over bank deposits, storm surges and crevasse splays. Periods of little or non-deposition of sediments are marked by a presumed marsh environment with varying amounts of organic accumulation which ultimately resulted in the formation of the coal measures contained in the Pottsville Formation.

The following is a generalized description of the lithologies encountered in the core. The shales are light gray to black, and generally fissile. They contain laminations of highly contorted, bioturbated(?), light gray siltstone to very fine grained, light gray sandstones. Siltstones are light to medium gray and are present within the shales as previously described and as gradational contacts between shale and very fine grained sandstones. The sandstones which were encountered are generally non-calcareous, well cemented, very fine grained and rarely medium grained, angular to sub-angular, and light to medium gray in color. These sandstones generally exhibit shale and siltstone laminations that are conformable to highly contorted, disconformable to the overall bedding planes (e.g. plume and flame structures, apparent burrowing etc). Some of these disconformable relationships may be the result of crevasse splays and/or storm surges. A complete sequence of fining upward sediments was found which consisted of a basal conglomerate member grading into coarse, medium, fine, and very fine grain sandstones, siltstone and lastly into a shale upper end member. Only one limestone unit was recognized, which was approximately one and one-half feet thick, dark to medium gray, crystalline, and non-fossiliferous. The coal groups which were encountered, from youngest to oldest are the West Point, Sand Creek, and Houlka Creek Groups. The coals which were retrieved have undergone gas desorption tests. The residual coal materials have been archived by the Mississippi Office of Geology.

RESULTS

Visual examination of the core and petrophysical log analysis over the interval from 1860 to 3383 feet both indicate the total thickness of coal seams to be approximately seven (7) feet. Individual seams ranged from just over three (3) feet, one coal seam, to generally around one (1) foot in thickness. The petrophysical log analysis utilized the bulk density readings as described below. Factors which may account for the thinner than anticipated total coal thicknesses at this location are:

(1) Localized variability in the environment of deposition which led to a thinner sequence of coals beds where the core hole was sited.
(2) The petrophysical methodology used by Henderson and Gazzier (1989), i.e. "mid-point method", is inaccurate. A suitable and more accurate method utilized by this writer and the industry involved with degasification of coals within the Black Warrior Basin uses the actual bulk density recorded by the density log and designates lithologies with a density of 2.0 gm/cc or less as coal (Streets, 1992).

Analyses indicate that the coals which were recovered are bituminous, high volatile A to B in rank, with a high ash content (Smith, 1992). The gas content originally anticipated by Henderson and Gazzier (1989) to be contained in these coals was 200 SCFG/TON

(Standard Cubic Feet Gas per Ton of coal). The desorption data obtained on the coals recovered from the Plantation core hole indicates that 100 to 110 standard cubic feet of gas per ton (SCFG/TON) is present (Smith, 1992 and Stroud, 1992), or roughly one-half as much gas as initially projected.

SUMMARY

Based on the thin cumulative thickness, uncertain natural gas prices, and lower than anticipated gas content of the coal seams encountered in the Plantation Petroleum core hole, it is unlikely that the potential of coal degasification in the West Point Coalbeds of the Mississippi portion of the Black Warrior Basin will be exploited at the present time. This may be demonstrated by calculating the cost of the drilling and completion of a 3300' coal degasification well, the amount of estimated natural gas reserves which would be recovered, and the gross revenue which would be generated by said well - all of which are based on accepted industry standards. This calculation is based on the following criteria:

(1)	Well Spacing	-	80 acres/well
(2)	Methane/ton of coal	-	100 SCFG
(3)	Methane Recovery Factor	-	75 %
(4)	Cumulative coal thickness	-	Seven (7) feet
(5)	Amount of coal per acre-foot (est.)	-	1800 tons/acre-foot (Averitt, 1975)
(6)	Net Revenue Interest	-	1/8 royalty burden or a 87.5% net revenue int.

Based upon the above criteria the following results may be anticipated if the subject core hole were to be completed:

RECOVERABLE RESERVES -
(80 acres/well)X(100 SCFG/ton)X(7 feet coal)X(75% recovery)X
(1800 tons/acre-foot) = 75.6 MMCFG

Further, assuming an average gas price of $1.50/MCFG and an average net revenue of 87.5% (1/8 royalty burdens), would generate gross revenues as follows:

($1.50/MCFG)X(75.6 MMCF)X(87.5%) = $99,225.00 *
Drill and complete a 3300' well = $180,000.00 (est.)
RETURN ON INVESTMENT - = 0.55 TO 1 *

* - Note that these figures do not include local, state or federal taxes, operating costs, workover costs, lease costs, administrative overhead etc. or federal tax credits which may be applied. All figures are undiscounted.

In conclusion, unless a re-examination of the existing subsurface well control and/or new well control indicates the unexpected presence of thicker and/or gassier coal seams within the West Point Coalbed area of the Black Warrior Basin, it appears that this area does not hold promise for commercial production of coalbed methane gas under current economic conditions. Should any of these factors change, additional evaluations may be warranted. However, another coalbed area, termed the Monroe Coalbeds located in Monroe County, Mississippi warrants additional studies. The coals contained within this area are shallower than the West Point Coalbeds and hence the salinity of the water produced should be lower and more easily disposed of by acceptable conventional methods. Further, the Monroe Coalbeds also appear to be thicker and more analogous to the coal degasification projects within the Alabama portion of the Black Warrior Basin.

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Continued from page 23 of January, 1993 MGS Bulletin.

The reserve pit should be designed to prevent collection of runoff water. Runoff water should be collected in a sump or separate pit from which it can be discharged, treated, or used around the rig.

Off site runoff water can increase disposal costs and may possibly bring contaminants. To prevent this, ring levees may be used around the location, but the ditches should be segmented to isolate local spills. Through effective planning, an operator can lower location costs (smaller location to build and board) and lower disposal costs (lower volumes of waste and fewer surprises).

Reserve pits

The drilling engineer must determine if a reserve pit will be the best system of handling and storing drill cuttings, mud, and water. A reserve pit may be the best waste management technique if there is adequate space for landfarming around the site, if it appears that wastes can be landfarmed, and if the surface owner will allow landfarming. Closed systems (without pits) are being used more frequency if construction of a reserve pit is not feasible or if it is cheaper to handle cuttings without putting then in a pit.

Pits should be located to minimize hazards to the surrounding area. This may require the operator to dig the pit rather than simply push up an earthen levee.

Any pit which may contain a contaminant should be lined. Some states already require impermeable liners for certain pits. Without an impermeable liner, the pit fluids could leach into the ground and possibly contaminate groundwater. This is of special concern for salt water and salt cuttings. The cost of a liner is small compared to the cost of any contamination cleanup.

The pits should be designed as small as practical. One rule of thumb for pit construction is to allow 2 bbl of drilling waste for every foot of hole drilled. The pit volume should be built assuming vertical pit walls, plus 2 ft of freeboard to meet most regulatory requirements. Most reserve pits have sloped wails resulting in about I I/2 bbl of actual pit volume per foot of hole. This is an extremely small but manageable volume. The rig personnel must continuously monitor and regulate the volume of material entering the pit.

Reserve pit systems should consist of multiple pits, with a minimum of two and preferably three pits. These isolate drill cuttings and contaminants from the main part of the pit system. One consideration is the use of pumps to move fluids between pits rather than using overflow ditches. Pumps help eliminate inadvertent contamination of all the pits because fluid does not transfer automatically; it requires energy or physical effort.

The reserve pits must be designed to allow for processing the material while it is in them. By managing the reserve pit fluids efficiently, waste generation can be reduced, and problems with handling the waste can be minimized.

On two recent wells un South Louisiana, Oryx Energy Co. successfully used a managed reserve pit system. The overall disposal costs wire reduced by 50-75%, and the volume of waste hauled to commercial disposal sites was

much lower than on comparable wells.

Drilling operations

During the bidding process, the rigs should be inspected while on other wells. The drilling engineer should conduct a second rig inspection during the early part of drilling the well while the mud system is still relatively new. Successful minimization operations require environmental awareness meetings as well as an environmental audit of the rig prior to spudding.

An inefficient drilling operation can use up to 300 bbl of water/day in operations other than actual drilling. Water meters should be installed and monitored to control water use. All water hoses should have shutoff valves, preferably automatic. Rig wash hoses should be equipped with high-pressure, low-volume sprayers, and rig washing should be limited to only what is necessary to maintain safety. Reserve pit water should be reused to clean solids control slides, and ring levee ditch waler can be used for makeup water in the mud system.

It is good practice lo handle all mud systems as if they were oil-based muds. This results in better supervision of the equipment and less waste produced.

It is important to require zero discharge where contaminants such as lubricating oils are present. Drip pans should be used under leaking machinery until the leak can be fixed. The collected oils should be stored for reprocessing or proper disposal. This is especially true for lubricating oils classified as hazardous waste under Environmental Protection Agency guidelines. Lubricating oil spilled into the reserve pit could cause the entire pit contents to be considered as hazardous.

Another possible problem source is the mouse hole. Because the mouse hole is generally 20-40 ft deep, mud contaminants or salt water might leach onto the ground. The bottom of the mouse hole should be cemented to prevent drilling fluids from reaching groundwater if the water table is shallow.

The efficient use of solids control equipment minimizes the dilution water needed to maintain acceptable drill solids in the mud system. A mud with 6% drill solids can require up to 16 bbl of water for every barrel of solids. specialty solids control equipment.t such as centrifuges and cuttings washing equipment can significantly reduce waste by concentrating the solids or isolating contaminants.

Solid waste (not drill solids) from the drilling operation includes municipal-type trash (food waste, paper, etc.), mud additive bags, dope pails, and drums. Typically, paper and plastic trash are burned on location. Local regulations may prohibit burning certain trash because of the possibility of chemical contaminants. The trash should be separated into bulk containers for proper disposal off site. Any vendor-supplied item such as sacks, pails, or drums should be returned to the vendor for recycling or proper disposal.

Mud system wastes can be reduced by limiting the size of the reserve pits, controlling water usage, and reusing water whenever possible.

Personnel training

It is essential lo get the drilling foreman involved with the goals of the waste management program before spud(ding the' well. If the foreman understands the regulatory constraints and is given the opportunity to try his ideas, he can become the most effective part of the program.

An effective means of communicating the waste minimization program to the entire rig crew is to hold an environmental meeting at the beginning of each shift change. The details of the waste minimization program are discussed so that each person understands his role. Each worker must also understand why certain things are being done differently.

