

Preferred **U**pstream **M**anagement **P**ractices
Rewriting the Meaning of "Standard Business Practices"

PUMP





Photo credit: Steve Ruppel, Bureau of Economic Geology, University of Texas, Austin. West Texas oil well Permian Basin.

overview PUMP

The PUMP program helps slow the decline in America's oil production. PUMP is aimed at pairing "best practices" and solutions coming from new technologies to an active campaign of disseminating information to domestic producers. PUMP is a high-priority program to collect and distribute information that domestic producers can use to keep oil flowing from American's oil fields. Slowing the decline of domestic oil fields and maintaining the infrastructure to continue to produce oil has become a vital part of our National Security. The goals of PUMP are to reduce barriers to domestic production and address specific issues to maximize return on investment. The focus is very near term with regional emphasis.

STRATEGIES

PUMP employs four strategies to have a rapidly impact production. **(1)** focus on regions that present the biggest potential for additional oil production, **(2)** integrate solutions to technological, regulatory and data constraints, **(3)** validity of these solutions will be demonstrated either through targeted field demonstrations or comprehensive documentation of successful use, **(4)** established Technology Transfer methods and organizations will be used to give producers access to the information. The three phases of PUMP address several areas of regional practices, technology development, environmental strategies and technology transfer. Areas for participation are:

TECHNOLOGY TRANSFER TO THE USER

- **Regional Production Obstacles:** Identification of specific regional obstacles to oil production, and the preferred management practices to overcome the problems. Demonstrate drilling, field operations technology, reservoir management approaches, computer tools, or better ways to comply with environmental regulations in a case study.

- **Research Groups or Councils:** Use established groups or councils in a region to formulate the "best practices" appropriate to that region. The goal is to develop a self-sustaining system to identify production constraints and solve them through regionally specific preferred management practices.

DATA

- **Develop Play Portfolios:** Play portfolios are geographic areas with petroleum potential caused by favorable combinations of source rock, migration paths, reservoir rock characteristics and related factors. The play portfolios will include reservoir description, maps, production data, field evaluation, and summaries of drilling, completion and enhanced oil recovery strategies.

- **Regional Water Quality Strategies:** The emphasis is on regional data and strategies for information sharing of environmental technologies. The objectives are to develop regional databases and accurate information to streamline planning or to provide better ways to handle water quality issues.

ENVIRONMENTAL LEVEL

- **Regulatory Barriers:** Applied research or analysis to quickly overcome an environmental regulatory barrier whose resolution would result in an increase in near term oil production from onshore or offshore Federal, State, Tribal or private land. Emphasis is on data collection, systems or methodologies that enable oil-permitting agencies to make decisions more quickly.



Photo credit: Scott Hara, Tidelands Oil Co., Long Beach. Urban drilling facilities, Wilmington Field, Los Angeles Basin, CA.

projects **PUMP I**

Gas Technology Institute (GTI), Chicago, IL, is developing computer-assisted practices for optimizing oil field operations based on neural networks, genetic algorithms, and “fuzzy” logic. This approach, originally used to successfully develop gas project, is being adapted by GTI to oil research. GTI researchers teaming with specialists from West Virginia University, Intelligent Solutions Inc, and TechnoMatrix Inc. will develop a Virtual Intelligence Technique that will enable operators to optimize current practices.

Anticipated Benefits: The goal of the project is to increase oil production by an average of 15% over a period of five years at a cost equal to or lower than that of current practices. The reduction in production cost will be achieved by producing oil that is not currently commercial to produce.

The DOE federal funding is \$577,000, and GTI is contributing \$620,000 in cost-share for the 24-month effort. The project technical contact is Brian Gahan at (773) 399-5481.

