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ENCOAL Mild Coal Gasification Demonstration Project

Annual Report

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For
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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

This document is the combination of the fourth quarter report (July - September 1993) and the 1993 annual report for the ENCOAL project. The following pages include the background and process description for the project, brief summaries of the accomplishments for the first three quarters, and a detailed fourth quarter report. Its purpose is to convey the accomplishments and current progress of the project.

BACKGROUND INFORMATION

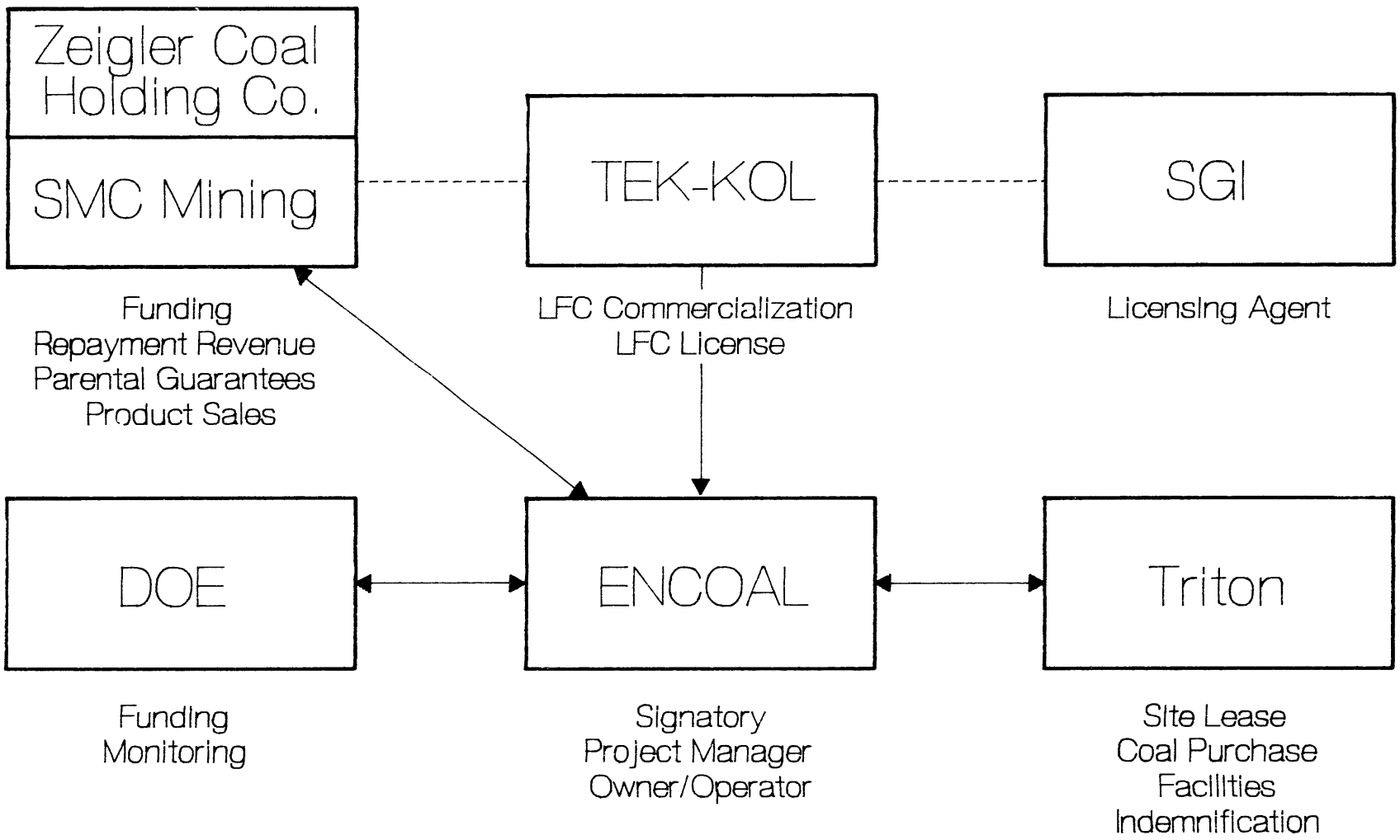
ENCOAL Corporation, a wholly-owned subsidiary of SMC Mining Company (formerly Shell Mining Company, now owned by Zeigler Coal Holding Company), has completed the construction of a mild gasification demonstration plant at Triton Coal Company's Buckskin Mine near Gillette, Wyoming. The process, using Liquids From Coal (LFC) technology developed by SMC and SGI International, utilizes low-sulfur Powder River Basin coal to produce two new fuels, Process Derived Fuel (PDF) and Coal Derived Liquids (CDL). The products, as alternative fuels sources, are expected to significantly lower current sulfur emissions at industrial and utility boiler sites throughout the nation, thereby reducing pollutants causing acid rain.

ENCOAL submitted an application to the U.S. Department of Energy (DOE) in August, 1989, soliciting joint funding of the project in the third round of the Clean Coal Technology Program. The project was selected by DOE in December, 1989 and the Cooperative Agreement approved in September, 1990. Construction, commissioning, and start-up of the ENCOAL mild coal gasification facility was completed in June of 1992, and the project is currently in the operations phase. Some plant modifications have been required as discussed below.

PROJECT ORGANIZATION OVERVIEW

ENCOAL is the participant with the DOE and the signatory to the Cooperative Agreement and is the owner, manager and operator of the demonstration plant. ENCOAL is responsible for all aspects of the project, including design, permitting, construction, operation, data collection and reporting. ENCOAL managed the design and construction of the project through a project manager, who was assisted by a team of technical and managerial personnel. The engineering, procurement and construction of the plant was contracted to The M. W. Kellogg Company. Coal that is processed during plant operation is purchased from the site host, Triton Coal Company. Triton also provides access to the site, associated facilities and infrastructure vital to the project and administrative services. Equity funding, administrative services, and product marketing services for the project are provided by service subsidiaries of Zeigler Coal Holding Company. Additional technical development support is provided by TEK-KOL, which also has the primary responsibility for commercialization. All assets are assigned to ENCOAL, while all technology rights are held by TEK-KOL and licensed to ENCOAL. (See Figure 1: ENCOAL Project Organization)

Figure 1. ENCOAL Project Organization



LOCATION

The demonstration plant site is located in Campbell County, Wyoming, approximately ten miles north of the county seat of Gillette (Figure 2). The site is within the Triton Coal Company's, (a wholly owned subsidiary of SMC Mining Company), Buckskin Mine boundary, proximal to the mine's rail transportation loop. Active coal mining and reclamation activities surround the demonstration plant site.

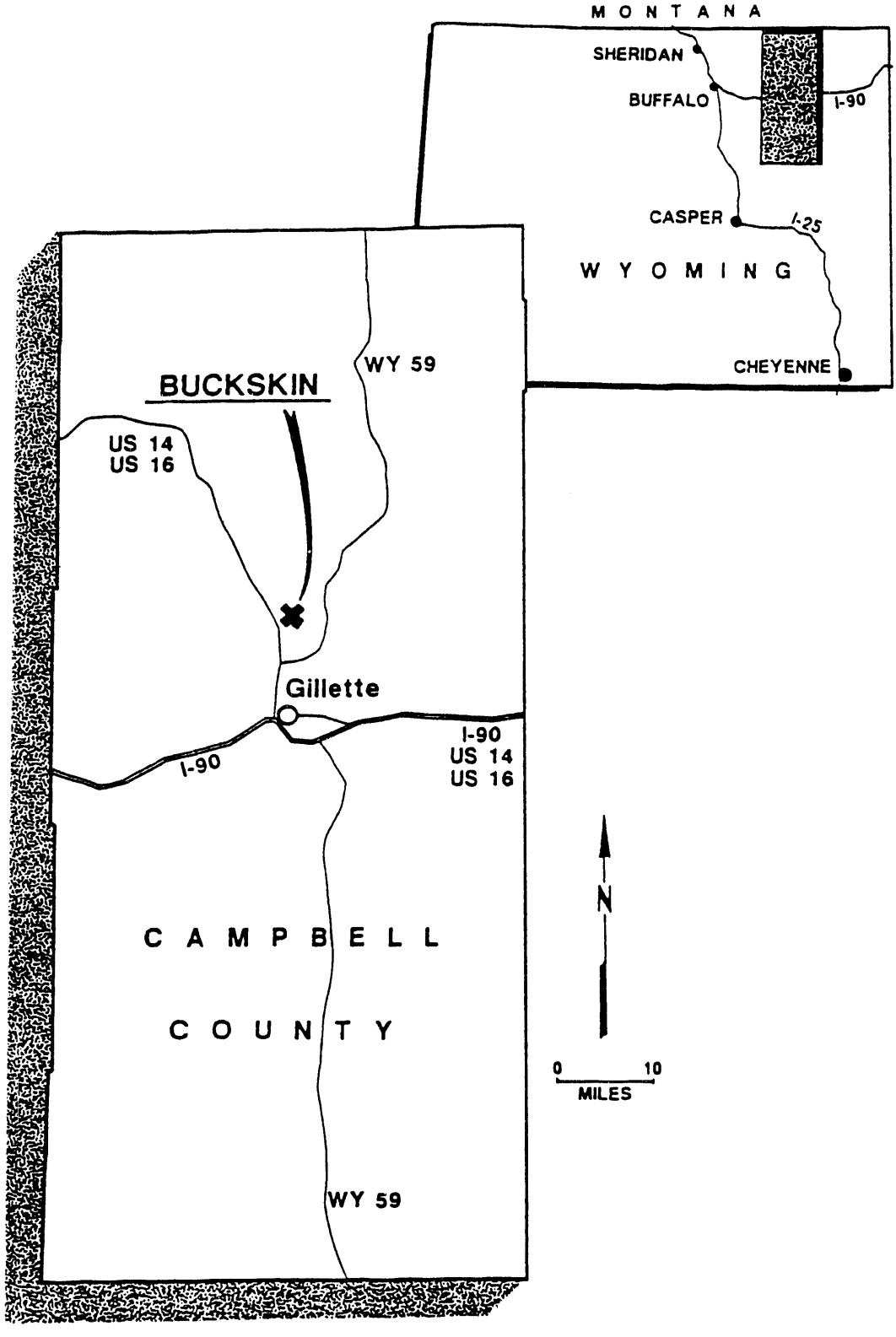
PROCESS CONCEPT

The LFC technology uses a mild pyrolysis or mild gasification process which involves heating the coal under carefully controlled conditions. The process causes chemical changes in the feed coal in contrast to conventional drying, which leads only to physical changes. Wet subbituminous coal contains considerable water, and conventional drying processes physically remove some of this moisture, causing the heating value to increase. The deeper the coal is physically dried, the higher the heating value and the more the pore structure permanently collapses, preventing resorption of moisture. However, deeply dried Powder River Basin coals exhibit significant stability problems when dried by conventional thermal processes. The LFC process overcomes these stability problems by thermally altering the solid to create PDF and CDL. Specification PDF is a stable low sulfur, high BTU fuel similar in composition and handling properties to bituminous coal. CDL is a heavy, low sulfur hydrocarbon liquid that can be used as an industrial fuel or perhaps upgraded for chemical feed stock or transportation fuels.

