

SECTION IV. TASK 4. APPLICATION OF INTEGRATED CODES

Objective

The objectives of this task are to evaluate the integrated comprehensive codes for pulverized coal and fixed-bed reactors and to apply the codes to selected cases of interest to METC.

Task Outline

This task will be accomplished in two subtasks, one for the entrained-bed lasting 45 months and one for the fixed-bed lasting 36 months. Each of these subtasks will consists of three components: 1) Simulation of demonstration cases on BYU computers; 2) Implementation on a work station at AFR; and 3) Simulation of demonstration cases on the workstation.

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**IV.A. SUBTASK 4.a. - APPLICATION OF GENERALIZED PULVERIZED
COAL COMPREHENSION CODE**

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Objective

The objectives of this subtask are 1) to implement the comprehensive entrained-bed code developed in Task 3 at AFR and 2) to simulate reactors of interest to METC.

Accomplishments

No work was conducted on this subtask during the past quarter.

Plans

No work is planned for this subtask during the next quarter.

IV. B. SUBTASK 4. B. - APPLICATION OF FIXED-BED CODE

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Objectives

The objective of this subtask is to apply the advanced fixed-bed code developed in Subtask 3.b to simulate fixed-bed gasifiers of interest to METC.

Accomplishments

Fixed-bed data collection

During the last quarter, work continued on collecting fixed-bed design and test data by direct contact with the organizations and the individuals involved in fixed- or moving-bed gasification or combustion research or in research on non-reacting fixed- or moving-beds. Seventy-eight answers to the fixed-bed data questionnaire have been received, thirty-four have been positive, and eighteen sets of data have been obtained to date. However, some of the most important data sets have not yet been obtained. Requests for data were sent again to a number of individuals and organizations who had not responded to the first request. It is known that several U.S. coals have been tested in SASOL, South Africa, between 1974 and 1982: Kentucky No. 9 bituminous, Powder River Basin subbituminous, Texas lignite, and North Dakota lignite (Simbeck et al., 1983). The test data have been requested from SASOL, Fluor Engineering, and The Department of Energy and an answer has been received from SASOL. SASOL has referred the request to Lurgi, which in turn has declined to provide the test data, claiming confidentiality. Great Plains Gasification Project is another important potential source of test data. The test data have been requested but only a suggestion to obtain "Great Plains Coal Gasification Plant Public Report" has been received. Help from DOE/METC is being sought in collecting some of fixed-bed gasification test data. Work also continued on collecting fixed-bed experimental data from the open literature. The computerized data search was updated.

Fixed-bed code validation

Further testing and validating of the advanced fixed-bed code developed in Subtask 3.b was performed. The test case was the same as one used before - the test run of the Wellman-Galusha gasifier with Jetson high volatile B bituminous coal. Details of testing and evaluating the code are presented under Subtask 3.b. A paper presenting these results was submitted to the 23rd International Symposium on Combustion and given in Appendix B. Key results are summarized below.

The predicted temperature and composition at the bottom and the top of the reactor are in good agreement with the measured values. The predicted temperature profile agrees reasonably well with limited experimental data, but the agreement could be better. The predicted carbon conversion and gas composition profiles seem qualitatively correct, but there are no measured profiles to compare with. Good agreement is obtained between the predicted and measured pressure variations for linearly varying bed void fraction. There is need for further improvement of the advanced fixed-bed code.

Plans

During the next quarter, work will continue on collecting fixed-bed design and test data. The fixed-bed design and test data will be collected both from the open literature and by direct contact with the organizations and individuals involved in fixed- or moving-bed gasification or combustion research or in research on non-reacting fixed or moving beds. Efforts will continue to identify additional test cases for simulation and validation. Further testing and validation of the code will be performed.

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