

BCR-MPR--25

TECHNICAL SECTION

of

PROGRESS REPORT NO. 25

on

CONTRACT NO. 14-32-0001-1513

to

OFFICE OF COAL RESEARCH

February 19, 1975

BATTELLE
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201

SUMMARY

During this reporting period Chemico continued expediting material deliveries to the site and continued field construction. Greater attention was also given by Chemico to preparation of operating and vendor information catalogs. The New York office engineering and drafting work is now on an as-needed basis.

Battelle continued to monitor the work of Chemico, assisted them in expediting, and gave substantially increased attention to PDU operations planning.

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INTRODUCTION AND PROJECT OBJECTIVE

This progress report describes work completed by Battelle on the Coal Gasification Program during the period January 21, 1975, to February 20, 1975. The work completed during this period was nonexperimental and was associated with the installation of the 25-ton-a-day coal gasification process development unit by Chemico for Battelle. Nothing of a patentable nature is disclosed within this report.

The general objective of the current contract is development of a two-stage fluidized-bed process utilizing a self-agglomerating fluidized-bed burner as part of a practical and economical method for producing synthesis gas by steam gasification of coal. The developed process is to be useful as part of a system for producing synthetic pipeline gas or for other purposes.

Pursuant to the general objective, a 25-ton-a-day-of-coal Process Development Unit (PDU) is to be erected and operated and the following aspects of the process explored:

- The operability of a self-agglomerating fluidized-bed coal burner operating on an Eastern bituminous coal under pressure and using air for combustion.

- The mechanical feasibility of continuously circulating a burden of hot-ash agglomerates between fluidized-bed burner and fluidized-bed gasifier vessels at 100 psig of pressure and the rates and temperatures required for effective heat transfer.
- The operability of integrated fluidized-bed burner and gasifier vessels both fed by Eastern bituminous coal (or char in the case of the burner) and operating at 100 psig of pressure. The gasifier is to be fluidized by steam and the endothermic heat of gasification is to be provided by the circulating burden of hot-ash agglomerates.
- The operability over extended time periods of a power-recovery turbine using hot, fluidized-bed burner effluent gases as the turbine working fluid.
- The factors that influence the long-term operability of the process. Included is to be the gathering of data on all key process variables and their effect on the characteristics of the process.

Concurrent with operation of the PDU, sufficient process data and information will be acquired to permit scale-up of the process to its next logical stage of development.

WORK COMPLETED

Chemico's New York Office Activity

The detailed engineering design and procurement work which was being conducted primarily in Chemico's New York office has practically been concluded. All major Chemico activity is presently on field construction of the PDU.

New York office departments now are working on the Battelle job in New York only on an as-needed basis. The needs are determined by

requests from the field and by the Chemico project manager and project engineer and Battelle. The following summarizes activities by departments.

Purchasing and Expediting

Change orders on some of the commodity items and new purchase orders on small items overlooked are continuing to be issued by Chemico's purchasing department. The Chemico purchasing agents are also involved in negotiating with various vendors regarding claims for changes which have been made by some of the vendors. The requirement that the procurement procedure be changed for obtaining the refractory materials and installation has also involved the Chemico purchasing department.

Expediting, which organizationally is a part of the responsibility of the purchasing department at Chemico, continues to follow purchase orders with phone calls and some visitations. The items which now require expediting continue to be bulk or commodity items. Battelle and the Chemico project engineer continue to supplement Chemico's normal expediting and inspection activity by visits to the vendor shops.

Start-Up

Chemico has assigned Mr. Frank Shirley from their Start-Up Group to assist in check out and start-up assistance for the Battelle Coal Gasification PDU. Mr. Shirley has been preparing an operating manual for the PDU and has visited the construction site for several days.

Discussions have been held between Mr. Shirley and others at Chemico and Battelle on start-up procedures, plant check out, and mechanical completion. Chemico submitted a checklist for plant completion to Battelle for review and comment. An initial rough draft of the operating manual has also been received by Battelle from Chemico and is serving as the basis for discussion of operating procedures.

Mechanical Catalogs

Most vendor instructions and prints have been received by Chemico in New York and these are being assembled into the mechanical catalogs for turnover to Battelle. Receipt of these catalogs is expected in the forthcoming reporting period.

Construction Scheduling and Management

This group at Chemico's New York offices continues to follow the job, updating the schedule and providing other assistance as required.

Engineering and Drafting

These groups have no one attached to the project permanently at this point according to the Chemico project management. Various engineers and draftsmen associated with the job are called upon as needed.

Project Management

The project management function of Messrs. Dillon and Regan will continue until the end of the job. Mr. Dillon has made several trips to the site and it is anticipated that he may spend a more extended period at the site in the near future.

