



DATE PUBLISHED-January 1998

## AVAILABILITY OF PUBLICATIONS

The Department of Energy makes the results of all DOE-funded research and development efforts available to DOE and DOE contractors from the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831; prices available from (615) 576-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161; prices available from (703) 487-4650.

Give the full title of the report and the report number.

Sometimes there are slight delays between the time reports are shipped to NTIS and the time it takes for NTIS to process the reports and make them available. Accordingly, we will provide one copy of any individual report as long as our limited supply lasts. Please help us in our effort to eliminate wasteful spending on government publications by requesting only those publications needed. Order the report number listed at the beginning of each citation and enclose a self-addressed mailing label. Available from National Petroleum Technology Office, ATTN: Herbert A. Tiedemann, One West Third Street, Williams Center Tower One, 14th Floor, Tulsa, OK 74103; (918)699-2017.

### Environmental

**DOE/BC/W-31-109-Eng-38-1 Bibliography Of Reports, Papers, And Presentations On Naturally Occurring Radioactive Material (NORM) In Petroleum Industry Wastes.** NORM Report. Argonne National Laboratory. July 1997. 24 pp. Order No. DE96001296. This is a bibliography created to support projects conducted by Argonne National Laboratory (ANL) addressing issues related to naturally occurring radioactive material (NORM) in petroleum industry wastes. The bibliography provides citations for many of the available published reports, papers, articles, and presentations on petroleum industry NORM.

**DOE/BC/W-31-109-Eng-38-2 Costs For Off-Site Disposal Of Non-hazardous Oil Field Wastes: Salt Caverns Versus Other Disposal Methods.** Topical. Argonne National Laboratory. September 1997. 51 pp. Order No. DE97008692. Argonne National Laboratory conducted interviews with oil and gas officials in 31 oil and gas producing states to learn how oil field wastes are disposed of in their states and to identify commercial off-site disposal companies. Argonne then surveyed these disposal companies to learn what type of wastes they disposed of, what disposal methods they used, and how much they charged their customers.

### Extraction Research

**DOE/BC/14899-46 Water Influx And Its Effect On Oil Recovery.** SUPRI TR 103. August 1996 to June 1997. Stanford University. September 1997. 92 pp. Order No. DE97008688. Looking at discussions of water influx in reservoir

engineering texts, the subject is treated as though only the aquifer needs to be looked at. With this view, the various inner and outer boundary conditions and geometries are addressed, and solutions on the behavior of the aquifers are discussed. From these, various ways of solving these problems are presented, assuming one knows the inner boundary rate or pressure history.

**DOE/BC/14994-2 Techno-Economic And Risk Evaluation Of A Thermal Recovery Project.** SUPRI TR 102. August 1996 to June 1997. Stanford University. July 1997. 138 pp. Order No. DE96001294. The Wilmington Steamflood of Union Pacific Resources Co. (UPRC) at Long Beach, CA was initiated in 1989. Average initial reservoir oil saturation was 35%. Field production data were studied, to derive an overall energy balance for the steamflood, to calculate the steam flood capture efficiency and predict future steamflood performance. Heat-losses due to produced fluids were calculated. Predicted production schedules from the model were history-matched with field production data. The reservoir parameters were evaluated statistically using both Gaussian and triangular distributions. These resulted in distributed recovery predictions. This result is important, for it indicates that complete Monte-Carlo simulations may not be necessary.

### Field Demonstration

**DOE/BC/14934-7 Increasing Waterflood Reserves In The Wilmington Oil Field Through Improved Reservoir Characterization And Reservoir Management.** Annual. March 31, 1995 to March 30, 1996. Tidelands Oil Production Co and City of Long Beach. August 1997. 68 pp. Order No. DE96001299. This project uses advanced reservoir characterization tools, including the pulsed acoustic cased-hole logging tool, geologic three-dimensional (3-D) modeling software, and commercially available reservoir management software to identify sands with remaining high oil saturation following waterflood. Production from the identified high oil saturation sands will be stimulated by recompleting existing production and injection wells in these sands using conventional means as well as short radius and ultra-short radius laterals.