The waste management process involves the rig personnel directly—they become aware of the need for waste management and understand the problems resulting from improper procedures. Ultimately, the rig crews will become more conscious of the effects of their actions.

Because they are directly involved with the operations, they may come Up with some innovative methods and technologies of waste minimization.

Mud recycling

If a material can be reused or recycled. it is not considered a waste. An excellent example is weighted drilling mud. If at all possible, the drilling foreman should contact a local drilling mud company to inquire about selling the mud to it. The amount of money received for the weighted mud may not seem attractive compared to the initial cost, but it is definitely better than paying for disposal.

Salt water is often purchased for the mud system as kill weight fluid. Once the salt water enters the reserve pit, the liquid has to be hauled away as a waste product. On a drilling location in South Texas, the foreman isolated the salt water from the rest of the fluids. The supplier took back the clean salt water and was able to sell it again. Although the well did not receive a credit for the, reclaimed salt water, the disposal costs were significantly lowered.

If an operator is drilling a multiwell program, transfer ring the mud from one well to another may be a viable option. In the Carthage field in Panola County, Texas, a specially designed mud used for drilling through a highly pressured zone followed by a depleted zone was reused by an operator in a number of wells. The transportation costs were far lower than the costs of building new mud systems.

If the pit water is clean enough, it can be used in the mud system or around the rig to wash the rig or to wash mud slides. This is important because a large portion of the daily water used on a drilling rig is for cleaning.

Another source of waste is cooling water used on slush pump rods. This water can be reused in the mud system instead of allowing it to fall into the rig sump. If the drilling operation is managed properly, cleanup and restoration operations should be fairly routine. The key is to keep problems small and easy to handle, primarily by isolating small volumes of highly contaminated

waste from large volumes of uncontaminated material.

An example of the importance of this occurred recently on a well drilled by Oryx near New Orleans. The barite-contaminated cuttings from the bottom portion of the hole were inadvertently mixed with the uncontaminated native cuttings from the upper hole. Instead of 5-10 loads of material hauled to commercial disposal, 38 loads were hauled to disposal.

There are five main methods of drilling fluids and cuttings cleanup:

- Burial
- Solidification
- Landfarming
- Annular injection
- Commercial disposal.

It is typically better to handle the waste products on site through some of the first four methods than to haul them away for commercial disposal. Commercial disposal sites pose major risks because of possible Superfund responsibilities. Some companies have addressed this problem by purchasing specific sites where only their wastes can be deposited. A commercial site, no matter how good it is now, could pose a serious problem in the future. This does not mean that commercial disposal sites should be avoided. However, commercial disposal sites must be used judiciously. The sites must be evaluated prior to delivering any material.

On site waste management is generally easier and should be used whenever possible. If possible, the mud and cuttings should be spread through landfarming (this is not considered a waste).

Often, waste disposal can best be done through annular injection. There are several ways to maximize the use of annular injection. For example, a cuttings washing unit can separate the barite from the cuttings.

The barite and fluid can then be handled through annular disposal, and the remaining cleaned cuttings can be landfarmed. Another option is a portable cuttings grinding unit which will reduce the size of cuttings for annular injection.

Solidification can make some material suitable as landf ill for the location. However, burial of whole mud and cuttings is not recommended because experience has shown that this leaves the material in a condition that prevents it from being readily assimilated by the environment.

In some states, such as Louisiana, burial is highly restricted or impractical. Waste management and minimization is becoming a major part of the drilling operation through financial and operational commitments. A poorly managed waste management/minimization program takes time and money away from the purpose of the drilling group—drilling wells. A well-planned waste program will hold down costs and can easily be incorporated in the drilling operation.

Reprinted from the Oil & Gas Journal, July 1,1991
Based on a paper presented at the Petro-Safe '91 Conference, Feb. 6-8, 1991, Houston

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3. Mesozoic-Paleozoic Producing Areas of Mississippi and Alabama. Volume I. Maps and producing data on 57 fields, with 2 composite logs, clothbound, 139 pp., 1957 .....10.00
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Volume XLI No. 9 April, 1993

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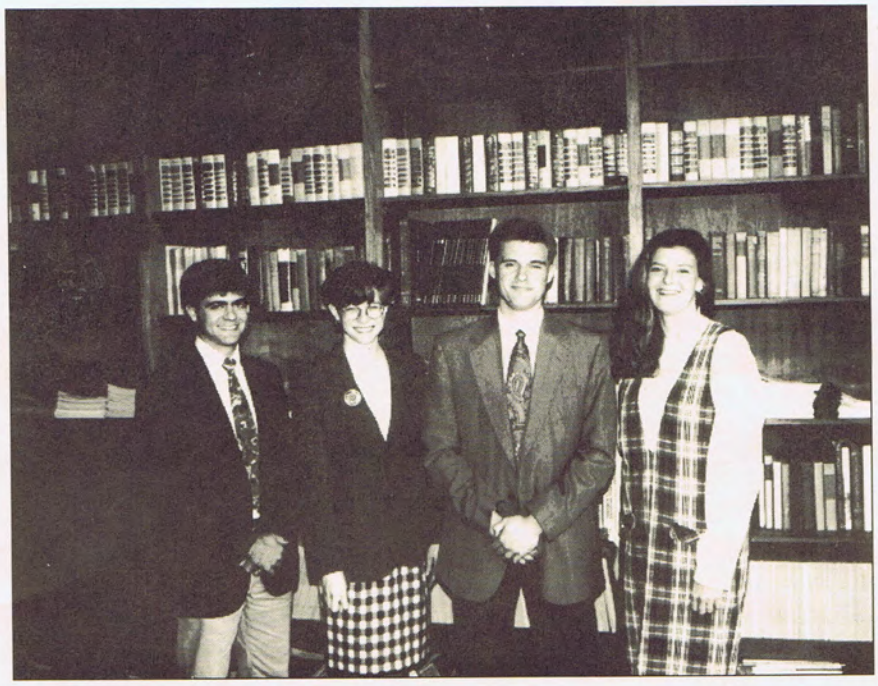

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PRESIDENT'S MESSAGE

Would somebody please tell me where the time is going? April is upon us and I really have just gotten used to writing March on checks and such. Oh well!

If April is upon us. then it must be nearing time for election of next year's officers for your Society. Else- where in this month's bulletin you will find a slate of officer nominees who have consented to serve our Society. You will notice, I'm sure, that only one candidate appears for each of the offices. That is because many of you, when contacted, did not consent to run, for whatever reason (and I know some are valid reasons). At any rate. we are left with a single nominee for each office unless additional nominees are added from the floor at the April luncheon meeting. The election will take place at the regular May meeting of the Society, to be held on May 11.

Along the lines of next year's officers, I have decided that I will not serve as president of the Society next year. Although technically able to do so by virtue of the bylaws and by the fact that the term as president I now serve is the unfulfilled term of Mike Noone (who resigned when he moved out of town last summer), I will not continue as president. It is after much thought and consideration that I have made this decision and my only concern has been for the future of the Society and the continuation of the efforts made toward that end. It is time to move over and let some "new blood" have their fun!

Our meeting for April will be on the 13th, and should prove to be quite interesting. On that date we will be informed by representatives of the Pearson & Olsen law firm from Houston on the ins and outs of 'Theft of Geological Ideas'. Grab your favorite con man to bring as your guest and watch him squirm. If you wish to get a set of speaker!s notes, etc.. you must get your reservation in to Stan Thieling at (601) 969-5519. You do not have to make reser- vations to come to the meeting, only if you want the notes.

Well he's done it!! Our intrepid field trip committee chairman, George Vockroth, has arranged for Dr. James L. Coleman from Amoco to come and participate in a briefing/ field trip on sequence stratigraphy. The briefing will be on June 4, from 9 AM to 4 PM. led by Dr. Coleman, while the field trip will be from 8 AM to 5 PM on the 5th of June. The field trip will be to "the Mountain' in Meridian and will be led by Dr. David Dockery and Steve Ingram of the Office of Geology. The announcement for this event is found later in this bulletin. Costs and further details will be provided next month.

Satis verborem.

Stanley King

BUSINESS MEETING LUNCHEON SCHEDULE

Spring Fling, May 20, 1993

May 11, 1993

ABOUT THE COVER: 1992 Boland Scholarship Recipients: (left to right) David Edwards, Mississippi State University; Jessica Kincaid, University of Mississippi; Clint Roberts, University of Southern Mississippi; Vicky Andrews, Millsaps College.

BUSINESS MEETING LUNCHEON

11:30 A.M. April 13, 1993
Capitol City Petroleum Club, Smackover Room

THEFT OF GEOLOGICAL CONCEPTS, INFORMATION AND IDEAS

James H. Peerson, Thomas D. Kennedy, Thomas A. Dickinson
Pearson & Olsen, P.C.

Representatives of the law firm of Pearson & Olsen, P.C., Houston, will speak on the 'THEFT OF GEOLOGICAL CONCEPTS". This talk has been presented to SIPES chapters and Geological Socoieties throughout the Gulf Coast area, as well as on Houston cable television. While based on Texas law, the authors have found tha the basic principles hold true in other states as well.

This talk is aimed at 'both sides of the table'. Geologicsts, landmen, engineers and owners; buyers and sellers, bring your sitautions for discussion. The success of past presentations has partly depended upon discussion of situations brought forth.

A set of "speaker's notes-references-case studies-outline" titled A PRIMER ON THEFT OF GEOLOGICAL CONCEPTS, INFORMATION AND IDEAS will be given, at no extra cost, to each in attendance. Because the speakers must have the number of attendees to bring handout material for, reservations will be taken for this meeting. Those not making reservations will be welcome to attend, but will not be assured of receiving the handouts. Reservations, for this April 13 meeting only, can be made with Stan Thieling from March 4-31 at (601) 961-5519.

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The election will be held at the May 11 meeting.

According to Society Bylaws, the 1st Vice President is automatically elevated to the Presidency each succeeding year. Therefore there is no election for President. Congratulations to Brian Sims!

Nominations will be taken from the floor during the regular meeting on May11. Absentee ballots will be available from the Secretary.

Candidate biographies will be in the May bulletin.

GOING GREEN

Environmental quality is now a core value for most Americans - and they expect corporations to share their commitment.

by Gene Pokorny

The climate of opinion in America is changing. Consumers are no longer simply satisfied if you manufacture a product that suits their needs. They want to know where you purchase your supplies, how you treat your employees and what efforts you take to protect the environment.

