c. Modifications of design of the 5 ton/hr pilot plant gasifier and associated equipment,

d. Completion of the first rough draft of the final summary report should be available early in January, 1972.

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)

Work proceeded during the month on the cold flow model studies in accordance with the schedule presented in Progress Report No. 92, page 3912. The model studies are expected to indicate both the location and size of nozzles and the shape of the reactor which will avoid excessive localizing of temperatures near the reactor walls. Stages 1 and 2 of the gasifier are to be studied independently at first, followed by tests of the two stages together.

The Stage 1 studies have been divided into three phases, now underway: (I) single-burner tests, (II) multiple-burner tests, and (III) multiple-burner tests plus simulated slag. The experimental requirements for the third phase are considered to be more difficult than those for the other phases. Provisional Phase III work is therefore being undertaken to solve some of the experimental problems so that Phase III data can be obtained immediately following Phase II tests.

The Phase II and III studies for Stage 1 of the two-stage gasifier were proceeding as planned and satisfactorily when it appeared expedient to review some of the assumptions on steam and char flow rates.

Computer studies, presently being concluded, indicated that somewhat higher char recycle rates and lower steam rates will be required than was initially expected. It appeared that these changes would not alter the mixing from the steam char nozzles. (The downstream mixing would probably be more rapid at the same steam velocity because the total mass of steam and char would be increased.)

It was suspected, however, that the char from Pittsburgh seam coal might present feeding difficulties because of the large particle sizes that were produced in the PEDU tests.

The PEDU products were unusual in their low bulk densities and large size compared to the size of the feed coal. It was decided, therefore, that chars from selected PEDU tests would be retrieved from storage and characterized.

1. Characterization of Chars from PEDU Tests 27 and 28: The results of operation during Test 27 were considered satisfactory for large-scale operation. The operation during Test 28 produced more char and a higher volatile content char than was considered satisfactory for large-scale operation. However, despite the differences in operation, most of the char collected during both tests was retained in the scrubber and removed as a "scrubber bottom product," while a smaller fraction was collected as a settling tank product.

Samples of both settling tank and scrubber bottom chars, therefore, were retrieved to determine their hardness, their operation in a laboratory fluidizing column and in a laboratory air elutriator.

a. Hardness Tests: When the char is first collected it contains coarse (plus 1/4 inch) aggregates that readily crumble to minus 16 mesh. These aggregates give the illusion that the bulk of the char is friable and therefore readily reduced to 100 percent minus 50 mesh.

To obtain a measure of the char hardness, the material was treated as if it were a coal. The present standard for determining coal grindability specifies a 16 x 30 mesh feed. Since little of the PEDU test chars fell within this size range, the procedure was modified to use finer char. For the initial hardness evaluation, a tentative standard was used in which 50 grams of 16 x 100 mesh coal is pulverized at 45 rpm in the standard Hardgrove machine. The grindability index is then calculated from the weight of minus 200 mesh coal produced from this initial charge according to the formula:

$$I = 16.3 + 7.13\ w$$

where w = weight of minus 200 mesh coal produced. Using this procedure, grindability indices were obtained as follows: PEDU Test 27, 29.1; and PEDU Test 28, 27.0.

These data should be taken only as indications that these PEDU chars are comparable in hardness to coal and that there would be little chance of devising a simple system for reducing their size in transit. Further tests are being devised so that the relative hardness of PEDU chars and proposed substitute chars for pilot plant start-up fuels can be determined.

b. Fluidization Tests: Samples of settling tank and scrubber bottom materials from both PEDU Tests were fluidized in a laboratory unit with an area of 5.27 sq cm. The settling tank fractions were readily fluidized but the scrubber bottom products were only partially fluidized. With the scrubber bottom products, there was an apparent fixed bed of coarse particles below the fluidized finer particles.

The fluidization data were plotted as shown in Figure 76 for PEDU Test 27 chars and Figure 77 for PEDU Test 28 chars. From the resulting plots, the minimum flow for fluidization (MFF) was obtained, and from this flow and the known area of the bed, the fluidizing velocity was calculated.

The apparent fluidization particle density, ρ_s, was then calculated from the fluidizing velocity and the average particle size for each char using the equation:

$$\rho_s = \frac{(\rho_p + \rho_g) \pm \sqrt{(\rho_p + \rho_g)^2 \pm 4\left(\rho_p\rho_g - \frac{2.80\times10^{-5} V_s \rho_p}{D^2}\right)}}{2}$$

where ρ_p = apparent density of the char
ρ_g = density of the gas (air)
V_s = minimum fluidization velocity
D = average diameter of the particles

The results are summarized in Table 64.