**DOE/BC/14936-9 Application Of Advanced Reservoir Characterization, Simulation And Production Optimization Strategies To Maximize Recovery In Slope And Basin Clastic Reservoirs, West Texas (Delaware Basin).** Annual. March 31, 1996 to March 30, 1997. University of Texas at Austin/BEG. November 1997. 187 pp. Order No. DE98000456. The objective of this Class III project is to demonstrate that detailed reservoir characterization of clastic reservoirs in basinal sandstones of the Delaware Mountain Group in the Delaware Basin of West Texas and New Mexico is a cost-effective way to recover more of the original oil in place by strategic infill-well placement and geologically based field development.

**DOE/BC/14938-7 Advanced Reservoir Characterization In The Antelope Shale To Establish The Viability Of CO2 Enhanced Oil Recovery In California's**

**Monterey Formation Siliceous Shales. Annual. February 12, 1996 to February 11, 1997. Chevron USA Production Company. December 1997. 48 pp. Order No. DE9800460.** This is the first annual report of the project. The Chevron Murvale 653Z-26B well was drilled in the Buena Vista Hills Field. The Monterey Formation equivalent Brown and Antelope Shales were continuously cored, the zone was logged with several different kinds of wireline logs, and the well was cased to a total depth of 4907 ft. Core recovery was 99.5%. Core analyses that have been performed include Dean Stark porosity, permeability and fluid saturations, field wettability, anelastic strain recovery, spectral core gamma, profile permeametry, and photographic imaging. Wireline log analysis includes mineral-based error minimization (ELAN), NMR T2 processing, and dipole shear wave anisotropy. A shear wave vertical seismic profile was acquired after casing was set and processing is nearly complete.

**DOE/BC/14939-8**

**Increasing Heavy Oil Reserves In  
The Wilmington Oil Field Through**

**Advanced Reservoir Characterization and Thermal Production Technologies. Annual. March 30, 1995 to March 31, 1996. City of Long Beach and Tidelands Oil Production Co. September 1997. 86 pp. Order No. DE97008690.** The objective of this project is to increase heavy oil reserves in a portion of the Wilmington Oil Field, near Long Beach, California, by implementing advanced reservoir characterization and thermal production technologies. Based on the knowledge and experience gained with this project, these technologies are intended to be extended to other sections of the Wilmington Oil Field, and, through technology transfer, will be available to increase heavy oil reserves in other slope and basin clastic (SBC) reservoirs.

**DOE/BC/14941-6**

**Advanced Oil Recovery Technolo-  
gied For Improved Recovery From**

**Slope Basin Clastic Reservoirs, Nash Draw Brushy Canyon Pool, Eddy County, New Mexico. Annual. September 25, 1995 to September 24, 1996. Strata Production Company. September 1997. 79 pp. Order No. DE97008428.** The objectives of this project are: (1) to demonstrate that a development drilling program and pressure maintenance program, based on advanced reservoir management methods, can significantly improve oil recovery compared with existing technology applications and (2) to transfer these advanced methodologies to oil and gas producers, especially in the Permian Basin.

**DOE/BC/14942-4**

**Advanced Reservoir Characteriza-  
tion And Evaluation Of CO2 Gravity**

**Drainage In The Naturally Fractured Spraberry Trend Area. Annual. September 1, 1995 to August 31, 1996. Parker & Parsley (NM Petroleum Recovery Research Center). December 1997. 133 pp. Order No. DE98000463.** The overall goal of this project is to assess the economic feasibility of CO2 flooding the naturally fractured Spraberry Trend Area in West Texas. This objective is being accomplished by conducting research in four areas: 1) extensive characterization of the reservoirs, 2) experimental studies of crude oil/brine/rock (COBR) interaction in the reservoirs, 3) analytical and numerical simulation of Spraberry reservoirs, and, 4) experimental investigations on CO2 gravity drainage in Spraberry whole cores. This report provides results of the first year of the five-year project for each of the four areas.

**DOE/BC/14953-19**

**Increased Oil Production and  
Reserves From Improved Comple-**

**tion Techniques In The Bluebell Field, Uinta Basin, Utah. Annual. 1995-96. Utah Geological Survey. July 1997. 86 pp. Order No. DE96001297.** A two year characterization study involved detailed examination of outcrop, core, well logs, surface and subsurface fractures, produced oil-field waters, engineering parameters of the two

demonstration wells, and analysis of past completion techniques and a field-demonstration program to test those techniques. The results of the characterization study and the proposed demonstration program are discussed in the second annual technical progress report.

