PROJECT FACT SHEET

CONTRACT TITLE: Geophysical and Transport Properties of Reservoir Rocks.

DATE REVIEWED: 01/19/93 **DATE REVISED:** 01/05/93

OBJECTIVE: The experiments are to investigate how pore topology, the physics and chemistry of mineral-fluid and fluid-fluid interactions affect both the flow of fluids through porous rocks and the relationships between these fluid transport properties and the geophysical properties of the rock. The objective is to determine the extent to which the transport properties of rocks and their contained fluids can be identified remotely using seismic and electrical methods.

ID NUMBER: DE-AC22-89BC14475

B & R CODE: AC0530000

CONTRACT PERFORMANCE PERIOD:
09/22/89 to 10/21/93
PROGRAM: AEPT
RESEARCH AREA: Geoscience

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PROJECT SITE:
Berkeley, CA

SCHEDULED MILESTONES:

TASK 1 - Modify and test equipment - completed.	
TASK 2 - Fluid permeability and electrical impedance measurement with Wood's metal.	02/90
TASK 3 - Analysis of pore topology and heterogeneity.	09/91
TASK 4 - Permeability, electrical and seismic measurements.	09/91
TASK 5 - Analysis of permeability - seismic and electrical.	09/92
TASK 6 - Analysis of data and final report.	09/93

FUNDING (1000'S)	DOE	OTHER	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	412	0	0	**412**
FISCAL YR 1993	0	0	0	**0**
FUTURE FUNDS	0	0	0	**0**
TOTAL EST'D FUNDS	**412**	**0**	**0**	**412**

PROJECT DESCRIPTION: The research is to make careful measurements of pore topology, fluid flow, electrical impedance and seismic wave propagation on laboratory samples of reservoir rocks using a variety of wetting and non-wetting pore fluids, some of which can be solidified in place. These experiments will be analyzed in terms of the micromechanics, microphysics and microchemistry of the processes involved. The data will provide a fundamental theoretical basis for the development of macroscopic constitutive relationships relating fluid-flow and geophysical properties.

PRESENT STATUS: PI has requested a no-cost extension through 10/21/93.

ACCOMPLISHMENTS: Porosimetry and one-dimensional percolation measurements have been made on samples of Berea sandstone and Indiana limestone using Wood's metal. These measurements have shown that relative permeability is controlled by interconnected percolating paths rather that by the percentage saturation.

Seismic measurements on samples of the same rocks and on samples of Alundum and sintered glass beads with a variety of pore fluids have shown that attentuation is much more sensitive to changes in the physical and chemical properties of pore fluids than is velocity. Much of the attenuation in rocks occurs as a result of processes at grain contacts.

BACKGROUND: It has become apparent that reservoir properties and reservoir rock heterogeneities are in need of greater quantification if additional reserves are to be produced from existing fields. The precise definition of reservoir characteristics and structure on the scale of meters is key to planning and control of successful advanced enhanced oil recovery techniques. Rock mineralogy, pore morphology, fluid compositions, physical and chemical properties need further quantification such that they can be used to predict permeability, relative permeability, capillary pressures, contact angles, adsorption, film formation and other basic physical properties. These latter properties control in part the hydrocarbon trapping, the production and remobilization in the recovery processes.

Once equations relating seismic and electrical properties to changes in rock properties and fluid composition, temperature and pressure have been established, then geophysical tomographic data can be inverted to provide information about the geometrical distribution of permeability. The resultant understanding will be important in determining reservoir properties and heterogeneities before production and for the monitoring of production processes.