Briefly, in the LFC technology, coal is first deeply dried to remove water physically. The temperature is further raised in a second stage which results in decomposition reactions that form the new products. This chemical decomposition (mild gasification) creates gases by cracking reactions from the feed coal. The chemically altered solids are cooled and further processed to make PDF. The gases are cooled, condensing liquids as CDL, and the residual gases are burned in the process for heat. The process release for the ENCOAL plant predicted that one ton of feed coal would yield roughly ½ ton of PDF and ½ barrel of CDL. By varying plant running conditions, however, it has since been learned that the actual CDL recovery rate may be as much as 15% to 20% above the projections.

Figure 3 is a simplified flow diagram of the ENCOAL process. Run-of-mine coal is supplied to the demonstration plant from existing Buckskin Mine storage silos. The coal is transferred periodically to a new 3000-ton storage silo. Coal from this silo is sized by crushing and screening to 2" X 1/8", continuously fed (up to 1000 ton/day) onto a conveyor belt by a vibrating feeder and lifted about 195 feet to the top of the plant building (the entry point to the dryer on Figure 3).

Figure 2. ENCOAL Project Location



ENCOAL Mild Gasification Demonstration Project

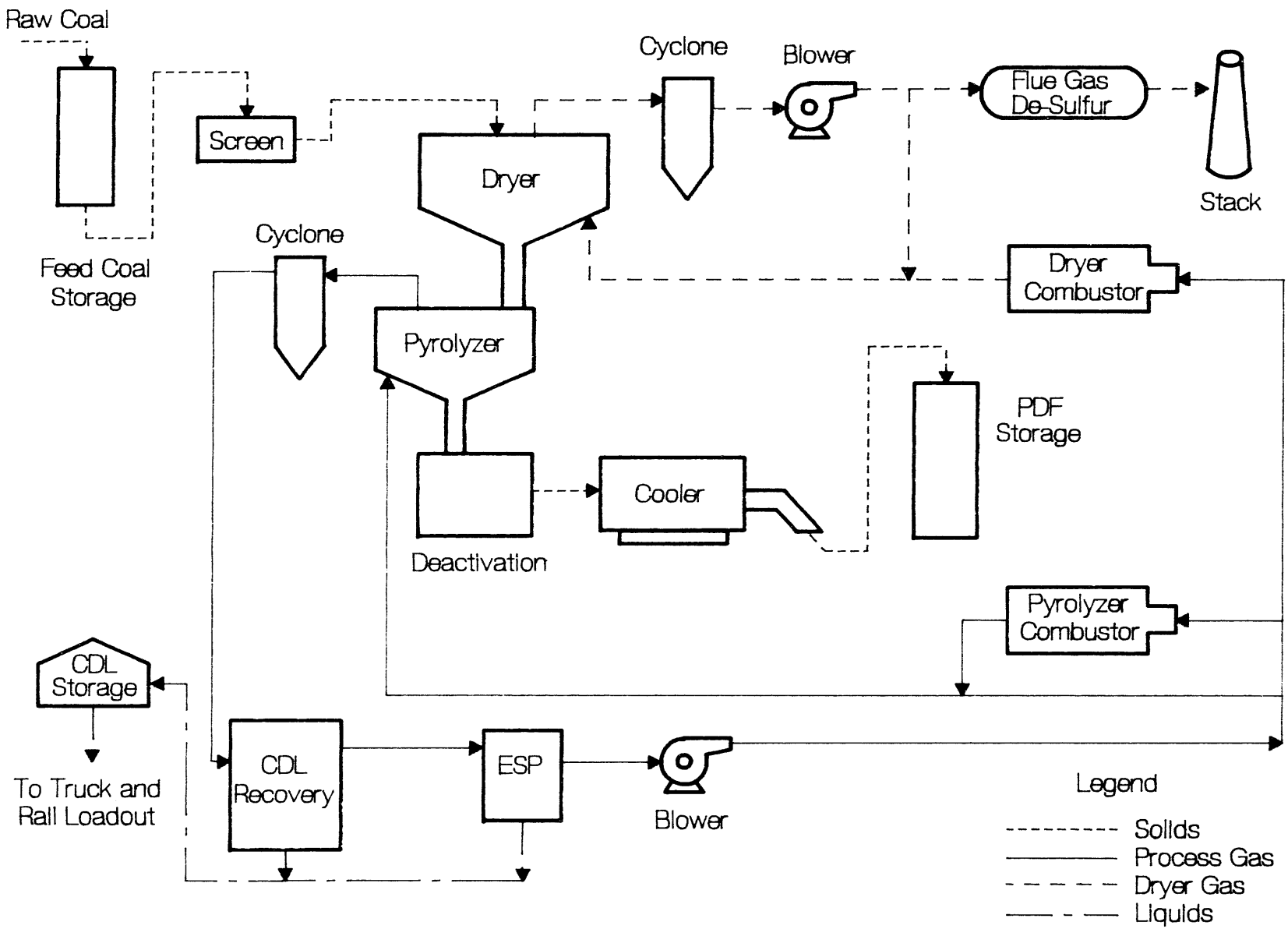


Figure 3: Simplified Process Flow Diagram

The coal is then fed into a rotary grate dryer where it is heated by a hot gas stream. The residence time and temperature of the inlet gas have been selected to reduce the moisture content of the coal without initiating pyrolysis or chemical changes. The solid bulk temperature is controlled so that no significant amounts of methane, carbon monoxide, or carbon dioxide are released from the coal.

The solids then report to the pyrolyzer where the temperature is further raised to about 1000 °F on another rotary grate by a hot recycled gas stream. The rate of heating of the solid and its residence time are carefully controlled as these parameters affect the properties of both products. During processing in the pyrolyzer, all remaining free water is removed and the chemical reactions occur. After leaving the pyrolyzer, the solids are quickly cooled to stop the pyrolysis reactions.

The processed coal is then fed into the deactivation loop of the process where it is partially fluidized and treated with a controlled temperature and oxygen content gas stream in a vibrating fluidized bed unit, (VFB). The residence time, oxygen content, and temperature of the gas stream have been selected to stabilize the coal within the VFB unit.

The stabilized solids are then further cooled and transferred to a surge bin. Since the solids will be dusty, having no surface moisture, they require dust suppression. A very effective dust suppressant patented by SMC Mining Company, called MK, is added to the solid product as it leaves the surge bin. The resulting new fuel form is now called PDF. It is transferred to storage silos where it is held for shipment by rail through existing Buckskin loadout facilities.

In the liquids recovery section of the plant, the pyrolysis gas stream leaving the pyrolyzer is cooled in a quench tower to stop any additional pyrolysis reactions and to condense the desired hydrocarbons. The gas temperature is kept above the dew point of the water so that only CDL is condensed. This step prevents the formation of water in the process and the resulting separation and disposal problems.

Most of the residual gas from the condensation unit is recycled to the pyrolyzer by a blower. Some of this gas is burned in the pyrolyzer combustor and blended with the recycled gas which provides heat for the pyrolyzer.

The remaining gas is burned in the dryer combustor which converts all sulfur compounds to sulfur oxides. Nitrogen oxide emissions are controlled by appropriate design of the combustor, based on evaluation of NO_x control technologies for low BTU gases. The hot flue gas is blended with the recycle gas from the dryer to provide heat and gas flow necessary for drying. The exhaust gas from the dryer gas loop is treated first in a wet scrubber followed by a horizontal scrubber, both using a water-based sodium carbonate solution. The wet gas scrubber recovers fine particulates that escape the dryer cyclone and the horizontal scrubber removes most of the sulfur oxides from the flue gas. The spent solution discharges into a clay lined pond for evaporation.

PROJECT DESCRIPTION

The ENCOAL project involves the design, construction and operation of a 1000 ton per day mild coal gasification demonstration plant and all required support facilities. A significant reduction in work scope and cost is being realized on the project due to the existence of the host Buckskin Mine. Coal storage and handling facilities, rail loadout, access roads, utilities, office, warehouse and shop facilities are all present at the mine site and thus reduce the need for new facilities for the ENCOAL project. Operations staff, supervision, administrative services and site security are being provided under contract with Triton Coal Company. The balance of the project requirements are being provided by ENCOAL and its subcontractors.

The project is divided into three phases listed as follows:

Phase I -- Design and Permitting
Phase II -- Construction and Start-up
Phase III -- Operation, Data Collection, and Reporting

Two budget periods encompass the work, the first covering Phases I and II and the second covering Phase III. A typical Work Breakdown Structure has been developed for the project.

Engineering, procurement and construction management (EPC) for the project was handled by The M.W. Kellogg Company. Kellogg's scope of work included home office design, project coordination, field construction supervision, scheduling, project controls, procurement and project management.

ENCOAL and Triton are handling the operations planning, training, maintenance planning, staffing, plant commissioning and start-up, data gathering and plant operation. Other than the actual plant operation, many of these activities took place in Phase II. Preparation of written plans and manuals was also a part of these activities. All permitting requirements were handled by ENCOAL, and field engineering and construction support was handled by ENCOAL's technical team. ENCOAL submitted its Continuation Application to the DOE on May 17, 1992, and the ENCOAL plant is currently operating under Phase III of the project.

INTERFACE WITH BUCKSKIN MINE PLANT EXPANSION

The Buckskin Mine plant expansion project commenced construction in 1990 adjacent to the ENCOAL project site. Construction of the expansion was completed in January 1993 and the new facilities are currently in operation. The expansion allows the mine to eventually increase coal production to 20 million tons per year and consists of three new 12,000 ton silos, an automated batch loadout facility, a transfer tower, and an in-pit hopper with associated conveyors.