This shift has led to major changes in basic beliefs. If I had to distill our recent consumer opinion research down to "four facts" they would be as follows: Environmental protection has become increasingly "environmental self protection"; Americans are becoming "green consumers"; there is growing concern about value or "efficiency" issues; and Americans thoughts on energy are increasingly linked with the perceived benefits and risks they perceive for the environment.

These points give a flavor of some of our recent consumer research in this whole area. And they all lead to a simple overreaching conclusion. Based on almost 20 years of looking at thousands of consumer research projects, we firmly believe that fundamental changes have taken place and are taking place in American environmental values, beliefs and opinions. It is not hype, a passing fancy or a media event-though sometimes it has the aspects of all that, too-it is real.

New consumer environmental needs, wants and preferences exist today that were not present before in the American economic and political marketplace. And these new views exist in combination with changing attitudes on energy and economic issues.

Climate of Opinion

It seems to me the implications of this climate of opinion on environmental, energy and economic issues that businesses operate in today are two fold.

First and foremost, energy companies must accept that protecting the environment has become a core American value. Second, these companies must position themselves in the eyes of the American people and their leaders as companies that are increasingly more environmentally responsible.

Concerns about the environment are clearly on the rise and transcend the conventional demographic, regional and ideological divisions that normally characterize American society. Although it is hard to predict future events, environmental anxieties will probably only accelerate in the years ahead.

Consequently, the energy industry is being asked to meet new consumer environmental needs and preferences in both its operations and its products.

Nonetheless, traditional consumer needs and preferences will continue to be important. Consumers still want economic growth, a rising standard of living and plentiful and affordable energy. The energy industry must accept the fact that they do not want to choose between energy development or economic growth and the

environment and see no need to do so.

The Ends, Not Means

Going back to my four facts, our research shows that Americans are not just dramatically more concerned about a wide range of environmental issues than they were just a few years ago. Hence, **Fact 1:** Environmental protection has moved up the hierarchy from being a means to a greater end, to being an intrinsically valuable end in and of itself.

Environmental quality and preservation now are core values and associated in people's minds with other basic things we feel are intrinsically desirable and of worth, such as personal health, family security and the well-being of children.

The implication of change is now that environmentalism has become a core value, consumers will be far less likely than they have been in the past to trade it off for other core values-like family economic security-even in times of economic downturn and uncertainty

* 48 percent of Americans say environmental quality has decreased in the last five years; in 1987 it was about 30 percent. Thus, whether rightly or wrongly, Americans perceive things are getting worse, as far as environmental quality is concerned.

* 68 percent of Americans say no trade-off is necessary between the societal goals of environmental protection and economic growth. If we say a trade-off is necessary and force a choice, respondents say they'll sacrifice economic growth for the sake of the environment by almost a 4-to-1 margin. In 1989, before the economic recession began, this margin was only 2-to-1. Thus, in the last three years, even though many have experienced economic hardships, Americans have become more supportive of environmental protection, not less.

* For many, environmental protection has become more immediate, more personal than it used to be. What used to be called environmental protection has become in their eyes environmental self-protection. A turn-of phrase-, perhaps but it captures a very fundamental change occurring in how Americans think about the environment and evaluate actions meant to preserve and enhance environmental quality.

Consumer Aware

Fact 2: A significant and growing number of Americans claim to be "green consumers" in their buying behavior and "green voters" in their political activity. This "green" segment of the overall population is highly educated and has generally higher income. Thus, it speaks loudly in the economic marketplace and the political arena-in some sense, it sets a good deal of the agenda for both.

* Approximately 18-25 percent of adult Americans consider themselves "green consumers"; just a few years ago the size of this identical segment was 13 percent.

* 90 percent of those "Greens" (and 77 percent of all Americans) now say they are making changes in their daily consumer behavior because of their environmental concerns. Only 57 percent said this in 1989.

* 83 percent of Greens (and 71 percent of all Americans) say they'll pay more per

month for the goods and services they buy in order to have them be more environmentally safe. This number was 52 percent in 1989. How much more? In 1989, Americans said $9 a month. Today the comparable figure is approximately $42 per month.

* 73 percent of Greens (and 50 percent of all Americans) say they are trying to avoid doing business with companies they perceive to be hurting the environment. This was only 30 percent just three years ago.

An important overall point needs to be made in thinking about these numbers. The consistent, dramatic changes seen from 1989 to 1992 took place at the same time our economy was slipping into and experiencing a recession. Whereas economic difficulties may temporarily slow changes in environmental attitudes and behaviors, it clearly appears not to stop them

More Bang For the Buck

In an era of constrained personal income growth, as well as broader constrained economic growth, and in an era of rapidly escalating worries about our country's international economic competitiveness, Americans are increasingly concerned about value or "efficiency" issues. What do I mean? They want to make the same inputs go further, whether within their homes, their job locations or their broader society **Fact 3**: Waste is out! Efficiency, in the broadest sense, is in!

I realize this is a rather general kind of finding. But let me share some "straws in the wind" that illustrate my point. What do we as Americans think about our own and our economy's health and competitiveness in a post-Cold War world?

* By a 10-to-1 ratio (33 to 3 percent), Americans think our economic strength and growth is behind that of our major competitors (Japan and Germany). That ratio was 5-to-1 a decade ago. By the way, another 35 percent think the United States is currently ahead of Japan and Germany, but we're losing our lead.

* 63 percent believe the average foreign company is better managed then the average U.S. company (25 percent vice versa). The 63 percent was 49 percent in 1987.

* One-third of Americans disagree with the statement "Although there may be bad times every now and then, America will always continue to be prosperous and make economic progress." (It was one-half in 1974).

* Majorities believe in survey after survey that increasingly, in a post-Cold War world, economic health equals national security. And our lack of economic health is causing great distress for many.

What about our own individual household sense of well-being?

* 55 percent believe that during the last 15 years the average American's standard of living has declined or remained stable; whereas, 43 percent feel the average standard of living has improved.

* 44 percent think their children's standard of living will be worse or the same as theirs. This is the American dream violated. Although a plurality (49 percent) still think their children's future will be better, that number is declining. And the 44

percent was 34 percent a few years back

.* 75 percent of consumers believe the phrase "throwaway society" describes contemporary America. They believe this is a serious economic/social/environmental problem that must be changed for our future to be better. We must use our resources (broadly defined) better,if we want to succeed and compete better in the world.

Because of these general views certain behaviors and actions become "symbols." Reduce/reuse/recycle is becoming part of our contemporary culture. We're beginning to develop an "ecological systems" orientation, as opposed to a "disposal" orientation.

* 85-90 percent of Americans currently favor mandatory recycling in their communities.

* 84 percent say they're recycling something today in their households-cans, bottles or paper.

* 82 percent say they're trying to buy recycled consumer products to the extent they're available.

* Americans think "if we really try" we could recycle 57 percent of all the waste generated in this country. Just a few years ago when asked the identical question, the median estimate of how much we could recycle was 27 percent-an amazing change in such short space of time.

Hand In Hand

As the environment becomes more important to Americans, things that affect it come under closer scrutiny **Fact 4:** How Americans think about and evaluate energy and economic issues, and even their energy use, is increasingly linked with the environmental benefits and risks they perceive to be associated with different energy sources, energy development priorities and energy use patterns.

To risk over simplification, in today's climate of opinion when you talk with Americans about energy and economic issues, you are also talking to them about environmental issues. The two go hand in hand.

Here's some evidence we've seen in recent research that leads us to this conclusion:

* Fossil fuels in general are now seen by many Americans to be dangerous to use by society because of their perceived negative environmental side effects. These perceptions are particularly strong for oil and coal and significantly less so for natural gas, which is seen generally to be the "best" of the fossil fuels' bad lot.

The perceived negative environmental side effects of fossil fuels are twofold. Many Americans believe the use of fossil fuels causes environmental damage (oil spills, acid rain, global climate effects, etc.). Also, many Americans believe their use depletes a finite resource, and this fact in itself is an environmental negative. They are non-renewable-sustainable over the long term. Thus, the bottom line for fossil fuels in the minds of many Americans comes down to a two-count indictment, "I'm

hurting my kids by using them," and "By using them now I'm also denying future possibilities to my children's children."

* Looking specifically at oil, we're finding marked changes in public attitudes from those we saw in earlier research done during the oil crises of the 1970s and the early 1980s. To put it simply, in the earlier oil crises, Americans were negative about oil companies, but liked oil. Here in the 1990s the problem is not just oil companies, but now the product itself-oil. Oil is increasingly becoming for many Americans a kind of four-letter word-they know they can't currently live without it; they know they're dependent upon it. Yet they worry about the environmental consequences of its use and resent their very dependence upon it.

Now I'm not saying consumers will quit using oil or energy generally (most can't, even if they wanted to). But I am saying there is a fascinating, bubbling stew in our country right now of beliefs, values, needs, anxieties and guilt about our oil and energy use.

Here's a single piece of survey data to consider in this area. It;s a question we've been asking in our national consumer surveys for a number of years now:

"When developing new energy sources, should the nation's primary consideration be protecting the environment, or should it be making sure we have sufficient energy supply?

	Environment	Energy	Both
1985	35%	21%	38%
1992	68%	15%	13%

Now while there is some understanding that trade-offs may be needed-that higher environmental performance has some price™Americans are not really interested in dealing with these trade-off issues in all their complexity just yet. At this point, Americans are simply demanding that better environmental performance be placed higher on this industry's agenda. The methods and costs of meeting their new environmental desires are questions they know they will have to return to. But right now, Americans want the energy industry to first acknowledge and identify with the problem™in their minds that's the essential first step. The solutions will inevitably come later.

Responsible Energy Provider

This comes back to a point I mentioned earlier-that companies must position themselves as more environmentally responsible.

This task can be accomplished by developing an integrated "environmentally responsible energy provider" strategy. Such a strategy should serve as the essential foundation for energy industry programs and activities that should be developed to enhance the industry's performance, credibility and image.

This strategy also must be based on programs and activities that better demonstrate the reality of the industry's commitment to developing new energy

products and operating in new ways that meet' new consumer environmental demands in the marketplace. Communications should magnify and amplify this environmentally responsible energy provider story as it develops and unfolds at the operational level in your companies.

And most important, the industry must convince Americans that it truly is committed to environmental values as core values of the American societY

Substance Over Style

What do I mean by this latter point? One of the persistent themes that emerges in studying consumer opinion in the environmental area is that Americans do not believe business is really and truly committed to the values of environmental protection, quality and preservation. As a result, there is wide spread skepticism about business motives and an unwillingness to give business full credit for what it does to help the environment. This skepticism is pervasive.

