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TWO-PHASE FLOW IN GEOTHERMAL SYSTEMS

BI-MONTHLY PROGRESS REPORT

for the period

October 1, 1984-November 30, 1984

CONTRACT NO. DE-AC03-84SF12197

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Prepared for
U. S. Department of Energy
San Francisco Operations Office

Report prepared by
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I. CONTRACT MANAGEMENT SUMMARY REPORT

During October and November 1984, the research team consisted of the following individuals:

Dr. P. F. Maeder
Dr. J. Kestin
Dr. R. DiPippo
Mr. D. E. Nikitopoulos
Mr. R. N. Laoulache
Mr. R. Follansbee

II. TECHNICAL PROGRESS REPORT

A. Meetings and Related Items of Interest

1. Dr. J. Kestin continued actively in the role of Chairman of the Steering Committee for the International Workshop on Two-Phase Flow.

2. Dr. R. DiPippo made a presentation on geothermal power developments overseas before the Annual Meeting of the Interagency Geothermal Coordinating Council in Washington, DC on October 5. (No expense to contract.)

3. Drs. P. F. Maeder and R. DiPippo attended the DOE Program Review Meeting, October 11-12, in Burlingame, CA. Dr. Maeder presented a summary of the current research and Dr. DiPippo served on the Review Panel for Brine Injection research (No expense to contract.)

4. Dr. R. DiPippo attended the DOE Geothermal Technology Conference in El Centro, CA, from October 16-19. (No expense to contract.)

5. Dr. R. DiPippo served as a reviewer for the DOE/USAID project on geothermal assessment of the island of Saint Lucia in Washington, DC on October 25. (No expense to contract.)

B. Operation of the Test Facility

1. Maintenance of the Facility

The entire test facility underwent an extensive maintenance check. Leak tests were conducted at every point in the system where leaks are possible. This procedure is necessary periodically to assure the integrity of the test loop and to guard against loss of R114. Furthermore, spot tests were carried out on all electronic data acquisition systems. These tests showed that all instrumentation are in satisfactory operating condition, and that no calibration runs are needed at this time. The full check-out program was completed in one week; another week was required to bring the system back to a fully on-line condition.

2. Experimental results

The present series of measurements deals with two-phase flows under the conditions:

flashing Froude number, $Fr^* = 2.59$
flashing Mach number, $Ma^* = 0.33$

The pace of the measurements is according to our established goals and is roughly 80% complete.

3. Design, fabrication and testing of the Quick-Closing Valve (QCV)

The recently designed and constructed QCV has passed all bench-top tests of operation and integrity. By these tests, we have proven the suitability of the design. No modifications are necessary to the design that was presented in our Bi-Monthly Report for April 1-May 31, 1984.

A second valve is now under construction in our machine shop. Upon completion of the fabrication and bench-top testing, it will be installed along with the first unit into the test section for use in flow tests.

C. Theoretical Studies

1. We have modified our developmental two-phase well-flow simulator computer program so as to allow it to accept any type of closure. It now contains the Dukler correlation for wall friction and the Hughmark correlation for holdup, both for water substance.

2. The mathematical nature of the two-fluid model equations is being investigated. We believe that an understanding of the interrelation between the physics represented by the equations and the mathematical character of the equations (i.e., be they hyperbolic or elliptic) is vital in interpreting the meaning of the results obtained from such a model, and even in assessing the appropriateness of the numerical scheme adopted in the solution of the equations.