The decisions and approvals of the Buckskin Mine project were made independent of and subsequent to ENCOAL's Cooperative Agreement with the DOE. The interface and proximity of the ENCOAL project and the plant expansion provided optimization opportunities for ENCOAL, but also required changes in some instances from ENCOAL's original plans.

Examples were changes in grade elevations, moving conveyor supports, use of existing MCC buildings, and moving temporary construction facilities.

EXECUTIVE SUMMARY FOR QUARTERS 1, 2, AND 3 -- *October 1992 through June 1993*

During the first three quarters, ENCOAL kept ahead of the baseline schedule. Several design modifications to the dryer, pyrolyzer, quench table, ESP's, and rotary cooler were implemented, and ENCOAL achieved its first shipment of CDL in October 1992. (The material was slightly high in percent solids and water content, so it was shipped as off-specification product). ENCOAL also conducted a total of eight plant runs during the year. The fourth of these runs, (conducted during the period of January 4, 1993 through January 13, 1993), was held in hopes of using existing plant equipment to produce stable PDF. It was determined from this run, however, that product deactivation would require a separate, sealed vessel. Numerous experiments were conducted in February and March using laboratory equipment and test facilities to establish effective criteria for deactivation. Based upon the results of the testing, an option for PDF deactivation was chosen. This option will utilize a vibrating fluidized bed, (VFB), and support equipment installed in series with the original plant equipment to deactivate PDF. Further design studies and testing continued through April and May, and all construction packages and major equipment items for the erection of the new PDF deactivation facilities were issued and awarded by the end of June. Construction of the PDF deactivation facility began in June with a targeted completion of December 1993.

In conjunction with the PDF deactivation design work, ENCOAL achieved four additional plant runs including two of its most successful tests to date which exceeded four weeks of total operation. The four plant runs were held during the periods of April 13th through the 29th, May 12th, May 20th, and June 2nd through the 15th. These runs were conducted to test plant changes, prove major equipment reliability, calibrate gas flow and solids throughput instruments, and to gather additional information/product for PDF stabilization studies. All of the test plans were completed and the information gathered was useful for the design of PDF deactivation equipment. Approximately 9600 tons of raw coal were processed, yielding nearly 5500 barrels of CDL and producing a total of 4200 tons of PDF, *(1200 tons of which were stabilized in batch quantities)*, from both the April and June runs. The CDL contained only small amounts of water and less than 1% solids, which was much better than previous runs. These amounts are slightly above desired specifications, so the CDL was shipped as off-spec product.

Several plant operability and safety projects were also completed by the end of June 1993. These included a plant eastside drainage project, a PDF structure canopy and vestibule contract, and construction of an ENCOAL warehouse/shop. These contracts were necessary to ensure the safe and efficient operation of the ENCOAL plant. A bid package for a drive-in sump enclosure was also drafted and included with the PDF deactivation mechanical construction bid.

The sale of Shell Mining Company to Zeigler Coal Holding Company was finalized on November 23, 1992. Shell Mining Company (renamed SMC Mining Company) became a wholly-owned subsidiary of Zeigler Coal Holding Company. ENCOAL remains a wholly-owned

subsidiary of SMC Mining Company, and there were no material impacts on the project, future commercialization, or any current ENCOAL agreements.

I. FIRST QUARTER ACCOMPLISHMENTS - *October through December 1992*

3.0 PHASE III -- OPERATION, DATA COLLECTION, AND REPORTING

The Operations Team implemented several plant modifications, conducted plant tests, and performed mechanical repairs, maintenance, and cleanup activities during the quarter. Many of the plant modifications involved the rotary cooler, Salem equipment, and the ESP's. Three plant runs were conducted in October. Several tests were performed during each run, with the majority involving variations of process variables. These tests were conducted with the primary objective of stabilizing the PDF product utilizing existing equipment; ie the rotary cooler. Extended runs were not attained due to mechanical equipment failures, however the plant tests were successful in obtaining necessary data for further PDF stabilization study. In particular, speed control on the rotary cooler was installed and successfully tested. Modifications made to the rotary cooler included the control of solids flow, temperature, and PDF oxidative deactivation in three separate stages within the vessel. These changes were installed by the end of December for a scheduled January 1993 plant run. Several operator training sessions were also held to cover process changes made since the original April 1992 training classes. These sessions were held to ensure operator understanding of systems prior to the January plant run.

Much time was spent repairing the ESP's due to further problems encountered during the October plant tests. Full electric potential could not be achieved in two of the three units. Both units were found to have cracked insulators similar to the cracked insulators found after past plant runs. ENCOAL worked in conjunction with the ESP manufacturer to establish the cause of the insulator failures. Preliminary analysis indicated that better control of the temperature in the insulator housing and an insulator material change would aid in eliminating the cracking phenomena. A new type of insulator material was installed in two of the three units for testing in January 1993.

Excessive use of sand in the dryer sand seal during past plant runs prompted the opening of both the dryer and pyrolyzer for inspection. Cause for the sand loss was found to be a "migration" of the sand as the dryer rotated during normal operation. The sand would flow to the outer plate of the seal and overflow into the gas plenum under the grate. Sand "pumps" that would counteract this migration were furnished by the manufacturer and installed in December.

Excessive wear of the sand seal blade was also discovered during the inspection. The wear problem was evaluated by the dryer manufacturer and turbulent sand

flow due to a large irregular weld was found to be the cause. Modifications to the weld and inspection of the sand seal "pumps" was scheduled to be made by ENCOAL personnel after the January plant test.

ENCOAL achieved its first shipment of CDL in October 1992. The CDL was shipped as off-spec product as it contained higher than allowable solids and water, but was usable as a lower grade oil. Approximately 60,000 gallons of the CDL were loaded and shipped to TEXPAR INC, a regional distributor of fuel oil and ENCOAL's primary customer. *(See Figures 4 & 5: CDL Tank Car and ENCOAL Truck Train Loadout Platform).* Some handling problems were encountered at TEXPAR's unloading facility, however. The CDL required more time than usual to heat up and liquify the train car, and plugging occurred in the piping handling system between the car and the storage tank. ENCOAL is presently working with TEXPAR to ensure that their oil handling system is properly equipped to handle CDL; ie proper heat tracing and tank heating coils.

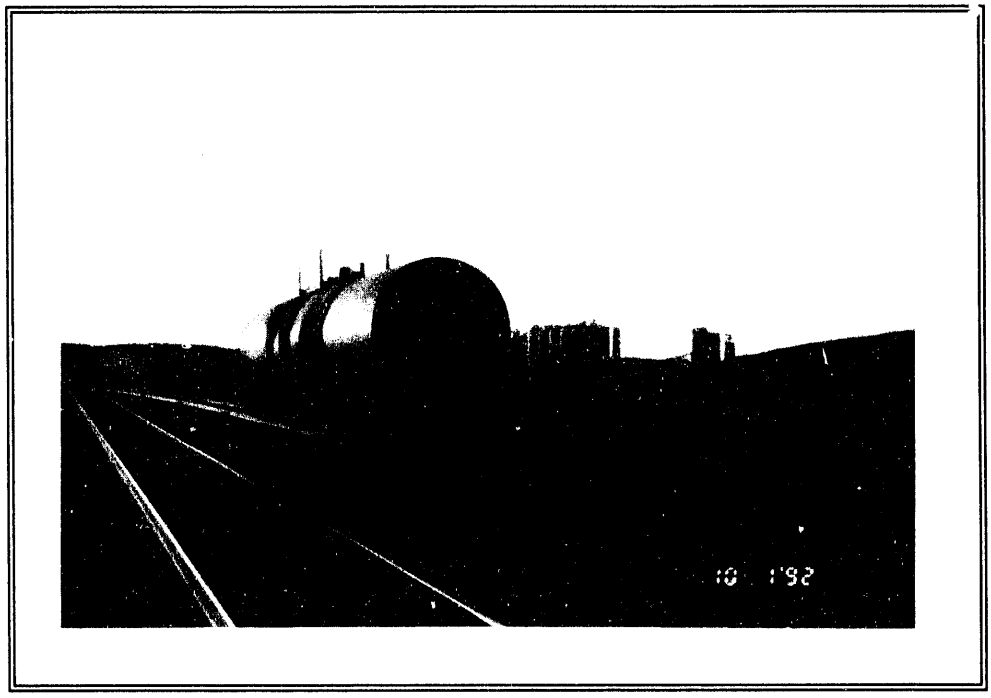


FIGURE 4: CDL Tank Car *(October 1992).*

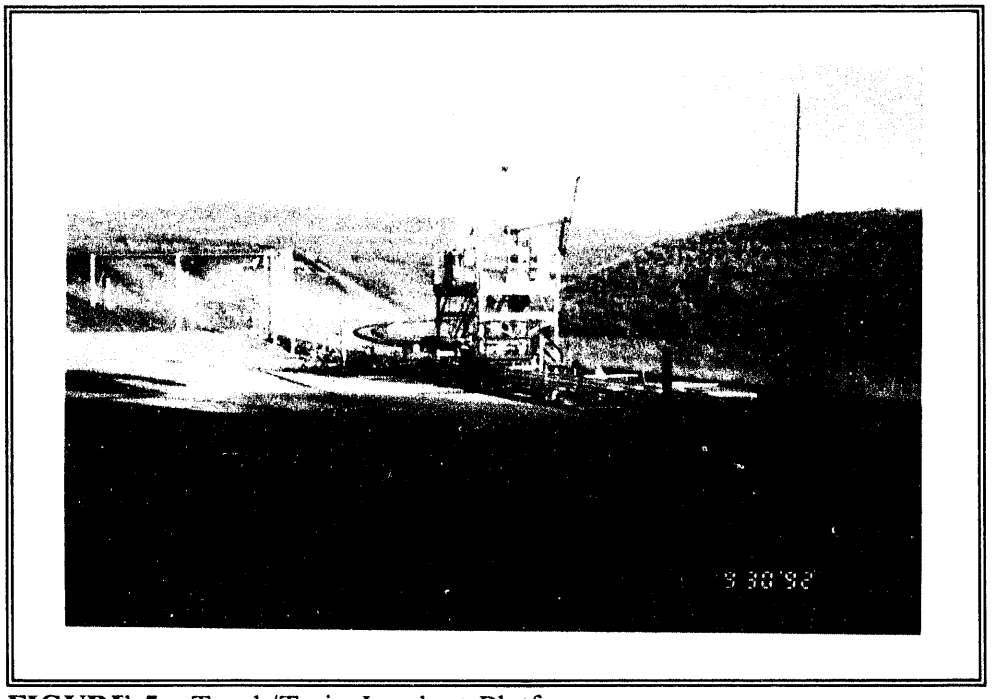


FIGURE 5: Truck/Train Loadout Platform.

