SECTION 4

GKT GASIFICATION PLANT

CONTENTS.

4.1 INTRODUCTION

A preliminary meeting between GAI and GKT (Krupp-Koppers) was held in October, 1980, to discuss various matters including the performance of its gasification plant. It was agreed that GKT would provide GAI with an information package for its battery limit plant based on coal data supplied by GAI. In November, the necessary coal data on Pittsburgh No. 8 coal (a generic coal used in Phase I conceptual design) and C&K coal (a Pennsylvania bituminous selected as potential candidate design coal in Phase II coal search) were given to GKT. On December 30, 1980, an information package via telex was received from GKT for the Pittsburgh No. 8 coal. It was the opinion of GKT that plant design parameter should not vary significantly with different Pennsylvania coals.

The information package was prepared for a gas production rate of 20 x 10^9 BTU/day based on the lower heating value of gas. (Note: This is equivalent to 21.35 x 10^9 BTU/day based on the higher heating value of gas). The plant battery limits were defined as:

Upstream: Coal dust (i.e., pulverized coal) intake service bunker.

Donwstream: Raw gas, free of particulates after gas holder.

Interpretations of this information package are discussed in the following sections.

4.2 PLANT DESCRIPTION AND MATERIAL BALANCE

The overall material balance prepared from the supplied information for the GKT gasification plant using Pittsburgh No. 8 coal is shown in Figure 4.1. The oxygen/coal ratio is 0.93 and steam/coal ratio is 0.092 based on 1% moisture coal (for PGW Phase I these ratios were 0.92 and 0.4, respectively). The oxygen (98% purity) pressure

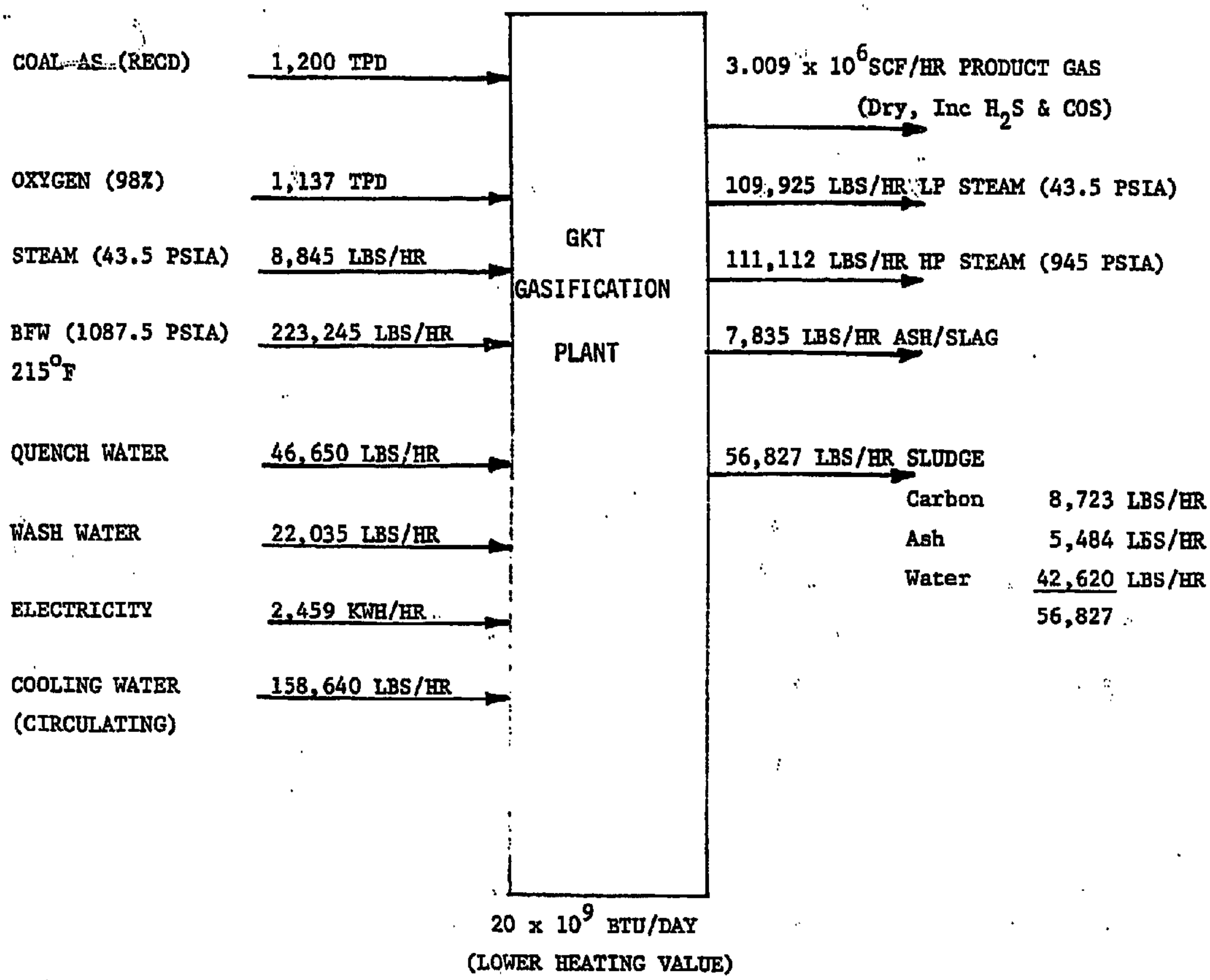


FIGURE 4.1 OVERALL MATERIAL BALANCE FOR B.L. GASIFICATION PLANT

required at the gasifier is 30 psia (2 bar). For operational reasons GKT prefers to have the oxygen blower be installed within their B.L. plant. However, compression can be also done in the air separation plant. Steam is required at 43.5 psia (3 bar). To avoid condensation of steam in the blow pipe, oxygen temperature should be about 285°F and an oxygen heater will be required in the GKT B.L. plant. Low-pressure steam generated in the gasifier jacket could be used in the heater.

Pulverized coal is first received in the service bins and then goes to feed bins. Both bins are blanketed with nitrogen, which is also required for purging in the event of emergency shutdown or plant start-up. For purging and blanketing purposes 149,000 SCF/HR nitrogen is required at 25 psia (1.7 bar).

The gasifier jacket produces low pressure steam (43.5 psia) at a rate of 1.139 lbs per lb of coal (1% moisture). As shown in Figure 4.1 total LP steam produced is 109,925 lbs/hr. Of this, only 8,845 lbs/hr is used in the gasifier as reaction steam. The utilization of the remaining steam requires further investigation. The gasifier raw gas temperature is not given. This high temperature gas after quench is passed through a waste heat boiler (WHB) for heat recovery to produce high pressure steam (945 psia) at rate of 1.152 lbs per lb of coal. Total HP steam produced is 111,110 lbs/hr. This is a saturated steam and will have to be superheated prior to its use in the oxygen plant for air compression. Boiler feed water for the gasifier jacket is at 145 psia (10 bar) and for WHB it is at 1,090 psia (75 bar). BFW temperature is 250°F. (It should be noted that LP steam generation and gasification steam consumption rates are respectively, very high and low compared to the PGW Phase I steam rates.) GKT believes that the LP steam generation rate cannot be shifted in favor of producing more HP steam in the WHB.

The quench water 247 psia (17 bar) required at the gasifier exit is 46,650 lbs/hr. This water is evaporated as it contacts the exiting hot gases and the entire mixture which then flows through the WHB is further cooled in the gas scrubber. Entrained flyash (5,483 lbs/hr) from the gasifier is also removed in the gas scrubber. 70 percent of the coal ash goes up in the gases and is removed in the gas scrubber and disintegrators. The unconverted carbon (8,723 lbs/hr) is also entrained with the hot gases and is removed in the gas scrubber.

The water vapor in the hot gases condenses to water in the scrubber. This condensate and wash water from the scrubber go to the clarifier for solids removal. The overflow from the clarifier is then cooled in the plant cooling tower and recycled back to the gas scrubber along with make-up wash water (22,035 lbs/hr). A large quantity of water (42,620 lbs/hr or about 75 percent of the total sludge weight) leaves the clarifier. The remaining 25 percent of the sludge consists of entrained flyash and unconverted carbon. The cooling tower water circulation rate is 158,640 lbs/hr.

About 30 percent of coal ash (2,350 lbs/hr) leaves the gasifier from the bottom as molten slag. It is cooled in the slag extractor by circulating water. It is then removed from the slag extractor for disposal.

The gasification plant electricity consumption (as quoted in GKT) which includes power uses by oxygen blower, electrostatic precipitator, gasifier slag excavator, disintegrators, and water circulating pumps is 2,459 kwh/hr. However, individual utility requirements were not given.

4.3 PRODUCT GAS CHARACTERISTICS

The gas characteristics at the GKT B.L. plant is given below:

Temperature: 95°F

Pressure: 15.5 psia

Gas Composition (Wet Gas, Vol %)

CO_2	6.36
CO	58.61
H_2	27.29
N_2	0.92
H_2S & COS	0.94 (H_2S/COS = 10/1)
Ar	0.57
CH_4	0.01
H_2O	5.30
HCN	75 ppm

Heating Value (Dry, S-Free), BTU/SCF

LHV	279.7
HHV	295.7

The wet gas composition at the gasifier exit was not provided by GKT.

4.4 EFFICIENCIES

The thermal efficiencies for the gasification plant with a gas (dry, including H_2S and CO_2) make rate of 62,388 SCF per ton of 1% moisture feed coal are as follows:

$$\text{Cold Gas Efficiency} = \frac{\text{Product Gas HHV}}{\text{Coal Feed HHV}} = 65.5 \text{ percent}$$

$$\text{Gross Process Efficiency} = \frac{\text{Product Gas HHV + Energy in Steam}}{\text{Coal Feed HHV}}$$

$$= 82 \text{ percent.}$$

The heat loss in the unconverted carbon is 11.76%. The remaining heat loss (6.24%) accounts for the heat removed with the slag, sensible heat associated with the gas, and heat loss through the gasifier jacket.

SECTION 5

AIR SEPARATION PLANT

CONTENTS

AIR SEPARATION PLANT

5.1 INTRODUCTION

An air-separation plant is required to provide oxygen for the GKT gasification unit. In addition, by-product nitrogen from the air separation plant will be utilized for pneumatic conveying of pulverized coal from the coal preparation area to the gasification unit.

To meet these needs the following air separation plant suppliers were contacted to obtain technical and preliminary cost information:

1) AIRCO Energy Company, Inc.
2) Air Products and Chemicals, Inc.
3) Air Liquide, Inc.
4) Union Carbide Corporation, Linde Division

From these contacts it was determined that the air separation plant suppliers are willing to take the following different business approaches for energy related projects:

1) Supply turnkey air separation plant
2) Provide hardware sale
3) Supply oxygen at the plant site (own and operate the plant)

In addition, several of the suppliers were receptive to the possibility of taking an equity position in the PGW project.

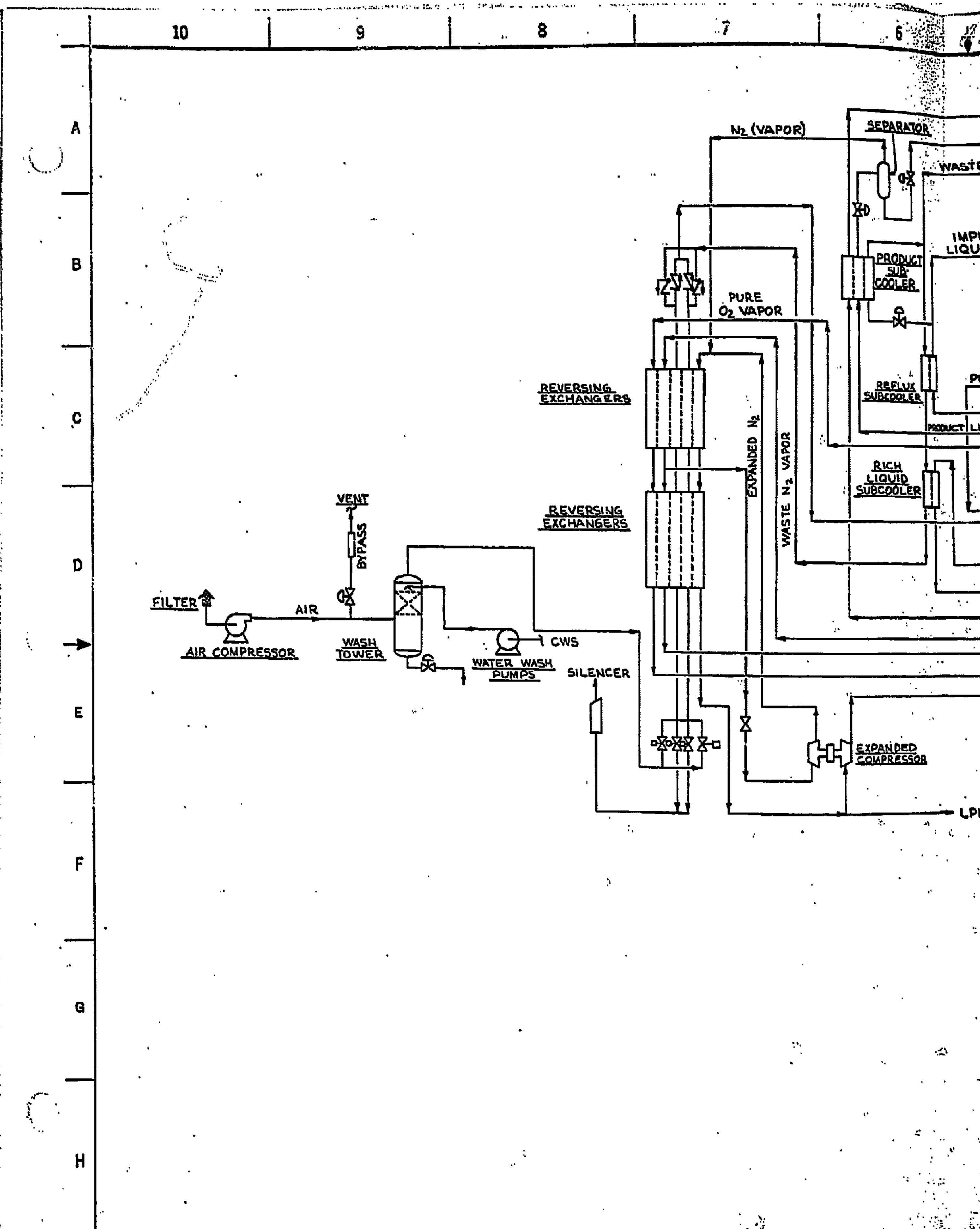
An investigation of the most desirable type of business arrangement for the air separation plant design and construction is recommended.