The **Texas Engineering Experiment Station**, at Texas A&M, College Station, TX is applying preferred practices for improving the effectiveness of injecting water to increase crude oil production from the Texas Spraberry Trend, a giant half-mil-

lion acre oil-bearing formation in Midland, Martin and surrounding counties in West Texas. Texas A & M researchers will work with a team from Pioneer Natural Resources to significantly and quickly increase field-wide production in the Spraberry Trend by application of preferred practices for managing and optimizing water injection. The economic benefit of waterflooding in this naturally fractured unit has been the subject of speculation for nearly five decades.

Anticipated Benefits: The project goal is to dispel negative attitudes and demonstrate successful waterflood methodology in the Spraberry Trend. A secondary objective is the purification and injection of produced waters to minimize downhole casing failure caused by corrosive waters from the San Andres formation.

The DOE is providing \$500,000 to the 24-month project, and Texas A&M is contributing \$1.5 million in cost sharing. The project technical contact is David Schechter at (970) 845-2275.

The **Texas Engineering Experiment Station**, at Texas A&M, College Station, TX has developed and is demonstrating a new practice for increasing oil production by deliberately producing sand from a reservoir, creating an underground cavity around the wellbore that allows

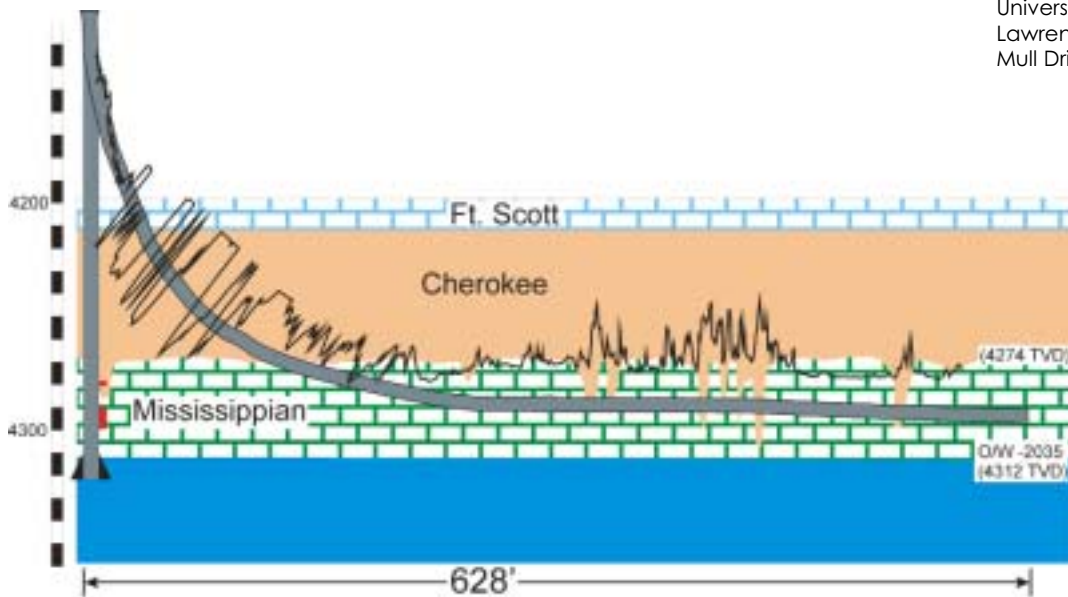
oil to flow more easily from the surrounding formation. The technique is being demonstrated in the Wilmington Field in Long Beach, CA. The technology is incorporated into a unified model of cavity-like completion that can be used to design other advanced completions.

Anticipated Benefits: In the Wilmington field the successful technology may recover an additional 4.7 million barrels of oil, and is applicable to other fields in southern California.

Long Beach Unit operator, THUMS, and the program sponsors (BP, Phillips, Schlumberger, Texaco and TotalFina, Elf) are contributing \$130,000 (70% cash, 30% in kind services) to the 12-month project, and the DOE is providing \$130,000 in federal funding. The project technical contact is D. Burnett at (970) 845-2274.