Work continued on both the mechanical and electrical maintenance contracts. Repairs and design changes were the primary focus; mainly rotary cooler design changes, nitrogen and oily water systems piping, winterization, and additional plant lighting. Other contractor activity included issuance of the following bids and contracts:

1. Drive-in sump concrete - This work was necessary to aid in the handling and cleanup of the PDF silo area. The design uses a sloped bottom sump and overflow weir plate to collect and settle out coal fines. This area may be utilized for an overall plant fines recovery area in the future. The scope of work was completed in November 1992.

2. Additional Process Insulation - The scope of work for this contract included the insulation of the three ESP's, Wash Oil Tank, CDL Pump Strainers, 48" & 30" process piping between Quench Tower and ESP's, miscellaneous small piping, and 2" of additional insulation on the Pyrolyzer Cyclone. The majority of this insulation was required in order to produce acceptable CDL. Without insulation, water would condense on the cool walls and be collected with the oil in the ESP's. Work was completed on these items in December 1992.

3. Winterization (Building Enclosures) - Thirteen conveyor penetrations and silo door openings were enclosed during the quarter. This work was done in conjunction with outside piping heat tracing in order to operate during the cold winter months.

4. PDF Building Ventilation - Two large ventilation fans were installed in the roof of the PDF building to remove hot air during the summer months.

5. 1st Floor Heating Modifications - A contract was awarded to modify the heating ducts on the ground floor of the PDF building. This work was necessary to keep the piping and floor of the PDF building from freezing during sub-zero weather. Work was initiated in December 1992 and was completed in January 1993.

6. Shop and Warehouse - A contract was awarded to construct a 40'x80' shop and warehouse. Construction began in December 1992 and was completed in March 1993.

The previously announced transaction between Shell Oil Company and Zeigler Coal Holding Company was finalized during the quarter. As of November 23, 1992 Shell Mining Company (renamed SMC Mining Company) became a wholly-owned subsidiary of Zeigler Coal Holding Company. ENCOAL is still a wholly-owned subsidiary of SMC Mining Company and there are no material impacts on the project, future commercialization or any current ENCOAL agreements. ENCOAL's new offices are located at Triton Coal Company's Buckskin Mine, near Gillette, Wyoming.

A revised draft of the ENCOAL Design Report was submitted to the DOE in December. This draft incorporated the comments made on the original and will undergo a second review by the DOE. ENCOAL is also currently drafting an Updated Project Management Plan (PMP) for Phase III project activities. Completion of the PMP is expected by late 1993, and will ensure that the administrative, accounting, and purchasing procedures of Zeigler Coal Holding Company are incorporated. No changes are anticipated to either the baseline schedule or costs submitted with the Continuation Plan.

A meeting was held with the WDEQ to discuss the status of the plant operation, notification requirements, status of the stack gas monitor, and prospective timing for plant performance tests. The meeting went very well and helped the WDEQ understand the plant activities during start-up. Subsequently a letter was sent confirming the stack gas monitor schedule and explained ENCOAL's temporary non-condensible gas venting arrangements installed for PDF cooler and quench table steam condenser tests scheduled for January 1993. The letter underwent a standard 90 day review and was approved in December 1992.

ENCOAL deferred the permitting and construction of the permanent disposal pond from 1993 activities to 1994. This action was taken because the temporary pond is adequate for the projected plant operations through mid 1994.

There was one lost time accident on the project this quarter. A concrete worker suffered a hairline crack in his wrist due to a fall while unloading forms from a truck. Contractor and operations safety meetings continue to be held to ensure project and safety awareness during operation. Frequent safety meetings are held. These sessions consist of respirator training, and ambient gas monitoring procedures.

II. SECOND QUARTER ACCOMPLISHMENTS - *January through March 1993*

3.0 PHASE III -- OPERATION, DATA COLLECTION, AND REPORTING

ENCOAL performed PDF stabilization studies and plant reliability testing during the quarter. The plant was operated from January 5th through the 13th. Early mechanical problems with the pyrolyzer recycle blower were overcome, and the plant proved to be somewhat operable in sub-zero conditions. The severe weather conditions, (+5 to -20°F), froze belts, chutes, and the combustor air blowers. The plant experienced twenty two (22) shut downs during the full eight day run, of which fifteen (15) were weather related. The entire test plan for the run was not completed due to the number of plant shut-downs, but several PDF stabilization objectives were accomplished on the rotary cooler. The rotary cooler had been modified to achieve improved solids flow, cooling and deactivation in three separate stages in hopes of using existing equipment to produce stable product. However, results of the tests indicated that while the modified cooler was very successful in controlling solids flow and product cooling, it was not suitable for product deactivation. It was determined that product deactivation requires a separate, sealed vessel. An April run was scheduled to perform additional process flow and plant reliability tests. These tests were scheduled to aid in fixing problem areas in the plant, (ie gas flow measurement, ESP's, winterization, and dryer and pyrolyzer sand seals), and fine tune plant subsystems. No merchantable PDF was expected to be produced during the planned April run.

Much time was spent repairing the ESP's due to further problems encountered during the January plant tests. Internal inspection after the run showed that the insulators failed in two of the three units. The failure was much the same as the cracking and splitting of the porcelain material seen in the October plant runs. A meeting was held in February to discuss these failures. Attendees of the meeting included ENCOAL, MW Kellogg, the ESP manufacturer, and the manufacturer of the new ceramic insulators. Results of tests performed on the ESP's and insulators were the main topic of discussion. Based upon the test results, several steps to permanently solve the insulator failures were identified.

These modifications were implemented by the end of March, and are listed as follows:

1) New non-glazed, ceramic insulators were fabricated for the two failed ESP's. The new insulators are made of a material that is resistant to cracking and are of a slightly different design than the originals. The six insulators were installed for plant testing in April. If successful, a third set of insulators were to be fabricated for the remaining ESP.

2) All heating blankets on the insulator cans were set to a temperature that will maintain 250°F at the insulator. The high temperatures keep the surface of the insulator hot and will not allow liquids to condense on the insulator surface.

3) Thermocouples were installed on all of the insulator cans to monitor the can temperature during plant operation. An operator alarm will be activated if the can temperature falls below the set temperature.

4) The gas flows through the three ESP units were balanced. A balanced flow ensures that process gas is distributed equally and not concentrated through one ESP.

These modifications were believed to be the permanent solution for the insulator failures, and were planned to be commissioned/tested during the April run.

The sand loss experienced in the dryer in previous runs was significantly reduced by the sand pumps. However, small amounts of sand did accumulate during the 8 days of the January plant operation. After evaluation by both the manufacturer and ENCOAL, it was decided to add four more sand pumps to the dryer sand seal. These pumps were fabricated and installed in the dryer seal for testing in April.

The lack of pressure drop across the pyrolyzer grate at the end of the January plant run prompted the inspection of the pyrolyzer sand seal. The seal was found to be empty and analysis of the failure disclosed that the seal failed due to a combination of a plugged grate and over-pressure. Plugging of the grate was caused by the numerous plant shut downs experienced during the January run, and is not expected to occur during normal plant operation. A higher density aluminum oxide sand was proposed to be used during the scheduled April run to obtain a 25% increase in pyrolyzer pressure capability. Operating procedures were also adjusted to ensure that the pyrolyzer grate is not over-pressured again. In addition, an alternate higher density, less abrasive material was tested by the pyrolyzer manufacturer. This new material would allow a higher pressure drop across the grate and would be less abrasive on the already worn sand seal blades.

Preliminary results were discouraging, however several different materials were still under consideration.

Several problems were encountered with the operation of the quench table steam condenser during the January run. Excessive coal fines build up was experienced in both the piping to the condenser and in the condenser tubes themselves. Plugging of the condenser caused an over pressuring of the system which in turn required the opening of a pressure relief valve vented to the dryer combustor primary air inlet. Ten (10) plant shut-downs were caused by the venting of the steam condenser to the dryer combustor blower. A fines knockout drum was installed in the line between the quench table and steam condenser to remove the fines. In addition, the condenser vent line was relocated to the suction of the pyrolyzer recycle gas blower to reduce the chance of a shutdown due to gas venting. These changes were both completed in March in time for the scheduled April plant run.

A leak in the 48" dryer loop pressure relief valve, prompted inspection of the valve seals and seats. The problem was found to be a warped carriage caused by excessive temperatures experienced during plant operation. The valve carriage was removed and shipped to the valve manufacturer for repairs/modifications to withstand the high temperatures. The new carriage, along with thermocouples attached to the valve face, were installed in late March. The thermocouples were used to monitor the outside face temperature of the valve during plant operation.

ENCOAL initiated discussions for the construction and permitting of an on-site land farm with the WDEQ. The purpose of the land farm would be to eliminate hydrocarbons from process fines prior to disposal on site. Samples of the fines were taken and tested, and discussions will continue as further information is gathered during future plant runs.

A new mechanical maintenance contract was awarded during the quarter. The existing maintenance contractor was the successful bidder. Most of the work covered by this contract involved repairs and design changes; mainly plant winterization, knock-out drum fabrication, piping revisions, and plant clean-up. The work load for the electrical contract became such that a full time crew was no longer necessary. The contract will continue, but will be used only on an as-needed basis. Most of the electrical work is now being done by ENCOAL's own plant electricians. Other contractor activity included issuance of the following bids and contracts:

1. Plant East-side Drainage - This work was necessary to provide proper drainage of the plant run-off near the existing railroad loop and load-out platform. Work was approximately 25% complete by the end of March.

2. PDF Structure Canopies and Vestibules - The scope of work for this contract included the installation of several door covers and vacuum breaking entrances into the PDF structure. This contract was necessary to provide safe access into the building despite high winds and falling ice during the winter months. Work was initiated in March and was 50% complete at the end of the quarter.

3. Updated SGTech Support - This contract was issued in July 1991 and is currently under re-negotiation. It is necessary in order to continue technical support services necessary for plant operation.

There was one lost time accident on the project this quarter. A contract laborer suffered a compound fracture in his ankle when a barrel handler tipped over on his leg. The incident happened while sand was being loaded into the pyrolyzer sand seal. The project also underwent a mandatory semi-annual MSHA inspection in January. The majority of the comments were favorable and no violations were received.