**DOE/BC/14962-16**

**The Utilization Of The Microflora  
Indigenous To And Present In Oil-**

**Bearing Formations To Selectively Plug The More Porous Zones Thereby Increasing Oil Recovery During Waterflooding. Annual. January 1, 1996 to December 31, 1996. Hughes Eastern Corporation. September 1997. 50 pp. Order No. DE97008691.** This project is a field demonstration of the ability of in-situ indigenous microorganism in the North Blowhorn Creek Oil Field to reduce the flow of injection water in the more permeable zones thereby diverting flow to other areas of the reservoir and thus increase the efficiency of the waterflooding operation. This effect is to be accomplished by adding microbial nutrients to the injection water. Work on the project is divided into three phases, Planning and Analysis (9 months), Implementation (45 months), and Technology Transfer (12 months). This report covers the third year of work on the project.

**DOE/BC/14982-12**

**An Integrated Study Of The Gray-  
burg/San Andres Reservoir, Foster**

**And South Cowden Fields, Ector County Texas. Annual. August 1, 1996 to July 31, 1997. Laguna Petroleum Corporation. December 1997. 59 pp. Order No. DE98000462.** A project to recover economic amounts of oil from a very mature oil field is being conducted to study shallow carbonate rock reservoirs. The objectives of the project are to use modern engineering methods to optimize oil field management and to use geological and geophysical data to discover untapped potential within the petroleum reservoirs. The integration of data and techniques from these disciplines has yielded results greater than those achievable without their cooperation. The cost of successfully accomplishing these goals is to be low enough for even small independent operators to afford. This article is a report describing accomplishments for the fiscal year 1996-1997.

**DOE/BC/14983-9**

**Recovery Of Bypassed Oil In The  
Dundee Formation Using Horizontal**

**Drains. Annual. 95/96. Michigan Technological University. July 1997. 40 pp. Order No. DE96001240.** The principal objective of this project is to demonstrate the feasibility and economic success of producing oil from abandoned or nearly abandoned fields in the Dundee Formation of Central Michigan using horizontal drilling technology. The project is a cooperative venture between Michigan Technological University (MTU), Western Michigan University (WMU), and Terra Energy (now Cronus Development Co.).

**DOE/BC/14987-10**

**Improved Oil Recovery In Missis-  
sippian Carbonate Reservoirs of**

**Kansas - Near Term. Annual. September 18, 1994 to March 15, 1997. The University of Kansas Center for Research Inc. September 1997. 170 pp. Order No. DE97008689.** This annual report describes progress during the second year of the project entitled "Improved Oil Recovery In Mississippian Carbonate Reservoirs in Kansas". This project funded under the Department of Energy's Class 2 program targets improving the reservoir performance of mature oil fields located in shallow shelf carbonate reservoirs. The focus of this project is development and demonstration of cost-effective reservoir description and management technologies to extend the economic life of mature reservoirs.

**DOE/BC/14988-9**

**Increased Oil Production And  
Reserves Utilizing Secondary/Ter-**

**tiary Recovery Techniques On Small Reservoirs In The Paradox Basin,**

Utah. Annual. February 9, 1996 to February 8, 1997. Utah Geological Survey. August 1997. 56 pp. Order No. DE96001301. The Paradox basin of Utah, Colorado, and Arizona contains nearly 100 small oil fields producing from carbonate buildup or mounds within the Pennsylvanian (Desmoinesian) Paradox Formation. At least 200 million barrels of oil is at risk of being unrecovered in these small fields because of inefficient recovery practices and undrained heterogeneous reservoirs.

DOE/BC/14990-14

**Application Of Reservoir Characterization And Advanced Technology**

**To Improve Recovery And Economics In A Lower Quality Shallow Shelf Carbonate Reservoir. Final. August 3, 1994 to December 31, 1996. Oxy USA, Inc. October 1997. 149 pp. Order No. DE97000793.** The Oxy West Welch project is designed to demonstrate how the use of advanced technology can improve the economics of miscible CO<sub>2</sub> injection projects in a lower quality shallow shelf carbonate reservoir. The research and design phase primarily involves advanced reservoir characterization and accelerating the production response. The demonstration phase will implement the reservoir management plan based on an optimum miscible CO<sub>2</sub> flood as designed in the initial phase.

