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 57 months and one for the fixed-bed lasting 48 months. Each of these subtasks will consist of three components: 1) Simulation of demonstration cases on BYU computers; 2) Implementation on a work station at AFR; and 3) Simulations of demonstration cases on the workstation.

IV.A. SUBTASK 4.A. - APPLICATION OF GENERALIZED, PULVERIZED-COAL COMPREHENSIVE CODE

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Objectives

The objectives of this subtask are to 1) demonstrate application of the code by simulating reactors of interest to METC and 2) implement the code at METC and conduct training.

Accomplishments

A post-doctoral research associate was recruited and began work on this subtask. Potential application cases that were considered are shown in Table IV.A-1. Three of the cases (Coal Tech., ABB Combustion Engineering, and Airpol) are projects in the DOE Clean Coal Technology (CCT) program. Letters were written to these three companies requesting available information or test data. Information has been received only from Coal Tech., and that case has been selected for application of the entrained-bed code under this subtask. A schematic diagram of the Coal Tech. combustor is shown in Fig. IV.A-1. Primary air and coal with sorbent are fed through numerous ports located in a ring on the west wall. Swirled secondary air is fed in an annulus outside of the primary stream. The flow is essentially two-dimensional. Because of the high swirl, the code will need to be modified to include the effect of centrifugal force on particle motion. The other application case will be the Texaco gasifier. Although the Texaco gasifier uses a slurry coal feed, it will be simulated with a dry coal feed.

Plans

Initiate simulation of Coal Tech. combustor and Texaco gasifier.

Table IV. A-1. Cases Considered for PCGC-2 Application

Name of Company	Type of Reactor	Location	Plant Capacity	Project Status
Texaco	entrained-flow gasifier	Barstow, CA	100 tons/day	in commercial operation
Shell Oil	entrained-flow gasifier	Royal Dutch Shell Research Lab	6 tons/day	project completed
Coal Tech. Corporation	cyclone combustor	Tampella Keeler Plant; Williamsport, PA	23 million Btu/hr	project completed
ABB Combustion Engineering	entrained-flow gasifier	Light & Power's Lakeside Stations Springfield, Sangamon County, IL	600 tons/day	under design and construction
Airpol, Inc.	gas suspension absorption system	West Paducah, McCracken County, KY	10 MW	under design and construction
Solar	coal-fired gas turbine combustor			
Allison	coal-fired gas turbine combustor			

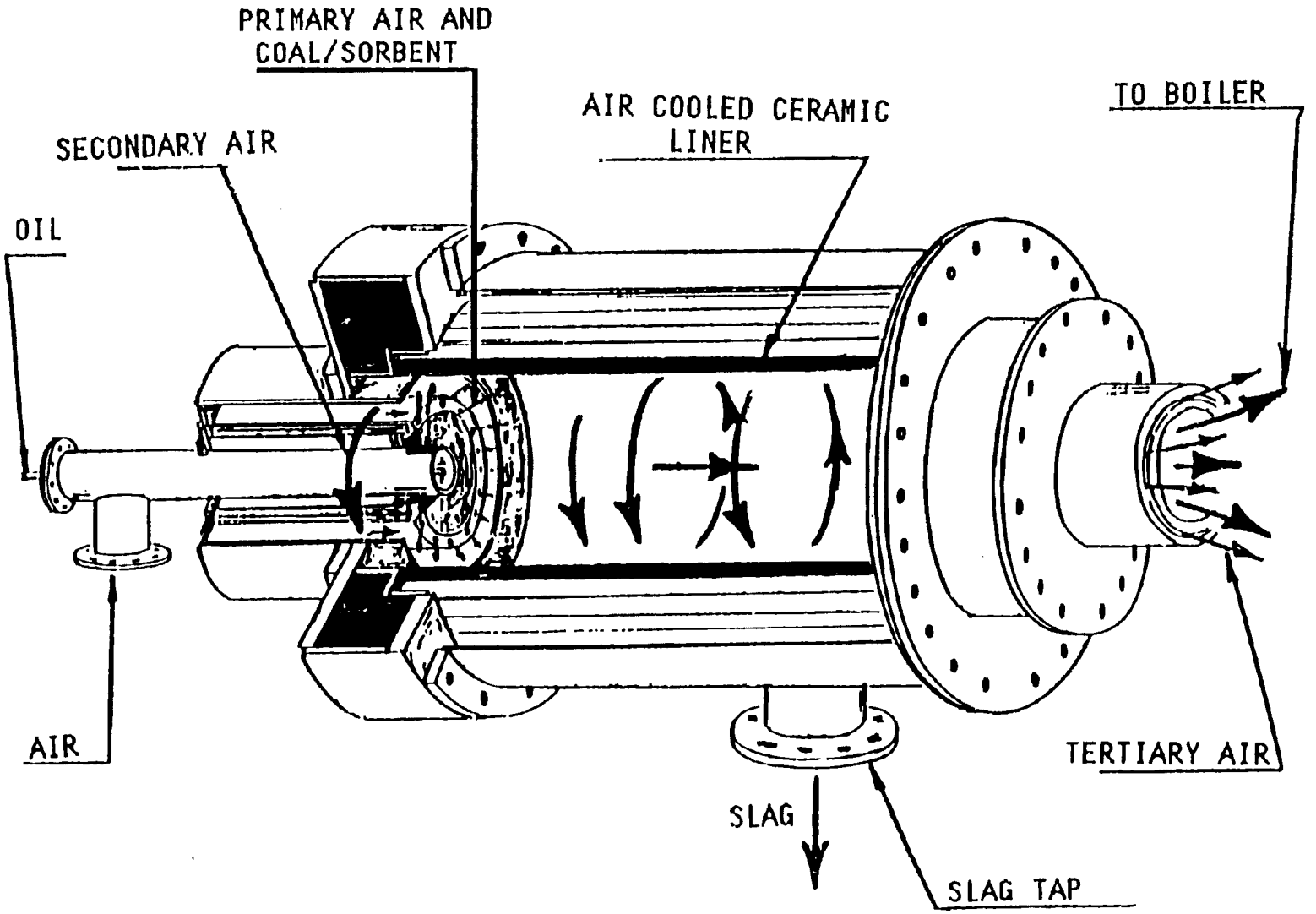

FIGURE IV. A-1. Coal Tech Corporation's air-cooled, cyclone coal combustor

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

The following application cases were approved by AFR and METC:

1. METC medium pressure, dry-ash gasifier.
2. BGC-Lurgi high pressure, dry-ash gasifier.
3. Wellman-Galusha atmospheric pressure, dry-ash gasifier.

Two new test cases of great potential interest were identified. Both are fixed-bed gasifiers integrated in gasification/combined cycle systems. One is a commercial, air-blown, dry-bottom, pressurized fixed-bed coal gasifier for the DOE/CCT project "Air-Blown/Integrated Gasification Combined Cycle Project." The other is an innovative, air-blown, dry-bottom, pressurized, fixed-bed coal gasifier for the DOE/METC project "Gasification Product Improvement Facility."

Plans

During the next quarter, work will continue to identify additional test cases for simulation, and the code will be applied to the cases of interest to METC.

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