If this persists, it will continually work to undercut good works in the environmental area. Therefore, companies must find'ways to "give witness" to their basic commitment to core environmental values. Specific product and operational performance improvements will obviously help, but something more is needed-in the realm of style and symbolism-in the realm of those things that communicate our values in ways that go beyond our specific behaviors.

Emphasizing the need to be attentive to these kinds of perceptions does not in

Reprogramming for Green America

There are three essential building blocks to creating a credible environmentally responsible energy provider strategy for industry All three components must be present if the American people and their leaders are going to believe it and as a result accept and trust it.

The energy industry identifies with environmental quality and preservation as a core American value.

Fossil fuels are increasingly given more environmentally positive product attributes or characteristics-that is, environmental benefits become defining fossil fuel characteristics of uses such as "green gas" or clean burning coal technologies.

Superior environmental performance is a developing and defining attribute of the energy industry itself.

THE BOTTOM LINE: Industry must aggressively tale actions that prove to consumers and leaders that the phrase "more environmentally responsible energy" is an appropriate attribute for them.

– G.P.

Continued on Page 12

argue for style over substance. The reality of the energy industry's environmental performance is absolutely essential to building its credibility and image as being environmentally responsible.

But something else must be done in addition. And that something else is unfortunately quite intangible. It's communicating in the broadest sense of that word that you as people and as companies really care about the environment. That you're doing whatever you're doing in this area not because you have to or because it's good business, but because you want to; because it's right. And never forget in this realm of communicating your values that the "little things" you do are often as important as the "big things."

Recent research shows, for example, recycling waste materials inside your companies and helping your community recycle it's wastes score virtually as high with the public as developing new more environmentally clean fuels.

My advice is to aggressively communicate your environmentally responsible energy provider strategy truthfully and honestly as a work-in-progress. Americans will understand and accept this because it matches the environmental and energy efforts they themselves are making right now. Their own judgements and attitudes are in flux as they try to bring their actions and purchase decisions in line with their energy and environmental values. Many are feeling guilty that they are not doing more.

What Americans do expect is the energy industry to make the same commitment they have made to a safer environment, a better energy future and a healthy, more efficient economy. Americans will even tolerate mistakes if they believe that core commitment has been made. The challenge then is to engage the public in a partnership, where people feel they are working with you to do a better job today and in the future than has been done in the past

Gene Pokorny is chairman of Cambridge Reports/Research International, Cambridge, Mass., a leading energy research organization. During the last seven years, they have expanded their efforts and have conducted more than 500 surveys on environmental issues ranging from the U.S. Department of Energy to Pepsico. They possess the country's largest archive of data on opinions toward environment-related issues.

reprinted from COAL VOICE, Vol. 16:1, January/February 1993

DEBUNKING CATASTROPHE

The popular vision of global temperature increases has no scientific foundation, according to Dr. Patrick Michaels.

In his new book, *Sound and Fury The Science and Politics of Global Warming*, Michaels criticises "science by press release" and congressional testimony that has not been peer reviewed to scientific standards.

An associate professor of environmental studies at the University of Virginia and a state climatologist, he also says that current climate models are suspect, that warming experienced so far only occurs at night, that carbon dioxide is a nutrient for plants and that the climate change scare could spark the most costly social engineering experiment in history.

Copies of the book cost $21.95 (or $11.95 for the paperback) and are available by contacting the Cato Insti- tute, 224 2nd Street, S.E., Washington, D.C. 20003 or call 202 546-0200.

KENTUCKY BOARD of REGIS
for PROFESSIONAL GEOLOGI
228 Mining and Mineral Resourc
University of Kentucky
Lexington, KY 40506-0107

October 13, 1992

TO WHOM IT MAY CONCERN:

Kentucky's new law for registration of professional geologists became effective July 14, 1992. This law was enacted to regulate the public practice of geology in the state. The law requires the registration of all geologists offering their professional services to the public in Kentucky.

Requirements and provisions of this new law may be important to members of your association/society who now practice or may practice geology in Kentucky. Please inform your membership of this matter in your next newsletter, or by other means. The suggested announcement is enclosed.

KENTUCKY IMPLEMENTS GEOLOGY REGISTRATION LAW October 13, 1992

Pursuant to the provisions of KRS 322A.020, Governor Brereton Jones has appointed members to the Kentucky Board of Registration for Professional Geologists. These appointments were received in early August.

The Board is in the process of setting up the necessary State Government accounts, promulgating administrative regulations, and composing the application forms relatin to the "Grandfather" period. The "Grandfather" period as set forth in the statute i from January 10, 1993, through January 9, 1994.

Qualifications required of the "Grandfather" applicants are as follows:

(a) Baccalaureate degree in geology, geophysics, geochemistry, or geological/geotechnical engineering from an accredited college or university plus five (5) years of professional geologic work. The board may give one (1) year of credit each for a master's or doctoral degree in the above disciplines in counting years of experience. During the twelve (12) month period January 10, 1993, through January 9, 1994, the Board shall waive the examination requirement for applicants qualified by education and experience.

(b) THE BOARD MAY WAIVE THE EDUCATION REQUIREMENTS FOR PERSONS WHO DERIVE THEI LIVELIHOOD FROM THE PUBLIC PRACTICE OF GEOLOGY WHO DO NOT MEET THE EDUCATION REQUIREMENTS, BUT WHO CAN DEMONSTRATE TO THE SATISFACTION OF TH BOARD THEIR COMPETENCY AND WHO HAVE AT LEAST EIGHT (8) YEARS OF EXPERIENC IN PROFESSIONAL GEOLOGIC WORK.

In order to qualify for registration after January 9, 1994, an applicant shall meet all of the requirements in part (a), plus successfully complete an examination designed by the Board to demonstrate the applicant's knowledge and skill required to exercise the responsibilities of the public practice of geology.

Starting January 10, 1994, it shall be unlawful to engage in the public practice of geology or to offer to publicly practice geology in this Commonwealth without being duly registered as a professional geologist.

The nonrefundable application fee is $200. Renewal will not be required prior to January 10, 1995, regardless of registration date. Application forms for registration may be obtained only by writing the address below. Requests will not b taken by phone.

KENTUCKY BOARD OF REGISTRATION FOR PROFESSIONAL GEOLOGISTS
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on Saturday June 5, 1993
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M I S S I S S I P P I

Vol. 10 No. 1 MUSEUM OF January 1993

NATURAL SCIENCE

DEPARTMENT OF WILDLIFE, FISHERIES AND PARKS

New Fossil Exhibit Opens

Systematics, the science of classifying living things into groups, is explored in the Museum's newest exhibit. Large fossils are used to explain the process of grouping animals by structure and function.

A mastodon tooth and tusk, mammoth tooth, elephant tooth, two ancient bison skulls, a present day bison skull, and an extinct crocodile skull are displayed along with educational information.

Mastodons, mammoths, and elephants are similar in appearance and are all in the Order Proboscidea. However, mastodons are in the Family Mammutidae while elephants and mammoths are in the Family Elephantidae.

Mastodons are in a separate family based on the structure of their teeth. Visitors can compare the tooth crowns of mastodons, mammoths and elephants.

The shapes of the teeth indicate these animals not only chewed their food in different ways but also had different diets. The Elephantidae ground tough vegetation by moving their jaw forward and back, while the mastodon chewed tender twigs and leaves in a sideways motion.

The partial skull of a large Cretaceous crocodile was found in Upper Cretaceous sediments near Tupelo. The crocodile died more than 65 million years ago. Despite its great age, the skull is readily recognizable as a member of the Family Crocodylidae, which includes modern crocodiles.

The two skulls of **Bison antiqiuus** were found on sand bars of the Mississippi River. This species was an ancestor of modern **Bison bison** which appeared about five thousand years ago. The easiest way to tell bison species apart is by differences in their horn cores. A skull of a modern bison bull is displayed for comparison. Its slightly smaller horn cores point in a different direction than those of the ancestral species.

The large mastodon tusk on exhibit is part of an elderly mastodon that died close to where Vicksburg is now. Radio carbon age analysis determined the tusk to be about 16,500 years old.

The exhibit is a fine example of the collaborative work done between the Museum and the community carried out through the MMNS Foundation.

The mastodon tusk on display was donated by Howard Miller, Chairman of the Department of Wildlife, Fisheries and Parks Commission and a past Foundation Board Director. The African elephant tooth was donated by Board of Directors member John Sullivan, Jr., past president of the Museum Foundation. The present day bison skull was contributed by Bob Wilson, a Foundation life member, and the mastodon tooth came from Brien Craig, a new Foundation friend. ■

Systematics Exhibit

Museum Hours:
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(Closed Sun.)

DEVELOPMENT OF A NATIONAL REGISTRATION EXAMINATION FOR GEOLOGY: A VIEW FROM THE INSIDE

by Robert E. Tepel

In October 1992, a small group of geologists took a professional registration exam that was the first of its kind in two important ways. It was the first geology registration exam based on nationwide input from geologists and their boards of registration. It was also the first exam to be given in more than one state. It was a small but auspicious start. Thirty four applicants took the exam in Arizona and one applicant took it in Wyoming. Not a big group, but even that would have seemed impossible only a few years ago.

The exam was based on thousands of hours donated by dozens of geologists called Subject Matter Experts, or SMEs. (A Subject Matter Expert is a member of a profession who possesses the qualifications and expertise to contribute to the construction of a licensure examination and perform related work). Since early 1992, the SMEs had been working to create an item bank, critique each others' items (questions and problems), and validate the exam drawn from the item bank. (An item bank is the total number of items available to draw upon to create an examination). Last November the SMEs met again to take the exam themselves, final check items for validity, and set the minimum passing level.

THE KEY PLAYERS

Who were the key players and how does this effort benefit the profession and the public?

The effort started when ASBOG (the Association of State Boards of Geology) realized that problems with boards recognizing the validity of each others' examinations were hindering the implementation of reciprocity. Under the leadership of Charles Sherman (South Carolina) and Don Williams (Arkansas), ASBOG resolved to create a basic registration examination that would meet mutually acceptable criteria and therefore be acceptable to most or all of its member boards. With ASBOG's member boards "buying in" through their shared oversight of the exam creation process, the acceptability of the new exam was enhanced.