III. THIRD QUARTER ACCOMPLISHMENTS - *April through June 1993*

3.0 PHASE III -- OPERATION, DATA COLLECTION, AND REPORTING

The technical support group designed plant modifications and developed plant operations and testing plans. Several tests were completed and the plant experienced two of its most successful runs; one from April 13th through the 29th, and one from June 2nd through the 15th. Two other runs were attempted on May 12th and May 20th, but were cut short due to problems with the plant Programmable Logic Controller (PLC) and pyrolyzer recycle blower bearing failures. Plant operation was very smooth overall and many of the previous problem areas, *(ie ESP failures, combustor control problems, coal slurry handling, and quench table condenser fines)*, were overcome.

The April plant test consisted of a continuous 16 day period with the exception of 24 hours on the 23rd when the dryer sand seal failed. The cause for the seal failure is suspected to be due to infiltration of coal into the sand making the seal density lighter than design. Early mechanical problems with the large process blowers were overcome, and the plant operated very well with few problems. Primary goals of the run were to test plant changes, prove major equipment reliability, calibrate gas flow and solids throughput instrumentation, and to gather additional information/product for PDF deactivation testing. All of the April test plans were completed within the first 7 days of operation, and a set of supplementary tests were drawn up and initiated. Supplementary tests were approximately 60% complete when the plant underwent a shutdown due to a plug in the inlet duct to the quench tower. Approximately 5200 tons of raw coal were processed

and nearly 3000 barrels of CDL were produced. The CDL contained no measurable water, but the solids content was approximately 2%. Although these solids were not ash and were found to be fully combustible, the concentration was still above specifications.

The June plant test consisted of a continuous 13 day period with the exception of 28 hours on the 7th, when the pyrolyzer sand seal failed. The cause of the seal failure was due to over-pressurization while testing the gas flow limits in the pyrolysis loop. The seal was refilled for the last 7 days of the run until the plant underwent a planned shutdown. Nearly 4,400 tons of raw coal were processed and approximately 2500 barrels of CDL were produced. The CDL contained small amounts of water and less than 1% solids by the end of the run. These amounts are slightly above specifications and the CDL will be shipped as off-spec product. The remainder of the month was used to clean up the plant and equipment in preparation for the PDF deactivation modifications. The plant will remain shutdown until construction of the PDF deactivation facilities are complete and commissioning is initiated as scheduled for December 1993.

The ESP modifications were successfully tested in the April run. ESP insulator can temperatures and voltages were closely monitored, and no insulator failures were experienced. All three units operated smoothly and inspection of the interiors in May indicated no oil build-up or insulator cracking. During efficiency testing in June, however, ESP C experienced an insulator failure. The ESP voltage had been increased to higher than usual levels when the failure occurred. As this particular ESP still contained the original insulator design, it is unclear if the failure was caused by the higher voltage or by insulator design. The "new" design insulators on the other two units did not fail at these higher voltages and the new insulator design will now be implemented in the third unit. All three units will continue to be closely monitored during future plant operations.

The pyrolyzer loop recycle gas blower experienced a vibration problem during the April run. The bearings were changed in both the blower and the 600 hp motor, and the fan blade assembly was balanced in the field. The changes were successful in eliminating the vibration seen in the blower, however, the blower experienced an over-temperature condition and vibration problem in May. The outboard bearing failed and scarred the blower shaft. Inadequate oiling was the suspected cause for the failure. RTD's, *(Resistance Temperature Detectors)*, and an oil circulating system were added to the bearings to ensure better oil circulation/cooling and to have an automatic high temperature shut down. A new shaft was turned at a local machine shop and the blower was reassembled on the 29th of May for the June run. No problems were detected in June with the exception of a slight resonant vibration in the blower foundation. The vibration is being investigated with a fix to be implemented during the next plant shutdown.

The dryer and pyrolyzer sand seals both failed during the April and June runs at gas flow rates and pressure drop well below design. Both units were opened and inspected in order to determine a cause for the seal failures. Results of the inspections were inconclusive, but possible causes are suspected to be; infiltration of coal into the sand making the seal density lighter than design, degradation or grinding of the sand to powder with time, and lower than desired fill levels. During the June run, an attempt was made to purposely blow the dryer seal while it still had fresh sand to establish its physical limits. This time the seal held at design flow and pressure drop. Further studies of both sand seals are currently being conducted in order to determine any necessary changes to improve their operability. A meeting with the dryer and pyrolyzer manufacturer was held in late July to discuss the sand seal issues.

After the June plant run ended, inspection of the plant verified that the 54" process gas inlet ducts to the quench column and pyrolyzer cyclone were plugging off. The lower horizontal section of the quench column duct was found to be ½ full of hard material consisting of dust and heavier ends of CDL. The pyrolyzer cyclone inlet duct was found to be ¾ full of layered fines and dust. These plugs were similar in composition to the plug cleaned out of the quench column inlet in May after the April plant shutdown. It is suspected that the plugging phenomenon is due to the low velocities in the pyrolyzer gas loop complicated by the flow restrictions of the pyrolyzer sand seal. Modifications to the pyrolyzer sand seal to allow greater gas velocities in the pyrolyzer loop are part of the above mentioned study. Clean-up of the plugged ductwork was accomplished during the plant shutdown period in July through December.

The new fines knock-out drum between the quench table and the steam condenser was successfully tested in both the April and June runs. The design significantly reduced the amounts of coal fines build-up and no plugging of the steam condenser or piping occurred during the entire period. Coal slurry data was collected and further studies for fines recovery and handling are proceeding. Conceptual design consists of equipment which would recover fines from the coal slurry to ship out with the stable PDF product.

Two new combustor control programs were also successfully tested in April and June. The new alarms and programs automatically adjust the combustor burners during minor plant upsets. Previous plant runs were dependent upon manual operation of the combustor burner control during upset conditions. The use of the programs eliminates the need of a separate continuous combustor operator, and the combustors may now be monitored by the regular plant personnel.

Various tests done on the dryer and pyrolyzer water seals during the April run indicated that a new dual seal water system was a success. The original seal water system design was split into two separate systems in March; one a closed

loop with process water supply and the other a once through system using a cooling water supply. The dual system was developed to reduce the amount of process water created from seal water blow down by up to 67%. Two of the water seals, the Pyrolyzer lower and Quench Table upper, will remain on the process water system, while the other four seals will be supplied by a seal water system with a small amount of cooling water make-up to maintain proper system volume. The permanent piping and system changes will be implemented during the scheduled plant shutdown in June.

No measurable leakage was detected from the modified dryer gas loop emergency pressure relief valve during the April run. A new valve carriage was installed in March due to warpage caused by excessive process temperatures in the January runs. The new components were modified by the valve manufacturer to withstand the higher temperatures and the valve remained seated without any measurable leaks. Valve face temperatures will continue to be monitored during plant operation.

ENCOAL commissioned the vapor collection system for the process water containment area. The system uses a small blower and an activated carbon filter to collect and filter odorous air from the process water containment areas within the plant. Once filtered, the gases are exhausted to atmosphere outside the plant. The system was very successful in reducing plant odors. The system did experience a problem with water saturation of the filters however. Water entrainment in the suction when the process water containment areas become overfilled was the cause of the problem. Floats were installed on the system in May to act as vacuum breakers to keep the water out. The floats were found to be very effective during the June run. Blower exhaust data was also collected during the April and June runs to support an application to the WDEQ-AQD for a permit of a point source exhaust from the blower. While not specifically required by current regulations, it was agreed that a permit would be prudent. Additional data will be collected during future plant runs to support the application.

The maintenance contractor continued through the quarter. Activities included plant repairs, clean-up, minor piping changes, and stock organization. A new nitrogen vaporizer was also installed in May to replace the original unit which never quite made specifications. This contractor will continue to be used on an as needed basis in future plant operations. They will also be used during the PDF deactivation construction to provide aid in the installation of utilities, instrumentation ports, and miscellaneous platforms. Other contractor activity included the completion of the plant eastside drainage contract, the ENCOAL shop/warehouse, and the PDF structure canopies and vestibules package. These contracts were necessary to improve the safety and operability of the ENCOAL plant.

ENCOAL received approval from the WDEQ for the chemical treatment of the cooling water system to combat scaling problems. Scale deposits throughout the cooling water system have caused plugging and flow problems, interrupting plant operations. The chemical treatment is expected to eliminate the existing fouling problems, and will be installed during the scheduled plant shutdown in June.

Significant visitors to the project during the quarter included General Abdul Rachman Ramly, *(Ambassador from Indonesia)*, Dr. C. Lowell Miller, *(Associate Deputy Assistant Secretary for Clean Coal Technology)*, and Dr. Ernest Esztergar, *(President of SGI International)*. Another visitor to the site was Dr. Yoshio Yamada, *(Chief of Carbon Materials Division, National Institute of Research and Environment, Ibaraki, Japan)*. The visitors toured the ENCOAL facility and discussed the possible uses of LFC technology. A sample of stable PDF produced in the June run was also shipped to US Steel for laboratory testing for possible future use.

There were no lost time or reportable accidents on the project and ENCOAL achieved 160 days without a lost time accident by the end of the quarter. Contractor and operations safety meetings continued to be held to ensure safety awareness.

EXECUTIVE SUMMARY -- FOURTH QUARTER - *July through September 1993*

ENCOAL concentrated on the PDF deactivation and plant operability projects during the quarter; mainly S-belt clean-up modifications, rotary cooler seals, dryer and pyrolyzer modifications, fines handling, equipment maintenance, training, and rebuilding of used equipment for the PDF deactivation facilities. Construction of the PDF deactivation facilities, *(ie the VFB project)*, progressed well. The original VFB foundations contract was complete in August, and the mechanical contractor mobilized a large crane on site in mid-September. VFB building structural steel erection was approximately 30% complete, however delivery of the structural steel became a critical path item. Final drawings were received from all of the major equipment vendors, however most delivery dates slipped by approximately three weeks. All of the major equipment items, ductwork, and the balance of the structural steel are now expected on site by mid-October, and upper levels of the VFB building will be erected as the materials arrive. Construction of the PDF deactivation facilities is scheduled to be complete by December 1993.

