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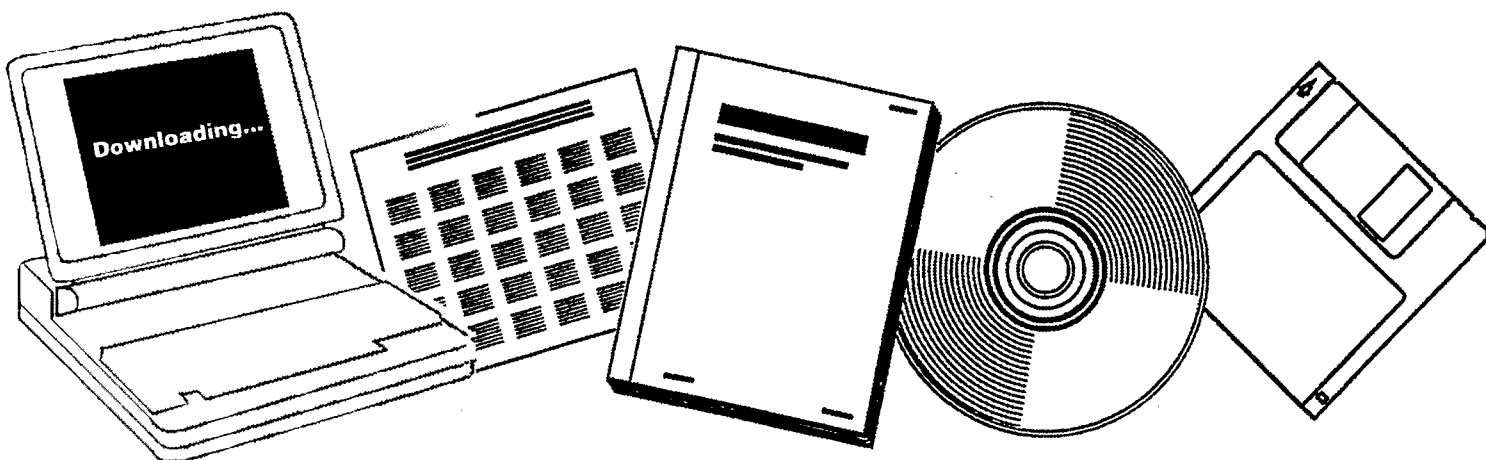
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**BASELINE DESIGN/ECONOMICS FOR ADVANCED
FISCHER-TROPSCH TECHNOLOGY. QUARTERLY
REPORT, OCTOBER--DECEMBER 1994**

DEPARTMENT OF ENERGY, PITTSBURGH, PA.
PITTSBURGH ENERGY TECHNOLOGY CENTER

1994



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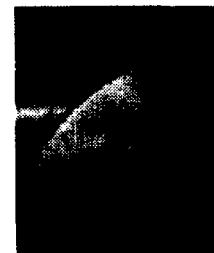
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U.S. Department of Energy Pittsburgh Energy Technology Center

Baseline Design/Economics for Advanced Fischer-Tropsch Technology

Contract No. DE-AC22-91PC90027

Quarterly Report

MAY 15 1995

OSTI

October - December 1994

We have no objection from a patent standpoint to the publication or dissemination of this material.

Mark Dvorscak 4-25-95

Office of Intellectual
Property Counsel
DOE Field Office, Chicago



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MASTER

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Section 1

Summary

This report is Bechtel's thirteenth quarterly technical progress report and it covers the period of October through December, 1994.

All major tasks associated with the contract study have essentially been completed. Our activities during this quarter comprise mainly of project documentation, management and administration. Topical reports which document the accomplishments of the various tasks were issued.

As a result of the current contract study, DOE\PETC is contemplating to modify the subject contract to include:

- Replacing hydrocracking with FCC as an alternative scheme for F-T wax upgrading,
- Enhancing the ZSM-5 reactor ASPEN modeling algorithm,
- Incorporating the ZSM-5 reaction scheme to the Western Coal Case,
- Considering F-T synthesis using natural gas as feedstock.