Equipment and Materials Received at the Site

About 90 percent of the major items of process equipment have arrived at the site; in addition over 60 percent of the instruments are at the site. The percentages last month were 80 percent and 49 percent, respectively. The equipment and the materials, for the most part, are being used as they are received. Equipment and materials which have arrived to date are as follows:

FLWSHEET EQUIPMENT ITEMS

<u>Description</u>	
U-100	Control Cabinets
B-180	Equipment Shelter
G-101	Coal Mill Surge Hopper
G-102	Coal Receiving Hopper
R-101	Grizzly
K-201	Main Fan
P-205	Screened Coal Cyclone
D-201	Inert Gas Generator (for Coal Pulverizer)
K-203	Combustion Air Blower
K-202	Auxiliary Fan
K-204	Screened Coal Blower
O-201	Coal Pulverizer
P-201	Cyclone Separator & Support Ring
L-202	Spinner Separator
P-203	Bag Filter
O-205	Ground Coal En Masse Conveyor/Elevator
P-204	Vibrating Screen
H-301	Coal Pretreater
J-301-A&B	Oil-Solids Pumps
O-301	Screw Conveyor Cooler
O-303	Rotary Valves
P-301	Pretreater Cyclone
K-303	Pretreated Coal Blower
P-302	Pretreated Coal Bag Filter
P-301	Gas Separator
R-301	Teflon-Lined Separator & Scrubber
R-301 & 302	Rotary Valves
P-401-A&B	Bag Filters and Bin Vents
G-401-A	Combustor Feed Bin
G-401-B	Gasifier Feed Bin
G-402	Combustor Feed Pressurizing Bin
G-403	Combustor Feed Injection Bin
G-404	Pretreated Coal Receiving Bin
G-405	Gasifier Feed Pressurizing Bin
G-406	Gasifier Feed Injection Bin
G-506	Char Letdown Hopper
G-504	Gasifier Letdown Hopper
G-501	Cyclone Hopper
G-502	Cyclone Hopper
G-503	Cyclone Hopper
G-505	Char Hopper
G-511	Conveyer Hopper
P-501	Combustor Cyclone

FLWSHEET EQUIPMENT ITEMS (Continued)

<u>Description</u>	
P-502	Gasifier Cyclone
H-502	Gasifier Vessel and Spare Head
H-501	Combustor Vessel and Spare Head
K-501	Heater Recycle Blower
O-502	Char and Sinter Cooler-Conveyor
O-505	Dump Hoppers
O-506	Dump Hoppers
O-507	Dump Hoppers
O-508	Dump Hoppers
O-509	Dump Hoppers
O-510	Dump Hoppers
O-511	Dump Hoppers
O-512	Dump Hoppers
U-050	Instrument Panel
G-509	Ash Letdown Hopper
G-510	Ash Letdown Hopper
R-601	Teflon-Lined Separator & Scrubber
R-602	Teflon-Lined Separator & Scrubber
P-601	Gas Separator
G-603	Sludge Settler
J-602-A&B	Venturi Circulating Pumps
J-601-A&B	Venturi Circulating Pumps
E-604	Recycle Make Gas Cooler
K-603	Recycle Make Gas Compressor
E-605	Recycle Make Gas Aftercooler
P-602	Separator
E-604-B	Gas Cooler
E-605-B	Gas Aftercooler
D-602	Stack for Thermal Oxidizer
D-702	Inert Gas Generator
G-703	Instrument Air Receiver
E-703	Instrument Air Aftercooler
K-701-A&B	Process Air Compressors
G-701-A&B	Process Air Receivers
R-701	Instrument Air Dryer Package
K-703	Natural Gas Booster Compressor
G-702	Inert Gas Receiver
G-801	Deaerator
D-802	Steam Generator
R-804	Cooling Tower Water Treatment System
D-803	Steam Superheater
J-804-A&B	Valve Cooling Water Pumps
J-805	Sump Pump
V-802	Emergent Electrical Generator

FLWSHEET EQUIPMENT ITEMS (Continued)

<u>Description</u>	
G-802	H.P. Water Surge Tank
J-803-A&B	Cooling Tower Water Pumps
R-803	Cooling Tower
J-801-A&B	Boiler Feedwater Pumps
R-801-A&B	Boiler Feedwater Treating System
U-801	Motor Control Panel

BULK ITEMS

<u>Chemico Cost Code Number</u>	<u>Description</u>
A-190	Anchor Bolts
T-600 & T-605	TFE-Lined Valves
R-301-2, R-601-2, R-602-2	Raschig Rings for Scrubbers
--	Needle Glove Valve
--	Flow Switches
T-626	Miscellaneous Valves
T-450	Tubing
--	Strainers
--	Tube Fittings
--	Gaskets
T-620 & T-621	Miscellaneous Valves
T-615	Miscellaneous Valve
U-060	Pressure Regulators
P-450	Filter Regulators
T-450	Miscellaneous Valves
U-030	Annunciators
V-020	Transformer Substation (1)
A-190	Reinforcing Bars
U-030 & U-041	Weigh Systems (load cells)
T-31A2	Copper Tubing
P-145	Seamless Pipe
UGA-42	Gate Valves
6-COS	Expansion Joints
--	Ulukepe Cable
T-550	Miscellaneous Valves
U-060	Miscellaneous Valves
R-301-2, R-602-2, R-602-2	Gaskets
U-041	Pneumatic Pressure Transmitters
--	Teflon-Lined Pipe Fittings
U-020	Instruments
U-060	Fabri Valves
--	Gaskets
V-032	Miscellaneous Electrical Supplies
U-060	Control Valves
U-020	Pressure Gauges