5.2 PROCESS DESCRIPTION

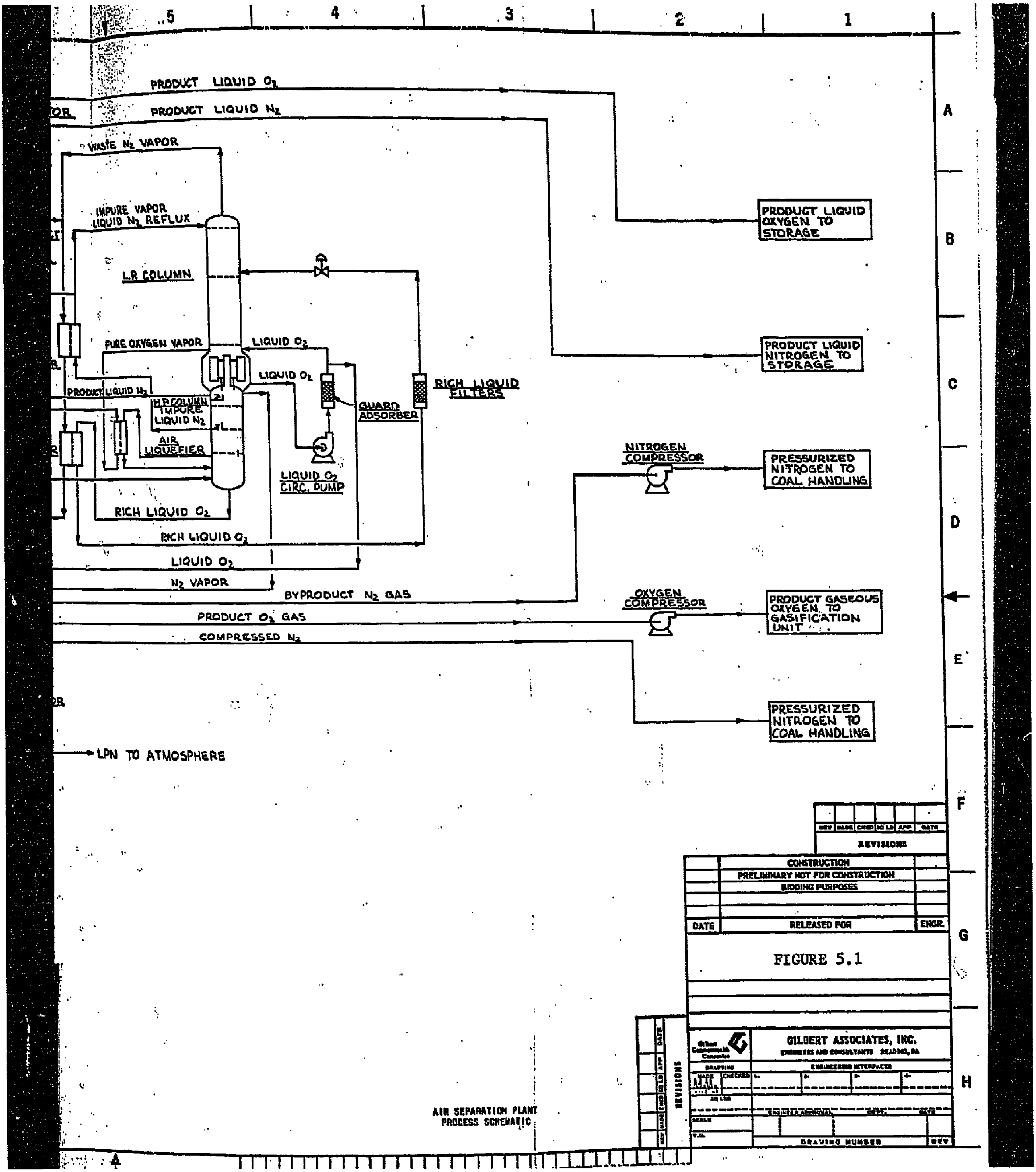
In a simplified form, the main process steps to produce oxygen and by-product nitrogen in an air separation plant include: air compression, water and carbon dioxide removal, cooling to liquid air temperature, gas expansion to produce refrigeration, separation of air by distillation, product heating by heat exchange with the incoming air, and compression of oxygen to the required pressure. Figure 5.1 depicts a typical low pressure cycle oxygen plant with oxygen compression.

In the air separation plant the refrigeration process used to reach liquid air temperatures is regenerative. Warm process air entering the plant is cooled by the separated products as they leave. The heat recovery is incomplete, however, so refrigeration must continually be added. Process considerations other than refrigeration require that air entering the first distillation column be at an elevated pressure.

Air also contains variable quantities of dust, water, carbon dioxide and hydrocarbons. These impurities must be removed from the system to insure safe, efficient operation. In the process, dust is removed by a filter on the inlet of the air compressors. The dust that goes by, along with certain other contaminants, is removed in the water wash tower.



N2 (VAPOR)
SEPARATOR
WASTE
IMPU
LIQUI
PRODUCT SUB-COOLER
PURE O2 VAPOR
REVERSING EXCHANGERS
REFLUX SUBCOOLER
PUR
PRODUCT LIQ
EXPANDED N2
WASTE N2 VAPOR
RICH LIQUID SUBCOOLER
REVERSING EXCHANGERS
VENT
BYPASS
FILTER
AIR
AIR COMPRESSOR
WASH TOWER
CWS
WATER WASH PUMPS
SILENCER
EXPANDED COMPRESSOR
LPN



PRODUCT LIQUID O2
PRODUCT LIQUID N2
WASTE N2 VAPOR
IMPURE VAPOR
LIQUID N2 REFLUX
LP COLUMN
PURE OXYGEN VAPOR
LIQUID O2
LIQUID O2
PRODUCT LIQUID N2
HP COLUMN
IMPURE LIQUID N2
AIR LIQUEFIER
GUARD ADSORBER
RICH LIQUID FILTERS
LIQUID O2 CIRC. PUMP
RICH LIQUID O2
RICH LIQUID O2
LIQUID O2
N2 VAPOR
BYPRODUCT N2 GAS
PRODUCT O2 GAS
COMPRESSED N2
LPN TO ATMOSPHERE
PRODUCT LIQUID OXYGEN TO STORAGE
PRODUCT LIQUID NITROGEN TO STORAGE
NITROGEN COMPRESSOR
PRESSURIZED NITROGEN TO COAL HANDLING
OXYGEN COMPRESSOR
PRODUCT GASEOUS OXYGEN TO GASIFICATION UNIT
PRESSURIZED NITROGEN TO COAL HANDLING
REVISIONS
CONSTRUCTION
PRELIMINARY NOT FOR CONSTRUCTION
BIDDING PURPOSES
DATE
RELEASED FOR
ENGR.
FIGURE 5.1
GILBERT ASSOCIATES, INC.
AIR SEPARATION PLANT
PROCESS SCHEMATIC
DRAWING NUMBER

Compressed air enters the base of water wash tower and is cooled in countercurrent direct contact with water which is sprayed into the top of the tower. The hot water is returned to the cooling water system by process air pressure. Air leaves at the top of the tower at very near ambient temperature and flows to the reversing exchangers.

Process air is cooled to liquid air temperatures in reversing heat exchangers by the outgoing streams. During this process, contained water and carbon dioxide are frozen and deposited as solids inside the exchanger.

At regular intervals, the air and the waste nitrogen stream, which is the largest effluent stream, are interchanged. Both continue to flow in the same direction, across the same temperature gradient, but the passages through which they flow are switched. As a result, the water and carbon dioxide deposited by the air before reversal is evaporated completely and removed from the plant by waste nitrogen. Switching is accomplished by an automatic system of timers, warm-end reversing valves, and cold-end check valves.

Slightly superheated air leaves the reversing exchangers, enters the high pressure column and is separated into an oxygen rich liquid at the bottom, pure liquid nitrogen at the top, and impure liquid nitrogen part way up the column.

Pure nitrogen gas from the top of the high pressure column is condensed in the reboiler by boiling pure liquid oxygen in the low pressure column. The returning liquid serves as reflux for the low pressure column.

Further down the high pressure column, impure liquid nitrogen is withdrawn and subcooled, part of it providing reflux for the low pressure column and part of it acting as a subcooling medium for liquid oxygen product in the product subcooler, if required. Waste nitrogen vapor is withdrawn from the top of the low pressure column.

Rich liquid is taken from the base of the high pressure column, subcooled via the waste nitrogen stream, purified in the rich liquid filter, and passed to the feed entry tray of the low pressure column.

Provisions for nitrogen drawn off the top of the high pressure column will be made in two places. First is the pure liquid nitrogen stream sent to separator where resulting liquid would be sent to storage. The flash from the separator would be combined with the effluent gas of the turbine expander and sent through the reversing exchangers for recovery of its refrigeration, then on to produce compression, otherwise it goes out as waste nitrogen through the silencer. The operator will control just how much liquid nitrogen is withdrawn, if any.

The other stream, cold pure nitrogen gas, is sent to the reversing exchanger. Part of this gas is drawn off at the midpoint and sent to the turbine expander. Expander exhaust along with the possible flash from the separator is sent back to the reversing exchanger as described above.

Final separation of oxygen takes place in the low pressure column. Provisions for liquid oxygen to be taken from the base of low pressure column, passed through liquid oxygen guard adsorber, subcooled in product subcooler, and then sent to storage will be made. The subcooling medium would be impure nitrogen from the high pressure column.

Product oxygen gas is taken off just above the bottom of the low pressure column and sent through air liquefier exchanger, where it may be superheated by a slipstream of condensing air, and then to the reversing exchangers for the recovery of the rest of its refrigeration, and finally on to compression.

The oxygen pressure requirement at the gasifier battery limits is approximately 30 psia. Presently, the oxygen compressors (2-50% units) are assumed to be in the air separation plant unit. The possibility of moving the oxygen compressors to the gasification unit for operational reasons should be investigated.

The nitrogen pressure requirement is 50 psia for conveying and 25 psia for blanketing and purging. Presently, the nitrogen compressors (2-50% units) are assumed to be in the air separation plant unit. The possibility of moving the nitrogen compressor to the gasification plant battery limits should also be investigated.

5.3 PROCESS DESIGN BASIS

5.3.1 PLANT SIZE AND PRODUCT PURITY

The oxygen plant sized to match GKT gasification plant producing 20×10^9 BTU/day gas (Lower Heating Value) is 1137 STPD at 98 vol. % oxygen purity for a typical Pittsburgh No. 8 coal. This corresponds to an oxygen to coal (1% moisture) feed ratio of 0.93 $\frac{lb}{}$. The required pressure at the gasification plant battery limits will be approximately 30 psia.

The maximum turndown of air separation plant will be approximately 65% based on the maximum air compressor turndown. As a result, the minimum oxygen production turndown for a 1137 TPD plant will be approximately 739 TPD.

The by-product nitrogen at a minimum of 95% purity produced in the oxygen plant will be used for the following purposes:

1) Pneumatic conveying gas for the dry, pulverized coal
2) Coal bin blanketing
3) Gasification system shutdown blanketing (purging)

The nitrogen requirement for conveying has been estimated to be approximately 187,000 SCF/hr based on 7.0 lbs of coal conveyed per lb of nitrogen. The conveying nitrogen will be compressed to 50 psia by a compressor in the air separation plant. The nitrogen requirement for blanketing and purging has been estimated to be 149,000 SCF at 25 psia.

It should be noted that a maximum of 17,250 SCF/hr of nitrogen can be removed directly from the high pressure column at 50 psia without the use of nitrogen product compression.

5.3.2 PLANT RELIABILITY/SPARING PHILOSOPHY

A typical air separation plant of the type recommended has an average on-stream time of 97-98%. After the start-up, and the plant is operated for one year the rotating equipment is inspected. Assuming no unusual problems, the reinspection is put on a three year cycle. So assuming a 97% on-stream time and a typical turnaround cycle of three years, the total down time would be 30 days; 15 days scheduled downtime and 15 days unscheduled downtime. This is equivalent to five days per year downtime (unscheduled), or 98.6 percent availability.