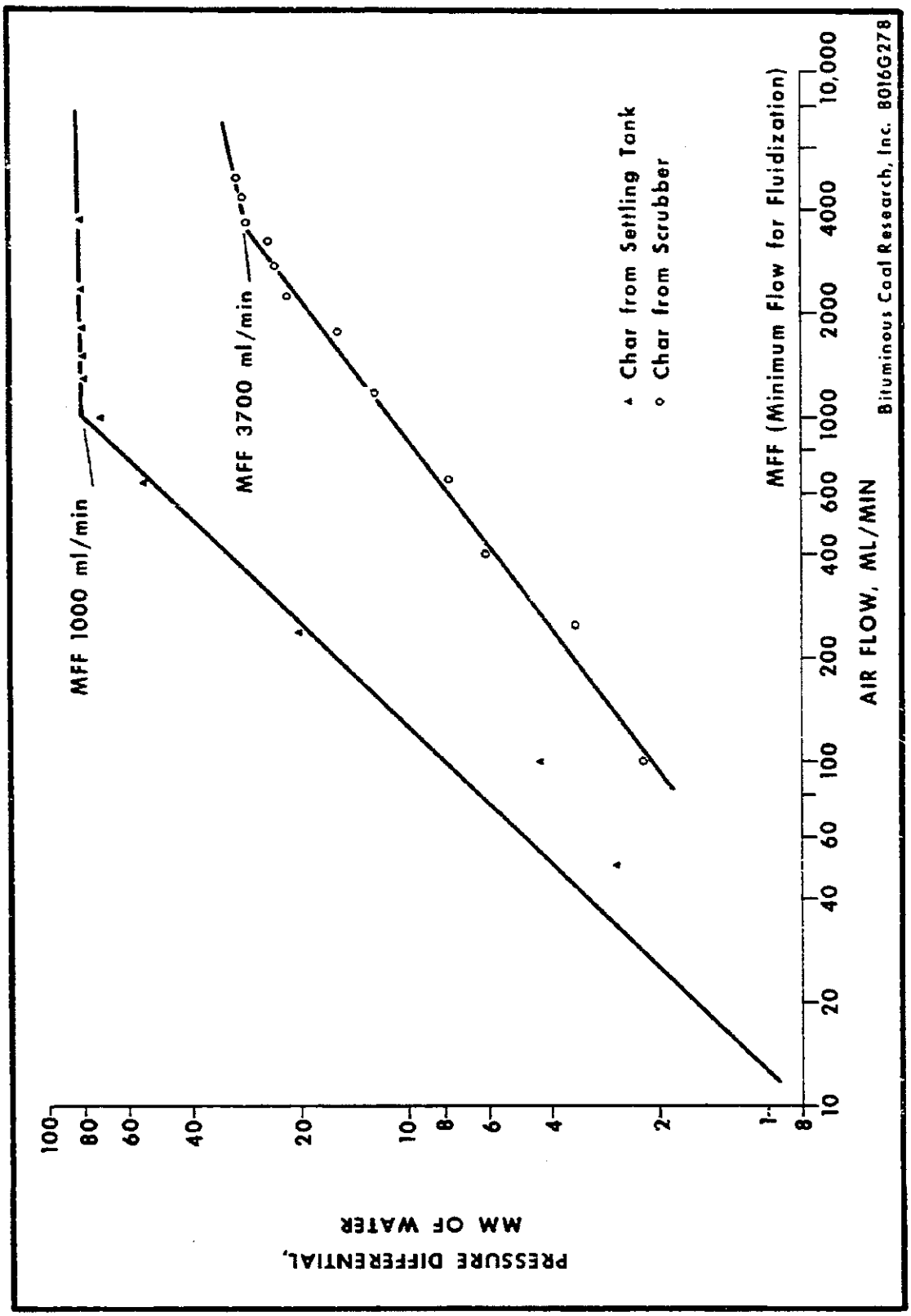


Figure 76. Pressure Differential across Fluidizing Bed as a function of Air Flow for Char from PEDU Test 27

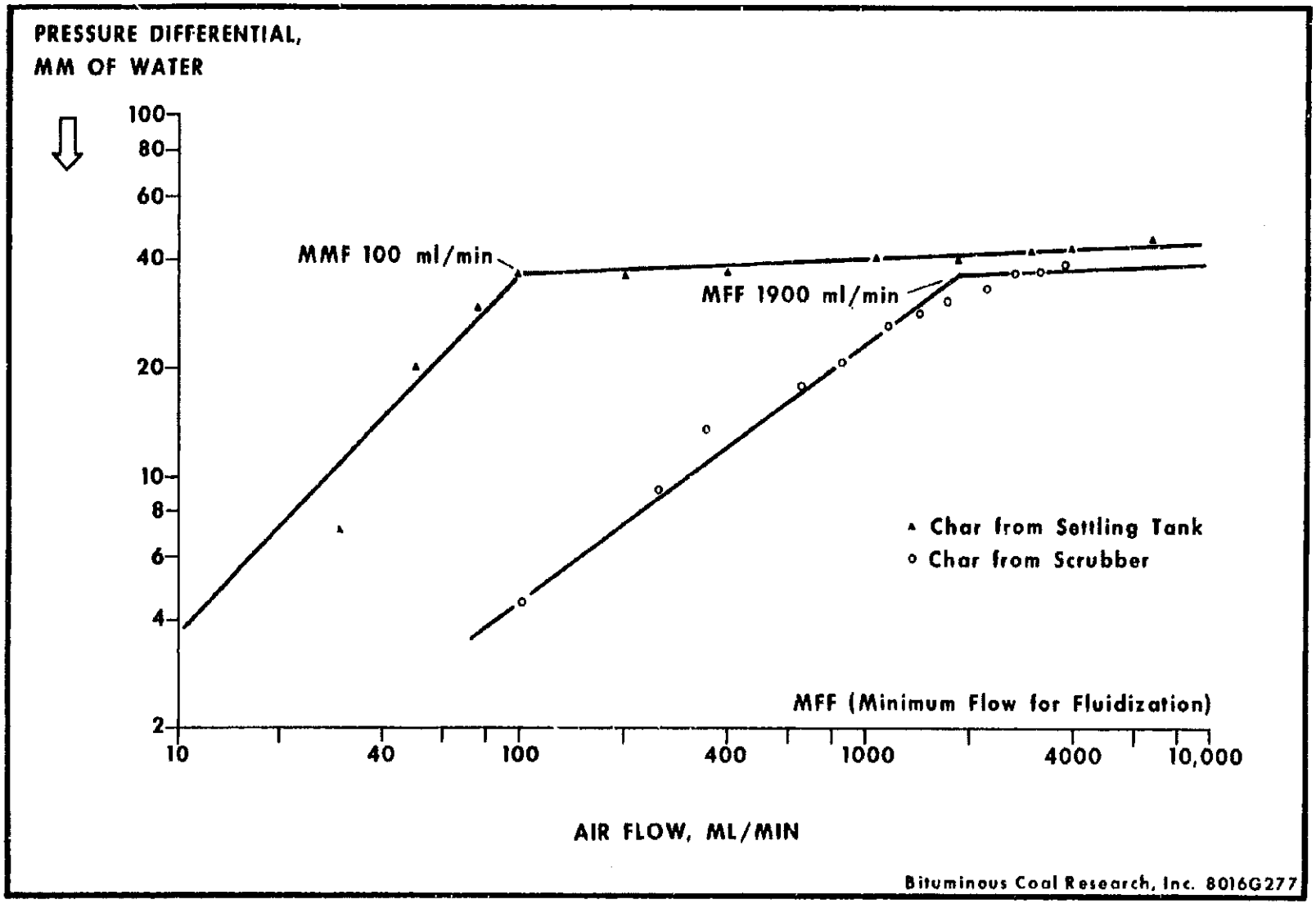


Figure 77. Pressure Differential across Fluidizing Bed as a Function of Air Flow for Char from PEDU Test 28

TABLE 64. SUMMARY OF DATA FROM BENCH-SCALE FLUIDIZATION TESTS WITH CHAR FROM PITTSBURGH SEAM COAL

Collection Point	PEDU Test No.	Av. Particle Size, mm	Apparent Density At Rest, gr/cm³	Properties at Minimum Fluidization				Calculated Particle Density	
				Apparent Density		Fluidizing Velocity			
				gr/cm³	lb/cu ft	cm/sec	ft/min	gr/cm³	lb/cu ft
Settling Tank	27	0.14	0.22	0.12	7.7	3.16	6.22	0.45	28.1
	28	0.14	0.19	0.12	7.7	0.32	0.63	0.23	14.4
Scrubber	27	0.31	0.15	0.17	10.4	11.71	23.05	0.31	19.3
	28	0.56	0.15	0.18	11.4	6.01	11.83	0.19	11.9

The data in Table 64 confirm the somewhat unusual properties of the PEDU test chars. The low apparent densities and the low densities at minimum fluidization indicate unusual conditions for the dense phase feeding of solids. For char samples collected from the scrubber, "rule of thumb" approximations indicate that the materials could only be transported at densities approaching 10.4 and 11.4 lb/cu ft, respectively, for Test 27 and 28 chars, and that these densities could only be maintained at transport velocities below 7.7 and 3.9 ft/sec, respectively. For the more realistic Test 27 char, the steam/char weight ratio at 900 F and 1,000 psig would be 0.06, significantly lower than the 0.5 ratio expected under normal operation. These data indicate that this char can probably be effectively transported at higher than the minimum estimated transport velocity and at less than the minimum density. These findings are fortunate since the saltation velocity of the larger char particles (25 percent are coarser than 0.5 mm) would probably exceed 7.7 ft/sec and therefore might not allow effective transport under the rule of thumb minimum conditions.

2. Future Work: Future work will involve characterization of char from PEDU Tests 27 and 28 (using Pittsburgh seam coal), and chars from PEDU tests with Elkol and lignite. Characterization will include: bench-scale fluidization tests, elutriation tests in a 3-inch elutriation column, and reactivity tests in the thermo-gravimetric balance.