BULK ITEMS (Continued)

<u>Chemico Cost Code Number</u>	<u>Description</u>
B-101	Small Bore Pipe (partical)
U-030	AIT 10-22 Gas Analyzers
"	AIT 30-39 Gas Analyzers
"	AIT 50-11 Gas Analyzers
80-V	Unistut
80-V	Lighting Fixtures
80-T-022	Pipe Fittings
U-100	Lab Panel
U-041	d/p Transmitters
80-T-040	S.S. Pipe
U-060	Valves
80-T-615	Valves
T-450	Swaglock Fittings
V-020	Substation No. 2
80-V	Conduit Fittings
80-V-100	Terminators
U-041	Level Transmitter
V-060	Cable
T-450	Tubing
80-V	Electrical Fittings
80-T-022	Pipe Fittings
T-450	S.S. Pipe
V-100	Motor Control Center
80-V	Conduit Fittings
V-060	Wire
80-T	Shop Fabricated Pipe (partial)
T-450	Valve Manifold-Gauge Siphon
U-050	Main Control Panel
80-T-615	Pipe Fittings
U-020	Thermocouples
U-030	Nuclear Density & Level Gauges
T-450	Steam Heat Pack
U-060	Relief Valves

In addition to the above listing, partial shipment of various orders for bulk items has been received. These items will be reported as received when the orders are completed.

The only major equipment items (i.e., those having an item number on the flowsheet) which have not arrived are the following:

D-201	Start-Up Heater
R-201	Diverter Valve

P-503	Remotely Located Vibrating Screen
J-603	Sludge Pump
K-604	Combustion Blower
R-605	Recycle Make Gas Dryer
G-804	Valve Jacket Water Surge Tank

Because this list represents less than 10 percent of the major items of process equipment, only the items which have not arrived will be presented in future reports.

Construction of the PDU

Continued progress has been made in spite of predominately cold and occasionally wet weather. Equipment deliveries are no longer significantly retarding the construction schedule. Material deliveries, on the other hand, continue to influence adversely the order in which the work can be undertaken. Of major importance are the pipe hangers (90 percent of which arrived in the field on February 14), the balance of the prefabricated pipe (a major portion of which is reported as ready for shipment), and the refractory lining of the vessels (now all at the site) and the small bore pipe and fittings.

During this reporting period, the combustor vessel and the pretreater vessel were set in place. Figure 1 shows the combustor vessel about to be set in the burner-gasifier structure in late January. Other than the vessels awaiting refractory lining, only one (the valve jacket water surge tank) is yet to be received and set in place.

The four sections of the stack have been received, and the base section has been placed on the foundation pad. The natural gas booster compressor, the scrubbers, and the recycle make-gas coolers were installed.

The outside of the auxiliary building or compressor shed which has been erected by a local contractor as a portion of Battelle's financial contribution to the program has been shown in a number of previous reports. This building houses the utilities for the PDU. Consequently, substantial effort is being directed by Chemico at completion of the work within this building. Figure 2 shows one of the two Ingersoll-Rand process air compressors which have been installed in the building and are being piped