The University of Kansas Center for Research, Inc.,

Lawrence, KS, is demonstrating several techniques for modeling oil reservoirs in a Central Kansas oil field. Using the information, the university and its partners will then drill horizontal wells (a technique called “horizontal infill drilling”) to recover oil that traditional vertical wells may have missed. The University of Kansas Center for Research will team with the Kansas Geological



Survey, Mull Drilling Company, and Maurer Engineering, Inc to combine integrated reservoir modeling with horizontal infill drilling.

Anticipated Benefits: Increase production efficiency in Central Kansas Mississippian carbonate reservoirs, which provide 43% of Kansas annual production, can save a potential five billion barrel of oil.

DOE is providing \$406,000 for the 24-month project, with a cost-share of \$407,000 from the University of Kansas. The project technical contact is Saibal Bhattacharya at (785) 864-2058.

The **Petroleum Technology Transfer Council**, Houston, TX, has organized a team of mentors to work with regional producers in Oklahoma and California to identify and transfer preferred practices that can increase oil production, slow or reverse production declines, and extend the life of marginal wells through workshops, publications and an interactive Internet web site. The PTTC Regional Lead Organizations, the South Mid-Continent RLO in Norman, OK, and the West Coast RLO in Los

Angeles, CA encompass areas with significant oil resources where production is constrained. The PTTC Team will refine understanding of production constraints, search globally for integrated solutions that can serve as preferred management practices and guide small producers to cost-reduction measures for implementing the solutions.

Anticipated Benefits: Results will be relayed to independents through personal contact, one-on-one or small group meetings, workshops, newsletters, and the Internet. Independent operators will be able to increase production and maintain extend the reservoir life of their leases.

DOE is providing federal funding of \$500,000 for the 24-month project, and the PTTC is contributing \$504,000 in cost sharing. The project technical contact is Donald Duttlinger at (713) 688-0900.

West Virginia University Research Corporation, Morgantown, WV has organized a regional council to identify and communicate to operators preferred practices through workshops, contacts with engineers

and geologists, publications and an interactive internet web site. Appalachian Region Preferred Management Practices Council has been created to provide information directly on problems faced by industry within the region. The council includes members of the Petroleum Technology Transfer Council's Application Regional Producer Advisor Group, other oil industry representatives and state geologists on the Appalachian Oil and Natural Gas Research Consortium Advisory Board. A "Problem and Preferred Management Practices Workshop" was held in January 2002.

Anticipated Benefits: PTTC's interactive website will enable independent operators in the region to respond quickly to technologies and management practices that have proven most successful in the Appalachian Basin.

DOE is providing \$362,000 to the 24-month project. The West Virginia University Research Corporation is contributing a 50% cost-share of \$362,000. The project technical contact is Douglas Patchen at (304) 293-2867.



Photo credit: Thomas Chidsey, Jr. Utah Geological Survey, Salt Lake. Ogden Thrust Belt, Uinta Basin, UT.

projects **PUMP II**

The Bureau of Economic Geology, University of Texas at Austin, TX is developing the “play portfolio” strategy of studying the major oil reservoirs of the Permian Basin in Texas and New Mexico. The geological surveys of Texas and New Mexico will team together for this project. The Permian Basin contains roughly one fourth of the active production within the United States. The portfolio will focus on reservoirs capable of producing more than a million barrels and summarize key characteristics and the most effective producing strategies. An active technology transfer program will include a CD, website and presentations.

Anticipated Benefits: Assist operators to increase production up to one million barrels from the Permian Basin of Texas and New Mexico.

DOE funding is \$499,299 for the 24-month project; the University of Texas is contributing a 50% cost-share of \$500,636. The technical lead for the projects is Dr. Shirley Dutton at (512) 471-0329.

The **Illinois State Geological Survey**, Champaign-Urbana, Illinois is developing a geographic information system approach for play portfolios to improve oil production in the Illinois Basin. More than 3 billion barrels of oil have been commercially produced in Illinois over 100 years. Recent calculations indicate that as much as

4 billion barrels remain to be produced from the Illinois Basin. The project will address production strategies and data collection covering 100 years of production history. Access to this data and the techniques required evaluate and manage this amount of diverse data are major barriers to increased production. Compiled data will be available on the ISMS and DOE websites in an interactive computer graphic display.