Ultimately, ASBOG hoped to make the exam available to any board that wished to use it. Exam administration, development, and maintenance costs would be repaid with the usage fees charged. The only problem was a lack of start up funding. The solution was conceived and proposed by Ron Dalrymple, Executive Director of the Arizona Board of Technical Registration. His board was in the process of revising its geology exam and already had a psychometrician under contract. (A psychometrician is a psychologist who specializes in the measurement and evaluation of mental processes. This

includes, for example, the construction and scoring of licensure and employment examinations).

Dalrymple proposed a team effort. The ASBOG team of Subject Matter Experts would essentially augment and become a part of the existing Arizona team of SMEs. This would not cost Arizona anything extra, and it would benefit by a greatly expanded (and nationally representative) item bank. In return, when ASBOG had the mechanisms in place to maintain the exam, assure its security,and market it to registration boards, the Arizona Board would send its item bank to ASBOG. (Representatives of other boards have also indicated a willingness to contribute their item banks to ASBOG under similar conditions.).

DESIGNING THE EXAM

ASBOG member boards and several professional associations provided the Subject Matter Experts. By and large, this was a labor of love on the part of the SMEs. Many of them personally absorbed the expenses involved in their participation, and all of them gave up valuable hours and days from their schedules to contribute their expertise to ASBOG. The SMEs toiled under the guidance of the Arizona Board's consulting psychometrician, Jack L. Warner, Ph.D. and his brother. Steven P. Warner, also a Ph.D. psychologist. Three two-day sessions were held in the first half of 1992. The SMEs met twice in Phoenix and once in Atlanta. A four hour conference call in September with eight geologists and the two psychometricians on-line finalized the exam content. Between meetings, the SMEs did a LOT of homework.

What did the SMEs do? We established an ASBOG Job Task Analysis, certainly the first nationally relevant Job Task Analysis ever created for geologists. The ASBOG Job Task Analysis lists 88 specific job tasks performed by professional geologists. When the SMEs weight these tasks by importance, the Job Task Analysis becomes the blueprint that guides the exam content. If a task is both important enough and related to the public health, safety, and welfare, it warrants questions on the exam. The importance assigned to the task governs the number of related questions on the exam. The test blueprint is created and approved by the SMEs.

The ASBOG exam consists of two parts. Part One (Fundamentals) consists of 100 multiple choice items, and Part Two (Principles and Practice) consists of 80 multiple choice items. The SMEs felt that both parts should be closed book. Applicants are allowed four hours to complete each part.

The great advantages of an exam that is entirely multiple choice are l) raw scores can be measured quickly and easily, and 2) many statistical tests can be applied that aid, for example, in determining the clarity and validity of each item, or if it has become stale or compromised (i.e., general knowledge among the applicants). A multiple choice test is particularly amenable to continuous improvement, given a certain amount of dedication on the part of the SMEs and the administrators of the test.

The great disadvantage of a multiple choice exam, in my opinion, is that items requiring the applicant to think and analyze in detail are typically difficult to construct. On the other hand, these items are very easy to construct for an exam that requires problems to be worked out (show ALL your work!) or essays to be written (explain in detail why...).The downside here is that grading such problems and essays is difficult to do fairly (and quickly) because there is an element of subjectivity, and there is a greater reliance on the judgment of the grader.

The SMEs also reviewed, and offered suggestions to improve, the Applicant's Handbook and the Proctor's Manual, which were written by the psychometricians. We selected a number of items from the item bank to sacrifice by using them as examples in the Applicant's Handbook.

We reviewed and critiqued and edited existing items from item banks contributed by three boards. We created many items of our own. Writing examination items is not an easy chore. Each item must meet several criteria to validate its relevance, and the wrong answers (called distracters by the psychometricians) are often as hard to write as the right answer. Regional differences in the usage of terms, as well as regional variation in practice conventions and standards, came to light in the SME workshops.

Writing the stem (first part of the item), the key (correct answer) and the distracters so that all parts were unambiguous both in themselves and with respect to the other parts, was often unexpectedly difficult. I didn't punch a time clock while I was writing items, but I have the feeling that it took an average of three hours per item to produce it in final form, given the need for extensive review and editing, research, coordination with other items, and responding to the critiques of my fellow SMEs. Our success can be measured by the tiny percentage of items thrown out (i.e., credit given to all examinees regardless of their answer) in our November meeting, after we took the exam ourselves.

SCORING THE TEST

The SMEs set the passing score using the "criterion-referenced" method. This is regarded by the psychometricians as fairer and more defensible than the more commonly used methods of either setting a fixed passing score (70%, for example), or using a "norm-referenced" score (grading on the curve).

To answer the question that no doubt just sprang into your mind, my informal poll of the SMEs indicated that we all passed the examination we created. Given the variety of rather mature and specialized expertise held by most individual members of the SME panel, this can be taken as some evidence of the essential fairness of the examination in its treatment of individual specialties.

BENEFITS TO THE PROFESSION AND THE PUBLIC

How does this benefit the profession and the boards? Geologists value

mobility. As registration becomes more prevalent, mobility will be thwarted unless each registration board can rely on the registration criteria set by other boards, including the geologist's "home" board. An examination that is acceptable to many boards means that those boards will find it much easier to accept the registration credentials of an out of state geologist if the geologist passed that examination.

If you take this examination, you benefit by knowing that you are taking an examination that is valid as determined by a national cross section of experienced geologists working under the guidance of a pair of psychometricians. It meets (and is scored under) accepted psychometric standards. Reciprocity (and temporary permission to practice) will be made easier for you, especially with boards that accept the ASBOG exam.

If economies of scale can be realized, the costs to each board of developing and maintaining its own examination will be reduced, and fees to the applicants can be made as reasonable as possible. The costs of developing a valid exam can be daunting to a new registration board. The availability of the ASBOG exam should reduce some of the cost based objections to the creation of new registration boards.

How does this benefit the public? With increased mobility on the part of registered geologists, the public will have more expertise available and a larger number of consultants from whom to choose. Competition will be enhanced. These are not small matters.

WHAT THE FUTURE HOLDS

Some hurdles remain, and it will no doubt take a decade or so for ASBOG's labors to come to full fruition. These efforts mark the beginning of maturity for the developing movement in professional registration for geologists. In addition to the Arizona and Wyoming boards, several other boards have indicated an interest in adopting or accepting the ASBOG examination. Chris Mathewson, Manager of AEG's Committee on Professional Registration, and I were AEG's representatives on the SME panel. We were pleased with the expertise, dedication, and energy brought to the panel by over 30 other geologists. We also learned that a registration examination is a living thing that needs nurture and maintenance every year. AEG members can expect to be called upon to participate in the next iteration of the ASBOG Job Task Analysis. If you get a questionnaire, the next generation of registered geologists will appreciate your considered input. Finally, this is a personal report. Much of the experience reported here is colored by my own opinions and may not represent the opinions or conclusions of the other participants.

reprinted from the AEG NEWS, VOL. 36, NO. 1, WINTER 1993

PUBLICATION LIST

1. Mississippi Geological Society Photo Directory, 1981 ..... $ 2.00
2. Wilcox Fields of Southwest Mississippi, Maps and production data on 171 fields, in ring binder, 350 pp., 1969 ..... 28.00
3. Mesozoic-Paleozoic Producing Areas of Mississippi and Alabama. Volume I. Maps and producing data on 57 fields, with 2 composite logs, clothbound, 139 pp., 1957 ..... 10.00
4. Volume II. Maps and producing data on 77 fields, includes Supplement 1, in ring binder, 143 pp., 1963 ..... 15.00
5. Supplements 2 through 7 for Volume II, Maps and producing data on 35 fields, 110 pp..... 15.00
6. Supplement 8 for Volume 11, Maps and producing data on 34 fields, 108 pp., 1980 ..... 25.00
7. Volume II, complete with Supplements 2-8, 361 pp., 146 fields 50.00
8. Volume III, 85 pp., 46 fields, 1987 ..... 50.00

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10. Cenozoic of Southeast Mississippi and Southwest Alabama, Fifteenth Field Trip, 52 pp., May 1960 ..... 6.00
11. Cenozoic of Horn Island and the Pascagoula Valley 10th Annual GCAGS Meeting, 24 pp., October, 1960 ..... 2.50
12. The Paleozoics of Northwest Arkansas Sixteenth FGield Trip, 48 pp., May, 1962..... 5.00
13. Tertiary Type Localities of East-Central Mississippi, 25th GCAGS Meeting, 133 pp., Octoberr 1975 ..... 5.00
14. Mississippi Rocks of the Balck Warrior Basin, Seventeenth Field Trip, 79 pp., April, 1978 ..... 8.00
15. Tertiary and Upper Cretaceous Depositional Environments, Central Mississippi and West Central Alabama 33rd Annual GCAGS Meeting, 40 pp., October 1983 ..... 7.50

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PRESIDENT'S MESSAGE

I am told that this will be my last letter to you on this page (please hold down your cheers to a mild roar!). Our erstwhile editor has informed me that we will not publish a Bulletin in June. It hardly seems possible that it is that time again and yet it seems to be a bit past due.

First. to business at hand—as you have been previously informed, we have formed the "E Square C Square" Committee — the Engineering and Environmental coordinating Committee. This committee will function as the vehicle for non-petroleum geologists to have a forum for speakers. seminars, etc. The chairman of this committee is Steve Jennings of the Land Water Bureau. DEQ. Steve's number is 961-5205. Call him and get involved in the affairs of this group.

At our regular May luncheon meeting to be held on May 11, we will be treated to a talk on non-conventional methods of exploration by Dr. Dietmar 'Deet" Schumacher of Pennzoil. I know many of us have definite views regarding the various facets of this topic. but I believe we will all find interesting this overview of some of the main types of non-conventional methods. especially as seen and experienced under many different conditions by a large company.

Also at our May meeting the elections for next year's officers will be held. If you will not be able to attend to vote in person. contact Larry Baria for an absentee ballot.

As you will note in this issue. our annual Spring Fling will be held on May 20th at the Reservoir Lodge. All members are welcome to bring their spouse and/or main squeeze, as there will be prizes for the ladies and good food and drink for all. The results of the election and the new officers for the coming year will be announced at this event.

One final announcement—the Sequence Stratigraphy Seminar and Field Trip— please see the announcement in this issue and make your plans accordingly After much wailing and gnashing of teeth George Vorckroth has come up with an excellent schedule. In order to properly plan for the seminar and trip, we must have your timely reservation.