FIGURE 1. COMBUSTOR VESSEL BEING INSTALLED IN THE STRUCTURE

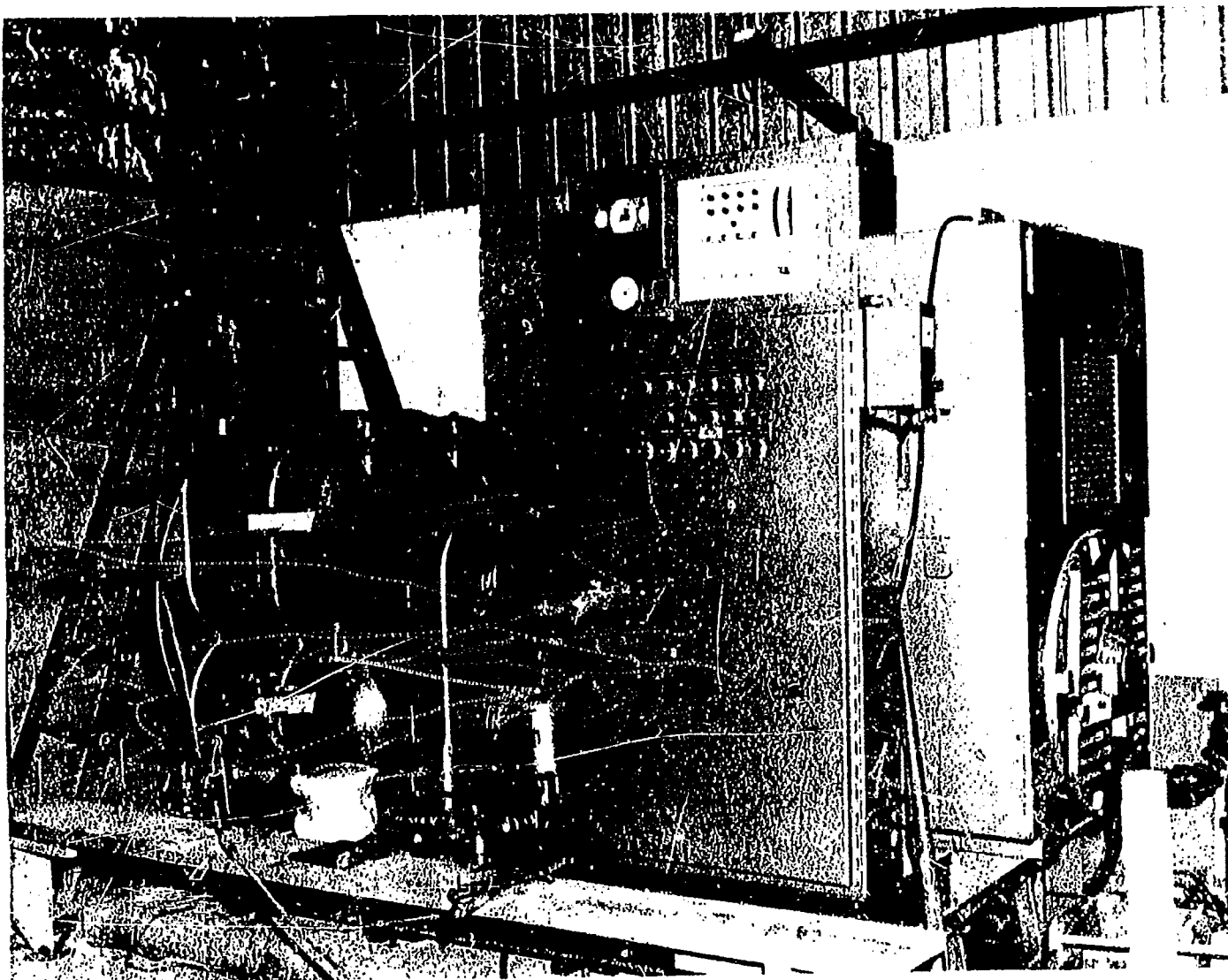


FIGURE 2. ONE OF THE PROCESS AIR COMPRESSORS WITHIN THE AUXILIARY BUILDING

and wired in. All of the other items of equipment in this building have also been installed and are being wired and piped. This equipment includes the inert gas generator, emergency electrical generator, boiler feedwater treatment system, steam generator, and natural gas booster compressor.

The load cells and their stay rods were installed on the three main coal storage vessels. The main process air compressors were aligned and grouted. The cooling tower water-treatment building was erected.

Work has continued on the coal conveying system, as well as on the two conveyor coolers. The fabrication and installation of small-bore piping continues, along with installation of the prefabricated pipe as availability permits. Considerable progress has also been made on the electrical installation, including work on the motor control panel, the control panel, and the instrument circuits.

To the extent possible, within the availability of supplies, work has been concentrated within the utilities area so that initial check-out can be started as quickly as possible.

The field labor force increased to about 50 during this reporting period. It went as high as 75 towards the period's end. There were no lost-time accidents.

Scale Model of the PDU

The scale model of the Coal Gasification PDU was completed by Chemico and is in use in the field. Figure 3 is an overall photograph of the model. At the left foreground is the auxiliary building area. The process air compressor shown in Figure 2 is located just inside the building towards the stack from the two vertical air storage tanks located just outside the building.

The white partitioned area behind the area of the auxiliary equipment represents a portion of the existing JS-2 Building. This portion of the building is being extensively modified at Battelle's expense to serve as the control room, motor switchgear, storage, operating office, and analytical areas for the PDU. The third compartment from the front in the photograph contains the main control panel.

