PROJECT FACT SHEET

CONTRACT TITLE: Evaluations of Radionucleides of Uranium, Thorium, and Radium Associated with Produced Fluids, Precipitates, and Sludges from Oil, Gas, and Oilfield Brine Injection Wells in Mississippi

ID NUMBER: DE-FG26-97BC15035

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DOE PROGRAM MANAGER:
NAME: William H. Hochheiser
PHONE: (202) 586-5614

DOE PROJECT MANAGER:
NAME: John K. Ford
LOCATION: NPTO
PHONE: (918) 699-2061

PROJECT SITE
CITY: Jackson **STATE:** MS
CITY: **STATE:**
CITY: **STATE:**

CONTRACTOR: Mississippi Office of Geology

ADDR: P.O. Box 20307
2380 Hwy 80 West
Jackson, MS 39289

PRINCIPAL INVESTIGATOR:
NAME: Rick L. Ericksen
PHONE: (601) 961-5507
FAX: (601) 961-5366
INTERNET ADDRESS: Rick_Ericksen@deq.state.ms.us

CONTRACT PERFORMANCE PERIOD:
09/01/1997 to 12/31/2001

PROGRAM: Environmental-Oil
RESEARCH AREA: Environmental

FUNDING ($1000'S)	DOE	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	40	25	65
FISCAL YR 1998	96	25	121
FUTURE FUNDS	366	76	442
TOTAL EST'D FUNDS	502	126	628

OBJECTIVE: Provide the knowledge base from which rational, informed, social, economic, and environmentally sound decisions may be made, including he potential for the data bases epidemiological studies and inferences.

PROJECT DESCRIPTION:
Work to be performed: The objectives of this work consists of: 1) Obtaining baseline data regarding the geographic and geologic occurrence and concentration/isotopic composition of NORM in produced formation water, scale, and sludge which result from hydrocarbon production in the state of Mississippi; and 2) provide valid, unbiased NORM data and guidance to both industry and governmental agencies based on the results of the proposed investigations.

PROJECT DESCRIPTION (Continued)

Background: Preliminary studies have indicated that the main contributor to NORM in oil and gas production is radium. Unfounded assumptions have been made concerning this issue especially with respect to the isotopic composition of the radium, i.e., Ra-228 versus Ra-226, found in NORM. Radium-228 is a product in the decay chain of thorium-232 and radium-226 is the daughter product of the naturally occurring uranium-238 decay series. Few, if any, studies have been made concerning the isotopic composition of naturally-occurring radium. It has been assumed that radium-228 and radium-226 are present in equal amounts. This assumption has not been supported or refuted in the literature. The underlying significance is that radium-226 decays emitting both beta and gamma radiation and radium-228 decays emitting beta radiation only. These two radiation emissions, gamma emissions are documented to be the most worrisome because of its capability to ravel through steel, iron, etc.

PROJECT STATUS:

Current Work: To date approximately 150 liters of oil field brines have been collected from 16 wells in Baxterville Field, located in Lamar County, MS. Along with the brines which were collected from oil wells completed in the Lower Tuscaloosa "stringer" and the Lower Tuscaloosa Massive sands, brine was also obtained from an Eagleford gas pool at Baxterville. Additional brines were collected at South Smithdale Field, located in Amite County, a Sparta gas field; earlier sampling of brines from several Wilcox fields; and Rodessa oil pool samples taken from Traxler Field, Smith County, MS.

Due to the commonly emulsified nature of the fluid at the wellhead, on-site sampling procedures were devised to minimize the amount of oil included in the collected fluids. To minimize the amount of oil, the fluid being produced at the wellhead was collected in a 20 liter sampling container equipped with an on/off valve located at its base. After the container was filled approximately two-thirds full, the collected fluid was allowed to sit briefly allowing the separation of the oil and water. The brine was then placed in a four liter sample container by simply opening the valve on the collection container which allowed the water phase to be removed without introduction of large amounts of oil.

Laboratory methodology for determining radium is in the final stages of development. The processing method consists of the following procedure(s). Suspended oil and solids are removed by passing the brine through 2 layers of Whatman No. 1 filter paper. Sodium carbonate solution (10% w/v), 25 ml, is added gradually with vigorous stirring to 1 liter of filtered brine. After stirring for 10 minutes the precipitate is collected by filtration through Whatman No. 1 filter paper. The filtrate receives a second, and third 25 ml aliquot of sodium carbonate solution as before. The first two precipitates from each of the brines represented less than 10 grams of dried solids. These were redissolved with 20 ml of 5 N HCl, diluted to 500 ml with deionized water, and 100 ml of concentrated sulfuric acid is added with vigorous stirring. After 10 minutes small crystals begin to appear, and continue to grow in over the next 2 hours. The crystals were collected by filtration through 2 micron glass fiber filters, the filtrate was made 2 N by adding concentrated nitric acid and which then is passed through a Radium Rad disk. The crystals had no detectable radioactivity while the Rad disk, counted within one hour of filtering, showed gamma and beta emission spectra characteristic of the 186 KEV gamma emission of Ra-226 and the 38.9 KEV beta emission from Ra-228.

Scheduled Milestones:

Development of laboratory methodology to measure NORM
Collection of initial set of oil/gas field brines
Results from initial set of oil/gas field brines

Accomplishments: During the initial "start-up" period, the infrastructure for the project was developed for the major work required in the later phases of the investigation. A significant portion of the work involved consultations with both the Mississippi Mineral Resources Institute (MMRI) and the Research Institute of Pharmacological Science (RIPS) resulting in a standard procedure for sample collection, labeling, and handling of samples. An equally important aspect of the sample collection procedure is the maintenance of custody records which can accurately document the handling of the sample(s) from the field collection site(s) to the final laboratory analysis(es).

Preliminary basic chemical characteristic/isotopic studies have examined the Sparta gas brine and the brines from a portion of the Baxterville Field samples. The Sparta brine was relatively free of suspended oil and relatively low in total dissolved solute. The sample had a pH of 5.88, density of 1.068 g/ml, and a total solute content of 119.5 g/l. Upon analysis this sample was found to have a small amount of NORM, within the range of 10 pCi/l over background. Because this sample's activity is so low data do not allow the calculation of the isotopic composition of radium contained therein. The Baxterville samples which were analyzed had relatively high suspended oil content and high dissolved solute. These samples had pH values ranging from 5.25 to 5.98, densities of 1.145 g/ml to 1.138 g/ml, and total solutes of 242.3 g/l to 230.6 g/l. The Baxterville samples which were analyzed had NORM activities in the range of 100 pCi/l over background levels.