DOE/BC/14991-13

**Design And Implementation of a CO<sub>2</sub> Flood Utilizing Advanced Reservoir Characterization And Horizontal Injection Wells in a Shallow Shelf Carbonate Approaching Waterflood Depletion. Annual. July 1, 1996 to June 30, 1997. Phillips Petroleum Company. December 1997. 45 pp. Order No. DE98000461.**

The work reported herein covers select tasks in Budget Phase II. Completion of many of the Field Demonstration tasks during the last report period enabled an optimum carbon dioxide (CO<sub>2</sub>) flood project to be designed, economically evaluated, and implemented in the field. Field implementation of the project commenced during late 1995, with actual CO<sub>2</sub> injection commencing in mid-July, 1996. This report summarizes activities incurred following initial project start-up, towards the goal of optimizing project performance.

DOE/PC/91008-2

**Area Balance And Strain In An Extensional Fault System: Strategies**

**For Improved Oil Recovery In Fractured Chalk, Gilbertown Field, Southwestern Alabama. Annual Report. March 1996 to March 1997. Geological Survey of Alabama. August 1997. 67 pp. Order No. DE96001300.** Gilbertown Fields is the oldest oil field in Alabama and produces oil from chalk of the Upper Cretaceous Selma Group and from sandstone of the Eutaw Formation along the southern margin of the Gilbertown fault system. Most of the field has been in primary recovery since establishment, but production has declined to marginally economic levels. This investigation applies advanced geologic concepts designed to aid implementation of improved recovery programs.

*General Research*

DOE/BC/W-31-109-ENG-38-3 **Biocide Usage In Cooling Towers In The Electric Power And Petroleum**

**Refining Industries. Topical. Argonne National Laboratory. November 1997. 70 pp. Order No. DE98000455.** Cooling tower users frequently apply biocides to the circulating cooling water to control growth of microorganisms. Because of the toxic properties of biocides, there is a potential for the regulatory controls on their use and discharge to become increasingly more stringent. This report examines the types of biocides used in cooling towers by companies in the electric power and

petroleum refining industries, and the experiences those companies have had in dealing with agencies that regulate cooling tower blow-down discharges.

DOE/PC/91008-4

**Improved Methods For Water Shut-off. Annual. October 1, 1996 to September 30, 1997. New Mexico Petroleum Recovery Research Center. November 1997. 242 pp. Order No. DE98000453.**

In the United States, more than 20 billion barrels of water are produced each year during oil-field operations. There is a tremendous economic incentive to reduce water production if it can be accomplished without sacrificing hydrocarbon production. For each 1% reduction in water production, the cost-savings to the oil industry could be between \$50,000,000 and \$100,000,000 per year. Reduced water production would result directly in improved oil recovery (IOR) efficiency in addition to reduced oil-production costs. A substantial positive environmental impact could also be realized if significant reductions are achieved in the amount of water produced during oilfield operations.

*Heavy Oil Recovery Mechanisms*

DOE/BC/14994-1

**Doublets And Other Allied Well Patterns. SUPRI TR 109. Stanford**

**University. June 1997. 89 pp. Order No. DE96001293.** When a liquid is injected into an infinite reservoir containing liquid with the same flow properties, the equations of flow are well known. The pressures in this system vary over time and distance (radius) in ways that depend on the formation and liquid flow properties. Suppose there are two wells - an injector and a producer - with identical rates. The behavior of this system can be calculated using superposition; which means the results can be added independently of each other. The result is that after a period of time there is a region that approaches steady state flow. "Steady state" characteristic can be used to solve a number of problems. A number of such problems are solved herein for doublet systems. In addition, concepts are presented to help solve other cases that flow logically from the problems solved herein.

*Reservoir Characterization*

DOE/BC-96/3

**Contracts For Field Projects and Supporting Research On Enhanced**

**Oil Recovery. Progress Review No. 87. April, 1996 to June, 1996. National Petroleum Technology Office. October 1997. 79 pp. Order No. DE97008854.** Status reports are given for various enhanced oil recovery and gas recovery projects sponsored by the Department of Energy. The field tests and supporting research on enhanced oil recovery include chemical flooding, gas displacement, thermal/heavy oil, resource assessment, geoscience technology, microbial technology, field demonstrations in high priority reservoir classes, novel, technology, and environmental technology.