PLANNED SCOPE OF WORK

Plant clean-up, maintenance, and operability improvement projects were the planned activities of the ENCOAL Operations Team. Construction of the PDF deactivation facilities was to be well underway. Commissioning plans and updated plant start-up, shut-down, and safety procedures were to be developed for a scheduled mid-December plant run. Designs for a coal fines handling system were to be developed, and installation of equipment items and piping

systems necessary for plant operation were to be initiated. An updated draft of the Project Management Plan for Phase III activities was to be near completion.

ACCOMPLISHMENTS
3.0 PHASE III -- OPERATION, DATA COLLECTION, AND REPORTING

3.1 Operation and Maintenance

The Operations Team concentrated on plant operability projects, equipment maintenance, training, and rebuilding of used equipment for the VFB project during the quarter. New seals were installed on the rotary cooler, and S-belt clean-up modifications were approximately 65% complete. The plant is currently shutdown until PDF deactivation construction activities are completed in December 1993. All major vessels were opened and cleaned, and all necessary demolition work associated with the deactivation project was completed in July. The PDF deactivation control system programming was approximately 60% complete and good progress was made on the installation of new plant instrumentation. Boiler operation and pyrolyzer dynamics classes were held to continue operator training during the construction period. Future operator training sessions are scheduled for November to cover process changes made to the plant since the last plant operation. These sessions will ensure operator understanding of the new systems in time for December 1993 plant operation.

The mechanical maintenance contractor continued repair, modifications, and clean-up activities; (ie air compressor piping changes and repairs, pyrolyzer sand seal modifications, sump piping changes, and platform construction). This contractor will continue to be used on an as-needed basis throughout the deactivation construction phase and into the next year.

There were no lost time or reportable accidents on the project this quarter. Contractor and operations safety meetings continue to be held to ensure safety awareness. The ENCOAL project achieved 260 days without a lost time accident by the end of September, and a safety recognition picnic was held in celebration of the improved safety performance.

3.2 Data Collection and Reporting

Monthly, Quarterly Technical Progress, and Quarterly Environmental Monitoring reports are all now routinely being submitted. A revised Final Design report is being drafted to include civil and structural design of the project, and a draft of the updated Project Management Plan for Phase III activities is nearing completion. The PMP is currently undergoing an internal review prior to submittal to the DOE. Both documents are expected to be submitted to the DOE in December 1993. ENCOAL has also begun the practice of organizing plant test

data into "run" books. The run books contain the data sheets, test results, and computer trending information for each plant test to be used as reference for future plant project designs or records. These books will also be used for creating reports on the overall plant performance, and to create a summary of significant run data of plant operation. *(See Table 2: RUN DATA)*

3.3 Alternate Coal Testing

Alternate coal testing was not done during this period of the operation. ENCOAL has scheduled alternate coal tests for September 1994 as shown in Phase III of the Milestone Log. Discussions are underway with SGI International on several potential candidates for alternate coals such as; other PRB *(Powder River Basin)* coals, North Dakota lignite, and an Alaska subbituminous coal.

3.4 Administration

ENCOAL is moving ahead with the permitting of an on-site land farm with the WDEQ. The purpose of the land farm is to eliminate the presence of possible hydrocarbons in process fines prior to disposal on site. Samples of the fines were taken during the January, April and June runs, and data obtained from their analysis will be used to support a permit. A preliminary design for the farm is currently being internally reviewed by ENCOAL prior to being submitted to the WDEQ. No objections to the permit are expected and construction of the land farm should begin in November 1993.

Project costs are running below forecast, and will continue to do so until the deactivation modifications are complete. This is because the plant operating hours are much lower than original estimates. When the plant is not running, ENCOAL's crews work on plant maintenance and revisions, thus displacing contract crews. Variable costs are also significantly reduced when the plant is down.

Significant visitors to the project this quarter included Wisconsin Power and Light and a Japanese group from NEDO. Wisconsin Power observed the pile of PDF from the April and June runs and discussed delivery of PDF for test burns in 1994. Both groups toured ENCOAL facilities.

The ENCOAL/DOE Annual Operations Review meeting was held on September 29th and 30th, 1993. The purpose of the meeting was to discuss the current status of the project.

3.5 Equipment Modifications

Plant operability improvement projects and PDF deactivation construction dominated all project activities. Plant test results and stable PDF produced by the

April and June runs were used for further PDF stabilization studies and equipment specifications. This data, combined with test data gathered during January through March 1993, was used to select a vibrating fluidized bed (VFB) unit for product deactivation, and finalized the design and layout of other associated PDF deactivation equipment. This equipment, when installed, will use a controlled oxygen content and gas stream temperature atmosphere to oxidatively deactivate the PDF on a continuous basis. Proper oxidative deactivation is expected to yield stable PDF suitable for test burn shipments.

Figure 6 is a simplified flow diagram for the newly installed PDF deactivation loop. Processed coal is fed into the deactivation loop were it is partially fluidized and treated with a controlled temperature and oxygen gas stream in the VFB unit. Once treated in the VFB, the solids exit the deactivation loop and are conveyed to a rotary cooler. The deactivation gas stream consists of a blower to move the gas stream, a cyclone to remove entrained solid fines, a heat exchanger to control gas temperature, and a booster blower to bleed off gas to the dryer combustor.

All major deactivation equipment and contracts were either awarded or in the bid process, and construction of the deactivation facilities was approximately 40% complete by the end of September. The mechanical contractor mobilized a large crane in mid-September and was 30% complete with the erection of the VFB building. *(See Figures 6 through 10: PDF Deactivation Facilities Construction Progress).* Delivery of the structural steel became the critical path item and the upper levels of the building will be placed when the remaining structural steel is delivered in October. Several of the major equipment items and all of the large OD ductwork were on site by September 30, and the remaining deactivation equipment items are expected to be delivered by mid-October. Construction of the PDF deactivation facilities is scheduled to be complete in December 1993.

The VFB foundations contractor completed the original scope of work, including several contract adders; ie S-belt clean-up basin extensions, small concrete slabs, and underground sump piping to Triton's waste water pond. The contractor is currently finishing punch list items prior to closing out the contract. They are expected to be 100% complete with all items in October upon the delivery and installation of sump trench covers in the VFB building.

ENCOAL installed a separate underground line from the ENCOAL facilities directly to Triton's existing waste water pond. This line enables the plant to discharge washdown water and dust scrubber effluent to the pond without using the Triton sump system. Plugging of Triton's sump system in the past has caused delays in plant start-up and has hindered the operation of the facilities. The new line was discussed with the WDEQ-LQD in order to obtain a revised permit to operate. No objections to the permit were received and the line was installed by the PDF deactivation foundation contractor in late August.