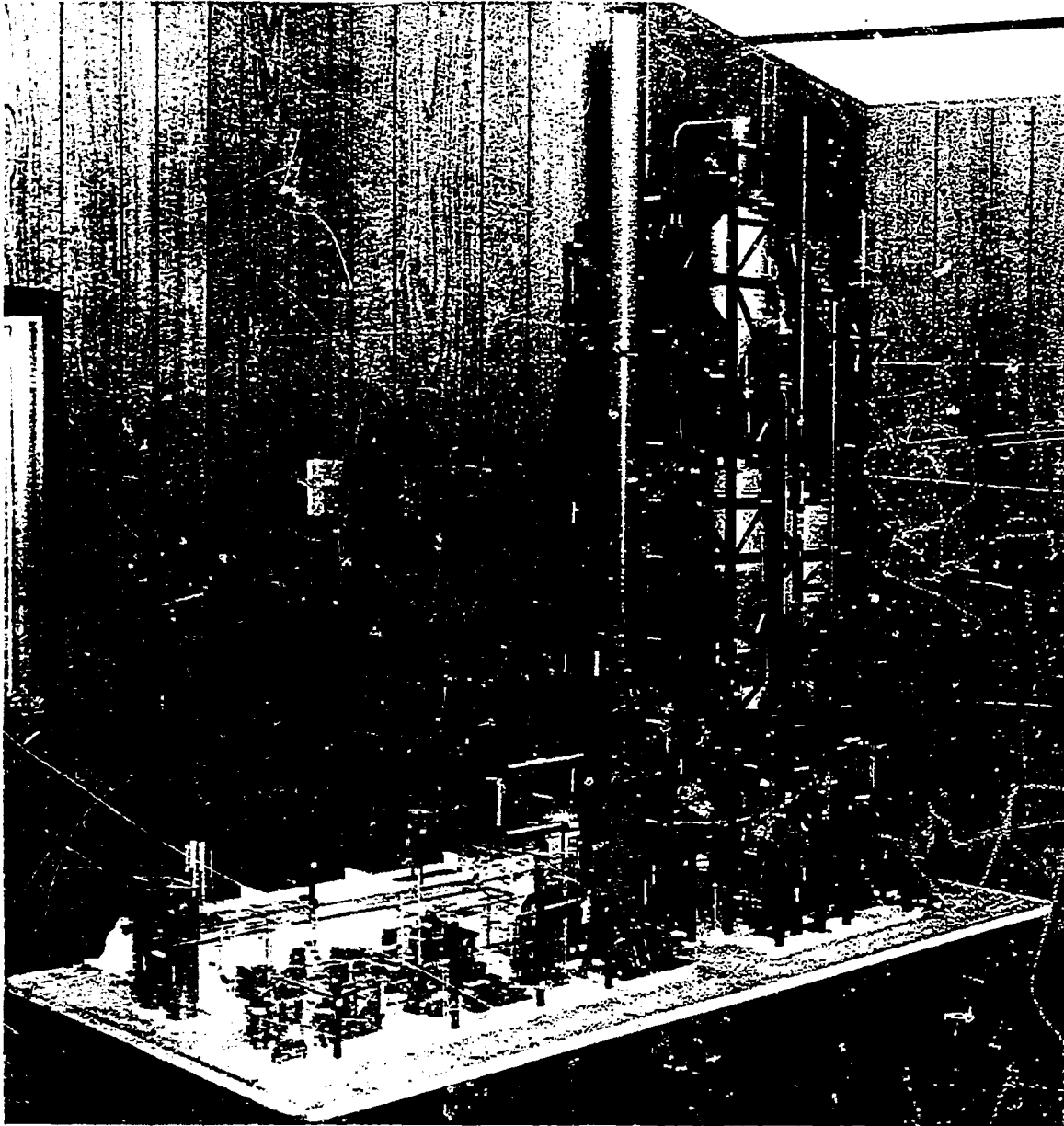


FIGURE 3. SCALE MODEL OF THE BATTELLE
COAL-GASIFICATION PDU

The stack is shown assembled in the figure. This stack arrived in four refractory-lined sections and Chemico is presently erecting them.

The coal feed and burner-gasifier structures are also shown in Figure 3. The burner-gasifier structure is located behind (to the west of) the coal feed structure. Consequently, the burner and gasifier vessels and various letdown hoppers cannot be seen in the photograph. The large vessels shown in the upper part of the coal feed structure are atmospheric pressure, prepared-coal storage vessels. The lower large vessel is the coal pretreater.

A personnel hoist is to be located adjacent to the pretreater towards the stack. This hoist will be used in plant operation and is being obtained as a separate procurement for the Chemico subcontract.

Battelle Activity Directly Related to Detailed
Design and Installation of the PDU

In addition to the Battelle activity related to monitoring Chemico's construction work and assisting them in expediting, the Battelle staff have been participating in other areas directly related to the PDU completion.

Administrative problems arose regarding the refractory installation and also the supply of some special valves for the PDU. The Battelle Project staff is assisting Chemico in resolving the problems of the refractory installation. The Project staff as well as members of Battelle's Metallurgy and Ceramics Departments worked with the valve supplier to develop a workable valve.

No significant efforts were expended on the turbine procurement during this reporting period. However, it is expected that this activity will be reinitiated during the forthcoming reporting period.