DOE/BC/96/4

**Contracts For Field Projects and Supporting Research On Enhanced**

**Oil Recovery. Progress Review No. 88. July, 1996 to September, 1996. National Petroleum Technology Office. December 1997. 97pp. Order No. DE98000454.** Status reports are given for various enhanced oil recovery and gas recovery projects sponsored by the Department of Energy. The field tests and supporting research on enhanced oil recovery

include chemical flooding, gas displacement, thermal/heavy oil, resource assessment, geoscience technology, microbial technology, field demonstrations in high priority reservoir classes, novel, technology, and environmental technology.

**DOE/BC/14896-15**                      **Geological And Petrophysical Characterization Of The Ferron Sandstone For 3-D Simulation Of A Fluvial-Deltaic Reservoir. Annual. October 1, 1995 to September 30, 1996. Utah Geological Survey. May 1997. 62 pp. Order No. DE96001278.** The objective of the Ferron Sandstone project is to develop a comprehensive, interdisciplinary, quantitative characterization of a fluvial-deltaic reservoir to allow realistic inter-well and reservoir-scale models to be developed for improved oil-field development in similar reservoirs world-wide. Quantitative geological and petrophysical information on the Cretaceous Ferron Sandstone in east-central Utah was collected. Both new and existing data is being integrated into a three-dimensional model of spatial variations in porosity, storativity, and tensorial rock permeability at a scale appropriate for inter-well to regional-scale reservoir simulation.

### *Supporting Research*

**DOE/BC-98/1/SP**                      **Supporting Technology For Enhanced Oil Recovery EOR Thermal Processes. Venezuela-MEM/USA-DOE Fossil Energy Report IV-10. 1983-1995. DOE of USA and The Ministry of Energy and Mines of the Republic of Venezuela. December 1997. Order No. DE98000459.** This report contains the results of efforts under the six tasks of the Ninth Amendment and Extension of Annex IV, Enhanced Oil Recovery Thermal Processes of the Venezuela/USA Agreement. The report is presented in sections (for each of the 6 tasks) and each section contains one or more reports prepared by various individuals or groups describing the results of efforts under each of the tasks.

**DOE/BC/14833-5**                      **National Geoscience Data Repository System Phase II. Final. 1994 to 1997. American Geological Institute. November 1997. 121 pp. Order No. DE98000458.** The American Geological Institute (AGI) has completed Phase II of a project to establish a National Geoscience Data Repository System (NGDRS). The project's primary objectives are to preserve geoscience data in jeopardy of being destroyed and to make that data available to those who have a need to use it in future investigations. These data are available for donation to the public as a result of the downsizing that has occurred in the major petroleum and mining companies in the United States for the past decade. The national repository project will make many of these data available to the geoscience community for the first time.

**DOE/BC/14881-22**                      **Improving Reservoir Conformance Using Gelled Polymer Systems. Final. September 25, 1992 to July 31, 1996. The University of**

**Kansas Center for Research. October 1997. Order No. DE97007192.** The objectives of the research program were to (1) identify and develop polymer systems which have potential to improve reservoir conformance of fluid displacement processes, (2) determine the performance of these systems in bulk and in porous media, and (3) develop methods to predict their performance in field applications.

**DOE/BC/14938-7**                      **Advanced Reservoir Characterization In The Antelope Shale To Establish The Viability of CO2 Enhanced Oil Recovery In California's Monterey Formation Siliceous Shales. Annual. February 12, 1996 to February 11, 1997. Chevron USA Production Company. December 1997. 59 pp. Order No. DE98000460.** This is the first annual report of the project. The Antelope Shale zone has a proposed pilot which consists of four existing producers of 20 acre spacing with a new 10 acre infill well drilled as the pilot CO2 injector. Most of the reservoir characterization of the first phase of the project will be performed using data collected in the pilot pattern wells.

**DOE/BC/14994-4**                      **Oil-Foam Interactions In A Micro-model. SUPRI TR 110. Stanford University. November 1997. 108 pp. Order No. DE98000457.** This report presents results of a pore-level visualization study of foam stability in the presence of oil. Many laboratory investigations have been carried out in the absence of oil, but comparatively few have been carried out in the presence of oil. For a field application, where the residual oil saturation may vary from as low as 0 to as high as 40% depending on the recovery method applied, any effect of the oil on foam stability becomes a crucial matter.