D. Data Processing (R. K. Young and D. R. Hauck)

1. Commercial Gasifier Modeling: As indicated in Progress Report No. 3, subroutine GASIFY was utilized to generate gasifier simulations on each of four coals: Pittsburgh seam, Elkol, West Kentucky No. 11, and lignite.

The purpose of these computer simulation runs was to determine general limits of operability for the two-stage gasifier. More specifically, the objective was to determine the minimum total carbon yield in Stage 2 of the gasifier which would permit slagging conditions (approximately 3000 F) in Stage 1.

As indicated by Figure 78, the Stage 1 temperature is a function of the carbon-oxygen ratio and the weight of ash in Stage 1. Figure 79 shows that the oxygen required for material and energy balances is a function of the coal type, char withdrawal factor, and the methane yield.

In order to determine operability limits for the gasifier by means of Figures 78 and 79, it is necessary to first calculate carbon and ash feed rates into Stage 1 by means of the following expressions:

$$\text{Pounds carbon into Stage 1} = \frac{(\text{1-withdrawal})\ (\text{1-Y CH}_4\text{-Y CO})\ (\text{pounds C in the coal})}{\text{1- (1-withdrawal)(1-YC)}}$$

$$\text{Pounds ash into Stage 1} = \frac{(\text{1-withdrawal})\ (\text{pounds ash in the coal})}{\text{1- (1-withdrawal)(1-YC)}}$$

where: withdrawal = char withdrawal factor
Y_{CH_4} = methane yield
YCO = Stage 2 carbon oxides yield
YC = Stage 1 carbon oxides yield