And now, "enfin mais pas au moins" ("last but not least" for you non-Francophiles). I would like to thank the officers and committee chairmen who have made this year a great year in the life of MGS. Not because of who was in charge, but because of the effort put forth by each of these. Your fellow geologists. in the interests of the Society. It is an easier task to be President when everyone does the job set before them—thank you one and all. We have tried to address many issues before our Society declining numbers. registration. regulation and so on. These issues will not go away; they will be faced by your new President, Brian Sims, and his fellow officers. Give each of them your wholehearted support and participation.

Thank you for the honor and privilege to have again served as President of your Society.

Stanley King

BUSINESS MEETING LUNCHEON SCHEDULE

Spring Fling, May 20, 1993

May 11, 1993

BUSINESS MEETING LUNCHEON

11:30 A.M. April 13, 1993
Capitol City Petroleum Club, Smackover Room

SURFACE PROSPECTING FOR OIL AND GAS: ADVANCES OF THE EIGHTIES, APPLICATIONS FOR THE NINETIES

Dietmar (Deet) Schumacher
Pennzoil Exploration & Production Company
Houston, Texas

Surface indications of oil and gas have been noted for thousands of years and such visible seeps have led to the discovery of many important oil producing areas. Since the first development of surface geochemical methods more than sixty years ago, surface prospecting has gone through periods of widespread acceptance and application only to be followed by periods of skepticism and rejection. Even today, surface geochemistry- and surface prospecting in general- remains a highly controversial topic.

The underlying assumption of all near-surface geochemical prospecting techniques is that hydrocarbons are generated and/or trapped at depth and leak in varying but detectable quantities to the earth's surface. This has long been shown to be an established fact, and the close association of near-surface geochemical anomalies with faults and fractures is well known. It is further assumed, or at least implied, that the anomaly at the surface can be reliably related to a petroleum accumulation at depth. While this assumption is supported by some of the published data, there are also an unfortunately large number of examples where no such simple relationship exists.

The surface expression of hydrocarbon seepage can take many forms, including (1) anomalous hydrocarbon concentrations in sediment, soil, water, and even atmosphere; (2) microbiological anomalies and the formation of "paraffin dirt"; (3) fluorescence anomalies; (4) mineralogic changes such as formation of calcite, pyrite, elemental sulfur, and certain magnetic iron oxides and sulfides; (5) geothermal and hydrologic anomalies; (6) bleaching of redbeds; and (7) geobotanical anomalies. These different surface and near-surface expressions of hydrocarbon seepage have led to the development and marketing of an equally diverse number of surface prospecting techniques.

Some of these methods are geochemical, some are geophysical and others come under the category of remote sensing. Each method has its proponents; each claims success; and all compete for the explorationist's attention and money. Is it any wonder if the explorationist is confused, or at least skeptical?

Recent advances in petroleum geochemistry have helped establish the validity of many of these geochemical and non-seismic geophysical methods. These studies further

demonstrate that the most successful methods are those based on the direct detection of hydrocarbons and/or hydrocarbon-induced alteration anomalies. We now know that the composition of near-surface hydrocarbons often shows a striking similarity to the composition of the underlying production. This ability to predict the type of petroleum likely to be found in the subsurface (oil, gas. or gas-condensate) further enhances the value of surface geochemical data. In addition, a number of these methods when properly applied show considerable promise for the early delineation of the productive limits of a field or recent discovery.

The presence of magnetic anomalies over oil fields has been noted for several decades, but it is only in recent years that the phenomenon has been critically examined. Analyses from geologically and geographically diverse regions show that (1) authigenic magnetic minerals may occur in near-surface sediments above petroleum accumulations, (2) that this hydrocarbon-induced mineralization is detectable with low-level, high-resolution aeromagnetic data, and (3) that magnetic susceptibility analysis of well cuttings confirms the existence of the aeromagnetic anomalies.

Electrical geophysical methods have also gained acceptance in recent years due to advances in both hardware and software technology. The electrical tools most appropriate for oil and gas exploration include induced polarization (IP), spectral IP, magnetotellurics (MT), and controlled source audio magnetotellurics (CSAMT). Each of these methods is designed to detect electrochemically-altered sediments, that is, the conductive plume or alteration chimney which may extend from the petroleum accumulation to the surface. Magnetotelluric data is the result of measuring natural fluctuations in magnetic and electrical fields at the earth's surface. CSAMT is a more recent electrical geophysical application which uses an artificial signal source, unlike MT which uses naturally-occurring signals. CSAMT now appears to have sufficient resolution to image the subsurface alteration plume across a wide range of geologic conditions.

Although the discovery of a surface geochemical anomaly does not guarantee the discovery of commercially significant hydrocarbons, it does, however, establish the presence of hydrocarbons in the area of interest. Traps and structures in such areas should be considered significantly more prospective than those not associated with hydrocarbon anomalies. As the emphasis of the exploration industry shifts increasingly from frontier basins to mature basins, and from exploration to development, new opportunities will be created for the use of these cost-effective surface exploration methods. These applications will be not only to high-grade leads and prospects, but to help guide the development program as well.

Surface prospecting methods cannot replace conventional exploration methods, but they can be a powerful complement to them. Geochemical and other surface methods have found their greatest utility when used in conjunction with available geologic and geophysical information. The need for such an integrated approach cannot be overemphasized. Properly applied, the combination of surface and subsurface exploration methods has the potential to greatly reduce exploration and development costs, while improving success rates and shortening development time.

CANDIDATES FOR MISSISSIPPI GEOLOGICAL SOCIETY OFFICES
1993-1994

FIRST VICE PRESIDENT
Cornelius W. "Neil" Barnes
Education: LSU, B.S. Geology, 1978
Millsaps, MBA, 1989
Experience: Texaco, Inc. 1978-1982
Coastal Oil & Gas Corp. 1982-1991
Natural Resources Investment Co. 1991-present
MGS Offices held: Program Chairman 1984-1986
Cont. Education Chairman 1985-1986
Professional Memberships: AAPG, SPE, MGS, NOGS, HGS

SECOND VICE PRESIDENT
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Texas A&M, BS Geology 1970, MS Geology 1973
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Cleary Petroleum 1977-1978
Conwood Petroleum 1978-1981
Clayton Williams 1981-1985
Independent 1985-1989
Hughes Eastern/Prairie Producing 1989-1990
Independent 1990-1992
Bureau Land Management 1992-present
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Geologist-Arkansas

SECRETARY
Roger Bergeron
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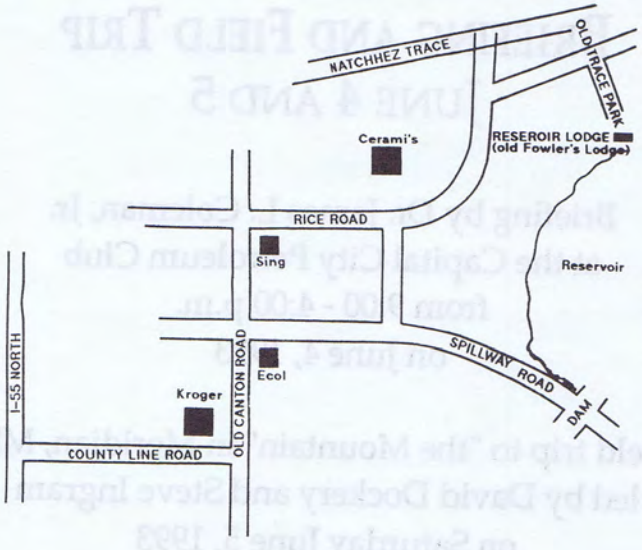
U. South Alabama, BS Geology
Experience: Baroid 1972-1973
Core Lab 1973-1977
Locatios Sample Service 1977-present
Professional Memberships: MGS, Soc. Core Analysts

TREASURER
A. John Warner
Education: USM, BS Geology
Experience: Anadrill, Downhole Data, Inc. and
The Mudlogging Company 1983-1990
Professional Memberships: MGS

SPRING FLING

Thursday, May 20
Reservoir Lodge

Festivities 4:30 p.m.
Dinner 6:00 p.m.



$10.00 per person
$5.00 per student

MISSISSIPPI GEOLOGICAL SOCIETY

By Popular Demand

Presents

SEQUENCE STRATIGRAPHY PRINCIPLES BRIEFING AND FIELD TRIP JUNE 4 AND 5

Briefing by Dr. James L. Coleman, Jr.
at the Capital City Petroleum Club
from 9:00 - 4:00 p.m.
on June 4, 1993

Field trip to "the Mountain" in Meridian, MS
led by David Dockery and Steve Ingram
on Saturday June 5, 1993
8:00 - 5:00 from the
Capital Towers Parking Garage

- Can attend either or both sessions
- Registration deadline: material must be in to MGS by 5-17-93
- Saturday's field trip lunch is not included in the cost. You will be on your own. The field trip will be at the Red Hot Truck Stop for lunch.
- Free parking at Capitol Towers garage.
- Either days registration includes notes and guidebook.

SEQUENCE STRATIGRAPHY PRINCIPLES BRIEFING AND FIELD TRIP REGISTRATION FORM

Name _____

Phone No. _____

Company Name _____

Address _____

_____

_____

$20.00	Briefing, includes notes and lunch
$15.00	Field Trip, includes refreshments and transportation, no lunch
$35.00	Total

Return to:
MGS, P.O. Box 422
Jackson, Mississippi 39205-0422

GCAGS ADVERTISERS NEEDED NOW !!!

The Gulf Coast Association of Geological Societies will hold its 43rd Annual Convention in Shreveport, Louisiana, October 20-22, 1993. We are currently seeking advertisers for the 1993 TRANSACTIONS - the annual publication of the association which contains the technical papers that are presented at the convention. Preliminary indications suggest that over 2,000 people will register for the convention and each registrant will receive a copy of the 1993 TRANSACTIONS. This technical publication is purchased by both industry and schools and is widely used as a reference.

Financing for the TRANSACTIONS is accomplished to a great degree through funds collected from advertisers. The GCAGS needs your support for this very important publication. An advertisement placed in the TRANSACTIONS will surely prove to be a worthwhile investment for the exposure alone. Prices for advertising space are as follows:

Size of Ad Space	Cost
Full Page (8 1/2 x 11)	$325
1/2 Page	$200
1/4 Page	$125
1/8 Page	$ 85

If you wish to place an advertisement in the 1993 GCAGS TRANSACTIONS, please send your ad copy, payment, and the enclosed form by June 1, 1993, to:

Advertising Chairman
1993 GCAGS Convention
400 Travis, Ste. 320
Shreveport LA 71101

Call us at (318) 226-8910 if you have any questions, or if you need minor assistance with drafting of advertisements. We will also provide proofs for your inspection. Payment with your order will be greatly appreciated and will be promptly acknowledged. Please make checks payable to GCAGS 1993 Convention. Again, the deadline for getting your ad copy to the advertising committee is June 1, 1993. Thank you for supporting the 1993 TRANSACTIONS and the 43rd Annual Convention of the GCAGS.

