IMPLEMENTING AGREEMENT NO. XIII
TO THE AGREEMENT
BETWEEN
DEPARTMENT OF ENERGY OF THE UNITED STATES OF AMERICA
AND
THE MINISTRY OF ENERGY AND MINES
OF THE REPUBLIC OF VENEZUELA
IN THE AREA OF MICROBIAL ENHANCED OIL RECOVERY

WHEREAS, the United States Department of Energy (hereinafter referred to as DOE) and the Ministry of Energy and Mines of Venezuela (hereinafter referred to as MEMV) desire to cooperate in the field of energy research and development;

WHEREAS, in the furtherance of their mutual interest DOE and MEMV entered into the Agreement in the field of Energy Research and Development signed March 6, 1980 (hereinafter referred to as the Energy R&D Agreement);

WHEREAS, DOE and MEMV have a mutual interest in technology exchange on the application of microorganisms for the recovery of petroleum;

WHEREAS, DOE and MEMV have a mutual interest in developing modeling capability to predict the recovery of petroleum via microorganisms from applicable petroleum reservoirs;

WHEREAS, Venezuela is known to be a prolific petroleum producing area, and therefore a prime candidate for evaluation, selection and petroleum recovery studies of the microbial enhanced oil recovery (MEOR) processes.

It is agreed as follows:

ARTICLE 1

In accordance with Article V of the Energy R&D Agreement, the Venezuelan representatives of the Steering Committee have designated INTEVEP, S.A. to act on behalf of MEMV under this Implementing Agreement. INTEVEP and DOE shall be hereinafter referred to as the Parties to this Implementing Agreement. NIPER and the University of Oklahoma shall carry out DOE's technical responsibilities under Paragraph C, of Article 2 of this Implementing Agreement. Each Party shall designate one Project Manager; these Project Managers shall provide technical management and coordination of the tasks described in this Implementing Agreement.

ARTICLE 2

The Parties shall cooperate in the area of application of microbial enhanced oil recovery in the Venezuelan petroleum reservoirs as set forth below:

The Parties shall carry out a series of tasks over an initial period of 18 months. Further work may be required to complete all tasks at the end of the initial 18 month period. Any further work shall be the subject of a future Amendment and Extension to this Implementing Agreement.

A. Technical Information Exchange

The DOE and INTEVEP shall provide an annual summary of MEOR activities in their respective countries.

B. INTEVEP Experimental Tasks

Task 1 - Applied Venezuelan Microbial Laboratory Work

INTEVEP shall identify and select strains of surfactant producing bacteria such as Pseudomonas Aeruginosa. Results of experiments with these bacteria show that surfactant is easily liberated to the culture media instead of being associated with the bacterial surface. This capacity could prove to be of economical importance in an industrial extraction process. Experimental studies are being conducted to determine the influence of medium, temperature, pH, salt type, surface tension reduction and emulsifying capacity of the bacteria in order to optimize the production of surfactant.

Task 2 - Evaluation of INTEVEP Reservoirs for MEOR

INTEVEP shall analyze samples of various types of oils, effluent from bituminous sands, and other types of stratum for which MEOR could be used. INTEVEP shall analyze the reservoir data and the chemical composition and physical properties of the reservoir material therefrom and shall select candidate reservoirs for further screening studies. INTEVEP shall provide this information to DOE.

Task 3 - Screening and Selection of Microorganisms

INTEVEP shall screen and select several microbial strains that have potential for EOR using the samples from the candidate reservoirs selected in Task 2. Compatibility studies shall be performed to evaluate the microbial species and metabolic products shall be determined under the reservoir conditions selected by INTEVEP and DOE. INTEVEP shall provide this data for DOE.

Task 4 - Bioprocessing of Waste Materials

INTEVEP shall determine the efficiency of bioprocessing waste materials as nutrients in surface reactors to produce metabolic products suitable for use in EOR processes.

C. DOE Experimental Task

Task 1 - Microbial Transport and Porous Media Evaluation

DOE shall perform studies in porous media, cores and micromodels, to investigate the transport of selected microbial species, and to determine the oil recovery efficiency of the selected microbial strains, resulting in improved understanding of the fundamental mechanisms of mobilization and displacement of oil by microorganisms.

Task 2 - Effect of Nutrient on Oil Recovery Efficiency

DOE shall determine the metabolic products responsible for oil recovery improvement and nutrient screening and selection shall be done to optimize the production of these key microbial metabolities.

Task 3 - Development of Numerical Process Model

DOE shall obtain improvement in predictability and displacement sweep efficiencies by the development of a numerical simulator model of the MEOR process.

Task 4 - Profile Modification Field Test

DOE shall conduct a profile modification field test to demonstrate selective plugging of the swept zone of a reservoir to allow flooding of the by-passed mobile oil in the unswept zone.

All work under Paragraphs A and B, excluding Task 3 & 4, is to be completed by the end of the 18 months of the project. The Project Managers shall report to the Steering Committee at the end of the first year and propose the effort in man-years and funds required by the participants to complete the project. Effort beyond the 18-month duration of this Implementing Agreement shall be the subject of an amendment to the Implementing Agreement.

ARTICLE 3

A. The performance of Article 2, Paragraph B shall be by INTEVEP and all costs pertaining to Paragraph B shall be borne by INTEVEP.

B. The performance of Article 2, Paragraphs C, Tasks 1, 2, 3 and 4 shall be by DOE and all costs pertaining to Paragraphs C shall be borne by DOE, with the exception of shipping costs for any samples of oil, effluent from bitiminous sands, and other types of stratum required, which shall be borne by INTEVEP. Obtaining and shipping the samples from Venezuela to Bartlesville, OK, shall be the responsibility of INTEVEP.

ARTICLE 4

The Parties shall support the widest possible dissemination of information arising from this Implementing Agreement in accordance with Article 2 of the Annex to the Energy R&D Agreement. If a Party has access to proprietary information as defined in Article 2 of the Annex to the Energy R&D Agreement which would be useful to the activities under this Implementing Agreement, information shall be accepted for the task only on terms and conditions as agreed in writing by the Parties.

ARTICLE 5

Rights to any invention or discovery made or conceived in the course of or under this Implementing Agreement shall be distributed as provided in Paragraph 1 of Article VI of the Energy R&D Agreement. As to third countries, rights to such inventions shall be decided by the Joint Steering Committee.

Each Party shall take all necessary steps to provide the cooperation from its inventors required to carry out this Article. Each Party shall assume the responsibility to pay awards to compensation required to be paid to its own nationals according to its own laws.

ARTICLE 6

The existing terms and conditions of the Energy R&D Agreement shall continue and remain in full force and effect notwithstanding the terms of this Implementing Agreement.

ARTICLE 7

This Implementing Agreement shall enter into force upon the later date of signature and shall remain in force for a period of 18 months. It may be amended or extended by mutual written consent of the Parties in accordance with Article V of the Energy R&D Agreement.

ARTICLE 8

This Implementing Agreement may be terminated at any time at the discretion of either Party, upon six (6) months advance notification in writing to the other Party by the Party seeking to terminate. Such termination shall be without prejudice to the rights which may have accrued under this Implementing Agreement, to either Party up to the date of such termination.

Done in Caracas & Washington this day 29 Feb, 1988.

THE JOINT STEERING COMMITTEE

On behalf of DOE

Member Marvin Singer

Member George Stosur

Member Thomas Wesson

Feb 29, 1988

Date

On behalf of MEMV

Member Enrique Vásquez

Member Manuel Alayeto E.

Member Pedro Luis Díaz

Feb. 26, 1988

Date