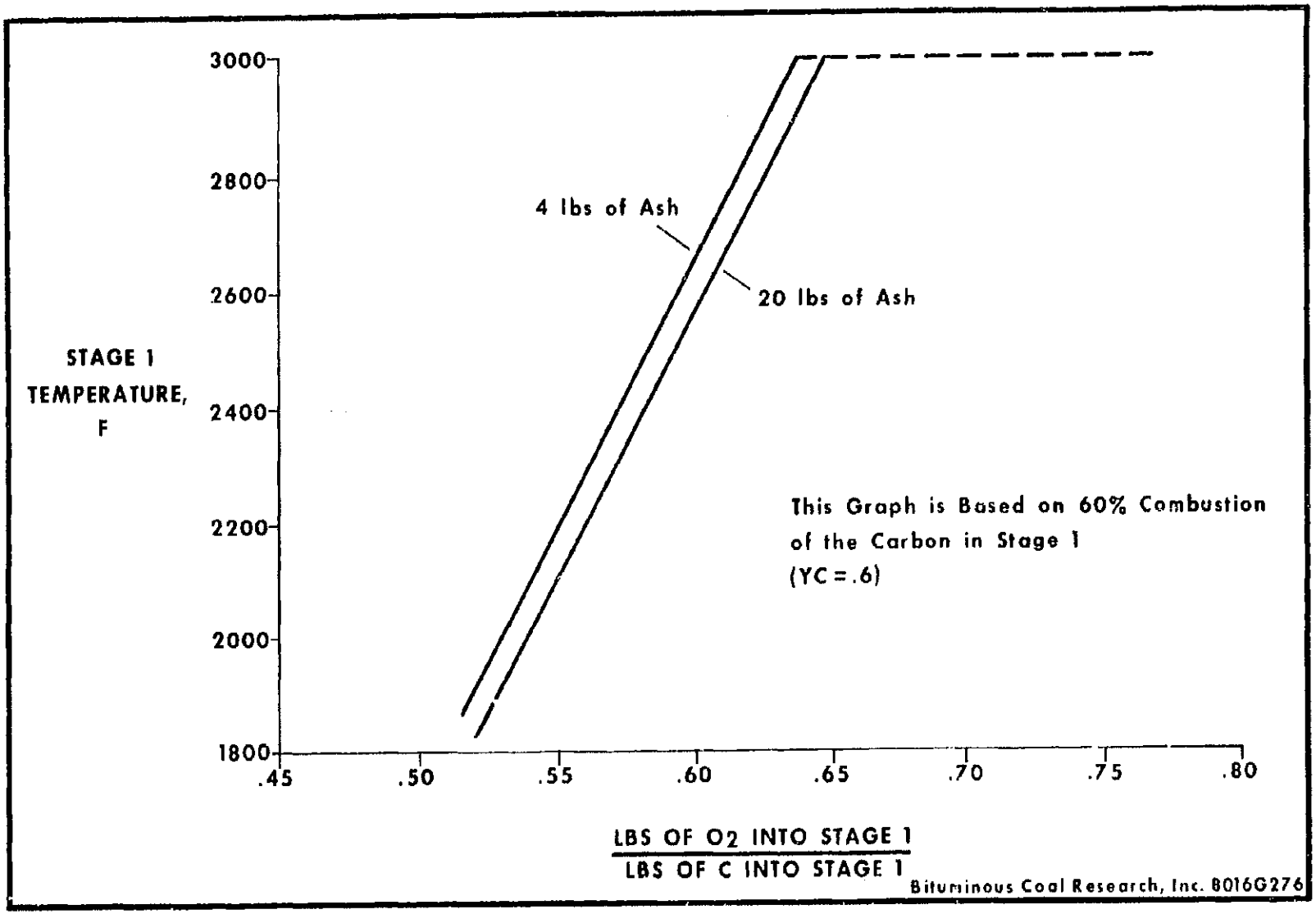


Figure 78. Temperature Profile in Stage 1 of the Two-stage Gasifier

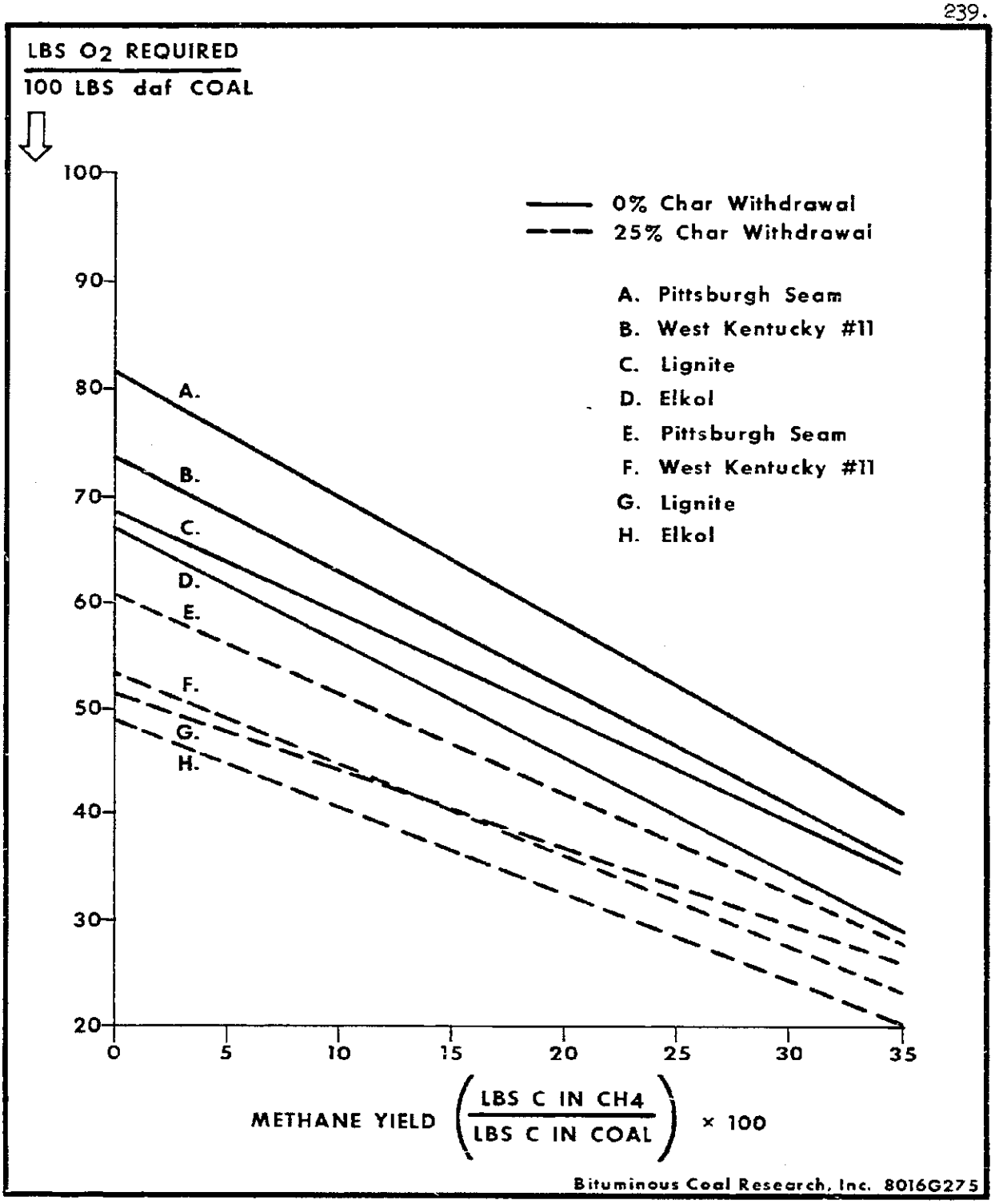


Figure 79. Oxygen Requirement for Material and Energy Balances in the Two-stage Gasifier

For example, if the Stage 2 methane yield and carbon oxides yield were 25 and 10 percent, respectively, for Pittsburgh seam coal, and withdrawal were zero percent, the Stage 1 temperature would be found as follows:

a. From Figure 79 the oxygen rate would be 53 pounds.

b. From the above expressions, 91 pounds of carbon and 13 pounds of ash would be fed into Stage 1.

c. From Figure 78 the resulting Stage 1 temperature would be approximately 2500 F.

This temperature is obviously too low and should be raised to 3000 F (to obtain slagging conditions) by increasing the Stage 2 carbon oxides yield and repeating steps a, b, and c above until satisfactory results are obtained.

2. Automated Data Acquisition: Delivery of the PDP8/E computer and peripherals is expected during January, 1972.

3. Subroutine ENERGY: Subroutine ENERGY was utilized to generate 18 different product gas compositions for a range of methanation feed gases at varied recycle ratios.

4. Future Work: Plans for the next report period include:

a. Set up PDP8/E computer and peripherals.

b. Generate simulation runs with subroutine GASIFY as required.

c. Describe in detail the complete calculational scheme presently utilized in computer subroutine GASIFY.

d. Re-analyze the oxygen, methane yield, and withdrawal relationship (Figure 79) to determine a general equation which would permit oxygen estimates at any desired char withdrawal rate.

E. Engineering Design and Evaluation

1. BI-GAS Process: The commercial gasifier computer program (subroutine GASIFY) was used to generate data on four different coals: Pittsburgh seam, Elkol, West Kentucky No. 11, and lignite. Yields of carbon oxides and methane were set at various levels.

The objective of this work was to determine operability limits for the two-stage gasifier under slagging conditions (3000 F) in Stage 1. An example of these calculations was described in Section II. D. 1. of this report. Briefly, the method involves determination of carbon and ash feed rates into Stage 1 for selected Stage 2 yields of methane and carbon oxides. This information is utilized to determine oxygen requirements and subsequently the Stage 1 operating temperature.

2. OCR/BCR Gasification--Power Generation: Discussions continue at low key with industry on this application of the two-stage gasifier.

3. Fischer-Tropsch System: No further development occurred in this area this month, and no further work is contemplated currently.

F. Multipurpose Research Pilot Plant Facility (MPRF)

The first draft of the Engineering Bid Package for the 5 ton/hr oxygen-blown system (BI-GAS Process) and the MPRF general facilities was received from Koppers on December 3, 1971. The bid package was revised on December 17, 1971, and the first mailing of the report to prospective bidders was made December 29, 1971 (See Koppers' Progress Report No. 29 in Appendix B.)

1. AGA Materials Evaluation Program: A Task Group on Materials Design Data for Coal Gasification Process Equipment was organized in November by AGA and OCR. A subcommittee Work Group was appointed to formulate programs aimed at developing useful engineering data concerned with potential material problem areas. The subcommittee met on December 9, 1971, at the Flying Carpet Motel in Pittsburgh, Pennsylvania. The purpose of the meeting was to review three reports submitted by Bituminous Coal Research, Inc., Institute of Gas Technology, and Consolidation Coal Co. which contained individual materials of construction, specific environmental conditions, and potential corrosion areas common to each of the three coal gasification processes.

A report will be written by the Work Group and distributed to the Task Group members for a meeting in Pittsburgh, Pennsylvania set for January 26, 1972.

2. Model Status: The process pilot plant model (1/4 inch = 1 foot) is essentially complete except for minor tagging of equipment sections and for adding identification name plates to both models. The overall site model (1 inch = 20 feet) is about 75 percent complete, and both models should be available for delivery to Bituminous Coal Research, Inc., on or about January 7, 1972.

3. Reports and Papers: The revised manuscript of the paper entitled "Gasification of Lignite by the BCR Two-stage Super-pressure Process," by R. J. Grace, R. A. Glenn, and R. L. Zahradnik, was returned to INDUSTRIAL & ENGINEERING Quarterlies. Publication in I & EC Process Design & Development is expected in January, 1972.

4. Patent Matters: Worthwhile ideas continue to be written up as invention disclosures for submission to OCR for consideration.

a. OCR-866 and OCR-1078: A U.S. patent application based on the new process concept (E. E. Donath, December 11, 1970) has been filed and given Serial Number 182,652. The application, entitled "Gasification of Carbonaceous Solids," contains nine claims. The appropriate document assigning rights to the U.S. Government was filed with the application on September 22, 1971. BCR has applied for and received a license for foreign filing; however, to date the recording particulars have not been received from the Patent Office.

b. New Invention Disclosures: Formal Invention Disclosures (Form DI 1217) for six individual BCR suggestions were submitted to OCR on May 7, 1971. These were listed in Progress Report No. 1.