Anticipated Benefits: Information provided to independent operators in the Illinois Basin will assist in producing an additional 4 billion barrels of oil.

DOE funding is \$425,602 for the 24-month project. The Illinois State Geological Survey’s cost-share is 51% for \$431,377. The project contact is J. J. Kamerer at (217) 333-2187.

The **Utah Geological Survey**, Salt Lake City, Utah is focused on major oil plays in Utah and adjacent areas. Oil fields in Utah have produced more than 1 billion barrels. However, since the mid-1980s production has declined, and the 15 million barrels produced in 2000 was the lowest level in over 40 years. The Utah Geological Survey believes this trend can be reversed by increased recovery from existing field, new discoveries, preventing premature abandonment of small fields and reducing development costs and risks. The Survey will develop play

portfolios from the major oil producing provinces; thrust belt, Uinta Basin and Paradox Basin. All play maps, reports, databases, etc produced for the project will be published in an interactive (web-based and compact disc) or hard copy format and presented to the petroleum industry through a Technical Advisory Board (industry representatives operating in Utah) and a Stake Holders Board of state and federal agencies.

Anticipated Benefits: Reverse the decline in Utah’s oil production, and demonstrate to independent operators technologies and strategies to increase oil production from numerous small oil fields in the three targeted regions.

DOE funding is \$133,924 for the 24-month project. The Utah Geological Survey’s cost-share is \$133,924. Contact for the project is Thomas Chidsey, Jr. (801) 537-3364.

New Mexico Institute of Mining and Technology and New Mexico Petroleum Recovery Research Center (PRRC),

Socorro, New Mexico will develop an Information Data System for produced water quality for New Mexico oil and gas producers. Producers in New Mexico handle more than 450 million barrels of produced water annually. Some of it is re-injected into the ground, while the rest of it flows through pipelines and producing facilities. This produced water often becomes



Photo credit: NETL
DOE staff photo.
Oil field Permian
Basin, west Texas.

corrosive as it commingles with gases and common oil field chemicals. The objective of the project is to alleviate a number of produced water issues in southeast New Mexico. As part of the project the New Mexico Petroleum Recovery Research Center (PRRC) will design a website that includes comprehensive oil field and ground water information databases, risk assessment tools and suggested corrosion mitigation strategies.

Anticipated Benefits: The information system will significantly reduce time to identify the nature and components of produced water in the region and will assist oilfield operators in anticipating and planning corrosion management strategies that will reduce leaks, spills and associated costs.

DOE is providing \$273,833 and New Mexico PRRC's cost-share is \$273,883 for the 24-month project. The project lead is Dr. Robert Lee (505) 835-5142.

DOE "Best Practices" Success

Texas Electronic Compliance and Approval Process (ECAP)

- **Joint Partnership**
 - Texas Railroad Commission
 - U. S. Department of Energy
 - Oil and gas Industry
- Texas selected as the state with the largest and most diverse population of operators and wells.
- Pilot developed a 2-way electronic communication system for handling compliance aspects of oil and gas regulations
- **Goal: On-line oil and gas permitting**
 - Approval of Drilling permits reduced from four days to hours
 - Cost savings with on-line permitting estimated at \$200 to \$400 per permit
 - Texas – 25% utilization of ECAP – estimated savings of \$17,500,000
 - ECAP fully operational in Texas since September 2001
- DOE impact – increase production by eliminating administrative burden
- Texas ECAP pilot is model for other state and federal regulatory agencies.

<http://www.rrc.state.tx.us/ecap>



awards PUMP III

ALASKAN OIL AND GAS EXPLORATION, DEVELOPMENT AND PERMITTING, THE STATE OF ALASKA. *Principal Investigator – Charles Dense, Juneau, AK (907) 465-3937.*

The goals of this project are to encourage exploration and development of the state's vast oil prospects, to improve permitting of oil exploration and development activities and create a shared GIS environment to support exploration, development and permitting. The project is statewide in scope, with emphasis on the North Slope and Cook Inlet.