On December 12 a hearing was held before the Ohio Public Utilities Commission. Battelle was instructed to investigate alternate fuels which might lend themselves to substitution for some of the natural gas we now use in various Battelle facilities and thus free an equivalent portion of natural gas for use in the PDU. We have done this

and have concluded that, at this point, it is impractical to convert PDU operations to oil. Two other alternatives both of which will result in increased operating costs for the PDU have been seriously explored by Battelle's Physical Plant and Facilities Department. One involved the shifting of natural gas allocations and obtaining an oil allocation increase. The other involves purchase of intrastate natural gas at a premium cost. It is expected that these alternatives will be discussed with the Ohio Public Utilities Commission momentarily.

Battelle presently has a permit from the State of Ohio Environmental Protection Agency to construct the PDU. All forms necessary to obtain the Operating Permit have been completed by Battelle's environmental coordinator and have been transmitted to the Ohio EPA. Our environmental coordinator is in frequent contact with the agency and we await the agency's action.

Activity Related to Operation of the PDU

Several discussions have been held with Chemico regarding what constitutes their completion of the PDU and turnover to Battelle. These discussions have involved compilation of checklists, division of responsibilities, and definitions of completion of construction, mechanical completion, precommissioning, commissioning, and initial start-up. We have drawn upon experience of the OCR/A.G.A. sponsor representative, Mr. B. Switalski, in these discussions as well as upon our own experience.

A review of Chemico's first draft of an operating manual has been concluded and we have discussed this with their start-up man. Work continues on the manual, and thought is being given to putting the Chemico start-up man in residence at the site around April 1.

Battelle is initiating work on marking up P&I and isometric drawings in consideration of operating various systems within the PDU at the earliest possible date and assisting Chemico in establishing priorities for completion. Detailed, semi-independent (of Chemico), thought is being given to start-up and operation of the various process sections of the PDU by Battelle. Mr. T. L. Tewksbury, Battelle's Supervisor of

Operations for the PDU, is heading this effort with assistance from Mr. H. Batchelder (Battelle Staff Consultant), Mr. A. Reed (Senior Chemical Engineer at Battelle), and other members of the Battelle project staff.

Mr. L. Stickel who will be responsible for maintenance functions during the PDU operations is also participating in the preoperations activities. He has established a checklist for routine inspection of the rotating equipment while the plant is under construction, is tracing out lines using the isometrics, and is observing initial assembly of the various vessels and pieces of equipment. Mr. Stickel will also extensively examine the vendor's manuals and instructions as we receive them.

Activities have also been initiated to obtain additional operating staff for the PDU. Plans are being made to fill those positions which cannot be filled from within Battelle with experienced plant operators.

PROBLEMS AND RECOMMENDATIONS

Technically related problems at present continue to be due to the slower-than-desired delivery of materials to the field and inclement weather. The "weak-link" in timely completion of the PDU appears to still be lack of materials on schedule. We are trying to assist Chemico in their still-very-important expediting activities.

WORK PLANT AND SCHEDULE

Chemico issued their first construction schedule on May 23, 1974 (Issue P-1). This schedule indicated a PDU completion date of February, 1975. In December, 1974, Chemico issued a completely revised schedule (Issue 3₁) showing completion of all PDU construction activities by mid-July, 1975. This was the last schedule transmitted by Battelle to the Operating Committee and to Dr. Detman of C. F. Braun and Company.

During meetings on February 5 and 6 in New York between Chemico and Battelle and again on February 11 at a meeting in New York of OCR,

A.G.A., Battelle, and Chemico we were informed that a mid-July completion date was no longer considered valid by Chemico. We were shown a schedule designated Issue 3₄ which projected about a 12-week delay in completion to mid-September, 1975. This projected delay is attributed by Chemico to be due to lack of materials including refractories, in the field. Several critical deliveries must be made in the forthcoming reporting period to improve this schedule and draw completion back towards mid-July. Another schedule meeting is planned with Chemico for the first week in March.

The major emphasis during the forthcoming reporting period will be on continuing field construction and related activities (e.g., expediting). Battelle will increase emphasis on planning for the PDU operations.

As a result of the recently approved prime contract modification, Battelle is committed to completion of all experimental work on the program by June 30, 1977. This modification and the schedule anticipated in it was predicted on Chemico's completion of the PDU occurring in mid-February, 1975. Following the schedule meeting early in March it is expected that Battelle will prepare and submit a new overall schedule for approval.

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February 19, 1975

FINANCIAL

Table B-1 presents the Task Cost and Manpower Projection form for the month ending January 31, 1975. Billings have been paid to Chemico for New York operating costs through November and all of their fee except for the final payment which by contract is withheld. In addition, Chemico has been reimbursed \$1,514,508 for equipment invoices paid by them. Total actual disbursements to Chemico are \$3,037,788.