Inasmuch as 90 days have elapsed since the submission of these invention disclosures, in accordance with the patent clause under Contract 14-01-0001-324, BCR is proceeding, as reported last month, to develop patent applications for filing in the U.S., first obtaining the approval of the Solicitor's Office. Action taken on these disclosures is as follows:

(1) OCR-1859: As stated above, this Invention Disclosure (BCR Suggestion 178) was submitted to OCR on May 7, 1971. In reviewing this disclosure, entitled "Low-Sulfur Char from Coal Gasification," it was decided to combine it with OCR-1078, "Gasification of Carbonaceous Solids," the application for which has already been filed.

(2) OCR-1860 and OCR-1861: OCR Disclosures 1860 and 1861 have been combined into a single patent application entitled "Two-Stage Gasification of Pretreated Coal." A copy of this application was mailed to Mr. Howard Silverstein, Branch of Patents, on December 6, 1971, for his review, and, if found satisfactory, subsequent authorization for filing by BCR. The appropriate document assigning rights to the U.S. Government has been prepared.

(3) OCR-1862: A U.S. application has been prepared on OCR Disclosure 1862 entitled "Three Stage Gasification of Coal." A copy of this application was sent to Mr. Howard Silverstein, Branch of Patents, on December 13, 1971, for his review and approval for filing by BCR. The appropriate document assigning rights to the U.S. Government has been prepared.

(4) OCR-1863: A U.S. application has also been prepared on OCR Disclosure 1863 entitled "Two-stage Downflow Gasification of Coal." A copy of this application was forwarded to Mr. Howard Silverstein, Branch of Patents, on December 13, 1971, for his review and approval for filing by BCR. The appropriate document assigning rights to the U.S. Government has been prepared.

(5) OCR-1864: A U.S. application has been prepared on OCR Disclosure 1864 entitled "Two-Stage Gasification of Coal with Forced Reactant Mixing and Steam Treatment of Recycled Char." A copy of this application was mailed to Mr. Howard Silverstein, Branch of Patents, on December 8, 1971, for his review and approval for filing by BCR. The appropriate document assigning rights to the U.S. Government has been prepared.

G. Literature Search (V. E. Gleason)

Annotated literature references completed during the month are listed in Appendix C.

H. Other

1. Prime Contract Matters: An initial list of surplus equipment was supplied OCR on September 30, 1971. Other lists are being prepared and will be submitted in January. Early action is requested because of limited storage facilities.

2. Outside Engineering and Services: In addition to working on the bid package for the MPRF, Koppers continues to provide engineering assistance as required and as reported above.

Copies of proposed Amendment No. 7 to Subcontract No. 2 signed by Koppers were submitted to OCR for approval on October 20, 1971. Action by OCR on the request has not been received.

3. Brigham Young University: The project entitled "Study of High Rate, High Temperature Pyrolysis of Coal" with joint funding by Brigham Young University and BCR is now in its ninth month. Figure 80, Monthly Progress Chart, Expenditures, shows the current budget status. The letter report of progress by BYU is as follows:

> During December the 3/4 inch reactor and the new quench system were assembled. The latter permits diversion of the flow from the reactor into a small sampling container. Two checkout runs have been performed with the new equipment.
>
> The quench system operated perfectly. Collection of the effluent quench water from the reactor for a timed period is made. Then the char is separated from the water by filtration, dried, weighed, and analyzed for ash. Using these data along with the ash analysis on the coal, the coal feed rate and the percent of the coal gasified are calculated.
>
> It was found that the 3/4 inch reaction chamber required modification. The chamber was designed with a machineable ceramic insulator at the point where the coal is injected. This insulator cracked and eroded during the checkout tests. Replacement of this section of the reactor with pure alumina tube, as is used for the remainder of the reaction chamber, is planned.
>
> Plugging in this reactor by coal caking to the walls as in the 1-1/2 inch reactor was also encountered. Future tests will be made using an inert solid as a diluent.
>
> The needed modifications should be completed during the first two weeks of January. The new chromatograph has been received and is being placed into operation.

I. Visitors During December, 1971

December 2, 1971

Mr. Thomas J. Eisenman
Pennsylvania Electric Co.
1001 Broad Street
Johnstown, Pennsylvania

December 3, 1971

Mr. E. Romano
Miss Yvonne Forester
KDKA-TV
Pittsburgh, Pennsylvania

Mr. J. F. Farnsworth
Mr. J. Robb
Mr. D. M. Mitsak
Mr. S. M. Tymiak
Koppers Company, Inc.
Koppers Building
Pittsburgh, Pennsylvania