Type of Advertisement:

1. Plate enclosed ( ) or will be forwarded ( ).
2. Use same ad as in _____ (YEAR) TRANSACTIONS.
3. Sketch of ad shown on back or on separate sheet ( ).
4. Use same ad as in _____, Geological Society Bulletin.
5. Size of Ad: ( ) Full Page; ( ) 1/2 Page; ( ) 1/4 Page; ( ) 1/8 Page.

Payment:

1. Check in the amount of $_____ is enclosed made payable to "GCAGS - 1993 Convention".

ORDERED BY: _____

DATE: _____

COMPANY: _____

IT'S POP TEST TIME!!!

CHECK YOUR KNOWLEDGE OF MISSISSIPPI OIL PATCH HISTORICAL FACTS.

Match the name by which the field or feature is known today (Column A) with the name by which the field or feature was originally known or by which it was called before changed to its current name (Column B. Some may have more than one "old" name, some may have the same "old" and "new" name.

A-Today's name		B-Original name
1. Chaparral field	____ a.	Amy field
2. Raleigh field	____ b.	Hamburg field
3. Pickens field	____ c.	Pidgeon dome
4. Galloway Dome	____ d.	Pickwick field
5. Morton field	____ e.	West Kings field
6. Oldenburg field	____ f.	Hiwannee field
7. Magee field	____ g.	Whistler field
8. South Amory field	____ h.	Galloway dome
9. King's Dome	____ i.	Quincy field
10. Shubuta field	____ J.	Ellislie field
11. Armstrong field	____ k.	Sharpsburg field
12. Soso field	____ 1.	Maddox field
13. Yellow Creek field	____ m.	Independence Field
14. Dexter field	____ n.	Traxler field
	____ o.	Mingo Creek field

Answers elsewhere— as in next issue. Did you really think you could just look in the back for the answer??)

MISSISSIPPI GEOLOGICAL SOCIETY
SEQUENCE STRATIGRAPHY PRINCIPLES
BRIEFING AND FIELD TRIP
JUNE 4TH AND 5TH, 1993

MGS is holding a "down-and-dirty" orientation on the principles of sequence stratigraphy, June 4, 1993. A short field trip to Meridian, Mississippi is planned for the 5th. The orientation or briefing will be conducted by Jim Coleman, an exploration geologist with Amoco, at the Capital City Petroleum Club from 9 a.m to 4 p.m. (see ad and registration form - this bulletin). The field trip will be led by David Dockery and Steve Ingram of the Mississippi Office of Geology. meet at the Capital Towers Parking Garage (leaving at 8 a.m. - back around 5 p.m.). Several outcrops in the Tertiary Gulf Coastal Plain will be visited in and around the Meridian area. Stratigraphic sections will include the Meridian Sand and Tallahatta Formation (the TE2.1 coastal onlap cycle of Baum and Vail; 1991), the Winona-Tallahatta sequence boundary (TE2.2), and the Bashi and Hatchetigbee Formations (the Te1.1 sequence; and the Paleocene-Eocene Boundary). Several photos related to the field trip may be found on pages 12, 13, and 19.

Figure 1 – Mt. Barton (sand pit on west side), Meridian, Mississippi
The lower fluvial unit of the Meridian Sand represents the TE 2.1 Lowstand Systems Trace - incised valley fill. Interbedded channel sands and silt clast conglomerates depict a confined valley fill - to braided stream deposit

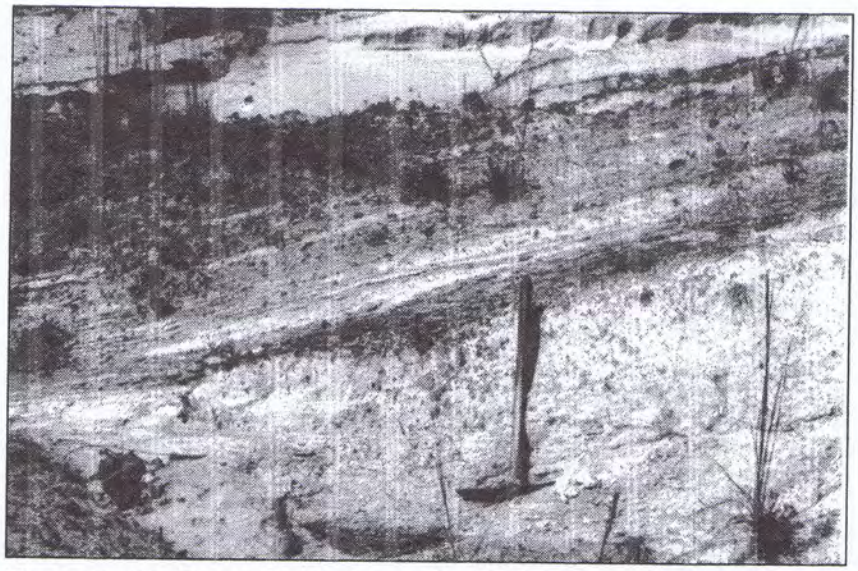


Figure 2 – Mt. Baron (Sand pit on west side)
Paleovalley wall floodplain facies of the Meridian Sand shows a 17 degree dip on penecontemporaneous slumped bedding juxtaposed to channel sands of figure 1. The sediments of the paleovalley wall and channel are overstepped by a white neritic bar sand indicating a vertical change in depositional environment from continental to marine. A eustatic sea level rise is inferred.

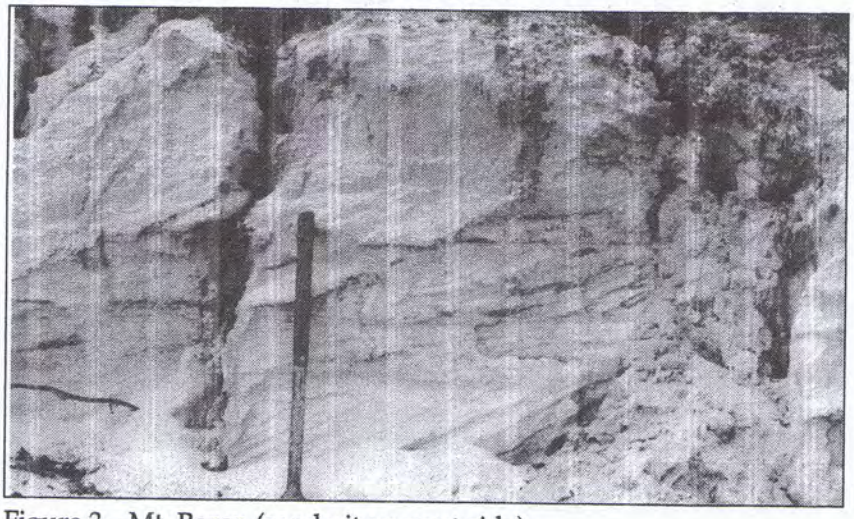


Figure 3 – Mt. Baron (sand pit on west side)
The Meridian Sand's middle unit, Reynolds' neritic bar facies (1992), is part of the lowstand systems tract, consisting of parallel, tubular crossbed sets.

KENTUCKY BOARD of REGIS
for PROFESSIONAL GEOLOGI
228 Mining and Mineral Resource
University of Kentucky
Lexington, KY 40506-0107

October 13, 1992

TO WHOM IT MAY CONCERN:

Kentucky's new law for registration of professional geologists became effective July 14, 1992. This law was enacted to regulate the public practice of geology in the state. The law requires the registration of all geologists offering their professional services to the public in Kentucky.

Requirements and provisions of this new law may be important to members of your association/society who now practice or may practice geology in Kentucky. Please inform your membership of this matter in your next newsletter, or by other means. The suggested announcement is enclosed.

KENTUCKY IMPLEMENTS GEOLOGY REGISTRATION LAW October 13, 1992

Pursuant to the provisions of KRS 322A.020, Governor Brereton Jones has appointed members to the Kentucky Board of Registration for Professional Geologists. These appointments were received in early August.

The Board is in the process of setting up the necessary State Government accounts, promulgating administrative regulations, and composing the application forms relatin to the "Grandfather" period. The "Grandfather" period as set forth in the statute i from January 10, 1993, through January 9, 1994.

Qualifications required of the "Grandfather" applicants are as follows:

(a) Baccalaureate degree in geology, geophysics, geochemistry, or geological/geotechnical engineering from an accredited college or university plus five (5) years of professional geologic work. The board may give one (1) year of credit each for a master's or doctoral degree in the above disciplines in counting years of experience. During the twelve (12) month period January 10, 1993, through January 9, 1994, the Board shall waive the examination requirement for applicants qualified by education and experience.

(b) THE BOARD MAY WAIVE THE EDUCATION REQUIREMENTS FOR PERSONS WHO DERIVE THEI LIVELIHOOD FROM THE PUBLIC PRACTICE OF GEOLOGY WHO DO NOT MEET THE EDUCATION REQUIREMENTS, BUT WHO CAN DEMONSTRATE TO THE SATISFACTION OF THE BOARD THEIR COMPETENCY AND WHO HAVE AT LEAST EIGHT (8) YEARS OF EXPERIENCE IN PROFESSIONAL GEOLOGIC WORK.

In order to qualify for registration after January 9, 1994, an applicant shall meet all of the requirements in part (a), plus successfully complete an examination designed by the Board to demonstrate the applicant's knowledge and skill required to exercise the responsibilities of the public practice of geology.

Starting January 10, 1994, it shall be unlawful to engage in the public practice of geology or to offer to publicly practice geology in this Commonwealth without being duly registered as a professional geologist.

The nonrefundable application fee is $200. Renewal will not be required prior to January 10, 1995, regardless of registration date. Application forms for registration may be obtained only by writing the address below. Requests will not b taken by phone.

