FINAL REPORT

INVESTIGATION OF CORE ORIENTATION AND PERFORATION DEBRIS ON STANDARD PERFORATION FLOW TESTS

API RP43, 5TH EDITION

Prepared by TerraTek, Inc.

for

The American Petroleum Institute
Project 90-36

TerraTek

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

PROGRAM OBJECTIVES

APPROACH AND METHODS

RESULTS AND DISCUSSION

- Post-Shot Cleanup
- The Effect of Core Orientation
- The Effect of Loose Debris in the Perforation
- The Effect of Wellbore Storage

APPENDIX A: TEST DATA

- Test No. 1
- Test No. 2
- Test No. 3
- Test No. 4
- Test No. 5
- Test No. 6

APPENDIX B: API RP43, SECTION 4 TEST PROCEDURE

EXECUTIVE SUMMARY

* No significant difference in CFE or penetration was observed between tests in Berea Sandstone cores cut parallel and perpendicular to bedding. Behavior in rocks with greater permeability anisotropy still needs to be determined.

* Flow does occur through loose debris left in the perforation tunnel. CFE based on debris-free penetration will be too high while that based on overall (rock) penetration will be too low. The average of the two appears to be a good approximation of actual empty-hole flow.

* Pretest permeability determination is critical to results and is difficult to reproduce; Based on empirical observations, cross-diameter permeabilities should be reduced ~20% from the simple formula in the RP.

* Flow stabilization takes ~8 hours and is accompanied by gas (detonation products?) in the produced brine. A consistent initial decrease in flow rate is unexplained; tests would take less time if back pressure were applied to pore fluid to compress and dissolve gases.

* The pressure setting, size and type of the wellbore accumulator affect both the amount of debris left in the perforation and the empty hole CFE value. Further work is needed to adjust this apparatus to better reproduce downhole conditions.