Total Funding: \$1,005K, DOE \$1,394K, State of Alaska \$600K.

ADAPTIVE MANAGEMENT AND PLANNING MODELS FOR CULTURAL RESOURCES IN OIL AND GAS FIELDS—NEW MEXICO AND WYOMING, GNOMON, INC.

Principal Investigator – Eric Ingbar, Carson City, NV (775) 885-2305.

The project will examine and analyze existing cultural resource and historic preservation management practices in Wyoming and New Mexico. The project will allow regulatory agencies and industry to anticipate or avoid regulatory entanglement when petroleum exploration and production permitting interest with historic preservation issues. **Total Funding: \$1,793K, DOE \$1,416K, Non-DOE \$377K.**

DISTRIBUTED GENERATION POWER UNITS AT MARGINAL OIL WELL SITES (OFFGASES FOR OIL), INTERSTATE OIL AND GAS COMPACT COMMISSION. *Principal Investigator – Mark Carl, Oklahoma City, OK (405) 525-3556.*

This project will increase oil production and reduce green house gases and NOx emissions in California by utilizing flare and shut-in gas from California's oil-fields to generate valuable electricity from new proven distributed generation technologies. Several types of conventional and new microturbine generators will be tested at selected sites from among California's 21,000 marginal wells.

Total Funding: \$3,155K, DOE \$1,000K, Non-DOE \$2,155K.

IMPLEMENTING A NOVEL CYCLIC CO₂ FLOOD IN PALEOZOIC REEFS, MICHIGAN TECHNOLOGICAL UNIVERSITY. *Principal Investigator – James Wood, Houghton, MI (906) 487-2894.*

The goal of this project is to show that bypassed oil in isolated areas can be economically recovered using existing technologies combined in new ways. Recycled CO₂ will be used to produce bypassed oil from Silurian pinnacle reefs in the Michigan Basin. Waste CO₂ from the Antrim shale production will be captured, compressed and re-injected into nearly pinnacle reefs.

Total Funding: \$2,214K, DOE \$1,062K, Non-DOE \$1,152K.

DEVELOPMENT PRACTICES FOR OPTIMIZED MEOR IN SHALLOW HEAVY OIL RESERVOIRS, UNIVERSITY OF MISSOURI-ROLLA. *Principal Investigator – Shari Dunn-Norman (573) 341-4840.*

This project will demonstrate an economically viable and sustainable method of producing shallow heavy oil reserves in Southwest Missouri and Southeast Kansas using a combination of microbial enhanced oil recovery and hydraulic fracturing in vertical wells.

Total Funding: \$1,267K, DOE \$630K, Non-DOE \$638K.

REVIVING ABANDONED RESERVOIRS WITH HIGH-PRESSURE AIR INJECTION: APPLICATION IN A FRACTURED AND KARSTED DOLOMITE RESERVOIR, THE UNIVERSITY OF TEXAS AT AUSTIN, BUREAU OF ECONOMIC GEOLOGY.

Principal Investigators Robert Loucks (512) 471-0366 and Stephen Ruppel (512) 471-2965.

Researchers will evaluate the applicability of high-pressure air injection in revitalizing an abandoned carbonate reservoir in the Permian Basin of West Texas.

Total Funding: \$5,055K, DOE \$1,092K, Non-DOE \$3,963K.

For additional details see <http://www.npto.doe.gov>.

public benefits

PUMP I, II, III

- Increase oil production by 21 million barrels of oil*
- Reduce operating costs
- Promote effective and environmentally protective advanced technologies
- Optimize the recovery of the Nation's valuable oil resources
- Promote domestic energy security

**Based on models from the Total Oil Resource Information System (TORIS)*



National Energy Technology Laboratory

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Visit these websites:

For Project Fact Sheets
<http://www.fe.doe.gov>

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