To provide the above stated reliability the following compressor sparing philosophy and liquid storage facilities requirements is considered:

1) Main air compressors: 1-100% steam turbine drive and 1-100% electric drive

2) Oxygen compressors: 2-50% electric drives

3) Nitrogen compressors: 2-50% electric drives

4) Liquid oxygen storage: one day production at 1137 TPD rate or approximately 240,000 gallon storage capacity

5) Liquid nitrogen storage - one day total nitrogen requirement at 336,000 SCF/hr rate or approximately 87,000 gallon storage capacity

It should be pointed out that in PGW Phase I (conceptual design) two 50% electric driven air compressor for start-up and/or back-up were recommended. One of the air separation plant suppliers (Union Carbide Linde), however, considered this arrangement to be overly conservative. As a result, one 100% electric drive is recommended. The 100% steam turbine drive will give a saving of approximately 5000 lb/hr in steam consumption plus some capital cost savings over the two 50% units.

A refrigeration capacity of approximately 40-50 tons is available for a 1137 TPD oxygen plant. This can be utilized for on-site liquid oxygen and/or nitrogen production and storage. The storage facilities recommended previously would then be filled with liquid products during normal operations. The liquid oxygen and nitrogen would then be withdrawn during air separation plant shutdown conditions.

The maximum liquid oxygen production for a 1137 TPD plant would be approximately 55 TPD. As a result, it would take a minimum of 20 days to provide 240,000 gallon of liquid oxygen for storage (one day gasification plant requirement).

5.3.3 UTILITY REQUIREMENTS

Power requirements were obtained from the air separation plant vendors based on a 935 TPD plant capacity at 98% oxygen purity. Power requirements based on Krupp Kopper's recently revised oxygen requirement have not yet been obtained from the vendors. In addition, the sparing philosophy of the air compressor drives has been recently revised. Listed below, however, are the power requirements for a 935 TPD plant for order of magnitude purposes.

Air Compressors Steam Turbine Drive (2-50%)	95,000 lb/hr.
Spare Air Compressor Electric Drive	(5,450 KW)
Oxygen Compressors (2-50%)	1,280 KW
Plant Auxillaries	400 KW

5.3.4 PLOT REQUIREMENTS

The plot area requirement for a 1137 TPD oxygen plant is about 2 acres including a cooling tower. The cooling tower for the oxygen plant does not have to be a separate unit from the plant cooling water. However, in cases where fouling of heat exchanger tubes will decrease the heat transfer rates a separate cooling tower is preferable.

5.4 ECONOMICS

Budgetary cost estimates were obtained from AIRCO, Air Products, and Union Carbide Linde for a complete turnkey facility. The quotation obtained were based on 935 TPD units producing 98% O_2 at 40 psia. Based on the latest information received from Krupp Kopper the oxygen plant rating is 1137 TPD. Listed below are the scaled-up budgetary cost figures for the air separation plant suppliers. This cost scale-up is approximate, however, since the oxygen plant battery limit pressure has been decreased from 40 to 30 psia and the compressor drive sparing philosophy has been revised.

	Capital Cost, MM$
Air Products	25.9
Linde	30.8 (Includes liquid O_2 storage)

The air separation cost estimates may be requoted in the definitive design portion of the PGW project.

5.5 RECOMMENDATIONS

It is recommended that the following items be pursued during the definitive design phase of the PGW project:

- Obtain definitive cost estimates (+ 20% and - 10% accuracy) based on the revised oxygen plant capacity and driver sparing philosophy stated in Sections 5.3.1 and 5.3.2.
- Investigate the feasibility of moving the oxygen and nitrogen compressors from the air separation plant to the gasifier battery limits.
- Determine the type of business approach (turnkey, hardware, equity position).
- Determine the size of the liquid oxygen and nitrogen storage facilities.

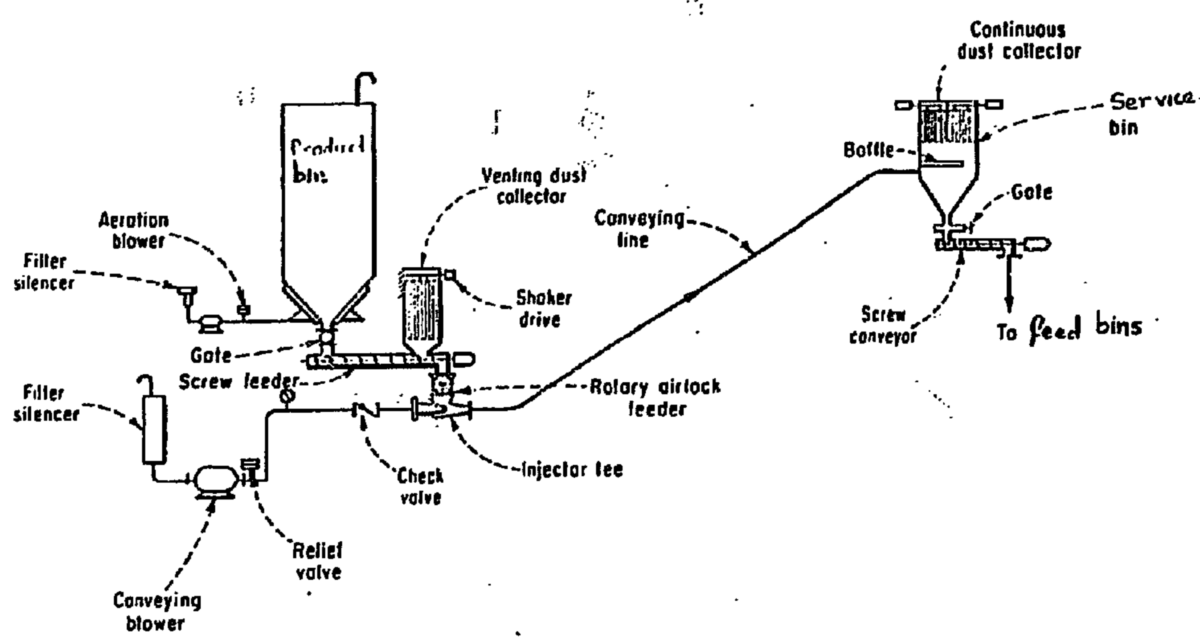


FIGURE 3.1 POSITIVE-PRESSURE, MATERIAL-INTO-AIR SYSTEM

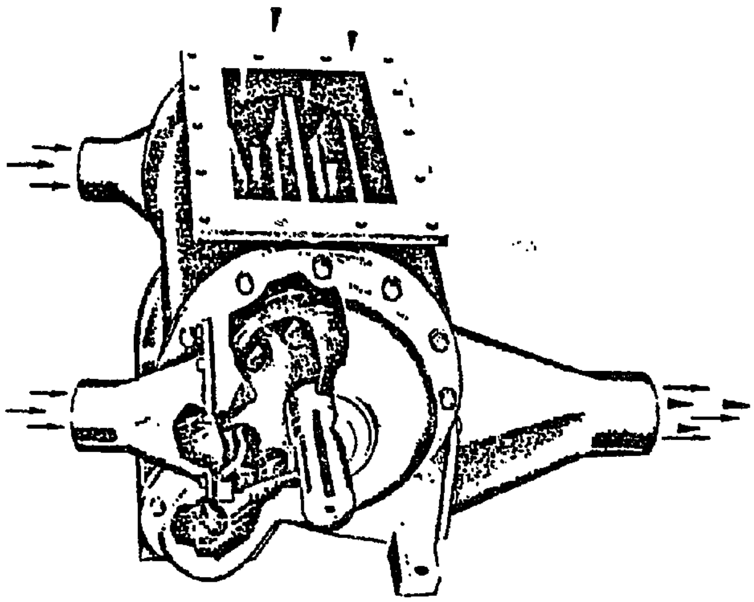


FIGURE 3.2 INTERIOR VIEW OF AIR-SWEPT DOUBLE ENTRY FEEDER VALVE (CEA-CARTER-DAY COMPANY)

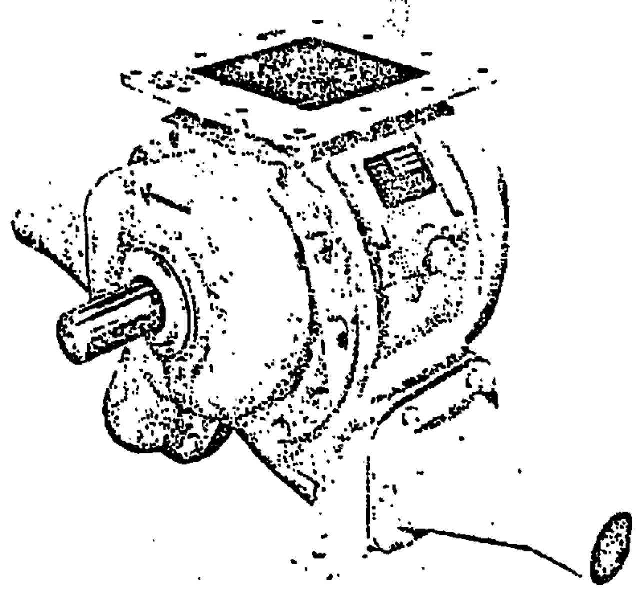


FIGURE 3.3 EXTERNAL VIEW OF AIR-SWEPT DOUBLE ENTRY FEEDER VALVE (CEA-CARTER-DAY COMPANY)

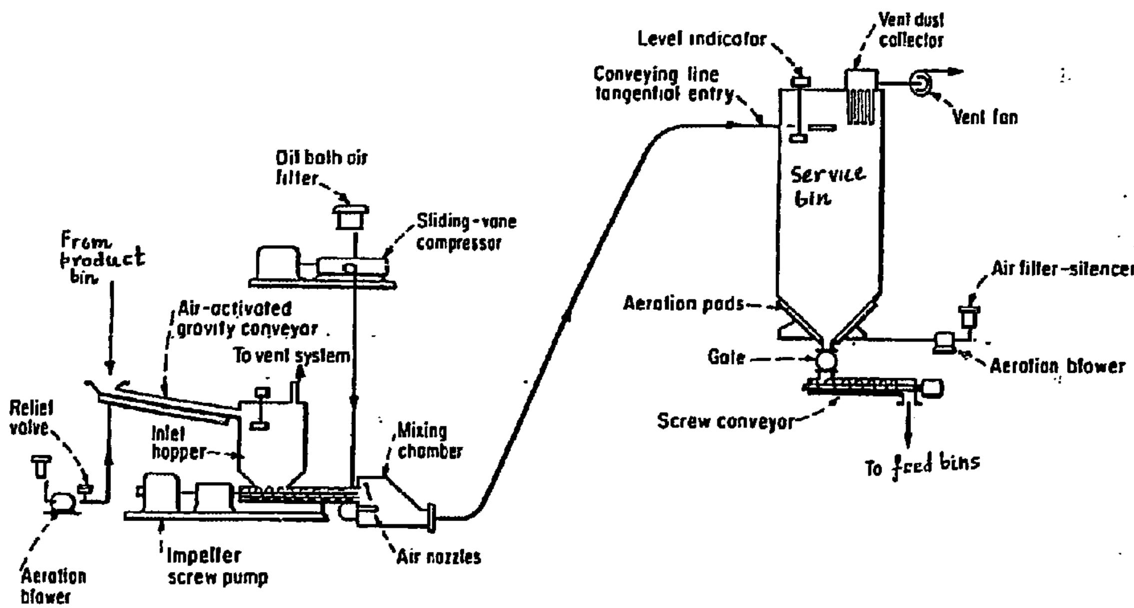


FIGURE 3.4 AIR-MIXING SYSTEM

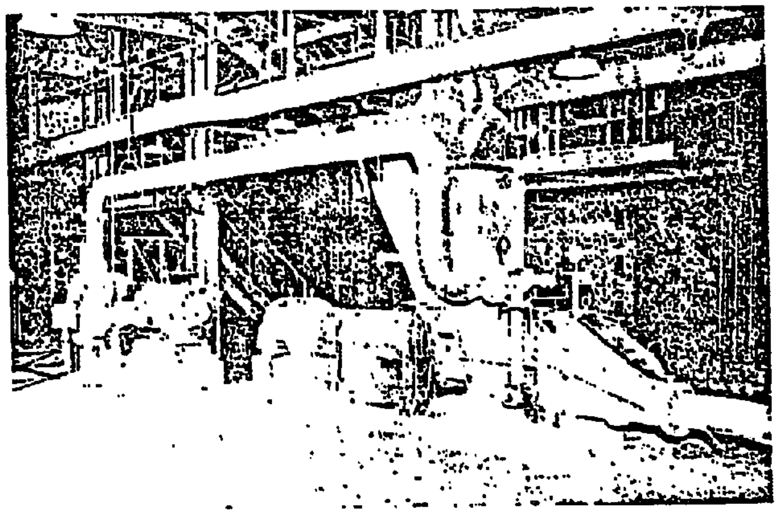


FIGURE 3.5 FULLER-KINYON AIRMIXING SYSTEM. (FULLER COMPANY/GATX)