**DOE/PC/91008-1**                      **Improved Methods For Water Shutoff. Semi-Annual. May 1, 1996 to September 30, 1996. New Mexico Institute of Mining and Technology. August 1997. 119 pp. Order No. DE96001298.** There is a tremendous economic incentive to reduce water production if that can be accomplished without significantly sacrificing hydrocarbon production. A substantial positive environmental impact could also be realized if significant reductions are achieved in the amount of water produced during oilfield operations.

**DOE/PC/91008-3**                      **In Situ Permeability Modification Using Gelled Polymer Systems. Topical. June 10, 1996 to April 10, 1997. The University of Kansas. October 1997. 102 pp. Order No. DE 97008693.** The research program is directed at improving the understanding of gelled polymer systems and how these systems can be used to increase oil recovery from petroleum reservoirs. The research is focused on five areas: (1) Gel treatment in fractured systems; (2) Gel treatment in carbonate rocks; (3) In-depth placement of gels; (4) Gel systems for application in carbon dioxide flooding; and (5) Gel treatment in production wells. A physical model was developed to study gel treatments that are applied to fractures. The model was designed to examine the effect of leak off on the placement and effectiveness of gelled polymer treatments.

## DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

# U. S. DEPARTMENT OF ENERGY

## COMPUTER SOFTWARE AND SUPPORTING DOCUMENTATION

### Personal Computer Programs

All software applications are available on 5.25" HD 1.2 MB or 3.5" HD 1.4 MB disks

1. DOE/BC-88/1/SP. *EOR Predictive Models*: Handbook for Personal Computer Versions of Enhanced Oil Recovery Predictive Models. BPO Staff. February 1988. 76 pp. NTIS Order No. DE89001204. FORTRAN source code and executable programs for five EOR Predictive Models shown below are available. The five recovery processes modeled are Steamflood, In-Situ Combustion, Polymer, Chemical, and CO<sub>2</sub> Miscible Flooding. The models are available individually. Min Req.: IBM PC/XT, PS-2, or compatible computer with 640 Kbytes of memory.
  - a- DOE/BC-86/6/SP. *Steamflood Predictive Model*, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 594 pp. NTIS Order No. DE87001219.
  - b- DOE/BC-86/7/SP. *In-Situ Combustion Predictive Model*, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 263 pp. NTIS Order No. DE86000264.
  - c- DOE/BC-86/10/SP. *Polymer Predictive Model*, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 394 pp. NTIS Order No. DE87001207.
  - d- DOE/BC-86/11/SP. *Chemical Flood Predictive Model*, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 360 pp. NTIS Order No. DE87001208.
  - e- DOE/BC-86/12/SP. *CO<sub>2</sub> Miscible Flood Predictive Model*, Supporting Technology for Enhanced Oil Recovery. Dec 1986, 469 pp. NTIS Order No. DE87001209.
2. DOE/BC-95/2/SP. *Infill Drilling Predictive Model*: User's Guide and Documentation Manual - Release 1.2.0, 1995 for the PC. FORTRAN source code and executable program. Min Req.: 80386/80387, DOS v3.1, and 2 Mbytes extended memory.
3. DOE/BC-86/10/SP. *Polymer/Waterflood Predictive Model: Windows Version 1.1* June 1995. This is an update to the Polymer Flood Predictive Model (PFPM) released in 1986. An addendum is available describing the updated economic cost and tax functions included in this release. This serves as a supplement to the original PFPM user's manual. This version runs out of the Microsoft Windows environment and supports post-processing graphics. Min Req.: 80386, 4 Mbytes extended memory, and Windows v3.1.
4. *CO<sub>2</sub> Prophet*: Water and CO<sub>2</sub> Flood Prediction Software. CO<sub>2</sub> Prophet, conceived by Texaco Exploration and Production Technology Department (EPTD), was partially developed as part of the DOE Class I cost share program "*Post Waterflood, CO<sub>2</sub> Flood in a Light Oil, Fluvial Dominated Deltaic Reservoir*" under DOE Contract No. DE-FC22-93BC14960. Min Req.: 80386/80387 and 4 Mbytes extended memory and will run under the Microsoft Windows environment. The DOE does not provide technical support for this application.
5. DOE/BC-89/3/SP. Handbook for Personal Computer Version of *BOAST II*: A Three-Dimensional, Three-Phase Black Oil Applied Simulation Tool. Bartlesville Project Office. January 1989. 82 pp. NTIS Order No. DE89000725. FORTRAN source code and executable program. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory.
6. *BOAST-VHS*: FORTRAN source code and executable program. User's Guide and Documentation Manual, NIPER-542, National Institute for Petroleum and Energy Research (NIPER). January 1992. 92 pp. NTIS Order No. DE92001021. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory. Math coprocessor optional.
7. *BOAST-3*: FORTRAN Source code and executable program. User's Guide and Documentation Manual. Bartlesville Project Office, September 21, 1996 (version 1.6). BOAST-3 is a modified version of BOAST-II containing postprocessors COLORGRID and B3PLOT2. The executable was compiled with the 32-bit Microsoft PowerStation FORTRAN and is 100% compatible with Windows. Min Req.: 386/486 PC environment.