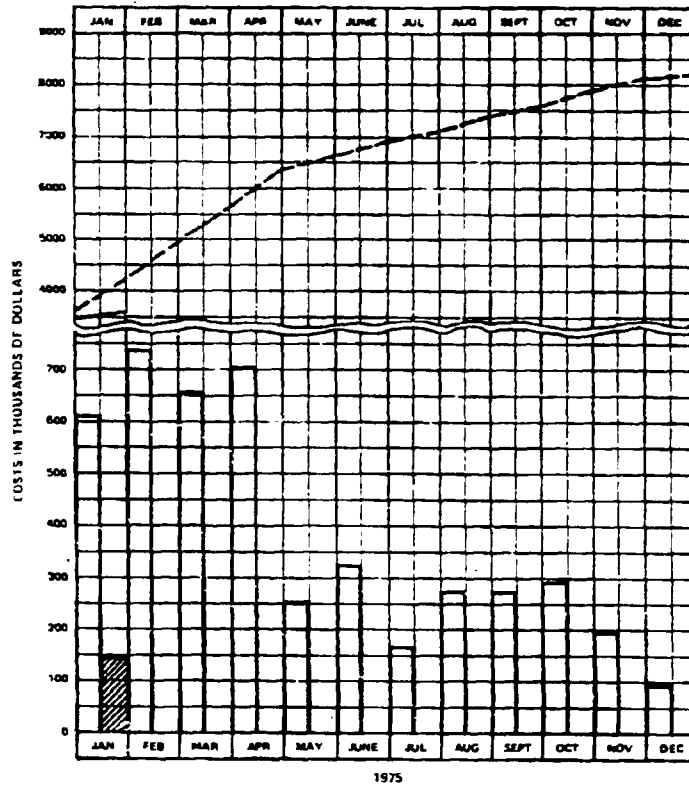
We have received additional vouchers from Chemico for equipment purchases amounting to about \$509,608 and for services for the month of December amounting to about \$58,515. These billings would place payments to Chemico above their currently approved subcontract* so they have not been paid. Battelle awaits approval of OCR of the \$5.7 MM subcontract modification which was submitted in December.

The cumulative money actually expended by Battelle, including actual payments to Chemico but exclusive of the Battelle fee, to date are about \$3,635,521 as shown in Table B-1. If the Battelle fee and received-but-not-paid vouchers of Chemico are included, the "expended" by Battelle is about \$4,306,520. This is about 48.7 percent of the total encumbered funds** for the project.

* Chemico's current authorization by Battelle and OCR/A.G.A. is \$3,143,000.

** Letter from Mr. G. Edward Larson (OCR) to Battelle dated December 11, 1974, shows authorized funding of \$8,850,000.

TABLE B 1.
BATTTELLE PDU
TASK COST AND MANPOWER PROJECTIONS
MONTH ENDING JANUARY 31, 1975



MANPOWER (MAN-MONTHS)

	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEPT	OCT	NOV	DEC
Pred.	7.0	7.0	8.0	8.0	9.0	9.0	11.0	14.0	14.0	17.0	17.0	17.0
Act.	5.7											

DIRECT LABOR & OVERHEAD COSTS (THOUSANDS OF DOLLARS)

	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEPT	OCT	NOV	DEC
Pred.	37.0	37.0	41.5	41.5	42.0	42.0	53.5	58.5	58.5	78.5	78.5	78.5
Act.	24.9											

SUBCONTRACT, AND CONSULTANT COSTS (THOUSANDS OF DOLLARS)⁽¹⁾

	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEPT	OCT	NOV	DEC
Pred.	570	698	600	650	200	273	100	200	200	200	100	0
Act.	118											

NON EXPENDABLE EQUIPMENT (THOUSANDS OF DOLLARS)⁽²⁾

	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEPT	OCT	NOV	DEC
Pred.	0.0	0.0	10.0	10.0	10.0	10.0	10.0	15.0	15.0	15.0	15.0	15.0
Act.	0.0											

MATERIALS, SUPPLIES, AND ODC (THOUSANDS OF DOLLARS)⁽³⁾

	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEPT	OCT	NOV	DEC
Pred.	3.0	3.0	2.5	2.5	2.0	2.0	1.5	1.5	1.5	1.5	1.5	1.5
Act.	2.1											

TOTAL (THOUSANDS OF DOLLARS)⁽⁴⁾

	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEPT	OCT	NOV	DEC
Pred.	610	738	654	704	254	327	165	275	275	295	195	95
Act.	145											

KEY TO GRAPH:

- PREDICTED TOTAL COSTS
- ACTUAL TOTAL COSTS
- PREDICTED CUMULATIVE
- ACTUAL CUMULATIVE

NOTES

- (1) OUTSIDE CONSULTANTS
- (2) NON EXPENDABLE EQUIPMENT TO BE PURCHASED BY SUBCONTRACTOR IS INCLUDED IN SUBCONTRACT CATEGORY
- (3) COST OF BATTTELLE RESIDENT CONSULTANTS INCLUDED IN THIS CATEGORY
- (4) DOES NOT INCLUDE BATTTELLE FEE

On December 6 Chemico estimated, informally, that their costs might increase from 5.7 million dollars to 6.3 million dollars for completion of the PDU. Battelle asked Chemico to thoroughly reappraise their cost estimate. They are in a continuing process of doing this. At a meeting held in New York on February 11, 1975, Chemico advised us their costs for completion of the PDU were now estimated at \$6,830,000. Representatives of OCR and A.G.A. attended this meeting as well as the Battelle representatives.