A detailed scope of work for the above tasks with a formal cost proposal was submitted to DOE\PETC for consideration.

Section 2

Introduction

Bechtel, with Amoco as the main subcontractor, initiated a study on September 26, 1991, for the U.S. Department of Energy's (DOE's) Pittsburgh Energy Technology Center (PETC) to develop a baseline design and computer model for advanced Fischer-Tropsch (F-T) technology. This study, with an approved budget of \$2.3 million, is being performed under DOE Contract Number DE-AC22-91PC90027.

The objectives of the study are to:

- o Develop a baseline design and two alternative designs for indirect liquefaction using advanced F-T technology. The baseline design uses Illinois No. 6 Eastern Coal and conventional refining. There is an alternative refining case using ZSM-5 treatment of the vapor stream from the slurry F-T reactor and an alternative coal case using Western coal from the Powder River Basin.
- o Prepare the capital and operating costs for the baseline design and the alternatives. Individual plant costs for the alternative cases will be prorated on capacity, wherever possible, from the baseline case.
- o Develop a process flowsheet simulation (PFS) model.

The baseline design, the economic analysis and computer model will be major research planning tools that PETC will use to plan, guide and evaluate its ongoing and future research and commercialization programs relating to indirect coal liquefaction for the manufacture of synthetic liquid fuels from coal.

The study has been divided into seven major tasks:

- o Task 1: Establish the baseline design and alternatives.
- o Task 2: Evaluate baseline and alternative economics.
- o Task 3: Develop engineering design criteria.
- o Task 4: Develop a process flowsheet simulation (PFS) model.
- o Task 5: Perform sensitivity studies using the PFS model.
- o Task 6: Document the PFS model and develop a DOE training session on its use.
- o Task 7: Perform project management, technical coordination and other miscellaneous support functions.

Section 3

Tasks 1 & 3 - Baseline and Alternative Engineering Designs

Topical reports were completed and issued for the three Fischer-Tropsch indirect coal liquefaction process designs, namely:

1. the Baseline Case using Illinois No. 6 coal,
2. the Alternate Upgrading Case using ZSM-5 treatment of the F-T vapor product, and
3. the Western Coal Case using Wyoming coal from the Powder River Basin.

They were issued as contract Topical Report Volumes I to III respectively.

These topical reports summarize, for each of the above three designs, their overall:

- engineering design basis and considerations,
- plant configuration with block and process flow diagrams and detailed material and utility balances,
- plant flow (steam and water) distributions,
- process descriptions for each individual plants including the offsite, and
- plant catalyst and chemical, and operating labor requirements.

They were issued on November 1, 1994.

Section 4

Task 4 - ASPEN Simulation Model Development

This task is completed. The engineering process designs from Tasks 1 & 3 form the bases from which the ASPEN process simulation models were developed for each of the three Fischer-Tropsch indirect coal liquefaction designs. These models were developed originally using ASPEN/SP. All three process simulation models have been converted into ASPEN/PLUS code. The converted models give essentially the same results as the original ASPEN/SP models, but execute significantly faster on the version 9 of ASPEN/PLUS.

Section 5

Task 5 - Sensitivity Studies

This task is completed. Results were reported in the April-June 1994 quarterly report and presented as:

1. a paper entitled "Process Simulation Model for Indirect Coal Liquefaction Using Slurry Reactor Fischer-Tropsch Technology" at the ACS Symposium on Alternate Routes for the Production of Fuels, held at Washington DC on August 22-25, 1994, and
2. a paper entitled "Process Design/Simulation Models for Advanced Fischer-Tropsch Technology" at the DOE Contractors' Review Conference, held at Pittsburgh, Pennsylvania on September 7-8, 1994.

Section 6

Task 6 - ASPEN Simulation Model Documentation and Training

The topical report for Task IV documenting the ASPEN process simulation models was completed and issued as contract Topical Report Volume IV. This report consists of 5 volumes. It documents the three process simulation models, presents their results with detailed designs, provides instructions for running them on ASPEN/SP, and contains a complete listing of all input files.