8. DOE/BC-91/2/SP. **MASTER**: Miscible Applied Simulation Techniques for Energy Recovery - Version 2.0. User's Guide and Technical Manual. Morgantown Energy Technology Center (METC). February 1991. 192 pp. NTIS Order No. DE91002222. FORTRAN source code and executable program. Min. Req.: See Users Guide.
9. NIPER-705. **PC-GEL**: A Three-Dimensional, Three-Phase, Permeability Modification Simulator. IIT Research Institute, National Institute for Petroleum and Energy Research (NIPER). October 1993. 190 pp. NTIS Order No. DE94000104. FORTRAN source code and executable program. Min. Req.: IBM PC/AT, PS-2, or compatible computer with 640 Kbytes of memory. Math coprocessor optional
10. DOE/BC/20006-18. **TRACRL-Single-Well Chemical Tracer Test Simulator**. A deliverable as part of "The Single-Well Chemical Tracer Method for Measuring Residual Oil Saturation-Final Report." Bartlesville Energy Technical Center (BETC), predecessor to National Institute for Petroleum and Energy Research (NIPER). October 1980. 190 pp. FORTRAN source code and sample input datasets for both PC and Apple environments. Executable program for the PC.
11. **UTCHEM**: A Three-Dimensional Chemical Flood Simulator, version 5.1, May 1992. Developed under the Enhanced Oil and Gas Recovery Research Program at the Center for Petroleum and Geosystems Engineering, The University of Texas at Austin. Software is not distributed or supported by the DOE. Contact Dr. Gary Pope at (512) 471-7234 for details.
12. **NPC Public Database**: (NPCPUBDB.GEO) Database developed for the National Petroleum Council (NPC) for its 1984 assessment of the nation's enhanced oil recovery (EOR) potential. The technical data description is at the reservoir level. Included with the database are the Appendices from the "TORIS Data Preparation Guidelines" (NIPER/BDM-0042) defining the data elements in the database. Available in ASCII or Spreadsheet format.
13. **CLEVER**: Class Evaluation Executive Report, v2.0, December 1995. Database application describing information from the DOE's Geologic/Reservoir Class Program. Developed at National Institute for Petroleum and Energy Research (NIPER) by BDM-Oklahoma, Inc. This includes administrative and general technical data. Covers Classes 1 - 3. Distributed as an executable PC program, FoxPro application not required. Min Reqs.: Windows v3.1 and an 80386 processor.
14. **Crude Oil Analysis Database**: COADB, v2.0, 1995. Database contains information on 9,056 crude oil analyses performed at the National Institute for Petroleum and Energy Research (NIPER). The database is publicly available via a Bulletin Board System (BBS) by dialing (918) 337-4440. A user's guide is available from the BBS in Microsoft Word v6.0. A printed user's guide is available by request, NIPER/BDM-0151. The database is also available on disk. Min Reqs.: DOS v5.0, 80386 processor, 4 MB RAM, and 20 MB hard disk memory.
15. **Risk Analysis and Decision Making Software**: Software package includes tools for Monte Carlo simulation, best fit for distributed functions, sample or rank correlation, investment risk analysis, and EOR method screening. Developed at National Institute for Petroleum and Energy Research (NIPER) by BDM-Oklahoma, Inc. A printed user's guide is available by request, NIPER/BDM-0227. Min Req. Windows v3.11, 8 MB hard disk space, 8 MB RAM, VGA color monitor, and an 80486 processor.
16. **FRAC-EXPLORE**: FRAC:-EXPLORE analyzes the characteristics and patterns of subsurface lineaments, fractures, and other geological features for the purpose of identifying the locations of potential subsurface oil and gas reservoirs. Developed at National Institute for Petroleum and Energy Research (NIPER) by BDM-Oklahoma, Inc. A printed user's guide is available by request, NIPER/BDM-0261. Min Req. Windows v3.1, 6 MB hard disk space, 4 MB RAM, VGA color monitor configured to at least 800x600 resolution, and an 80386 processor.