KENTUCKY BOARD OF REGISTRATION FOR PROFESSIONAL GEOLOGISTS
228 MINING AND MINERAL RESOURCES BUILDING
UNIVERSITY OF KENTUCKY
LEXINGTON, KY 40506-0107

David C. Scott

David C. Scott, Chairman
KY Board of Registration
for Professional Geologists

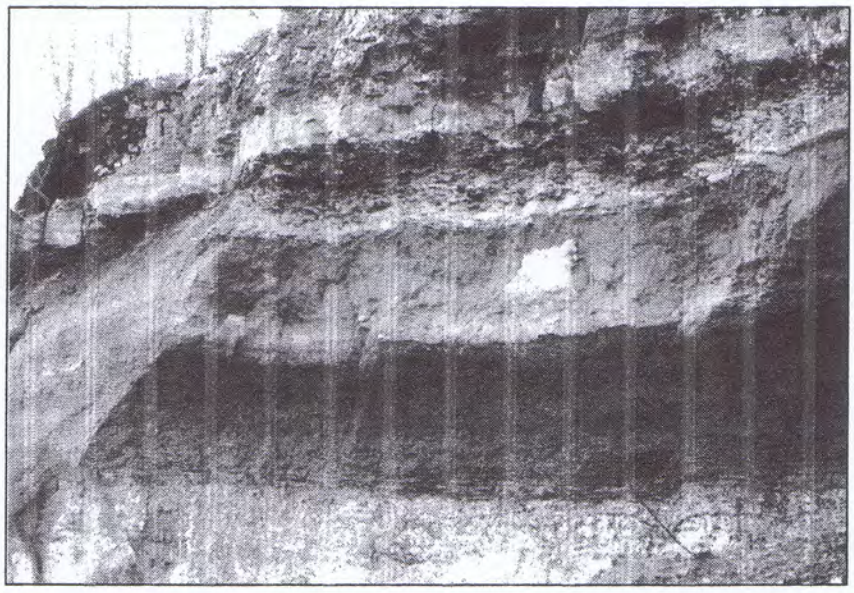


Figure 4 – Mt. Baron (crest of questa, north of sand pit)
Shallow shelf sediments of the tallahatta Formation caps the Meridian Sand at Mt. Barton. The contact between the Meridian Sand (lighter area at bottom) and the Tallahatta (darker area and above) represents the TE2.1 Transgressive Surface. The clay above the contact (dark zone) possibly represents a condensed section, and the mudstone ledges at the top represent the highstand deposits. Gibson and Bybell (1985) have reported multiple cycles within the Tallahatta, probably a reflection of 3rd-to-5th order cycles on the broad shallow upper Wilcox shelf.

REPEATED BUILD UP OF RENEWABLE ENERGY'S COMMERCIAL VIABILITY HAS INFLATED THE PUBLIC'S EXPECTATIONS FOR SOLAR AND WIND POWER BEYOND IMMEDIATE CAPABILITIES.

by Jason Makansi

The eighth grade science class project was entitled "Designing a Green Town." The New Jersey students were to create their own environmentally friendly city, tackling such real life problems as methods of garbage disposal, transportation systems and of course, methods of electricity generation. The result: Not one of the five groups of students even mentioned fossil fuels or nuclear power as playing a role in generating the town's power. Renewable energy was their answer-wind, solar and hydropower.

The choices made by these fledgling city planners are not surprising. Few would argue that the public's perception of renewable energy is overwhelmingly favorable, but the question is are the expectations for its power generation capabilities commensurate with technological reality.

There's no question that a number of renewable energy applications have made great technological strides toward commercial viability in the last decade. However, have they reached a stage where widespread use could be mandated, let alone contemplated? Continuously inflating the public's expectations for renewables, in particular solar and wind power, has built up powerful public and political support for these technologies and for the subsidizing of their commercial deployment at the expense of conventional sources of energy.

The term renewable energy tends to be used loosely. When the public hears the term renewables, they usually think solar and wind. Yet less than 1 percent of the electricity generated in the United States comes from wind, solar and other minor sources like geothermal.

The remaining portion of the renewable energy pie-9 percent of the total-comes from hydropower and biomass. This is not surprising since large scale hydroelectric and biomass-combustion technology have been established and proven for decades. Large scale wind and solar have not.

The largest hydroturbine/generators are at the Itaipu Station on the Parana River bordering Brazil and Paraguay. The world's largest generating station, Itaipu's 18 units, each rated at 700 megawatts (MW), can generate a total of 13,000 MW. The largest biomass-fueled units are around 50 MW.

California is home to virtually all of the solar and wind electric generation facilities of any practical size.

The average wind turbine operating commercially today generates less than 500 kilowatts (kW). The total amount of wind generated electricity is close to 1,000 MW-which amounts to one modern day nuclear generating

unit.

The largest unit ever operational was a nominal 5 MW Department of Energy research and development project started back in the early 1980s. It was not a commercial success.

Many of the first wind turbines installed in California simply failed because the designs were not thoroughly tested prior to scale up and/or field installation. Blade failures also were described as numerous for a variety of early machines and some of the later ones as well. A 1990 report by R. Lynette & Associates notes that many of the turbines deployed in California have under gone massive retrofits or will soon. In addition, annual energy production has often been less than 50 percent of original projections.

The total amount of solar electric generation operating today, around 300 MW, equals one modestly sized*coal fired unit. California is home to virtually all ft solar generating facilities of any practical size. Et of the facilities was developed by one company-the Israeli firm, Luz International Ltd., which by the way, recently went bankrupt. Each uses one type of technology-parabolic trough collector plates. Each was permitted to burn natural gas up to 25 percent of the time they operated to allow for, among other things, sunless days. All the power from these facilities is purchased by one company-Southern California Edison Co.

These are hardly the characteristics of a commercially available, large-scale option for power generation.

Thus, the idea that renewables can provide half of the nation's electricity by the year 2030 would require a massive research, development and commercialization effort on a scale not yet experienced in a peace time national or international program .

Reductions in the cost of electricity from solar and wind sources that have been achieved during the last decade are indeed impressive.

In the case of wind, the figures are generally quoted as dropping from 25 cents/kWh in the early 1980s to 7-9 cents/kWh today. However, according to the Electric Power Research Institute (EPRI) Journal, the low range is associated with the "best California locations, where winds are fairly predictable."

Unfortunately, enthusiasts quote the 7-9 cents/kWh as if it were an average or normal figure; more likely, it is the lowest cost of electricity that could be expected under the best of conditions.

The cost for solar power is even higher. EPRI estimates that solar thermal -the type used in the large facilities in California- costs 10 cents/kWh today but could drop to 8 cents/kWh by the year 2000.

Moreover, a cost-per-kilowatt figure does not account for capacity factor. Obviously, wind turbines do not generate electricity when the wind

isn't blowing and a solar electric facility turns down during cloud cover.

And because these wind Resources are not very predictable, the cost of using these resources actually may be substantially higher.

A bit of regulatory history is worth remembering to fully chronicle and understand the California experience. Both state and federal tax credits were available for the development of Renewable energy, and the,non-hydro elements of the industry wo;uld not have gotten off the ground without the Public Utilities Regulatory Policies Act of 1978 (PURPA). This legislation forced electric utilities to purchase electric power from developers of power projects and pay what was known as the "avoided cost."

When the price of fossil fuels was abnormally high, following the energy crises of the 1970s, a utility's avoided cost was high. Since the mid 1980s, the price of fossil fuels has plummeted and has remained low, barring short term fluctuations resulting from such events as the Persian Gulf War. Today a utility's avoided cost is typically lower, yet the California utilities are still buying high priced power from wind, solar and cogeneration facilities under the old contracts.

Thus, when all the relevant cost factors are included in the evaluation, the renewable sourced electricity is among the most expensive electricity available to California residents.

Renewable energy is often discussed in the same breath as externalities or so called "green" taxes on the environmental impact of conventional energy sources used for electricity production. Generally, it is recognized that non hydro renewables cannot be priced competitively against conventional fuel sources using traditional utility rate setting methodology. Accounting for environmental impact in the calculation, levels the playing field, so the theory goes.

However, there are many questions regarding the inclusion of externalities that have not been answered. Where you start and where you end when assigning externalities to various options requires a great deal more thought than what has been given by those looking for a "greener" playing field.

Environmentalists who championed wind and solar power in recent years have had to come to grips with the unpleasant thought that they have a downside, as well. The ability of wind turbines to injure and kill birds now is well known and the extent to which this damages the surroundings is being studied more thoroughly. As a result, the Sierra Club, for one, is now opposing wind farm development.

Residents who live near wind turbines have discovered that these machines can be extremely noisy, and some southern Californians have protested their installation. Others claim they are a form of visual pollution, citing California's Altamont Pass.

Thus the "not in my backyard," or NIMBY syndrome, faced by conventional power plants, affects the renewable energy industry as well.

Solar collectors may face similar NIMBY problems when attempts are made to provide enough land to install collection plates for large scale commercial use, especially in more populated areas.

Although mankind has been harnessing wind energy for centuries, both wind and solar are still relatively new, compared to established electric generating technologies and face numerous technical challenges, such as:

* Energy output suffers as wind turbine blades or solar collectors become laden with deposits, and the cleaning of such surfaces is both time consuming and delicate.

* The conversion of these into electricity is far from optimized. Wind turbines generally are, designed as constant speed machines. When wind speed drops, output suffers; if it is higher than design, damage can occur. Solar collectors require complicated tracking devices so that the collectors follow the incidence of sunlight and absorb the sun energy efficiently.

* The intermittent nature of these resources and the limitations on converting the energy to electricity impacts the electric utility grid, especially from the standpoint of voltage regulation, and harmonic distortion, for example. The transmission and distribution challenges are reinforced as larger quantities are put on the grid.

None of these technical or economic challenges are insurmountable by any means. In fact, they argue for an aggressive research and development program to ensure that renewables are technically viable, economical, responsibly scaled up and commercially deployable for electric generation duties.

In the meantime, however, to blindly build up public and political support for renewables and to subsidize their commercial deployment at the expense of conventional sources of energy, amounts to an energy policy which confuses perception and reality.

Just ask those eighth graders-all of them were shocked when they were told none of the electricity they use today comes from renewable sources.

Jason Makansi is executive editor of POWER, New York and editor of the newsletter, Common Sense and Our Environment, Morrisville, Pa.

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Mississippi Geological Society, Inc.

P.O. Box 422, Jackson, Mississippi 39205-0422

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APPLICATION FOR MEMBERSHIP

Please complete and return this card with your annual dues ($20.00) ($5.00 student) to the above address. I hereby make application for:

New ☐ Renewal ☐ membership in the Mississippi Geological Society.

No sponsors needed for a renewal membership.

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1. Mississippi Geological Society Photo Directory, 1981 ..... $ 2.00
2. Wilcox Fields of Southwest Mississippi, Maps and production data on 171 fields, in ring binder, 350 pp., 1969 ..... 28.00
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