As instructed by DOE/PETC, the documentation of the LOTUS spreadsheet economics model will be issued as a separate restricted addendum.

A separate report, contract Topical Report Volume V, was issued to document the conversion of the process simulation models to ASPEN/PLUS code. This work was performed under an extension clause to the subject contract. Process simulation models converted to ASPEN/PLUS include the three models developed for the subject contract as well as the models developed for direct coal liquefaction under the DOE Contract No. DE-AC22-90PC89857.

Topical Report Volume V provides a complete ASPEN/PLUS input files for each of the converted models, with discussion pertaining to their differences from the original ASPEN/SP codes. Instructions on how to install and execute these models were also documented. Floppy disks containing all the pertinent ASPEN/PLUS files for all of the models developed under DOE Contracts DE-AC22-91PC90027 and DE-AC22-90PC89857 were sent to DOE/PETC.

A training session report was also issued in November 1994, documenting the September 27, 28 and 29, 1994, training session on the indirect coal liquefaction process simulation models, and the LOTUS spreadsheet economics model.

Section 7

Project Management & Staffing Report

7.1 Project management

During this reporting period, cost & schedule control and project reporting were the primary activities.

A technical meeting was held at the DOE/PETC office on November 9, 1994, to discuss the approach needed to conduct economic evaluation of indirect and direct coal liquefaction. Attending the meeting were:

DOE	Ed. Schmetz and John Shen
DOE/PETC	Shelby Rogers and Ed. Klunder
Mitre	David Gray and Glen Tomlinson
Burns & Roe	John Marano and P.Zhou
Amoco	Sheldon Kramer
Bechtel	Sam Tam and Joe Fox

7.2 Key personnel staffing report

The key personnel staffing report for this reporting period as required by DOE/PETC is shown below:

Name	Function	% Time Spent(a)
Bechtel		
Samuel S. Tam	Program Manager	5
Gerald N. Choi	Project Manager/Process Engineer	30
Amoco		
R.D. Kaplan	Subcontract Manager	0
S. S. Kramer	Process Model/Simulation	30

(a) Number of hours spent divided by the total available working hours in the period and expressed as a percentage.

Figure 7-1
Overall Milestone Schedule
(as of December 18, 1994)

PLAN STATUS REPORT

FORM APPROVED
TABLE NO. 1001-1-100

1 TITLE Baseline Design-Economics for Advanced Fischer-Tropsch Technology		2 REPORTING PERIOD 11/21/94 to 12/18/94		3 IDENTIFICATION NUMBER DE-AC22-91PC90027																												
4 PARTICIPANT NAME AND ADDRESS Bechtel Corporation 50 Beale Street San Francisco, CA 94105		5 START DATE 9/26/91		6 COMPLETION DATE 12/31/94																												
ELEMENT CODE	5 REPORTING ELEMENT	Duration												PERCENT																		
		FY93						FY94						PLAN	ACTUAL																	
		J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M		
Task 1	Baseline Design	[Gantt bar with triangle]												100	100																	
Task 2	Economic Evaluation	[Gantt bar with triangle]												100	100																	
Task 3	Engineering Design Criteria	[Gantt bar with triangle]												100	100																	
Task 4	Process Flowsheet Simulation Model	[Gantt bar with triangle]												100	100																	
Task 5	Sensitivity Studies	[Gantt bar with triangle]												100	100																	
Task 6	Documentation and Training	[Gantt bar with circles and triangle]												91	91																	
Task 7	Project Management & Administration	[Gantt bar with circles and triangle]												91	91																	
△	Completion	○ Baseline case equipment list transmitted to Cost Estimating																														
○	Progress meetings	○ Topical reports issued																														
○	Baseline case design complete																															
11. SIGNATURE OF PARTICIPANT'S PROJECT MANAGER AND DATE		Samuel S. Tam		[Signature]		2/24/95																										

Figure 3-1 Overall Milestone Schedule (as of December 18, 1994)

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