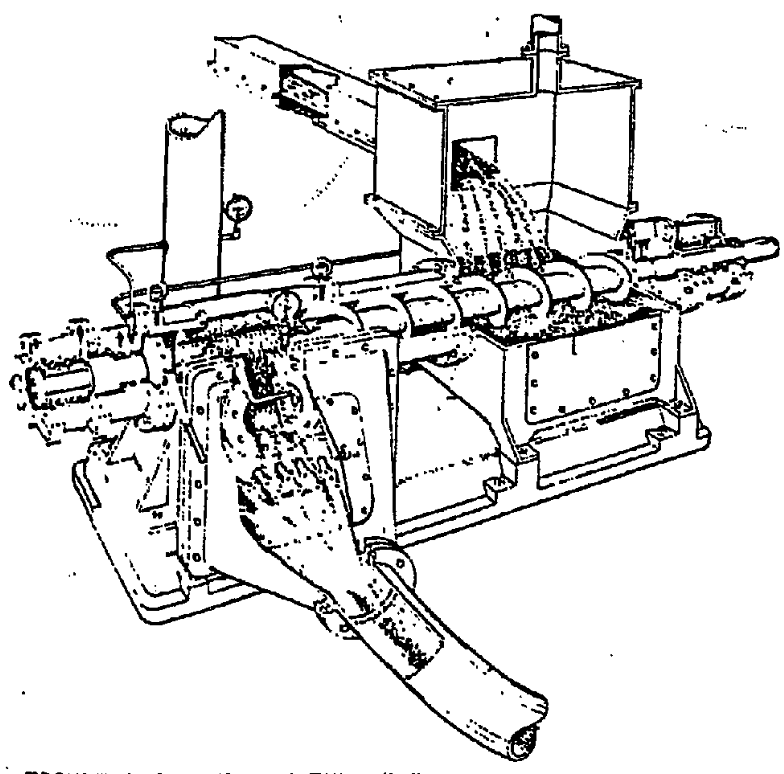


FIGURE 3.6 MODERN TYPE "M" DESIGN OF AIRMIXING SYSTEM. (FULLER COMPANY/GATX)

SECTION 6

STRETFORD PLANT

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STRETFORD PLANT

6.1 INTRODUCTION

The Stretford process, which was developed in England in the late 1950s by the North Western Gas Board and the Clayton Aniline Company of Manchester, is a wet chemistry process for converting H_2S to elemental sulfur. The process can also be used for removing H_2S from fuel gases. Originally, the process was used for removing H_2S from coal-dervied gas; since then it has been widely applied to gases from various sources. The process is fully commercial and is used in more than 50 plants throughout the world, with capacities ranging from 0.1×10^6 to 200×10^6 scfd of feed gas and sulfur production rates of 0.5 to 90 tons/day.

6.2 PROCESS DESCRIPTION*

A simplified flow diagram is shown as Figure 6.1. The raw feed gas enters an absorber, where it is contacted by a downflowing solution of sodium carbonate, sodium vanadate, and the disodium salt of the anthraquinonedisulfonic acid (ADA). Several complex reactions occur in the absorber, resulting in the oxidation of H_2S to elemental sulfur and the reduction of ADA. The spent solution flows from the bottom of the absorber to an oxidizer tank where it is sparged with air to regenerate the ADA. The sulfur is floated off as a froth from the top of the oxidizer and goes to a centrifuge or filter to remove adhering solution. The sulfur is then washed with water, melted, and stored.

Pressure in the absorber is usually dictated by the supply pressure of the feed gas and the desired pressure of the product gas; the absorption process does not require elevated pressures and can be operated satisfactorily at pressures slightly above atmospheric. Operating temperature is in the range 80 to 130°F. The sweetened

*SOURCE: Edwards, M.S., "H_2S Removal for Low-BTU Gas" Oak Ridge National Laboratory, January 1979.

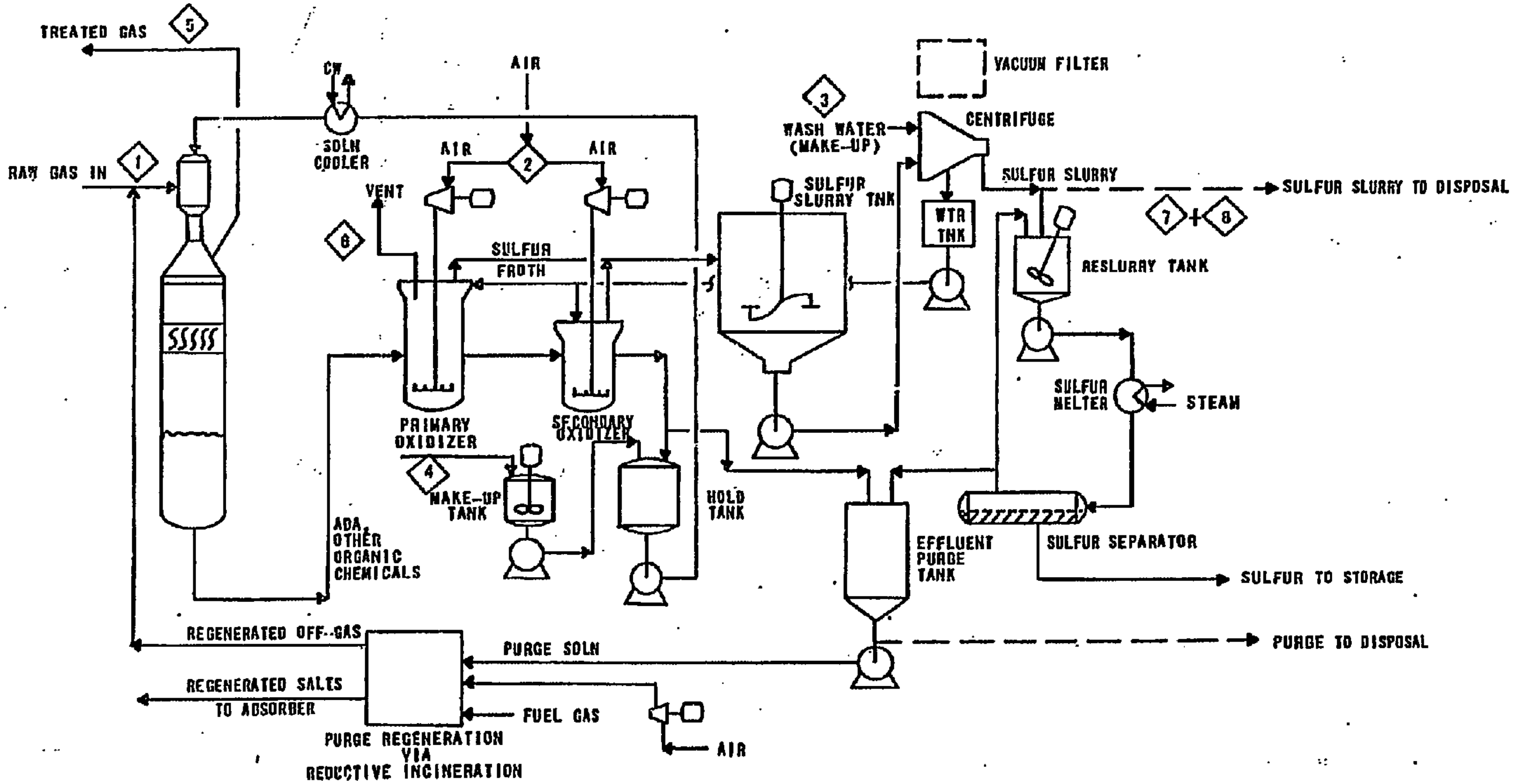

FIGURE 6.1
STRETFORD PROCESS WITH ALTERNATIVE SULFUR RECOVERY METHODS

product gas leaves the top of the absorber with a very low H_2S content (H_2S concentrations <1 ppmv are achievable).

Advantages of the Stretford process include (1) complete selectivity for H_2S in the presence of CO_2, (2) ability to treat feed gases with H_2S concentrations ranging from 300 ppmv to 95% (by volume), (3) ability to operate at low absorber pressures, (4) removal of H_2S to 1 ppmv or less, and (5) direct production of salable sulfur. On the other hand, the process is more expensive than the Claus process (per ton of sulfur produced) when the feed gas is rich enough in H_2S to permit use of the Claus process. In addition, the presence of hydrogen cyanide in the feed gas causes difficulties for the Stretford process due to the irreversible formation of sodium thiocyanate; however, this can be avoided by using a pre-wash column to remove most of the HCN before the feed gas enters the absorber. The buildup of irreversible reaction products is controlled by drawing off a purge stream from the circulating solution. The presence of high partial pressures of CO_2 in the absorber is also undesirable, exerting an adverse effect on the absorption of H_2S. If the partial pressure of CO_2 in the feed exceeds 30 psia, operation of the absorber for effective H_2S removal does not appear to be economically practicable. The Stretford process does not remove COS and CS_2; if these compounds are present in the feed, they will appear in the treated gas.

6.3 PROCESS CHEMISTRY*

As mentioned previously, the solution used in the Stretford absorber is an aqueous mixture of anthraquinonedisulfonic acid (ADA), sodium metavanadate, and sodium carbonate. Other additives such as citric acid are also used in some variations. The removal of H_2S and its conversion to elemental sulfur are represented by the following idealized reactions:

*SOURCE: Edwards, M.S., "H_2S Removal Processes for Low-BTU Coal Gas" Oak Ridge National Laboratory, January 1979.

$$2H_2S + 2Na_2CO_3 \rightarrow 2NaHS + 2NaHCO_3;$$
$$2NaHS + 4NaVO_3 + H_2O \rightarrow Na_2V_4O_9 + 4NaOH + 2S;$$
$$Na_2V_4O_9 + 2\ NaOH + H_2O + 2ADA \rightarrow 4NaVO_3 + 2ADA(H_2);$$
$$2NaHCO_3 + 2NaOH \rightarrow 2Na_2CO_3 + 2H_2O;$$
$$2ADA(H_2) + O_2 \rightarrow 2ADA + 2H_2O,$$

where $ADA(H_2)$ represents the reduced form of ADA. Ionized forms of the reactants in aqueous solution are usually involved. The sum of the foregoing reactions gives the overall reaction

$$2H_2S + O_2 \rightarrow 2H_2O + 2S.$$

In this sequence of reactions, H_2S is absorbed by sodium carbonate, the hydrosulfide reaction product is oxidized to free elemental sulfur by reduction of vanadium from the pentavalent to the quadrivalent oxidation state, and the reduced vanadium is reoxidized by reduction of ADA. Air is blown through the solution in the oxidizer vessel to reoxidize the reduced ADA. Although the rate of H_2S absorption increases with the alkalinity of the solution, pH values above 9.5 are unfavorable for conversion to elemental sulfur.

The oxidation of 1 mole of hydrosulfide to sulfur requires 2 moles of metavanadate. The vanadate concentration is normally maintained at about 10% in excess of the stoichiometric requirement to prevent unreacted hydrosulfide from reaching the oxidizer tank, where it would undergo the undesirable side reaction to thiosulfate. Various additives are used to help maintain solubility of the vanadium and to prevent the formation of complex precipitates.

The Holmes-Stretford process uses citric acid as a complexing agent; this additive has been found to be chemically stable and effective. Iron salts have also been used; about 50 to 100 ppm of iron, chelated with ethylenediaminetetraacetic acid, appreciably increases the rate of reoxidation of the reduced ADA.

Irreversible side reactions cause degradation of the Stretford treating solution. In the absence of HCN, the most significant side reaction is the formation of sodium thiosulfate:

$$2NaHS + 2O_2 \rightarrow Na_2S_2O_3 + H_2O.$$

Any SO_2 present in the feed gas also degrades the solution by the following reaction:

$$SO_2 + Na_2CO_3 \rightarrow Na_2SO_3 + CO_2.$$

Because thiosulfate and sulfite tend to build up in solution and reduce the ability of the system to remove H_2S, a purge stream is required. This stream is sent either to further treatment to recover chemicals or to disposal. Formation of thiosulfate can be controlled to below 1% of the hydrosulfide by proper plant operation. Thiosulfate formation is a function of temperature, solution pH, and the amount of hydrosulfide carried to the oxidizers.

When an appreciable concentration of HCN is present in the feed gas, purge requirements are substantially increased. This results from the fixation of HCN as thiocyanate by the following reaction:

$$HCN + Na_2CO_3 + S \rightarrow NaSCN + NaHCO_3.$$

As an example, a gas containing 1000 ppmv HCN will increase the purge requirements more than ten times that required by thiosulfate formation. For treating coke-oven gases, which typically have a high HCN content, a separate HCN removal column is frequently used prior to the H_2S absorber. Edwards quotes data for a 50×10^6 scfd coke-oven gas treatment plant in which the feed contained 10,000 ppmv H_2S and 1000 ppmv HCN; the use of an HCN absorber ahead of the H_2S absorber reduced the purge requirements from 6000 to 700 gal/day.

The concentrations of HCN in coal-derived gases have not been quantitatively established in all cases and will vary with the type of gasifier, type of coal, and operating conditions. Some estimates of HCN content are high enough to indicate that reductive incineration of the purge streams to recover Stretford chemicals is justified. The need for an HCN preabsorber has not been definitely established.

The presence of large concentrations of CO_2 in the feed gas may cause problems. Carbon dioxide is absorbed into sodium carbonate solution, forming sodium bicarbonate. This lowers the pH of the solution and reduces the H_2S absorption efficiency, thereby requiring an increase in absorber height to obtain the same H_2S removal.