ENCOAL Mild Gasification Demonstration Project

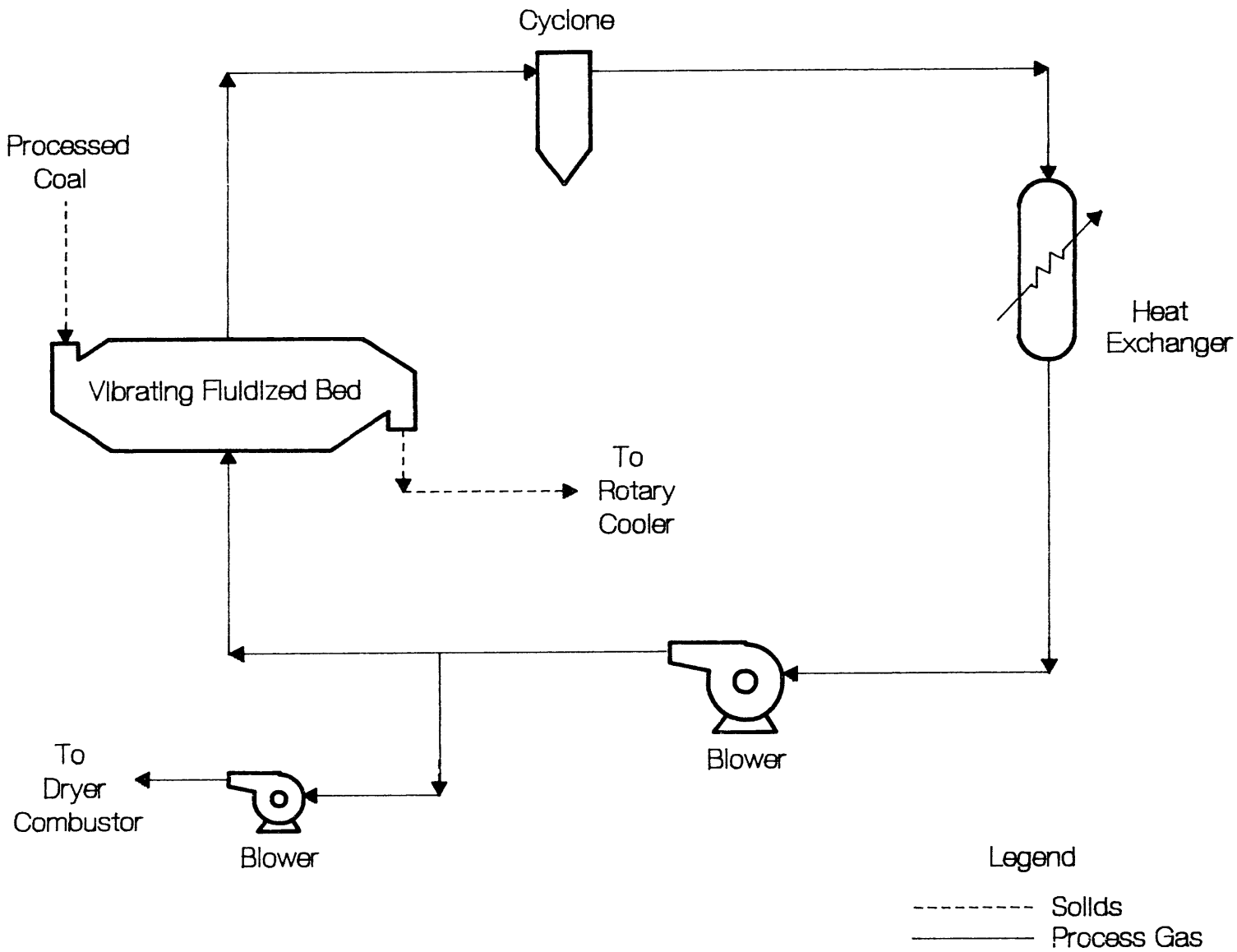


Figure 6: PDF Deactivation Loop Simplified Process Flow Diagram

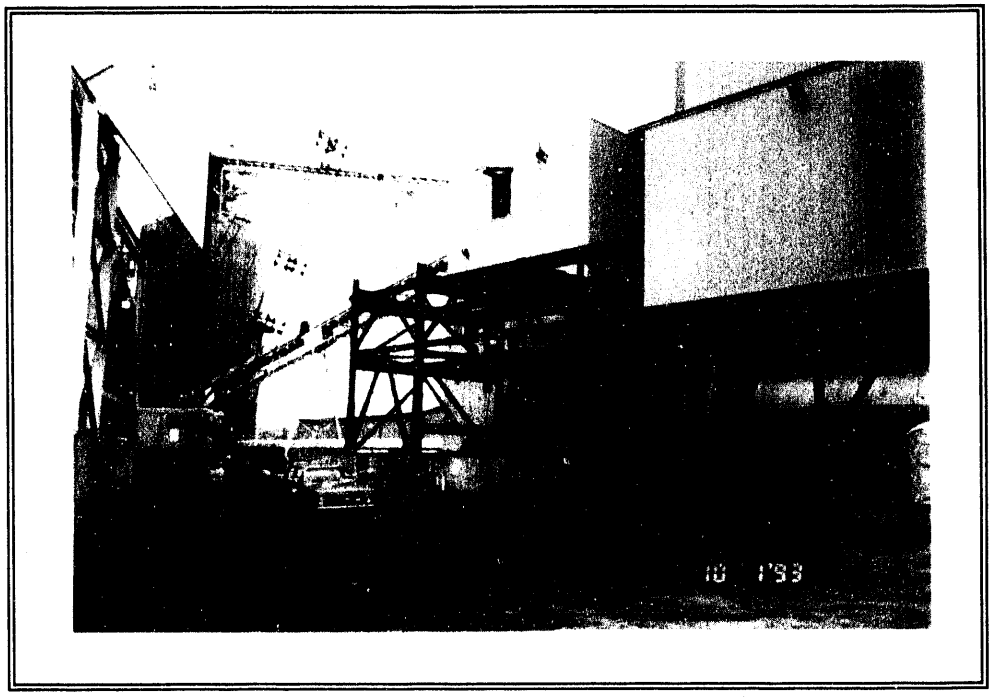


FIGURE 7: PDF Deactivation Construction Site *(Looking West).*

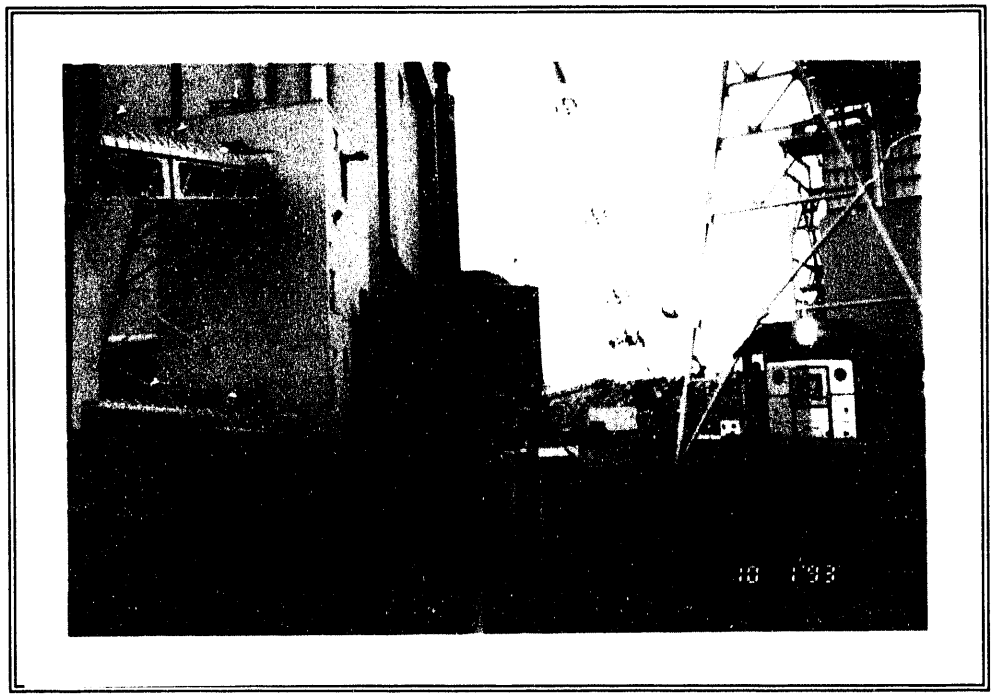


FIGURE 8: PDF Deactivation Construction Site *(Looking North).*

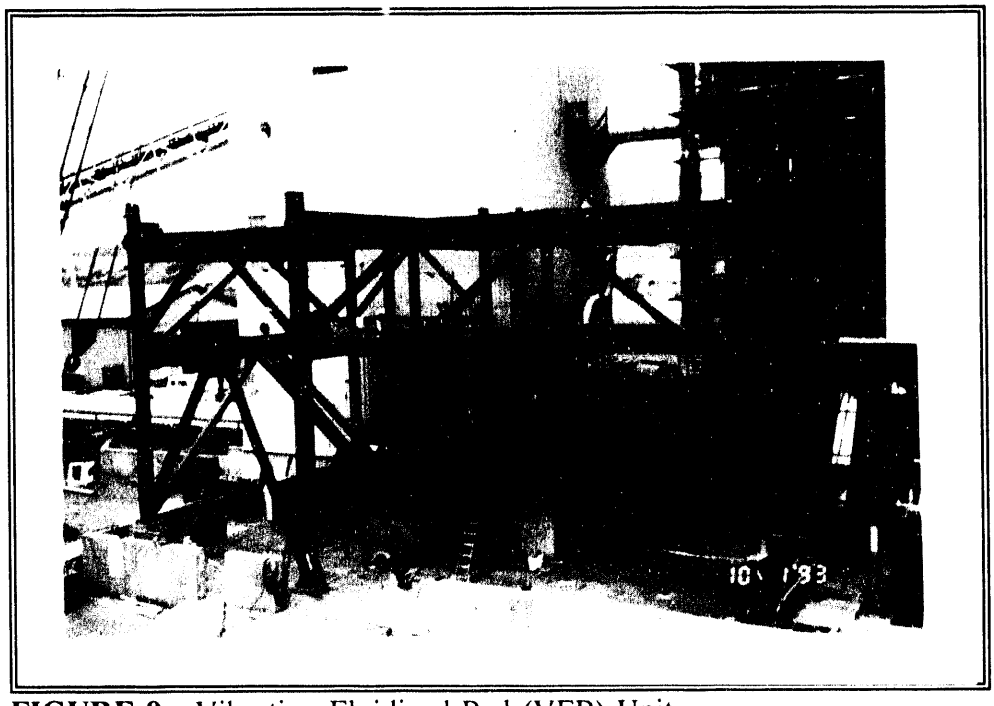


FIGURE 9: Vibrating Fluidized Bed (VFB) Unit.

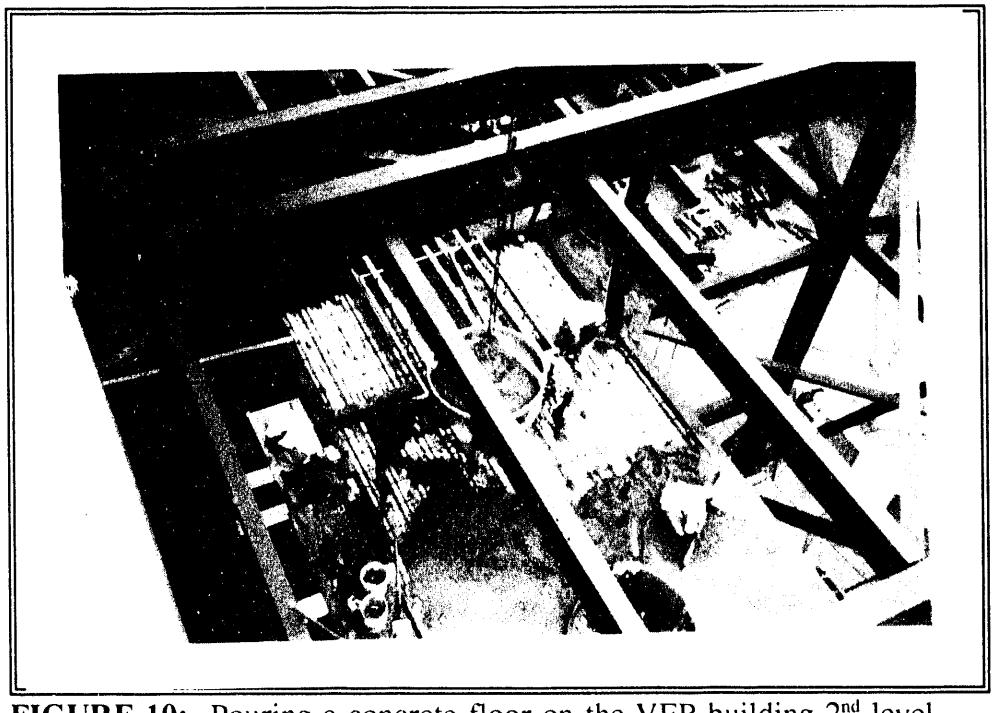


FIGURE 10: Pouring a concrete floor on the VFB building 2nd level.

A temporary water system and fines handling modification was also developed during the quarter, and equipment specifications and purchases are underway. Other modifications to the fines handling system are currently being reviewed. This review will include additional data from future runs to support the development of a final, complete fines recovery system.

A decision was made in August to replace the existing sand seal in the pyrolyzer with a water seal. Operability problems experienced with the existing sand seal were: limitations on the plant throughput; high maintenance requirements; and plant shutdowns caused by seal failures. The new water seal design will allow for greater plant operating flexibility and is expected to solve the long term maintenance problems of blade wear and sand degradation. A detailed design for the new pyrolyzer water seal was furnished by the manufacturer, and demolition of the sand seal was initiated in mid-September. Installation of the new seal is scheduled to be completed by the end of November. Due to the large amount of time required to complete the new water seal installation, the replacement of the dryer sand seal, if necessary, will be deferred to the next plant shut-down. This also allows for testing of the new water seal design before undertaking the larger, more expensive dryer modification.