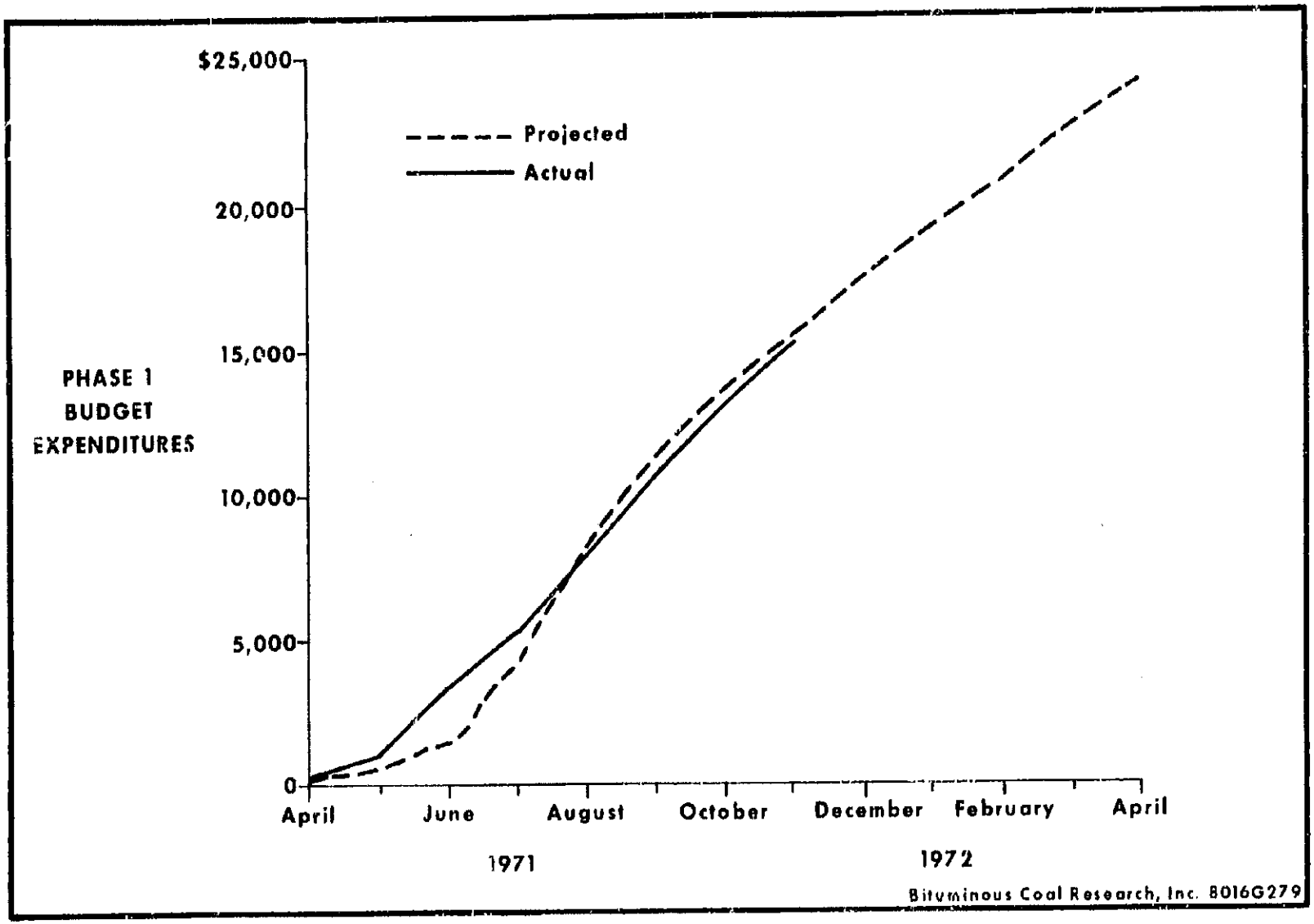


Figure 80. Monthly Progress Chart, Expenditures Brigham Young University

December 9, 1971

Mr. William G. Cronk
The H. K. Ferguson Co.
One Erieview Plaza
Cleveland, Ohio 44114

December 10, 1971

Mr. S. M. Tymiak
Mr. D. M. Mitsak
Koppers Company, Inc.
Koppers Building
Pittsburgh, Pennsylvania

Mr. Edward C. Johnson
Dr. William Yeh
Foster Wheeler Corporation
110 S. Orange Avenue
Livingston, New Jersey 07039

December 14, 1971

Mr. R. Dean Patterson
Mr. Francis W. Powers
Mr. E. B. Dunkak
Turbo Power & Marine Systems
United Aircraft Corporation
Farmington, Connecticut 06032

December 20, 1971

Mr. Douglas T. King
Dr. Ab Flowers
American Gas Association
1515 Wilson Boulevard
Arlington, Virginia

December 21, 1971

Mr. A. Howard Smith
Mr. Paul Towson
Mr. Jack Ryan
Office of Coal Research
U.S. Department of the Interior
Washington, D. C. 20240

December 22, 1971

Mr. H. F. Leonard
Mr. J. W. Lindstrom
Mr. D. M. Mitsak
Mr. K. Whiteacre
Koppers Company, Inc.
Koppers Building
Pittsburgh, Pennsylvania

December 28, 1971

Mr. J. M. Bialosky
Koppers Company, Inc.
Koppers Building
Pittsburgh, Pennsylvania

J. Trips, Visits, and Meetings During December

December 6, 1971	Office of Coal Research U.S. Department of the Interior Washington, D. C. 20240	R. A. Glenn
December 9, 1971	Meeting of AGA Materials Design Task Group Flying Carpet Motel Pittsburgh, Pennsylvania	R. A. Glenn J. P. Tassoney

K. Requests for Information

Mr. Nicholas Ricciuto
Dept. of Chemical Engineering
University of Western Ontario
London, Ontario, CANADA

III. WORK PLANNED FOR JANUARY, 1972

The work planned for January will be basically a continuation of the on-going program which has been underway for the past few months.

The final summary report on the coal composition and beneficiation studies is in the final editing process and will be completed this month.

The review of the bid package from Koppers for the fluidized-bed gasification PEDU will continue. Suggested design changes for the PEDU will be evaluated to determine whether their inclusion will add substantially to the research program. Reactivity studies of the Consol char have been completed, and a summary report of the procedure and development of the reactivity equations will be drafted. Chars obtained from the Stage 2 PEDU will be evaluated.

Tests will continue in the bench-scale methanator to evaluate suitable catalysts. Emphasis will be placed on non-nickel catalysts as a result of previous experience. Soliciting of bids for equipment for the methanation PEDU is planned, as well as continued work on the model studies.

Data on the Stage 2 PEDU (100 lb/hr) have been compiled and the first draft of a final summary report to cover work completed since September 20, 1970, has been written. Editing of the report will begin this month.

Tests in Phases II and III of the cold flow model studies for the 5 ton/hr two-stage gasifier will begin. Construction of equipment for Phases IV, V, and VI (Stage 2 tests) is also planned. In addition, studies of various chars will be continued.

Gas yield expressions will be revised and incorporated into subroutine GASIFY in order to obtain simulation runs for Pittsburgh seam, Elkol, and lignite coals. Operation of the PDP8/E computer will continue to be studied and the equipment will be set up as soon as it is received. Data from simulation runs will be evaluated.

A. Trips and Meetings Planned

January 19, 1972	Bidders' Conference BCR Laboratory Monroeville, Pa.	R. A. Glenn et al.
January 26, 1972	AGA Materials Design Task Group Meeting Pittsburgh, Pa.	R. A. Glenn J. P. Tassoney

