

## SECTION 2. INTRODUCTION

On December 20, 1963, a 3-year program of gas generator research and development was initiated by Bituminous Coal Research, Inc., for the Office of Coal Research under Contract No. 14-01-0001-324.

This research was conducted concurrent with that by others for the Office of Coal Research on specific gasification processes including that being conducted by the Institute of Gas Technology on the Hydrogasification, The M. W. Kellogg Company on the Molten Salt Bath, and the Consolidation Coal Company on the CO<sub>2</sub> Acceptor processes.

### A. Purpose and Objective of Overall 3-year Program

The general purpose and primary objective of this program was directed toward a systematic research and development investigation to develop one or more economic systems for gasifying coal and/or coal-derived materials to produce: (a) fuel gas; (b) synthesis gas; and, (c) gas suitable for transporting coal or char in a pipeline.

The systems envisioned were those producing gases ranging in heating value from about 150 to 350 Btu per cubic foot, with a gas at the upper end of this range (250 to 350 Btu per cubic foot) being capable of conversion by water-gas shift and methanation to a high Btu gas by means of processes being developed by others.

### B. Scope and Research Procedure for Overall 3-year Program

The scope, research procedure, and order of work for the project were based on the detailed research program proposal (RPP-74R2) submitted by Bituminous Coal Research, Inc., October 29, 1962, and as further outlined in Contract No. 14-01-0001-324. In brief, the research program requiring an estimated 3 years for completion, was to consist of two main phases of work:

Phase I consisting of a review of the current "state of the art" with respect to coal gasification processes, and

Phase II comprising further research and development in laboratory-scale equipment to develop data and information needed for design of pilot-scale equipment for processes recommended in Phase I and approved by the Office of Coal Research. Also, as a part of Phase II and concurrent with the work on developing design data and information, bench-scale efforts were to be directed toward obtaining basic data to support the overall program.

### C. Nature and Scope of Phase I

1. Objective: The specific objective of Phase I was to make recommendations, based on a review of the current "state of the art," concerning three coal-gas generating systems for further research and development.

2. Nature, Scope, and Order of Work: In achieving the specific objective of Phase I, a review was made of the "state of the art" with respect to coal gasification processes by means of a comprehensive literature search, field interviews, and plant visits. This review included field interviews in Europe as well as in the United States.

The data and information collected during this review were then studied and the more promising processes subjected to an economic evaluation to establish a basis for the final selection of processes worthy of further research and development. As the evaluations and reviews were made, attention was also given to possibilities for further research which might contribute in one way or another to the successful achievement of the overall objectives of the program. Finally, based on results obtained in all activities of Phase I, recommendations have been made regarding the three most promising processes considered worthy of further research and development under Phase II.

#### D. Project Technical Personnel

The following members of the BCR research staff participated in the conduct of the survey and the evaluation of research opportunities:

R. A. Glenn, Manager, Chemical Division  
E. E. Donath, Research Consultant  
R. J. Grace, Project Engineer  
R. D. Harris, Project Engineer  
W. T. Beery, Literature Chemist

All activities under Phase I were conducted in cooperation with the Blaw-Knox Company, Pittsburgh, Pennsylvania, an engineering firm approved by the Office of Coal Research to serve as subcontractor to Bituminous Coal Research, Inc. L. W. Alberts and E. J. Vidt, together with other Blaw-Knox staff, were assigned to the project.

#### E. Nature of Present Report

This report summarizes the results achieved on Phase I of the overall program, presents conclusions regarding the various processes evaluated, describes opportunities for further research, and makes recommendations concerning gas generating systems considered worthy of further research and development under Phase II.

In Section 1, a brief summary of the report is presented together with specific recommendations regarding further research and development. The Introduction in Section 2 presents the overall purpose, and scope of the overall program and of Phase I together with the project personnel. The data and information collected on available and proposed coal gasification processes are presented in Section 3. A general discussion of factors affecting the economics of gasification is presented in Section 4. The results of the initial screening of proposed gasification processes are given in Section 5, together with the list of processes finally selected for evaluation as projected to full-scale operation. The basis, procedure, and results of the evaluation of selected processes as projected to full-scale commercial operation are given in Sections 6, 7, and 8. Finally, in Section 9, a brief discussion is given of various opportunities for further research and equipment development that have been recognized during the conduct of the program.

Supporting data and information are included, for convenient reference, as appendixes.