Organic sulfur compounds COS and CS_2 are not removed to a significant extent by the Stretford process. Methyl mercaptan, however, is removed to a large degree. Ammonia will dissolve in solution but does not chemically degrade the solution. However, when large concentrations of ammonia are present in the feed gas, precautions must be taken to prevent release of NH_3 to the atmosphere from the solution oxidizer.

Tars and oils can also interfere with the proper operation of a Stretford plant. If large quantities are present, pretreatment by scrubbing or other means is recommended prior to absorption.

6.4 FEED GAS CHARACTERISTICS

The design of the Stretford process is highly dependent on the feed gas characteristics. For the C&K coal, the feed gas characteristics as predicted by the in-house combustion equilibrium calculations (CEC) computer program are:

Pressure: 4.5 Psig
Temperature: 105°F

Composition:	(Mole %, wet)	
CO	50.15	
COS	0.04	(420 ppmv, dry)
CO_2	8.40	
H_2	33.80	
H_2O	5.57	
H_2S	0.85	(9000 ppmv, dry)
N_2	1.19	
HCN	NA	
CS_2	NA	

Mol Wt (wet) 20.075

Gas Flow Rate: Wet - 3.073 MM SCFH
Dry - 2.902 MM SCFH

CEC does not show the presence of HCN, CS_2, NH_3, etc.

6.4.1 PRESSURE

The Stretford plant venturi scrubber pressure is dictated by the supply pressure of the feed gas and the desired pressure of the product gas. The absorption process does not require elevated pressures and can be operated satisfactorily at pressures slightly above atmospheric. Since the GKT gasifiers operate slightly above atmospheric pressure the operating pressure of the absorber is chosen to be 4.5 psig. The gas from the final cooler is compressed to this pressure in a booster compressor.

6.4.2 TEMPERATURE

Operating temperature is in the range of 80 to 110°F. The temperature considered is 105°F.

6.4.3 COMPOSITION

The presence of hydrogen cyanide in the feed gas causes difficulties for the Stretford process due to the irreversible formation of sodium thiocyanide. Higher HCN content in the feed gas will result in increased Stretford solution purge rate, because of irreversible reaction. If HCN concentration is above 100 ppmv, a pre-wash column will be required to remove most of the HCN.

The gas composition for C&K coal based on CEC program does not show HCN. However, the results of a source test program conducted on GKT gasifier operated by AECI at Modderfontein, Republic of South Africa shows 76 mg/Nm^3 of HCN on dry basis (67 ppmv) in the raw gas from the gasifier. The coal used was characterized as Bituminous, high volatile B coal. The raw gas is further cleaned and cooled in the primary scrubber, disintegrators and final cooler. Part of the HCN is dissolved in the wash water. HCN in the Stretford feed gas could be about 30 ppmv or less.

Based on the above discussion, for C&K coal the gas entering the Stretford process may contain only traces of HCN (30 ppmv or less) and a pre-wash column will not be required. Also, purge requirements will not be significantly affected or increased at this concentration level. The purge requirements for this plant could be about 1000 gal/day of liquor.

The Stretford process is not effective if a significant percentage of the sulfur in the feed gas is in the form of organic compounds. Most mercaptans, carbonyl sulfide (COS) and carbon disulfide (CS_2) pass through the absorber and leave with the exit gases. These compounds do not contaminate the solution.

The gas composition for C&K coal shows presence of COS, but no CS_2 is shown. Based on Modderfontein plant test results, the raw gas contains 450 mg/Nm^3 of CS_2 on dry basis (140 ppmv). CS_2 does not dissolve to a significant extent in the wash water and will remain in the feed gas going to the Stretford plant.

6.5 PROCESS DESIGN

The process flow diagram of the Stretford process is shown in Figure 6.1.

6.5.1 ABSORPTION AND REACTION

Feed gases enter the venturi and are accelerated in the converging section. The recycle Stretford solution is introduced uniformly, at the top of the converging section and cascades by gravity and velocity pressures towards the throat. The solution contains an excess of ADA and sodium metavanadate, at pH of about 8.5 and a temperature of about 80 to 110^{o}F. The gas and the scrubbing liquid are intimately mixed at the throat which can be sized to reduce H_2S concentration of the exit gas (stream No. 4) to as low as 1 ppmv. H_2S entrained droplets enter the diverging section. The gases then proceed to the separator where all the entrained liquid droplets are easily separated from the gas stream by impingement within a mesh demister or packed bed section. Most of the vanadate reduction reaction to produce sulfur takes place in the throat and diverging section. Figure 6.2 shows a Stretford venturi scrubber.

Underneath the separator is a delay tank where the Stretford solution is retained for 10-20 minutes to insure complete precipitation of sulfur. A typical design consisting of a venturi scrubber with a delay tank underneath would be about 60 feet hign. The pressure drop through the venturi absorber would be about 1 psi.

6.5.2 REGENERATION AND FROTH FORMATION

ADA generally is reoxidized, and sulfur froth floated to the surface in vertical cylindrical tank equipped with an air sparger manifold. A typical design of this type would require a 20 foot high tank. A 5-min. delay is necessary after oxygen addition in the oxidizer to complete reoxidation of ADA. An excess of air is used to perform oxidation and achieve floatation. The froth which floats to the surface contains finely divided sulfur. It overflows from the surface through a froth duct to a collection tank. Underflow goes to a surge tank and is eventually reintroduced to the H_2S absorber.

6.5.3 SULFUR RECOVERY

Treatment of sulfur froth depends upon the amount to be handled. Figure 6.3 shows several of the options available. For small loads, filtration alone producing an impure sulfur cake might be an appropriate choice. Alternatively, filtration followed by batch autoclave melting and separation may be used to recover sulfur in another form. Larger loads might require centrifuging followed by continuous sulfur melting and separation in a jacketed autoclave, or in a direct steam injection sulfur melter.

When the sulfur is to be recovered by filtration, a rotary vacuum drum filter is generally used. The filter cake produced contains 50-60% solids. One or more wash cycles are employed to economically recover the maximum amount of Stretford solution components from the cake. The filtrate and the wash solution are sent to a surge tank and are thus returned to the system. Sometimes, depending on the water balance for a particular design, it might be necessary to concentrate the wash solution leaving the filter. Centrifuges employed for larger loads are of the continuous type. Filtrate and wash are again returned to the system.

To produce molten sulfur, sulfur cake or sulfur cake re-slurried in recycled water can be fed to an autoclave melter-separator. The melter-separator is a vessel with a jacket or internal coil which is heated by steam at about 100 psig. Molten sulfur separated from the aqueous solution of residual salts is pumped to storage. Recovered water and salts are returned to the system. Sulfur recovered by the above separator/melter methods should be of a high purity in the range of 99.5% or better.

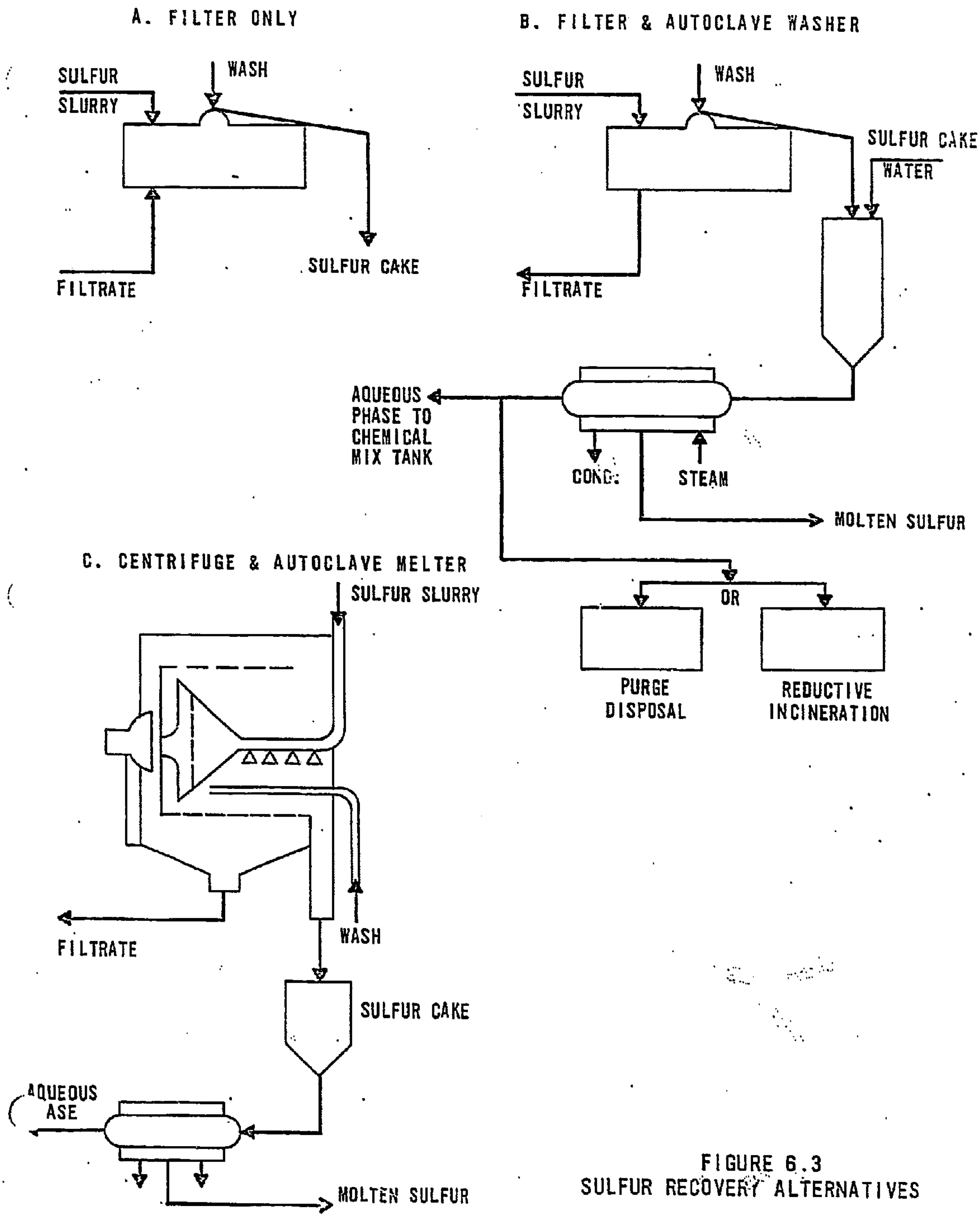

FIGURE 6.3
SULFUR RECOVERY ALTERNATIVES

6.5.4 MATERIALS OF CONSTRUCTION

Carbon steel can be used for most equipment in Stretford plants. Cold pure expoxy resin linings are sometimes used to avoid internal corrosion in the oxidation and slurry vessels. In the molten sulfur option the sulfur melter and ancilary equipment are of stainless steel.

6.5.5 MATERIAL BALANCE

Summarized in Table 6.1 is complete material balance for major inlet and effluent streams (refer to Figure 6.1 for stream numbers) in a 69.65 MM SCFD (dry) Stretford plant operating on a product gas from GKT battery limit gasification plant. The flow rates and major components of this gas were estimated by CEC program. The feed gas (stream No. 1) contains 9000 ppmv H_2S and 420 ppmv COS on dry basis. The HCN and CS_2 concentrations were estimated based on the GKT.

Modderfontein plant test results for bituminous coal (HCN 30 ppmv, CS_2 140 ppmv). H_2S removal of 95 percent was assumed. 100 percent excess air was assumed for oxidation of H_2S.

Clean product gas exits the process (stream No. 5) with an H_2S concentration of 454 ppmv (dry basis). Organic sulfur compounds in the form of COS and CS_2 pass through the process untouched. The SO_2 emission resulting from combustion of the clean gas at the user site will be 0.64 lbs/10^6 BTU and will meet environmental regulation requirements.

Blowdown from the process (stream No. 8) is estimated to be 1000 gal/day on the basis of available information. A 20 weight percent salts concentration was considered for estimating the composition of the blowdown stream (H_2O-80%, $Na_2S_2O_3$-10.8%, NaCNS-4.4%, $NaVO_3$-0.7%, ADA-1.1%, $NaHCO_3$ + Na_2CO_3-3.0%). Separate blowdown for the sulfur filter-cake disposal option may not be necessary. In such a case this blowdown would be considered as part of the filter cake content.

