

GAS GENERATOR RESEARCH AND DEVELOPMENT

Progress Report No. 1
March 1972
(FCR Report L-462)

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

April 25, 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
250 HOCHBERG ROAD
MONROEVILLE PA
15146
PHONE: 412 327-1600

April 1, 1972

Mr. George Fumich, Jr.
Director
Office of Coal Research
U.S. Department of the Interior
Washington, D. C. 20240

SUBJECT: Monthly Progress Report No. 7
OCR Contract No. 14-32-3001-1207

Dear Mr. Fumich,

The Phase II studies on process and equipment development continue according to schedule. Arrangements are being made for outside storage of the large-scale equipment from the Stage 2 PEDU (100 lb/hr). This equipment will be protected from the weather according to your instructions. The final summary report of the Stage 2 PEDU work has been prepared for final typing; a mailing date late in April has been scheduled.

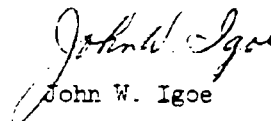
A large surplus blower (6,000 cfm) for the cold flow model studies was located and is now being installed. This size blower is needed to study simulated slag drainage from Stage 1.

Several promising catalysts have been found as a result of tests in the bench-scale methanator. These catalysts will be tested in the cold model of the PEDU. In the bench-scale work on char gasification, the small fluidized-bed unit showed interesting correlations between the dynamic system and the static system.

Detail engineering and solicitation of bids on equipment for the methanation PEDU continues. Approval to purchase has been received for a number of items and these are being ordered. Bids on the design of a fluidized-bed PEDU have been requested according to your instructions.

Preparations have been made to evaluate the bids received for construction and operation of the 5 ton/hr pilot plant.

Yours very truly,


John W. Igoe

JWI:ao
8006

TABLE OF CONTENTS

	<u>Page</u>
I. INTRODUCTION	364
A. Work Schedule	364
B. Monthly Progress Charts	364
II. PHASE II PROGRESS ACHIEVED DURING MONTH ENDING MARCH 25, 1972 .	364
A. Laboratory-scale Process Studies	364
1. Coal Composition and Beneficiation Studies, and Laboratory Pyrolysis of Coal (R. G. Moses, R. D. Saltsman, and J. E. Noll)	364
2. Fluidized-bed Gasification (E. K. Diehl and J. T. Stewart)	365
3. Gas Processing (M. S. Graboski)	369
4. Analytical Services (J. E. Noll)	408
5. Gas Chromatographic Procedures (J. E. Noll)	408
E. Stage 2 Process and Equipment Development Unit--100 lb/hr (R. J. Grace, E. E. Donath, and R. L. Zahradnik)	408
1. Dismantling of 100 lb/hr PEDU	408
2. Inspection of Stage 1 Refractories	408
3. Status of Phase II Summary Report	408
4. Future Work	408
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)	409
1. Further Model Tests	409
2. Determination of Reactivity of PEDU Chars	411
3. Development of Grindability Test for Low Density Chars	411
4. Future Work	417
D. Data Processing (R. K. Young and D. R. Hauck)	418
1. Automated Data Acquisition	418
2. Commercial Gasifier Modeling	418
3. Future Work	418
E. Engineering Design and Evaluation	418
1. BI-GAS Process	418
2. OCR/BCR Gasification--Power Generation	419

TABLE OF CONTENTS (continued)

	Page
F. Multipurpose Research Pilot Plant Facility (MPPF)	419
1. Materials Evaluation Program	419
2. Desk-top Model	419
3. Pollution Control Permits - Homer City, Pa.	419
G. Literature Search (V. E. Gleason)	420
H. Other	420
1. Prime Contract Matters	420
2. Outside Engineering and Services	420
3. Brigham Young University	420
4. FPC National Gas Survey - Economics of Manufacturing SKG From Coal	422
5. Patent Matters	424
I. Visitors During March, 1972	427
J. Trips, Visits, and Meetings During March, 1972	429
K. Requests for Information	429
III. WORK PLANNED FOR APRIL, 1972	429
A. Trips and Meetings Planned	430
B. Papers to be Presented	430
C. Visitors Expected	430
APPENDIX A-1 MANHCURS	431
APPENDIX A-2 CUMULATIVE EXPENDITURES	432
APPENDIX B ADDITIONS TO ABSTRACT FILE, MARCH, 1972	B-433
APPENDIX C KOPPERS PROGRESS REPORT NO. 32	C-437

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
104	Comparison of Fluidized-bed Reaction Rate Data With Derived Rate Equation for FMC Iron	367
105	Arrhenius Plot of Char Reactivity Data	368
106	Gas Processing Work Schedule for Calendar 1972	370
107	BI-GAS Gas Processing Systems	371
108	Extended Activity Data for Life Test 2904 Using Chromic Oxide on Alumina Catalyst (BCR Lot 2904)	403
109	Methanation Multitube Life Test Reactor Under Construction.	404
110	Methanation Multitube Life Test Reactor Unit	405
111	Housing of 6000 cfm Blower in Process of Installation . . .	410
112	Drive Train for 6000 cfm Blower	410
113	Rate of Weight Loss of 200 x 325 Mesh Materials at 1000 C in 100 Percent Steam	412
114	Rate of Weight Loss of 50 x 100 Mesh Materials at 1000 C in 100 Percent Steam	413
115	Rate of Weight Loss of 200 x 325 Mesh Materials at 1100 C in 100 Percent Steam	414
116	Rate of Weight Loss of 50 x 100 Mesh Materials at 1100 C in 100 Percent Steam	415
117	Results from Standard and Modified Test Procedures on Hardgrove Machine	416
118	Monthly Progress Chart, Expenditures, Brigham Young University	421

LIST OF TABLES

<u>Table</u>		<u>Page</u>
81	Data and Results for BSM Test 55, Period 1, Conducted at 835 F and 985 psig, Molybdenum Oxide Catalyst No. 2903	373
82	Summary of Results for BSM Test 55. Molybdenum Oxide Catalyst No. 2903	376
83	Summary of Results for BSM Tests 53, 54, and 55. Molybdenum Oxide Catalyst, Lot No. 2903	377
84	Data and Results for BSM Test 56, Period 1, Conducted at 825 F and 980 psig, Chromic Oxide Catalyst No. 2904	379
85	Summary of Results for BSM Test 56. Chromic Oxide Catalyst No. 2904	381
86	Data and Results for BSM Test 57, Period 1, Conducted at 830 F and 990 psig, Chromic Oxide Catalyst No. 2904	383
87	Summary of Results for BSM Test 57. Chromic Oxide Catalyst No. 2904	385
88	Data and Results for BSM Test 58, Period 1, Conducted at 820 F and 995 psig, Chromic Oxide Catalyst No. 2904	387
89	Summary of Results for BSM Test 58. Chromic Oxide Catalyst No. 2904	391
90	Data and Results for BSM Test 59, Period 1, Conducted at 845 F and 1000 psig, Chromic Oxide Catalyst No. 2904	392
91	Summary of Results for BSM Test 59. Chromic Oxide Catalyst No. 2904	395
92	Data and Results for BSM Test 60, Period 1, Conducted at 970 F and 990 psig, Chromic Oxide Catalyst No. 2904	397
93	Summary of Results for Test 60. Chromic Oxide Catalyst No. 2904	401
94	Summary of Methanation PEDU Equipment Items Having Firm Quotations	407
95	Results From Hydrogen Runs in 1 1/4-Inch Reactor	423
96	Revised Investment Breakdown Prepared by the Subgroup for Process Onsite Gas Costs, FPC National Gas Survey	425