B. Papers to be Presented

None

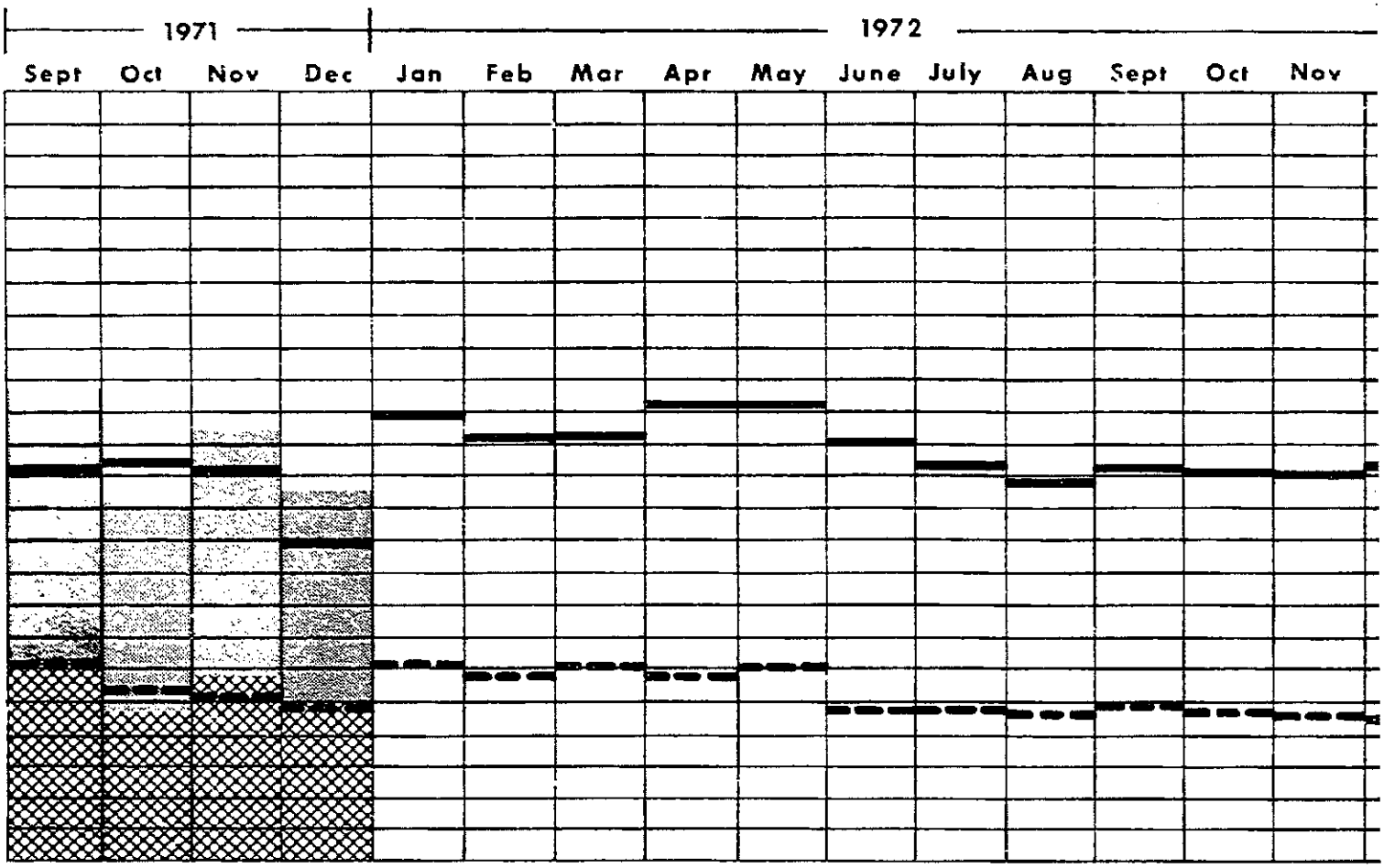
C. Visitors Expected

January 7, 1972	Mr. D. R. Miller Processes Research, Inc. 2912 Vernon Place Cincinnati, Ohio 45219

January 11, 1972	Fluor Corporation 2500 S. Atlantic Blvd. Los Angeles, California
January 12, 1972	Mr. Walter Linde Lotepro Corporation 801 Second Avenue New York, N. Y.
January 13, 1972	Mr. John Lutz Scientific Design Co., Inc. 2 Park Avenue New York, N. Y.
January 14, 1972	Burns & Poe 700 Kinderkamack Road Oradell, New Jersey 07649

RAG:v
1-14-72
8006

MANHOURS


1971
1972
Sept
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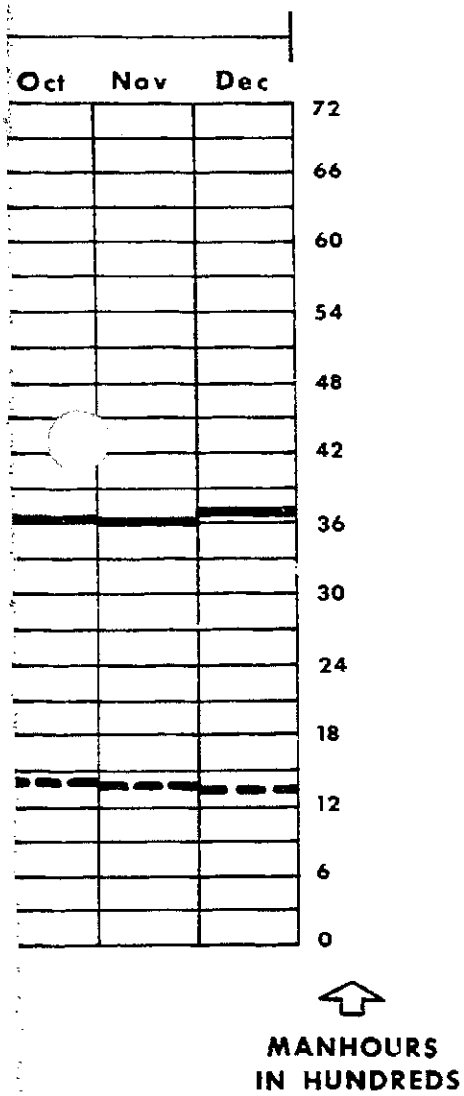
MONTHLY PROGRESS CHART
PART 1 MANHOURS

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

OFFICE OF COAL RESEARCH
DEPARTMENT OF THE INTERIOR

CONTRACT NO. 14-32-0001-1207



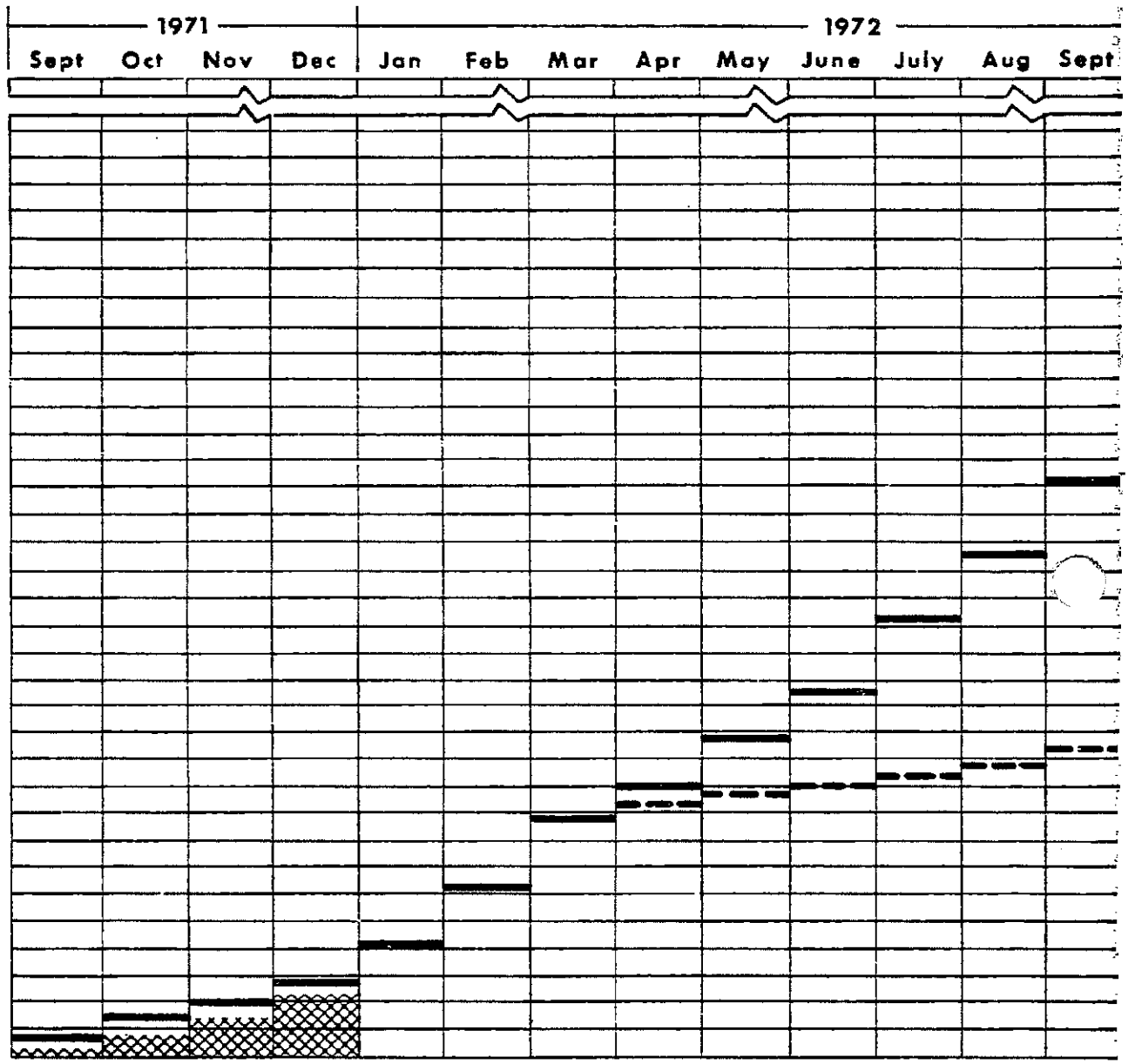
Predicted Professional and Non-professional