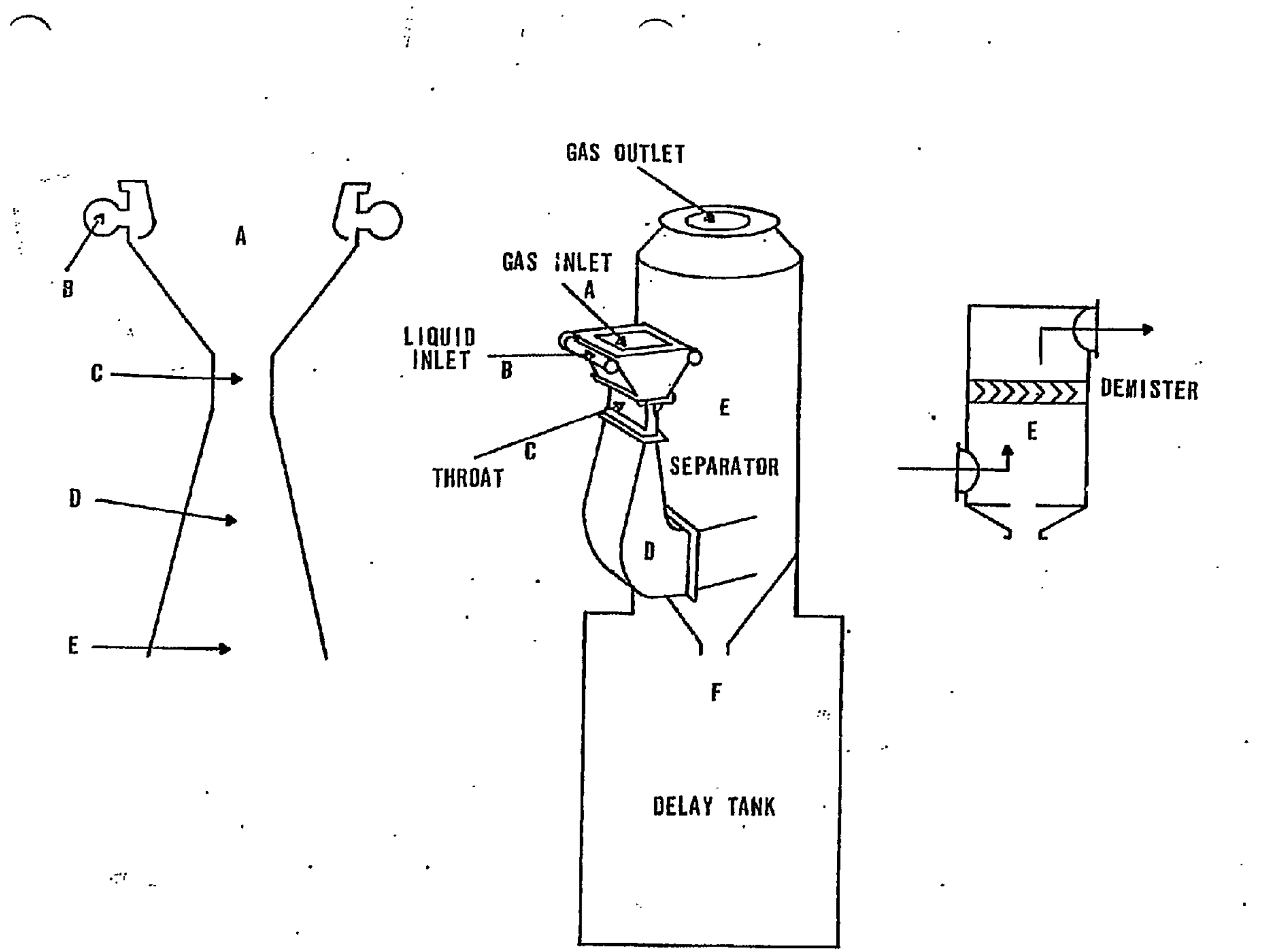

FIGURE 6.2
STRETFORD VENTURI SCRUBBER

TABLE 6.1

MATERIAL BALANCE FOR STRETFORD PROCESS FOR C&K COAL

	1		2		3		4	
Stream	Feed Gas From GKT B.L.		Oxidation Air		Make-Up Water		Make-Up Chemicals	
	lbs/hr	lb moles/hr	lbs/hr	lb moles/hr	lbs/hr	lb mole/hr	lbs/hr	lb moles/hr
CO_2	22,967.96	681.09						
H_2S	2,343.28	68.92						
COS	195.00	3.25						
CS_2	61.56	0.81						
HCN	6.75	0.25						
CO	113,855.84	4,066.28						
H_2	5,481.18	2,740.59						
O_2	-	-	2,205.14	68.92				
N_2	2,701.72	96.49	7,299.53	260.70				
S	-	-						
H_2O	8,129.16	451.62	59.44	3.33	1,122.88			
$Na_2S_2O_3$	-	-						
NaCNS	-	-						
$NaVO_3$	-	-					3.04	
ADA	-	-					4.78	
$NaHCO_3+Na_2CO_3$	-	-					62.74	
TOTAL	115,742.45	8,109.29	9,564.61	332.95	1,122.88		70.56	

TABLE 6.1 (Cont'd)

MATERIAL BALANCE FOR STRETFORD PROCESS FOR C&K COAL

Stream	5 Clean Gas From Stretford		6 Oxidizer Vent		7 Sulfur Slurry*		8 Solution Purge	
	lbs/hr	lb moles/hr	lbs/hr	lb moles/hr	lbs/hr	lb mole/hr	lbs/hr	lb moles/hr
CO_2	29,967.96	681.09						
H_2S	117.30	3.45						
COS	195.00	3.25						
CS_2	21.87	0.81						
HCN	-	-						
CO	113,855.84	4,066.28						
H_2	5,481.18	2,740.59						
O_2	-	-	1,102.72	34.46				
N_2	2,701.72	96.49	7,299.53	260.70				
S	-	-			2,095.04			
H_2O	7,744.50	430.25	259.10	14.39	2,095.04		347.70	
$Na_2S_2O_3$	-	-					46.94	
NaCNS	-	-					19.12	
$NaVO_3$	-	-					3.04	
ADA	-	-					4.78	
$NaHCO_3+Na_2CO_3$	-	-					13.04	
TOTAL	154,604.19	8,021.94	8,661.35	309.55	4,190.08		434.62	

* Streams No. 7 and 8 combined is equivalent to filter cake

A large quantity of water is lost through the sulfur slurry containing 50% solids concentration. Water is also carried out in the clean product gas from the absorber. To maintain an overall water balance it is necessary to add 1122.88 lbs/hr (2.25 gpm) of make-up water (stream No.3).

6.5.6 EFFLUENT DISPOSAL

One disadvantage of the Stretford process is production of undesired sodium thiosulfate, and sodium thiocyanate (if HCN is present in the feed gas) due to irreversible chemical reactions. The purge stream thus contains the above mentioned salts along with sodium metavanadate, ADA and sodium carbonate-bicarbonate present in the recirculating solution. In the case of sulfur filter-cake production and sulfur disposal option, a Stretford "blowdown" may not be necessary, since some solution will be lost with the filter cake. This filter cake can be mixed with the ash/slag mixture from the gasification plant destined for disposal (e.g. landfill).

In the case of molten sulfur recovery option, the Stretford purge will require disposal. Until quite recently, the effluent was considered innocuous, and there was little concern over disposal. The waste was sent to municipal sewers in small facilities or possibly mixed with the ash in a coal gas plant. Now it may not be possible to dispose of waste containing vanadium, ADA, thiosulfate and thiocyanate without further treatment. The waste can either be treated for disposal or processed to recover some of the Stretford solution constituents. The disposal methods include biodegradation, evaporation and incineration. The recovery treatment methods include reductive incineration, solvent extraction and adsorption, and ion exchange.

6.6 ECONOMICS

Capital and operating costs for the Stretford process are affected by many variables. The major design parameters that have a direct effect on the economics include the allowable hydrosulfide loading of the solution (which sets the circulation rate, hence pumping costs, etc.) and the required residence times in the various parts of the plant (which governs equipment sizes). A solution circulation rate could be 125-175 gal/lb sulfur depending on the hydrosulfide loadings. A residence time of 10 to 20 min is required in the base of the absorber or in a separate holding tank to permit maximum conversion of hydrosulfide to sulfur prior to entering the oxidizer. About 5-min delay is necessary after oxygen addition in the oxidizer to complete reoxidation of ADA.

Another factor that affects the economics is the sulfur disposal and/or recovery option selected (see Table 6.2). The sulfur filter cake option (case 1) has the advantage of low capital costs, but operating costs are high due to loss of chemicals and high tonnage disposal of sulfur cake (containing about 50% moisture). Molten sulfur and Stretford purge disposal options (cases 2 and 3) add 20% to the capital cost; however the chemicals loss is only about 60 percent of the filter cake option. Also, the amount of solution purged is less and the disposal cost is lower. If recovered sulfur can be sold then sulfur credit will help reduce the overall cost of operation (case 2). If sulfur can not be sold and has to be disposed (case 3), the overall operating costs per ton of sulfur output will be about $40 more than the filter cake disposal option (case 1).

With a sulfur melter, and reductive incineration for chemicals recovery added to the plant, the capital cost will be 35 percent higher than the filter cake option. This option with sulfur credit (case 4) shows improved economics over the base case. Compared with cases 2 and 3 the operating costs per ton of sulfur output are about

$17 and $67 higher. With reductive incineration almost all $NaVO_3$ and Na_2CO_3 are recovered, minimizing the cost of chemicals. If no sulfur by-product credit is given (case 5) the operating cost is about $53 higher per ton sulfur output than case 1 (base case).

Table 6.2 shows the comparative economics of the sulfur plant options. The data shown in Table 6.3 was used for estimating the capital and operating costs. The results show that with no sulfur by-product credit considered, the overall cost of operation for cases 3 and 5 is higher than the base case. However, when sulfur by-product credit of $60/ton is considered (cases 2 and 4) the overall cost of operation per ton of sulfur output is about $20-40 lower than the filter cake disposal option (case 1).

6.7 RECOMMENDATIONS

- o If no sulfur by-product credit can be claimed, the filter-cake disposal option (case 1) should be considered.
- o If sulfur can be sold at about $60/ton, the molten sulfur options (cases 2 and 4) should be considered. Reductive incineration (case 4) may be preferable to case 2 (purge disposal) because of only marginal benifits of case 2 over case 4.
- o Existing and potential sulfur markets in the Philadelphia area need to be investigated.

TABLE 6.2

ECONOMIC EVALUATION OF STRETFORD SULFUR PLANT OPTIONS

Case	1 (Base)	2	3	4	5
Sulfur Plant Options	Filter Cake Disposal	Molten Sulfur-Purge Disposal-Sulfur Credit	Molten Sulfur-Purge Disposal-Sulfur Disposal	Molten Sulfur-Red. Incineration-Sulfur Credit	Molten Sulfur-Red Incineration-Sulfur Disposal
Total Plant Invest., MM$	7.400	8.880	8.880	9.990	9.990
Yearly Operating Cost, MM$					
Chemicals	0.492	0.312	0.312	0.193	0.193
Electricity	0.618	0.767	0.767	0.767	0.767
Steam	None	0.048	0.048	0.048	0.048
Fuel	None	None	None	0.166	0.166
Labor	0.114	0.114	0.114	0.114	0.114
Maintenance (2% of TPI)	0.148	0.178	0.178	0.200	0.200
Depreciation (20% of TPI)	1.480	1.776	1.776	1.998	1.998
Filter Cake Disposal	0.366	None	None	None	None
Purge Liquor Disposal	None	0.185	0.185	None	None
Sulfur Disposal	None	None	0.166	None	0.166
Sulfur Credit	None	-(0.498)	None	-(0.498)	None
Total	3.218	2.882	3.546	2.988	3.652
Overall Cost of Operation $/Ton Sulfur Output	387.83	347.35	427.35	360.15	440.14

TABLE 6.3

ECONOMIC DATA FOR STRETFORD PLANT ALTERNATIVES

Sulfur Plant Options Case	1	2	3	4	5
Chemicals Make-up, lb/hr					
ADA	4.78	2.86	2.86	2.86	2.86
$NaVO_3$	3.04	1.82	1.82	0.18	0.18
Citric Acid	10.00	6.00	6.00	6.00	6.00
Na_2CO_3	62.74	60.00	60.00	3.76	3.76
Electricity Consumption, KWH/T Sulfur	1,491	1,540	1,540	1,540	1,540
Steam Consumption, lbs/T Sulfur	None	1,400	1,400	1,400	1,400
Fuel Consumption, 10^6 BTU/T Sulfur	None	None	None	4	4
Labor Requirements,	1 man/shift, 3 shift/day				
Waste Disposal, Tons/hr	2.312	0.519	1.5665	None	1.0475

Chemicals Cost, $/lb	ADA	- 6.45	Fuel Cost, $5/$10^6$ BTU
	$NaVO_3$	- 5.75	
	Citric Acid	- 0.75	Labor Cost, $13/hr
	Na_2CO_3	- 0.10	
Electricity Cost, $0.05/KWhr			Solid Waste Disposal (Non-Toxic) Cost, $20/ton
Steam Cost, $4.0/1000 lbs			Purge Disposal (Toxic) Cost, $45/ton

APPENDIX J

EQUIPMENT LIST

PGW

EQUIPMENT LIST - UNIT 10

COAL RECEIVING AND HANDLING

10-ME-1A	Car Shaker
10-ME-1A-M	Car Shaker Motor
10-ME-1B	Car Shaker
10-ME-1B-M	Car Shaker Motor
10-ME-2A	Hoist
10-ME-2A-M	Hoist Motor
10-ME-2B	Hoist
10-ME-2B-M	Hoist Motor
10-ME-2C	Hoist Trolley
10-ME-2C-M	Hoist Trolley Motor
10-ME-2D	Hoist Trolley
10-ME-2D-M	Hoist Trolley Motor
10-ME-3A	Shut Off Gate
10-ME-3B	Shut Off Gate
10-ME-3C	Shut Off Gate
10-ME-3D	Shut Off Gate
10-ME-3E	Shut Off Gate
10-ME-3F	Shut Off Gate
10-ME-3G	Shut Off Gate
10-ME-3H	Shut Off Gate
10-ME-4A	Vibrating Feeder
10-ME-4A-M	Vibrating Feeder Motor
10-ME-4B	Vibrating Feeder
10-ME-4B-M	Vibrating Feeder Motor
10-ME-4C	Vibrating Feeder
10-ME-4C-M	Vibrating Feeder Motor
10-ME-4D	Vibrating Feeder
10-ME-4D-M	Vibrating Feeder Motor
10-ME-4E	Vibrating Feeder
10-ME-4E-M	Vibrating Feeder Motor
10-ME-4F	Vibrating Feeder

