

MINUTE ITEM

This Calendar Item No. 35
was submitted for information
only, no action thereon
being necessary.

INFORMATIVE
CALENDAR ITEM

35

12/17/81
Thompson

REVIEW OF ENHANCED RECOVERY PROJECTS,
WILMINGTON OIL FIELD, LOS ANGELES COUNTY

Eight enhanced recovery pilot projects are in the planning or operational stage on State-interest properties in the Wilmington oil field. Their current status is as follows:

Micellar-Polymer Solution, Fault Block V, Upper Terminal Zone

Work on this project was begun in mid-1978 on the Long Beach Harbor Department tidelands parcel. It involved use of the Maraflood process which involves injection of a micellar solution freeing residual oil from the reservoir rock followed by a polymer solution to decrease water mobility. The pilot area consists of four injection wells and six producing wells on 11 acres. Injection of the micellar solution slug was begun in July, 1978 and was completed in October, 1979. The polymer thickened water slug was completed in August, 1981, followed by resumption of water injection. A reduction of water-oil ratio and a resulting oil rate response was noted some six months after initiation of the micellar slug injection, and continued for some 11 months. After peaking at well over five times the pre-response rate, the oil rate has declined, with that decline heightened by mechanical failure of one of the producing wells. Apparently the recent repair of this well has now temporarily arrested this decline, making it difficult to predict the ultimate recovery from the project at this time. Total expenditures on the project have been \$9,425,500 of which \$3,500,000 was reimbursed from the Federal Government. Cumulative enhanced oil production has been 159,000 barrels yielding an estimated net income of some \$3,300,000 to date. It appears almost certain that this specific project will fail to achieve an economic payout. Technically, however, it has demonstrated the physical feasibility of the method, and may provide valuable information for future enhanced recovery planning.

Caustic Solution, Fault Block VII, Ranger Zone

This project was initiated by contract between the City of Long Beach, as operator of the Long Beach Unit, and the Federal Government on a 60/40 cost sharing basis of an original estimated cost of \$11.6 million. The initial preflush injection was begun in April, 1979 and caustic

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solution has been injected since that time. To date there has been no positive indication of oil response attributable to the caustic injection.

Caustic Solution, Fault Block IV, Ranger Zone

The City of Long Beach is currently planning a caustic flood similar to that previously described in the Long Beach Unit. Based on technical information available on other projects, it is planned to inject a more concentrated solution than that used in the Long Beach Unit pilot, and laboratory work is being done to determine the feasibility of using polymer as well. It is currently planned to commence injection in March, 1982.

Steam Drive, Fault Block V, Tar Zone

The City of Long Beach is currently testing two experimental down hole steam generators developed by Sandia Laboratories for the Federal Government. This is significantly the first down hole test of such equipment of any duration. The advantages of this type of equipment, if practical, could be very significant to recovery of oil in the Tar Sands in the Wilmington Field. Oil recovery in these sands has been low due to its viscous nature. The introduction of heat reduces markedly its viscosity and increases the oil mobility into the producing wells. Down hole generation, if practical, would eliminate the large heat loss from the well tubing which occurs in transmitting the steam from a surface generator to the subsurface formation. It also allows for discharge of the combustion products directly into the oil formation along with the steam. These products may have some advantageous effect on oil recovery, but more importantly, it does away with discharge of these products to the surface atmosphere and its possibly harmful environmental effects.

The current test involves two generators injecting into five-spot patterns of eight and 5.1 acres. One generator burning an air-diesel mixture is now operating satisfactorily down hole after being pulled recently for design changes. It is injecting some 4,000,000 BTU per hour using 280 barrels per day water. The only significant reservoir response to date has been the appearance in the producing wells of combustion products in the gas stream within several days of commencing injection into the injector. The second generator burning an oxygen-diesel mixture, has been in test operation for only a short time, installed on the surface, with the steam and combustion products being injected down the well tubing.

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Steam Drive, Fault Block V, Tar Zone

The Long Beach Unit also initiated a five-acre five-spot pilot steam injection project in January, 1981. It is using a conventional surface steam generator. There has been no production response. The steam injection rate has been materially below that originally planned due to lower than normal well injectivity and frequent down hole mechanical problems.

Steam Drive, Fault Block II, Tar Zone

Champlin Petroleum Company is now drilling project wells and is planning to commence injecting steam, early in 1982, into the Tar Zone of the Fault Block II Unit. The City of Long Beach, as tideland trustee, participates in this Unit.

Carbon Dioxide Injection, Fault Block III, Tar Zone

Champlin Petroleum is conducting a carbon dioxide injection project in the Tar Zone of Fault Block III. They have been injecting since May, 1981 with all CO₂ being trucked in a liquid form. The City of Long Beach reports that there has been CO₂ breakthrough and that there has just recently been a significant oil rate response in one producing well. Additional and more specific technical and economic data will be reported as available.

Carbon Dioxide Injection, Fault Block V

The City of Long Beach is planning to start a carbon dioxide injection project on the Harbor Department Tidelands Parcel, commencing in January, 1982. A pipe line has been completed to transport a mixture of 83 percent carbon dioxide and 17 percent nitrogen in the gaseous form from a nearby refinery. Compressors for pressuring the gas for injection are currently being installed. Additional reservoir details of the project will be reported as the project proceeds.