

GAS GENERATOR RESEARCH AND DEVELOPMENT

Progress Report No. 5
January 1972
(BCR Report L-452)

Prepared by

R. A. Glenn
Assistant Director of Research
and
J. W. Tieman
Assistant to the President

Submitted to the

Office of Coal Research
Department of the Interior
Washington, D. C.

February 22, 1972

Bituminous Coal Research, Inc.
350 Hochberg Road
Monroeville, Pennsylvania

BITUMINOUS COAL RESEARCH, INC.
PITTSBURGH, PENNSYLVANIA

JAMES R. GARVEY
PRESIDENT
JOHN W. IGOE
EXECUTIVE VICE PRESIDENT
D. PAUL MCCLOSKEY
SECRETARY AND TREASURER



PLEASE ADDRESS REPLY TO:
350 HOCHBERG ROAD
MONROEVILLE, PA.
15146
PHONE: 412 327-1600

February 1, 1972

Mr. Paul Towson, Engineer
Division of Utilization
Office of Coal Research
U.S. Department of the Interior
Washington, D. C. 20240

SUBJECT: Monthly Progress Report No. 5
OCR Contract No. 14-32-0001-1207

Dear Mr. Towson,

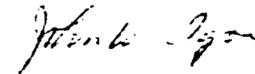
Phase II studies on process and equipment development continue according to schedule. The 100 lb/hr Stage 2 FEDU is being dismantled in preparation of the area for the new FEDUs. A final summary report of the Stage 2 FEDU work has been drafted for editing. Editing of the summary report on the coal composition and beneficiation studies is under way.

Equipment for the first three phases of the cold flow model studies of Stages 1 and 2 of the two-stage gasifier has been installed; some data have been obtained for feed nozzle orientation in an integrated gasifier. Initial studies of the characteristics of chars to be fed have been completed.

Evaluation studies are continuing in the bench-scale work on methanation catalysts for use in the BI-GAS process. Some tests have been made in the methanation FEDU model. In bench-scale work on char gasification, char obtained from the Stage 2 FEDU is being studied.

Authorization to commit funds for FEDU erection has been received from OCR. Detail engineering and procurement of equipment have been initiated. Estimates regarding design and equipment changes required to modify the fluidized-bed gasifier to (a) process coal, and (b) operate with a second bed in series are being developed with assistance from Koppers.

Yours very truly,


John W. Igoe

JWI:kag
5006

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION.	253
A. Work Schedule	253
B. Monthly Progress Charts	253
II. PHASE II PROGRESS ACHIEVED DURING MONTH ENDING JANUARY 25, 1972.	253
A. Laboratory-scale Process Studies.	253
1. Coal Composition and Beneficiation Studies, and Laboratory Pyrolysis of Coal (R. G. Moses, R. D. Saltsman, and J. E. Noll)	253
2. Fluidized-bed Gasification (E. K. Diehl and J. T. Stewart).	254
3. Gas Processing (M. S. Graboski)	257
4. Analytical Services (J. E. Noll).	275
5. Gas Chromatographic Procedures (J. E. Noll)	275
B. Stage 2 Process and Equipment Development Unit--100 lb/hr (R. J. Grace, E. E. Donath, and R. L. Zahradnik).	276
1. Inspection of Stage 1 Cooling Coils and Refractories.	276
2. Status of Phase 2 Summary Report.	276
3. Shipment of Surplus Items from 100 lb/hr PEDU	276
4. Future Work	278
C. Cold Flow Model Experiments--5 ton/hr Two-stage Gasifier (R. J. Grace, J. E. Noll, R. D. Harris, R. L. Zahradnik, and E. E. Donath)	278
1. Characterization of Selected PEDU Chars	279
2. Future Work	285
D. Data Processing (R. K. Young and D. R. Hauck)	286
1. Commercial Gasifier Modeling.	286
2. Automated Data Acquisition.	286
3. Particle Density Calculation.	287
4. Future Work	287
E. Engineering Design and Evaluation	287
1. BI-GAS Process.	287
2. OCR/BCR Gasification--Power Generation.	287

TABLE OF CONTENTS (continued)

	<u>Page</u>
F. Multipurpose Research Pilot Plant Facility (MPRF)	287
1. AGA Materials Evaluation Program	287
2. Model Status	288
3. Desk Top Model	288
G. Literature Search (V. E. Gleason).	288
H. Other.	288
1. Prime Contract Matters	288
2. Outside Engineering and Services	288
3. Brigham Young University	288
4. FPC National Gas Survey - Economics of Manufacturing SNG From Coal.	290
5. Reports and Papers	290
6. Patent Matters	290
I. Visitors During January, 1972.	292
J. Trips, Visits, and Meetings during January, 1972	294
K. Requests for Information	294
III. WORK PLANNED FOR FEBRUARY, 1972.	295
A. Trips and Meetings Planned	295
B. Papers to be Presented	295
C. Visitors Expected.	295
APPENDIX A-1 MANHOURS	296
APPENDIX A-2 CUMULATIVE EXPENDITURES.	297
APPENDIX B GASIFY: A COMPUTER SIMULATION OF THE BCR TWO-STAGE SUPER-PRESSURE COAL GASIFIER.	B-298
APPENDIX C ADDITIONS TO ABSTRACT FILE, JANUARY 1972	C-309
APPENDIX D PROGRESS REPORT NO. 30	D-311

LIST OF TABLES

<u>Table</u>		<u>Page</u>
65	Results for Test Period 49-1.	261
66	Results for Test Period 49-2.	262
67	Comparison of Data From Life Test 2903.	264
68	Results of Cold Model Fluidization Studies.	274
69	Surplus Items Shipped to University of Utah From Contract 14-32-0001-1207 100 lb/hr PEDU	276
70	Size Data on Feed Coals and Chars From Listed PEDU Tests. . . .	280
71	Properties of Char Samples Obtained From Tests In 1-Inch Fluidizer.	282
72	Input Data Sheet for Coal Gasification Simulation Runs.	B-304
73	Sample Print-out From GASIFY.	B-308

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
81	Minimum Fluidization Velocity of As-received (-60 mesh) FMC Char.	256
82	Gas Processing Work Schedule for Calendar 1972.	258
83	BI-GAS Processing Systems	259
84	Plastic Pipe Apparatus for Cold Model Program	267
85	Minimum Fluidization Velocity for Chromic Oxide on Alumina Catalyst (BCR Lot 2904)	268
86	Minimum Fluidization Velocity for Molybdenum Oxide on Alumina Catalyst (BCR Lot 2903)	271
87	Minimum Fluidization Velocity of Air-Sand System for Methanation Cold Model Studies.	273
88	Section of Cooling Coil From Stage 1, After Test 58	277
89	Pressure Differential Across Fluidizing Bed As A Function of Air Flow for Chars From FEDU Test 23 (Elkol) and FEDU Test 54 (Lignite)	281
90	Three-inch Diameter Laboratory Air Elutriator	283
91	Air Elutriation Tests With Three FEDU Chars	284
92	Monthly Progress Chart, Expenditures, Brigham Young University.	289
93	Simplified Flow Diagram for Two-stage Super-pressure Gasifier	B-299
94	Flow Chart for Program GASIFY	B-307