## Reel Tape Computer Programs

1. **Enhanced Oil Recovery Predictive Models**: FORTRAN source code, sample input datasets and output. The five recovery processes modeled are Steamflood, In-Situ Combustion, Polymer, Chemical Flooding, and CO<sub>2</sub> Miscible Flooding.; 1600 bpi, 9 inch, 9 track tape, ASCII, 80 bytes per record, 800 bytes per block. *Tape available on 14 day loan basis only.*
  - a- DOE/BC-86/6/SP. **Steamflood Predictive Model.**, Supporting Technology for Enhanced Oil Recovery. December 1986. 594 pp. NTIS Order No. DE87001219.
  - b- DOE/BC-86/7/SP. **In-Situ Combustion Predictive Model.**, Supporting Technology for Enhanced Oil Recovery. December 1986. 263 pp. NTIS Order No. DE86000264.
  - c- DOE/BC-86/10/SP. **Polymer Predictive Model.**, Supporting Technology for Enhanced Oil Recovery. December 1986. 394 pp. NTIS Order No. DE87001207.
  - d- DOE/BC-86/11/SP. **Chemical Flood Predictive Model.**, Supporting Technology for Enhanced Oil Recovery.
  - e- DOE/BC-86/12/SP. **CO<sub>2</sub> Miscible Flood Predictive Model.**, Supporting Technology for Enhanced Oil Recovery. December 1986. 469 pp. NTIS Order No. DE87001209.
2. DOE/BC/10033-3. **BOAST**: A Three-Dimensional, Three-Phase Black Oil Applied Simulation Tool, version 1.1, K&A Inc., & The BDM Corp. NTIS Order No. DE83003031, (Vols. 1 & 2). Prepared for U.S. DOE at Bartlesville Energy Technical Center (BETC), predecessor to National Institute for Petroleum and Energy Research (NIPER). September 1982. FORTRAN source code; 1600 bpi, 6 inch, 9 track tape, ASCII, 80 bytes per record, 800 bytes per block. *Tape available on 14 day loan basis only.*
3. DOE/BC-88/2/SP. **BOAST II**: A Three-Dimensional, Three-Phase Black Oil Applied Simulation Tool. K & A Technology, prepared for U.S. DOE at National Institute for Petroleum and Energy Research (NIPER), December 1987. 420 pp. NTIS Order No. DE88001205. FORTRAN source code; 1600 bpi, 6 inch, 9 track tape, ASCII, 80 bytes per record, 800 bytes per block. *Tape available on 14 day loan basis only.*
4. NIPER-326. **BOAST-VHS**: Modified BOAST program. Simulation of Production from Wells with Horizontal/Slanted Laterals. Final Report. National Institute for Petroleum and Energy Research (NIPER). March 1989. 41 pp. NTIS Order No. DE89000711. FORTRAN source code; 1600 bpi, 9 inch, 9 track tape, ASCII, 80 bytes per record, 800 bytes per block. *Tape available on 14 day loan basis only*

**Send requests to:** Herbert A. Tiedemann  
Technology Transfer Project Manager  
National Petroleum Technology Office  
One West Third Williams Center Tower One, 14th Floor  
Tulsa, OK 74103

918-699-2017 telephone

918-699-2048 facsimile

This information also available on the Internet via DOE's HomePage (address: <http://www.npto.doc.gov>)  
NTIS (National Technical Information Service) Order Desk: 703-487-4650

# **SOMETHING YOU SHOULD KNOW...**

---

## **IOR Meeting**

Eleventh Symposium on Improved Oil Recovery

1998 Society of Petroleum Engineers/Department of Energy

**April 19-22, 1998**

Doubletree Hotel -- Tulsa, Oklahoma

**“IOR Technology ---- Global Impact”**

Meeting/Registration Information

Exhibitor Information

Technical Program

Short Courses

For more information about the conference, contact Richard Spears at (918) 496-3434 or Jana Smith at (918) 699-2088. Or visit the Improved Oil Recovery Home Page at [www.doe.gov/ior.html](http://www.doe.gov/ior.html).