ENCOAL began modifications on the two plant S-belts during the quarter. Both belts have experienced excessive coal spilling in past runs, and clean-up under the belts has been very difficult. Coal build-up between the belt, conveyor housing and concrete floors would eventually either cause the belts to mis-align, or cause the belts to be shut down for clean-up. Several individual projects were initiated to reduce the S-belt spilling and clean-up problems. Some of the more major projects are:

1. Concrete Clean-out Basins - The concrete floors under both belts were lowered and sloped to drain toward collection areas more accessible to plant operators for spillage removal. A water spray system was installed in these basins to be periodically turned on to flush any spilled material from under the belt to the collection areas. Any coal spillage may now be removed from under the belt without shutting down or endangering personnel. This work was accomplished by the VFB foundations contractor in conjunction with the pouring of the concrete for the VFB building.

2. PDF S-belt Dribble Chute - A dribble chute was installed on the top horizontal section of the PDF S-belt to allow any coal spillage to drop directly into the PDF silo. This dribble chute was fabricated to gather spillage from the full horizontal length of the conveyor and was installed by ENCOAL personnel in August.

3. Coal Feed S-belt Clean-up Screw Conveyor - A clean-up screw conveyor and dribble chute was designed for the top horizontal section of the coal feed S-belt. The design allows for any coal spillage to be collected by the dribble chute and then carried to the dryer surge bin by a short screw conveyor. The dribble chute was installed by ENCOAL personnel in September, and delivery of the screw conveyor is expected in early October.

Several other S-belt improvement projects were modifications to both S-belt feed chutes, installation of clean-up V-plows, relocation of dust collection suction points, and changes to the elevation of the PDF S-belt to allow more room under the belt. These modifications are expected to be completed by the end of November.

TECHNICAL IMPACTS ON SCHEDULE AND MILESTONES

Technical problems and plant modifications dealt with so far have affected ENCOAL's preferred schedule. Continuous production of PDF and CDL at plant design throughput has been delayed by fourteen months, shipment of unit trains of PDF has slipped by approximately twelve months, and plant environmental performance tests have slipped by seven months. These schedule adjustments allow for the installation of the additional equipment for PDF deactivation. The new equipment is expected to be installed by November 30, 1993, and commissioned for operation by the end of December 1993. All changes to the baseline schedule will be summarized in the updated Project Management Plan. Milestones for the project are listed on the Phase III Milestone Log, *(see Table 1)*. There are no anticipated changes to baseline costs.

CONCLUSIONS AND LOOK AHEAD

Good progress was made on the construction of the PDF deactivation facilities, with the overall construction of the facilities being 70% complete. The foundations contract was 100% complete and the mechanical erection contract was 30% complete by the end of the quarter. *(See Figure 10: ENCOAL Plant Looking North (September 30, 1993)*. The ENCOAL plant is currently being prepared for December commissioning/testing. ENCOAL's efforts to modify the plant to improve operability have progressed well. Modifications to the S-belts were 65% complete, and a design for a fines handling system was developed. Installation of the new pyrolyzer water seal was initiated, and a new underground slurry line was completed to Triton's waste water pond. Evaluation and documentation of the June plant test results are underway, and a run book is being developed for the December plant test.

Further preparations for a December plant test should continue and ENCOAL plant alarms/interlocks, start-up and shutdown procedures, operating manuals, P&ID/electrical drawings, commissioning plans, and PLC programming should all be updated to include the new deactivation equipment. Construction of the PDF deactivation facilities should be 100% complete. Successful continuous plant operation should follow the installation, construction and commissioning of the deactivation equipment in December 1993. An updated Project Management Plan should be submitted to the DOE for approval by the end of the quarter.

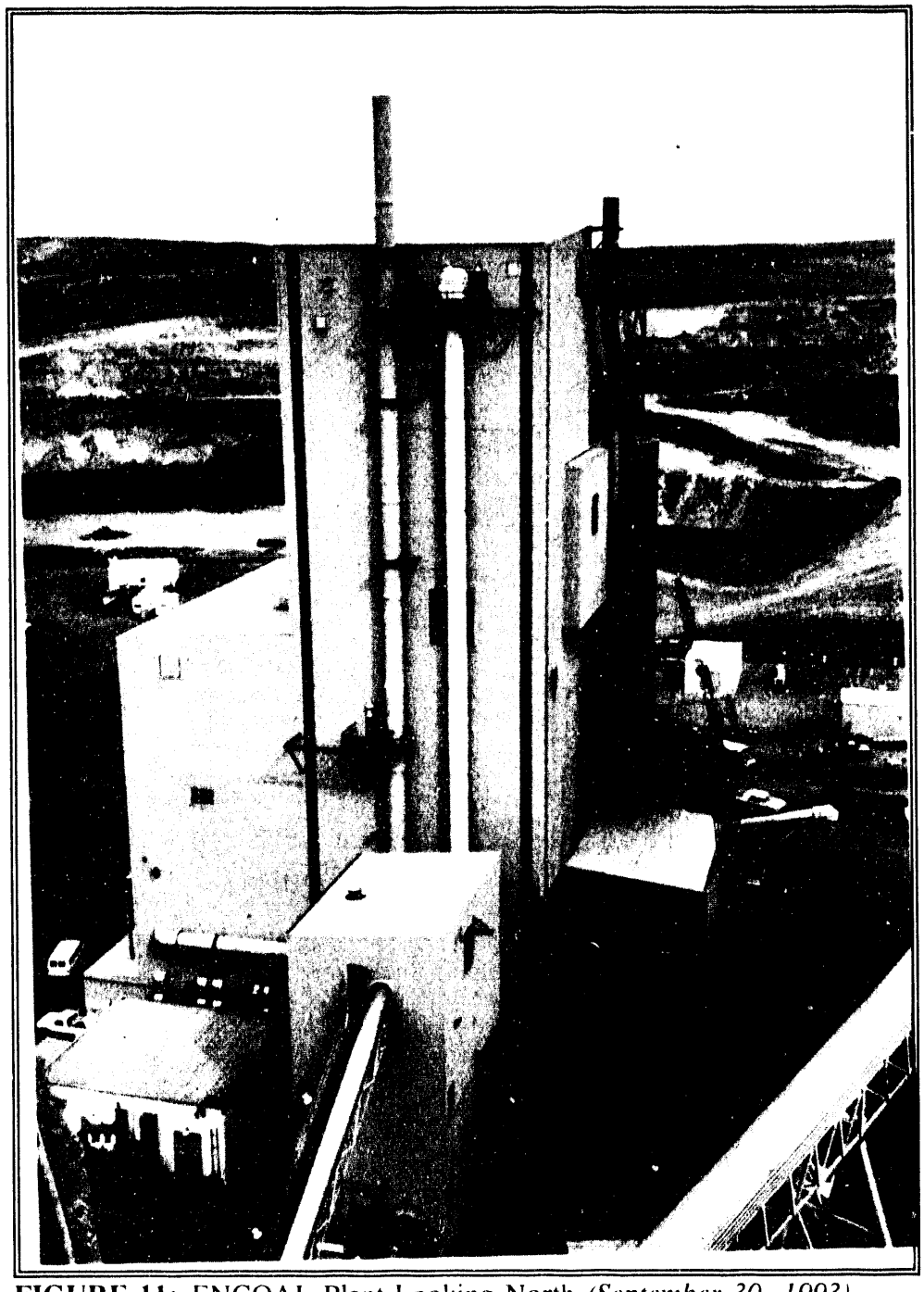


FIGURE 11: ENCOAL Plant Looking North *(September 30, 1993).*

ENCOAL Mild Gasification Demonstration Project

PHASE III MILESTONE LOG

Table 1

ID. No	Description	Planned Completion Date	Actual Completion Date	Comments
1	First Sale of CDL	31-Oct-92	17-Oct-92	
2	Updated Project Management Plan	31-Dec-93		Revised - Work in Progress
3	First Unit Train of PDF	15-Mar-94		Revised
4	Plant Performance Tests	15-Dec-93		Revised
5	Operations Review - 50%	28-Sept-93	28-Sept-93	
6	Select Candidates for Alternate Coal Testing	31-Dec-93		
7	Technical Performance and Economic Evaluation Report	1-July-94		
8	Alternate Coal Testing	17-Sept-94		
9	Operations Review - 100%	17-Sept-94		
10	Complete Deactivation Modifications	31-Dec-93		Revised

ENCOAL MILD GASIFICATION DEMONSTRATION PROJECT

RUN DATA

(October 1, 1992 through September 30, 1993)

TABLE 2

RUN START DATE	RUN DURATION (HRS)	TONS OF RAW COAL FEED	BARRELS OF ACCEPTABLE CDL PRODUCED	TONS OF PDF PRODUCED	REASON FOR FINAL PLANT SHUTDOWN
Oct. 15, 1992	120	2200	1100	700	ESP Failure
Oct. 26, 1992	24	--	--	--	Solids plug between dryer and pyrolyzer
Oct. 30, 1992	24	--	--	--	ESP Failure
Jan. 5, 1993	204	2800	1100	700	Pyrolyzer sand seal failure
April 13, 1993	396	5200	3000	2200	Normal plant shutdown
May 12, 1993	24	--	--	--	Failure of plant PLC controller
May 20, 1993	20	--	--	--	Pyrolyzer recycle blower bearing failure
June 2, 1993	336	4400	2500	2000	Normal plant shutdown

GLOSSARY

BACT	Best Available Control Technology
CDL	Coal Derived Liquid
DOE	U.S. Department of Energy
EMP	Environmental Monitoring Plan
ENCOAL	ENCOAL Corporation, a wholly-owned subsidiary of SMC Mining Company
EPA	U.S. Environmental Protection Agency
ESP	Electrostatic Precipitator
FGD	Flue Gas Desulfurization
HazOp	Hazardous Operation
Kellogg	The M.W. Kellogg Company
LFC	Liquids From Coal
MCC	Master Control Center
MSDS	Material Safety Data Sheet
MSHA	Mine Safety and Health Administration
NEPA	National Environmental Policy Act
PDF	Process Derived Fuel
PLC	Programmable Logic Controller
PMN	Pre-Manufacture Notice
PMP	Project Management Plan
PRB	Powder River Basin
P&ID	Piping and Instrumentation Diagram
QA/QC	Quality Assurance / Quality Control
RTD	Resistance Temperature Detector
SGI	SGI International
SMC	SMC Mining Company, a wholly-owned subsidiary of Zeigler Coal Holding Co.
VFB	Vibrating Fluidized Bed
WDEQ	Wyoming Department of Environmental Quality
ZCHC	Zeigler Coal Holding Company

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