10-ME-4F-M	Vibrating Feeder Motor
10-ME-4G	Vibrating Feeder
10-ME-4G-M	Vibrating Feeder Motor
10-ME-4H	Vibrating Feeder
10-ME-4H-M	Vibrating Feeder Motor
10-CV-1	Belt Conveyor - 48"
10-CV-1-GE	Belt Conveybr Reducer
10-CV-1-M	Belt Conveyor Motor
10-CV-2	Belt Conveyor - 48"
10-CV-2-GE	Belt Conveyor Reducer
10-CV-2-M	Belt Conveyor Motor
10-CV-3	Belt Conveyor - 48"
10-CV-3-GE	Belt Conveyor Reducer
10-CV-3-M	Belt Conveyor Motor
10-SC-1	Weighbelt Scale
10-ME-5	Lowering Well
10-ME-6A	Vibrating Storage Pile Discharger
10-ME-6A-GE	Vibrating Bottom Gyrator
10-ME-6A-M	Vibrating Bottom Motor
10-ME-6B	Vibrating Storage Pile Discharger
10-ME-6B-GE	Vibrating Bottom Gyrator
10-ME-6B-M	Vibrating Bottom Motor
10-ME-6C	Vibrating Storage Pile Discharger
10-ME-6C-GE	Vibrating Bottom Gyrator
10-ME-6C-M	Vibrating Bottom Motor
10-ME-7A	Shut Off Gate
10-ME-7B	Shut Off Gate
10-ME-7C	Shut Off Gate
10-ME-8A	Vibrating Feeder
10-ME-8A-M	Vibrating Feeder Motor
10-ME-8B	Vibrating Feeder
10-ME-8B-M	Vibrating Feeder Motor
10-ME-8C	Vibrating Feeder
10-ME-8C-M	Vibrating Feeder Motor

10-CV-4	Belt Conveyor - 30"
10-CV-4-GE	Belt Conveyor Reducer
10-CV-4-M	Belt Conveyor Motor
10-CS-1	Coal Sampler
10-CS-1-GE	Coal Sampler Reducer
10-CS-1-M	Coal Sampler Motor
10-CS-2	Coal Sampler
10-CS-2-GE	Coal Sampler Reducer
10-CS-2-M	Coal Sampler Motor
10-ME-9	Vibrating Feeder
10-ME-9-M	Vibrating Feeder Motor
10-ME-10	Bifurcated Chute with Diverter
10-CR-1	Coal Delumper
10-CR-1-GE	Coal Delumper Reducer
10-CR-1-M	Coal Delumper Motor
10-CR-2	Coal Sampling Crusher
10-CR-2-GE	Coal Sampling Crusher Reducer
10-CR-2-M	Coal Sampling Crusher Motor
10-CV-5	Belt Conveyor - 30"
10-CV-5-GE	Belt Conveyor Reducer
10-CV-5-M	Belt Conveyor Motor
10-TR-1	Belt Tripper with Platform
10-TR-1-GE	Belt Tripper Reducer
10-TR-1-M	Belt Tripper Motor
10-ME-12	Coal Sampling Table
10-ME-11A	Shut Off Gate
10-ME-11B	Shut Off Gate
10-ME-11C	Shut Off Gate
10-ME-11D	Shut Off Gate
10-ME-11E	Shut Off Gate
10-F-1A	Duplex Strainer

10-F-1B	Duplex Strainer
10-TK-1	Oil Tank
10-P-1A	Oil Pump
10-P-1A-M	Oil Pump Motor
10-P-1B	Oil Pump
10-P-1B-M	Oil Pump Motor

PGW

EQUIPMENT LIST - UNIT 15

COAL HANDLING DUST SUPRESSION

15-BD-1	Shelter House
15-EJ-1	Proportioner
15-EJ-2	Proportioner
15-TK-1A	Drum (55 Gal.)
15-TK-1B	Drum (55 Gal.)
15-TK-1C	Drum (55 Gal.)
15-TK-1D	Drum (55 Gal.)
15-TK-1E	Drum (55 Gal.)
15-TK-1F	Drum (55 Gal.)
15-TK-1G	Drum (55 Gal.)
15-TK-1H	Drum (55 Gal.)
15-P-1A	Concentr. Pump (.5-10 GPM)
15-P-1A-M	Concentr. Pump Motor (½ H.P.)
15-P-1B	Concentr. Pump (.5 - 10 APM)
15-P-1B-M	Concentr. Pump Motor (½ H.P.)
15-P-2	Centr. Pump (105 GPM)
15-P-2-M	Centr. Pump Motor (20 H.P.)
15-P-3	Solution Pump
15-P-3-M	Solution Pump Motor
15-F-1	Intake Water Filter
15-CM-1A	Spray Controller
15-CM-1A-EE	Spray Controller Heater (500 Watts)
15-CM-1B	Spray Controller
15-CM-1B-EE	Spray Controller Heater (500 Watts)
15-CM-1C	Spray Controller
15-CM-1C-EE	Spray Controller Heater (500 Watts)
15-CM-1D	Sprey Controller
15-CM-1D-EE	Spray Controller Heater (500 Watts)
15-CM-1E	Spray Controller
15-CM-1E-EE	Spray Controller Heater (500 Watts)

15-CM-1F	Spray Controller
15-CM-1F-EE	Spray Controller Heater (500 Watts)
15-CM-1G	Spray Controller
15-CM-1G-EE	Spray Controller Heater (500 Watts)
15-CM-2A	Spray Controller
15-CM-2A-EE	Spray Controller Heater (500 Watts)
15-CM-2B	Spray Controller
15-CM-2B-EE	Spray Controller Heater (500 Watts)
15-CM-2C	Spray Controller
15-CM-2C-EE	Spray Controller Heater (500 Watts)
15-CM-3A	Spray Controller
15-CM-3A-EE	Spray Controller Heater (500 Watts)
15-CM-3B	Spray Controller
15-CM-3B-EE	Spray Controller Heater (1000 Watts)
15-CM-3C	Spray Controller
15-CM-3C-EE	Spray Controller Heater (1000 Watts)
15-CM-3D	Spray Controller
15-CM-3D-EE	Spray Controller Heater (1000 Watts)
15-CM-3E	Spray Controller
15-CM-3E-EE	Spray Controller Heater (1000 Watts)
15-CM-3F	Spray Controller
15-CM-3F-EE	Spray Controller Heater (1000 Watts)
15-CM-3G	Spray Controller
15-CM-3G-EE	Spray Controller Heater (1000 Watts)
15-CM-3H	Spray Controller
15-CM-3H-EE	Spray Controller Heater (1000 Watts)
15-CM-3J	Spray Controller
15-CM-3J-EE	Spray Controller Heater (1000 Watts)
15-FA-1	Roof Vent. Fan (8439 C.F.M.)
15-FA-1-M	Roof Vent. Fan Motor (3 H.P.)
15-FA-2	Roof Vent. Fan (34,790 CFM)
15-FA-2-M	Roof Vent. Fan Motor (10 H.P.)
15-FA-3	Roof Vent Fan (3852 CFM)
15-FA-3-M	Roof Vent. Fan Motor (1½ H.P.)
15-DP-1	Damper

15-DP-1-M	Damper Motor (1/6 H.P.)
15-DP-2	Damper
15-DP-2-M	Damper Motor (1/6 H.P.)
15-DP-3	Damper
15-DP-3-M	Damper Motor (1/6 H.P.)
15-BF-1	Dust Collector
15-BF-1-F	Dust Collector Fan
15-BF-1-F-M	Dust Collector Fan Motor
15-BF-3	Dust Collector
15-BF-3-F	Dust Collector Fan
15-BF-3-F-M	Dust Collector Fan Motor
15-ME-12	Dump Valve
15-ME-12-M	Dump Valve Motor
15-ME-15	Double Dump Valve
15-ME-15-M	Double Dump Valve Motor

PGW

EQUIPMENT LIST - UNIT 20

COAL PREPARATION AND CONVEYING

20-TK-1A	Coal Silo
20-TK-1B	Coal Silo
20-ME-1A	Shut Off Gate
20-ME-1B	Shut Off Gate
20-ME-2A	Vibrating Feeder
20-ME-2A-M	Vibrating Feeder Motor
20-ME-2B	Vibrating Feeder
20-ME-2B-M	Vibrating Feeder Motor
20-ME-3A	Shut Off Gate
20-ME-3B	Shut Off Gate
20-ME-3C	Shut Off Gate
20-ME-3D	Shut Off Gate
20-CV-1A	Screw Conveyor - 14"
20-CV-1A-GE	Screw Conveyor Reducer
20-CV-1A-M	Screw Conveyor Motor
20-CV-1B	Screw Conveyor - 14"
20-CV-1B-GE	Screw Conveyor Reducer
20-CV-1B-M	Screw Conveyor Motor
20-ME-4A	Slide Gate
20-ME-4B	Slide Gate
20-PU-1A	Pulverizer
20-PU-1A-M-1	Pulverizer Motor
20-PU-1A-M-2	Pulverizer Motor
20-PU-1A-M-3	Pulverizer Motor
20-PU-1A-BL	Pulverizer Seal Air Blower
20-PU-1A-BL-M	Pulverizer Seal Air Blower Motor
20-PU-1B	Pulverizer
20-PU-1B-M-1	Pulverizer Motor
20-PU-1B-M-2	Pulverizer Motor
20-PU-1B-M-3	Pulverizer Motor
20-PU-1B-BL	Pulverizer Seal Air Blower
20-PU-1B-BL-M	Pulverizer Seal Air Blower Motor

20-PU-1C	Pulverizer
20-PU-1C-M-1	Pulverizer Motor
20-PU-1C-M-2	Pulverizer Motor
20-PU-1C-M-3	Pulverizer Motor
20-PU-1C-BL	Pulverizer Seal Air Blower
20-PU-1C-BL-M	Pulverizer Seal Air Blower Motor
20-ME-5A	Slide Gate - Pulv. to D.C.
20-ME-5B	Slide Gate - Pulv. to D.C.
20-ME-5C	Slide Gate - Pulv. to D.C.
20-ME-5D	Slide Gate - Pulv. to D.C.
20-ME-6A	Expansion Joint
20-ME-6B	Expansion Joint
20-ME-6C	Expansion Joint
20-ME-6D	Expansion Joint
20-ME-6E	Expansion Joint
20-BF-1A	Dust Collector
20-BF-1B	Dust Collector
20-DP-1A	Damper - Vent
20-DP-1B	Damper - Vent
20-DP-2A	Damper - Pulv. to Dust Collector
20-DP-2B	Damper - Pulv. to Dust Collector
20-DP-3A	Damper - Dust Collector to Fan
20-DP-3B	Damper - Dust Collector to Fan
20-FA-1A	Recycle Fan
20-FA-1A-M	Recycle Fan Motor
20-FA-1B	Recycle Fan
20-FA-1B-M	Recycle Fan Motor
20-ME-7A	Slide Gate - Fan to Pulv.
20-ME-7B	Slide Gate - Fan to Pulv.
20-ME-7C	Slide Gate - Fan to Pulv.
20-ME-7D	Slide Gate - Fan to Pulv.
20-ME-8A	Air Heater
20-ME-8A-FA	Air Heater Combustion Fan
20-ME-8A-FA-M	Air Heater Combustion Fan Motor
20-ME-8B	Air Heater
20-ME-8B-FA	Air Heater Combustion Fan

20-ME-8B-FA-M	Air Heater Combustion Fan Motor
20-ME-8C	Air Heater
20-ME-8C-FA	Air Heater Combustion Fan
20-ME-8C-FA-M	Air Heater Combustion Fan Motor
20-RF-1A	Rotary Feed Valve
20-RF-1A-GE	Rotary Feed Valve Reducer
20-RF-1A-M	Rotary Feed Valve Motor
20-RF-1B	Rotary Feed Valve
20-RF-1B-GE	Rotary Feed Valve Reducer
20-RF-1B-M	Rotary Feed Valve Motor
20-RF-1C	Rotary Feed Valve
20-RF-1C-GE	Rotary Feed Valve Reducer
20-RF-1C-M	Rotary Feed Valve Motor
20-RF-1D	Rotary Feed Valve
20-RF-1D-GE	Rotary Feed Valve Reducer
20-RF-1D-M	Rotary Feed Valve Motor
20-RF-1E	Rotary Feed Valve
20-RF-1E-GE	Rotary Feed Valve Reducer
20-RF-1E-M	Rotary Feed Valve Motor
20-RF-1F	Rotary Feed Valve
20-RF-1F-GE	Rotary Feed Valve Reducer
20-RF-1F-M	Rotary Feed Valve Motor
20-RF-1G	Rotary Feed Valve
20-RF-1G-GE	Rotary Feed Valve Reducer
20-RF-1G-M	Rotary Feed Valve Motor
20-RF-1H	Rotary Feed Valve
20-RF-1H-GE	Rotary Feed Valve Reducer
20-RF-1H-M	Rotary Feed Valve Motor
20-ME-9A	Double Dump Valve
20-ME-9B	Double Dump Valve
20-ME-9C	Double Dump Valve
20-ME-9D	Double Dump Valve
20-ME-9E	Double Dump Valve
20-ME-9F	Double Dump Valve