Several factors contributed to the estimated cost increase of Chemico's and these are being currently reviewed at Battelle. About 60 percent of the projected increase in Chemico's costs from \$5,700,000 to \$6,830,000 is attributable to increased direct labor, indirects and sub-contracts, largely due to schedule extension. When the \$5.7 MM projection was made in August of 1974, Battelle was told mechanical completion of the PDU would be in mid-February 1975. Chemico projected completion in mid-September at the February 11, 1975, meeting.

Whether or not completion of the PDU can be shifted forward in time to perhaps July of 1975 will depend on how several short-term problem areas are treated, namely:

- (1) Pipe Hangers. The pipe hangers must be delivered to the field before field fabricated, small-bore pipe and shop fabricated, larger pipe can be installed in large quantities. About 90 percent of the pipe hangers (over 15 tons) arrived at the field on February 14. The other 10 percent must be immediately forthcoming. We are informed it will be by February 24. Absence of the pipe hangers has been retarding construction progress.
- (2) Small Bore Fittings, Piping, and Valves. A portion of these materials are in the field and a significant amount has been field fabricated into piping runs. Large quantities are still required, especially fittings. Much increased quantities must be received in the next few weeks. Chemico has been asked to "camp out on the supplier's doorsteps" to improve their deliveries.

- (3) Remaining Shop-Fabricated Pipe. At least one-half to two-thirds of the shop-fabricated (larger than 3-inch nominal diameter) pipe has been received in the field. A large part of this is pipe requiring refractory lining. The remaining shop-fabricated pipe is required for completion of the various PDU systems. This remaining pipe is promised by the middle to the end of February and this schedule must be maintained. Chemico expeditors are visiting the fabricator's shop regularly.
- (4) Selection of Refractory Installer. Completion of many of the PDU systems is dependent upon getting the vessels and piping requiring refractory lining installed in place. Before the vessels and piping can be installed, they must be refractory lined. At present there is no refractory installer selected. The originally intended installer (with Babcock and Wilcox) was asked to rebid. Two local Columbus organizations who previously bid unsuccessfully with other refractory companies have provided new bids for the installation and these are being reviewed by Chemico and Battelle. The reason new bids for installation are required is that the original bidder projected a threefold cost increase. A decision will be made no later than February 21 with an award anticipated by the end of February.

Another factor which will have a major influence on being able to arrive at a more timely completion date than mid-September will be the ability of Chemico to increase the field labor force and increase their percentage completion per week rate. At present, percentage completion of the construction work per week is about 1.5 percent. To substantially improve the schedule, a rate on the order of at least 3 percent will be required.

Longer range, it will be necessary that deliveries of other critical components of the PDU be shifted forward in time from what they will be without eternal vigilance. We have noted instances of "foot dragging" on the parts of several of Chemico's vendors and the vendor's

subvendors which have already resulted in intolerable delays and will result in even worse delays if not specifically watched very closely. The special valves noted in last month's report are a prime example.

When the items of criticality enumerated above have been explored more fully, another meeting with Chemico in New York is planned. This meeting will be during the first week in March and will probably involve OCR, A.G.A., Battelle, and Chemico and will deal with reassessment of the schedule and costs based on latest information.

BATTELLE'S COLUMBUS LABORATORIES'
PERSONNEL ASSIGNED TO PROJECT

- | | |
|----------------------|---|
| (1) W. M. Goldberger | (4) H. R. Batchelder (Staff Consultant) |
| (2) W. C. Corder | (5) J. L. Stickel |
| (3) T. L. Tewksbury | (6) R. R. Adams |

CHEMICAL CONSTRUCTION CORPORATION
PERSONNEL ASSIGNED TO PROJECT**

- | | |
|--------------------|----------------------|
| (1) T. Dillon | (8) F. W. Shirley |
| (2) M. J. Dicianni | (9) L. Van Amerongen |
| (3) G. G. Elsis | (10) N. Vario |
| (4) H. J. Hubchen | (11) M. Young |
| (5) F. Matherne | (12) R. Jordan |
| (6) E. A. Postrk | (13) J. Hetland |
| (7) J. P. Regan | |

*Only staff who devote significant portions of their time to the program are listed. Various others have temporary assignments.

**Identified by Chemico as "key" staff on project.

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