Predicted Professional

Actual Non-professional

Actual Professional

2



MONTHLY EXPENDITURES (All Costs, in Dollar

		Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	M
Monroeville	Predicted	129,991	129,991	129,991	129,991	323,486	382,228	558,454	105,058	86,2
	Actual	63,610	121,696	146,834	144,590*					
Homer City	Predicted								154,000	215,7
	Actual									
Total	Predicted	129,991	129,991	129,991	129,991	323,486	382,228	558,454	259,058	
	Actual	63,610	121,696	146,834	144,590*					

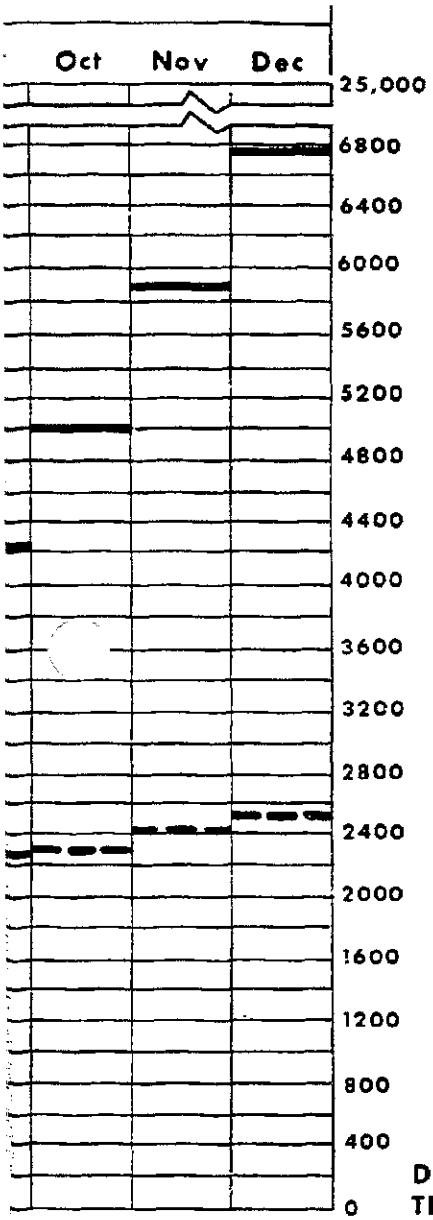
CUMULATIVE EXPENDITURES

MONTHLY PROGRESS CHART
PART 2 EXPENDITURES

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

OFFICE OF COAL RESEARCH
DEPARTMENT OF THE INTERIOR

CONTRACT NO. 14-32-0001-1207



Expenditures, Cumulative

- Actual, Monroeville
- Actual, Homer City

Predicted Expenditures, Cumulative

- Total, Monroeville and Homer City
- Monroeville

	June	July	Aug	Sept	Oct	Nov	Dec
	86,240	65,813	65,813	74,746	62,273	62,273	62,275
00	280,400	444,300	444,300	444,400	760,600	760,600	760,800
3	,640	510,113	510,113	519,146	822,873	822,873	823,075

* Estimated

2

APPENDIX B

PROGRESS REPORT #29

BITUMINOUS COAL RESEARCH, INC.
COAL GASIFICATION

DECEMBER 1971

KOPPERS CONTRACT 2415

I. STATUS OF CONTRACT

A. PILOT PLANT ENGINEERING BID PACKAGE

(1) A draft of the Bid Package for the pilot plant, Volumes I through V as tabulated in Koppers letter 2415-C212 dated November 9, 1971, was submitted for customer's review and approval on December 3, 1971.

(2) BCR requested Koppers to revise Section H of Volume III of the Bid Package by deleting design data and other references pertaining to Lurgi/Parsons Purisol Acid Gas Removal Process. For additional information refer to Conference Report 204, Part A. All drawings and specifications of the Bid Package were revised accordingly and the revised version of Volumes I through V was resubmitted to BCR on December 22, 1971.

(3) Koppers is now completing Volume VI of the Bid Package consisting of:

(a) Engineering, Procurement and Construction Services (Description)

(b) Proposed Progress Schedule

(c) Cost Estimates - (Based on Koppers internal estimating procedures only, since Koppers was refused permission to solicit price quotations from outside suppliers and subcontractors - as requested in Koppers letter dated November 18, 1971)

(d) Proposed Cash Flow Schedules

Additional information on Volume VI is reported in Conference Report 203. Volume VI is scheduled for transmittal to BCR on January 14, 1972.

B. ENGINEERING ASSISTANCE AND RECOMMENDATIONS FOR PEDU PROGRAM

A meeting (Conference Report 205) was held at BCR offices December 22, 1971 to discuss the status of Char Fluidized Bed Gasification PEDU and Fluidized Bed Methanation PEDU and the continuation of engineering by Koppers for these units.

At the meeting Koppers was instructed to (1) proceed with finalization of methanation PEDU specifications and (2) prepare preliminary engineering and investment cost information relative to adapting the char fluidized bed unit for coal feed and the addition of a second stage fluid bed.

As requested by BCR, Koppers submitted December 30, 1971 an outline of the functions to be performed by Koppers under the detail engineering phase of the PEDU's. After review of this information, BCR will advise Koppers when to proceed and the scope of the detail engineering to be accomplished.

II. CONTRACT EVALUATION

Four (4) copies of Amendment No. 7 to Amended Subcontract No. 2, including Appendices I through VIII, signed by Mr. J. D. Rice, Vice President, Engineering and Construction Division, Koppers Company, Inc., were transmitted to BCR in our letter C-183 dated October 18, 1971. Receipt of these copies was acknowledged by BCR in their letter dated October 18, 1971.

Koppers completed the Bid Package (Volumes I through V) in accordance with the scope of work stated in proposed Amendment No. 7 (par. III. A. 5 of Appendix I). The first draft of the Bid Package was delivered to BCR for their approval December 3, 1971. Upon completion of revisions requested by BCR, the final version of the Bid Package was resubmitted to BCR December 22, 1971.

J. F. Farnsworth
Project Manager

SMT:jp

APPENDIX C

ADDITIONS TO ABSTRACT FILE, DECEMBER 1971

Mills, G. A., "Gas from coal; fuel of the future," Environ. Sci. Technol. 5 (12), 1178-82 (1971). 540.000 Journal

The technology involved in producing methane from coal is reviewed.

"SNG: How much, at what cost, how soon in U.S.?" Oil & Gas J. 69 (49), 31-6 (1971). 540.000 71-9

The review of company projects in this article covers the present status of coal gasification technology as well as the planned use of the British Gas Council's Catalytic Rich Gas process, the processes of Lurgi Gesellshaft fuer Mineralcoeltechnik m.b.h., and the Methane Rich Gas process of the Japan Gasoline Co. for gasification of liquid hydrocarbons.