20-ME-9G	Double Dump Valve
20-ME-9H	Double Dump Valve
20-ME-9I	Double Dump Valve
20-ME-9J	Double Dump Valve
20-ME-9K	Double Dump Valve
20-ME-9L	Double Dump Valve
20-ME-9M	Double Dump Valve
20-ME-9N	Double Dump Valve
20-ME-9O	Double Dump Valve
20-ME-9P	Double Dump Valve
20-TK-2A	Surge Bin
20-TK-2B	Surge Bin
20-RF-2A	Rotary Feed Valve
20-RF-2A-GE	Rotary Feed Valve Reducer
20-RF-2A-M	Rotary Feed Valve Motor
20-RF-2B	Rotary Feed Valve
20-RF-2B-GE	Rotary Feed Valve Reducer
20-RF-2B-M	Rotary Feed Valve Motor
20-P-1A	Pulverizer Coal Pump
20-P-1A-M	Pulverizer Coal Pump Motor
20-P-1B	Pulverizer Coal Pump
20-P-1B-M	Pulverizer Coal Pump Motor
20-P-2A	Pulverizer Coal Pump
20-P-2A-M	Pulverizer Coal Pump Motor
20-P-2B	Pulverizer Coal Pump
20-P-2B-M	Pulverizer Coal Pump Motor
20-ME-10A	Splitter - 4 Way
20-ME-10B	Splitter - 4 Way
20-BF-2A	Dust Collector (GKT Service Bunker)
20-BF-2B	Dust Collector (GKT Service Bunker)
20-BF-2C	Dust Collector (GKT Service Bunker)
20-BF-2D	Dust Collector (GKT Service Bunker)
20-BF-2E	Dust Collector (GKT Service Bunker)
20-BF-2F	Dust Collector (GKT Service Bunker)
20-BF-2G	Dust Collector (GKT Service Bunker)
20-BF-2H	Dust Collector (GKT Service Bunker)

20-RF-3A	Rotary Feed Valve
20-RF-3A-GE	Rotary Feed Valve Reducer
20-RF-3A-M	Rotary Feed Valve Motor
20-RF-3B	Rotary Feed Valve
20-RF-3B-GE	Rotary Feed Valve Reducer
20-RF-3B-M	Rotary Feed Valve Motor
20-RF-3C	Rotary Feed Valve
20-RF-3C-GE	Rotary Feed Valve Reducer
20-RF-3C-M	Rotary Feed Valve Motor
20-RF-3D	Rotary Feed Valve
20-RF-3D-GE	Rotary Feed Valve Reducer
20-RF-3D-M	Rotary Feed Valve Motor
20-RF-3E	Rotary Feed Valve
20-RF-3E-GE	Rotary Feed Valve Reducer
20-RF-3E-M	Rotary Feed Valve Motor
20-RF-3F	Rotary Feed Valve
20-RF-3F-GE	Rotary Feed Valve Reducer
20-RF-3F-M	Rotary Feed Valve Motor
20-RF-3G	Rotary Feed Valve
20-RF-3G-GE	Rotary Feed Valve Reducer
20-RF-3G-M	Rotary Feed Valve Motor
20-RF-3H	Rotary Feed Valve
20-RF-3H-GE	Rotary Feed Valve Reducer
20-RF-3H-M	Rotary Feed Valve Motor
20-ME-11A	Bifurcated Chute with Diverter
20-ME-11B	Bifurcated Chute with Diverter
20-ME-12A	Expansion Joint (36")
20-ME-12B	Expansion Joint (36")
20-ME-12C	Expansion Joint (36")
20-ME-12D	Expansion Joint (36")
20-ME-13A	Expansion Joint (12")
20-ME-13B	Expansion Joint (12")
20-ME-13C	Expansion Joint (12")

20-ME-13D	Expansion Joint (12")
20-ME-13E	Expansion Joint (12")
20-ME-13F	Expansion Joint (12")
20-ME-13G	Expansion Joint (12")
20-ME-13H	Expansion Joint (12")
20-ME-14A	Shut Off Gate (6")
20-ME-14B	Shut Off Gate (6")
20-ME-14C	Shut Off Gate (6")

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EQUIPMENT LIST - UNIT 30

GKT GASIFICATION UNIT

30-V-1A	Gasification Reactor
30-V-1B	Gasification Reactor
30-V-2A	Service Bunker
30-V-2B	Service Bunker
30-V-2C	Service Bunker
30-V-2D	Service Bunker
30-V-2E	Service Bunker
30-V-2F	Service Bunker
30-V-2G	Service Bunker
30-V-2H	Service Bunker
30-V-3A	Feed Bunker
30-V-3B	Feed Bunker
30-V-3C	Feed Bunker
30-V-3D	Feed Bunker
30-V-3E	Feed Bunker
30-V-3F	Feed Bunker
30-V-3G	Feed Bunker
30-V-3H	Feed Bunker
30-V-4A	L.P. Steam Drum
30-V-4B	L.P. Steam Drum
30-V-5A	H.P. Steam Drum
30-V-5B	H.P. Steam Drum
30-V-6A	Nitrogen Vessel
30-V-6B	Nitrogen Vessel
30-V-7A	Drop Separator
30-V-7B	Drop Separator
30-V-8A	Separator
30-V-8B	Separator
30-V-9A	Oxygen-Steam Mixer Separator
30-V-9B	Oxygen-Steam Mixer Separator
30-V-10A	Blower Quick Gas Seal

30-V-10B	Blower Quick Gas Seal
30-V-11	Gas Holder Inlet Quick Gas Seal
30-V-12	Gas Holder Outlet Quick Gas Seal
30-V-13	Main Flare Seal Pot
30-V-15A	Steam Blowdown Vessel
30-V-15B	Steam Blowdown Vessel
30-V-16A	Flyash Discharge Tank
30-V-16B	Flyash Discharge Tank
30-V-20A	Flare Seal Pot
30-V-20B	Flare Seal Pot
30-E-1A	Waste Heat Recovery System
30-E-1B	Waste Heat Recovery System
30-E-2A	Cooling Washer
30-E-2B	Cooling Washer
30-E-4A	Oxygen Heater
30-E-4B	Oxygen Heater
30-BL-1A	Oxygen Blower
30-BL-1A-M	Oxygen Blower Motor
30-BL-1B	Oxygen Blower
30-BL-1B-M	Oxygen Blower Motor
30-BL-2A	Raw Gas Blower
30-BL-2A-M	Raw Gas Blower Motor
30-BL-2B	Raw Gas Blower
30-BL-2B-M	Raw Gas Blower Motor
30-PR-1	Electrostatic Precipitator
30-CV-1A	Slag Belt Conveyor
30-CV-1A-M	Slag Belt Conveyor Motor
30-CV-1B	Slag Belt Conveyor
30-CB-1B-M	Slag Belt Conveyor Motor
30-TK-1A	Overhead Water Tank
30-TK-1B	Overhead Water Tank
30-TK-2	Fuel Oil Tank
30-TK-3	Gas Holder Tank
30-P-1A	Quench Water Pump
30-P-1A-M	Quench Water Pump Motor

30-P-1B	Quench Water Pump
30-P-1B-M	Quench Water Pump Motor
30-P-2A	Washwater Recirculation Pump
30-P-2A-M	Washwater Recirculation Pump Motor
30-P-2B	Washwater Recirculation Pump
30-P-2B-M	Washwater Recirculation Pump Motor
30-P-3A	Fuel Oil Pump
30-P-3A-M	Fuel Oil Pump Motor
30-P-3B	Fuel Oil Pump
30-P-3B-M	Fuel Oil Pump Motor
30-P-4A	Washwater Sump Pump
30-P-4A-M	Washwater Sump Pump Motor
30-P-4B	Washwater Sump Pump
30-P-4B-M	Washwater Sump Pump Motor
30-ME-1A	Oxygen-Steam Mixer
30-ME-1B	Oxygen-Steam Mixer
30-ME-1C	Oxygen-Steam Mixer
30-ME-1D	Oxygen-Steam Mixer
30-ME-2A	Slag Extractor
30-ME-2B	Slag Extractor
30-ME-3A	Coal Dust Feeder
30-ME-3B	Coal Dust Feeder
30-ME-3C	Coal Dust Feeder
30-ME-3D	Coal Dust Feeder
30-ME-3E	Coal Dust Feeder
30-ME-3F	Coal Dust Feeder
30-ME-3G	Coal Dust Feeder
30-ME-3H	Coal Dust Feeder
30-ME-4A	Coal Dust Double Screw
30-ME-4B	Coal Dust Double Screw
30-ME-4C	Coal Dust Double Screw
30-ME-4D	Coal Dust Double Screw
30-ME-4E	Coal Dust Double Screw
30-ME-4F	Coal Dust Double Screw
30-ME-4G	Coal Dust Double Screw

30-ME-4H	Coal Dust Double Screw
30-ME-4I	Coal Dust Double Screw
30-ME-4J	Coal Dust Double Screw
30-ME-4K	Coal Dust Double Screw
30-ME-4L	Coal Dust Double Screw
30-ME-4M	Coal Dust Double Screw
30-ME-4N	Coal Dust Double Screw
30-ME-4O	Coal Dust Double Screw
30-ME-4P	Coal Dust Double Screw
30-ME-5A	Double Coal Dust Burner
30-ME-5B	Double Coal Dust Burner
30-ME-5C	Double Coal Dust Burner
30-ME-5D	Double Coal Dust Burner
30-ME-5E	Double Coal Dust Burner
30-ME-5F	Double Coal Dust Burner
30-ME-5G	Double Coal Dust Burner
30-ME-5H	Double Coal Dust Burner
30-ME-6A	Ignition Lance
30-ME-6B	Ignition Lance
30-ME-6C	Ignition Lance
30-ME-6D	Ignition Lance
30-ME-7A	Sintering Burner
30-ME-7B	Sintering Burner
30-ME-8A	Disintegrator
30-ME-8B	Disintegrator
30-ME-9A	Fly Dust Classifier
30-ME-9B	Fly Dust Classifier
30-ME-10A	Ignition Burner
30-ME-10B	Ignition Burner
30-ME-10C	Ignition Burner
30-ME-10D	Ignition Burner
30-ME-10E	Ignition Burner
30-ME-10F	Ignition Burner
30-ME-10G	Ignition Burner
30-ME-10H	Ignition Burner

30-ME-11A	Expansion Joint - 48"
30-ME-11B	Expansion Joint - 48"
30-ME-13A	Startup Flare Stack
30-ME-13B	Startup Flare Stack

EQUIPMENT LIST - UNIT 42
DESULFURIZATION PLANT (STRETFORD UNIT)

42-V-1	Reaction Vessel
42-V-2	Sulfur Separator
42-TK-1	Oxidizer Tank
42-TK-2	Stretford Solution Tank
42-TK-3	Slurry Tank (Sulfur Froth)
42-TK-4	Reslurry Tank
42-TK-4-M	Reslurry Tank Stirrer Motor
42-TK-5	Sulfur Storage Pit
42-TK-6	Chemical Mix Tank
42-TK-7A	Oil Reservoir
42-TK-7B	Oil Reservoir
42-E-1A	Aftercooler (Gas)
42-E-1B	Aftercooler (Gas)
42-E-2	Evaporative Cooler
42-E-2-F	Evaporative Cooler Fan
42-E-2-F-M	Evaporative Cooler Fan Motor
42-E-3	Sulfur Melter
42-E-4	Start-Up Heater
42-E-5A	Oil Cooler
42-E-5B	Oil Cooler
42-E-5C	Oil Cooler
42-E-5D	Oil Cooler
42-E-6	Plate Coil Pit Heater
42-MX-1A	Static Mixer
42-MX-1B	Static Mixer
42-MX-1C	Static Mixer
42-MX-1D	Static Mixer
42-MX-1E	Static Mixer
42-MX-1F	Static Mixer
42-MX-1G	Static Mixer

42-MX-1H	Static Mixer
42-MX-1J	Static Mixer
42-BL-1A	Gas Booster Compressor
42-BL-1A-M	Gas Booster Compressor Motor
42-BL-1B	Gas Booster Compressor
42-BL-1B-M	Gas Booster Compressor Motor
42-BL-2A	Oxidizer Air Blower
42-BL-2A-M	Oxidizer Air Blower Motor
42-BL-2B	Oxidizer Air Blower
42-BL-2B-M	Oxidizer Air Blower Motor
42-CE-1	Centrifuge
42-CE-1-M	Centrifuge Motor
42-F-1A	Inlet Filter Silencer - 30"
42-F-1B	Inlet Filter Silencer - 30"
42-F-2	Cyclotube Filter
42-AG-1	Slurry Mixer
42-AG-1-M	Slurry Mixer Motor
42-AG-2	Reslurry Agitator
42-AG-2-M	Reslurry Agitator Motor
42-P-1A	Stretford Solution Pump
42-P-1A-M	Stretford Solution Pump Motor
42-P-1B	Stretford Solution Pump
42-P-1B-M	Stretford Solution Pump Motor
42-P-2A	Evaporative Cooler Pump
42-P-2A-M	Evaporative Cooler Pump Motor
42-P-2B	Evaporative Cooler Pump
42-P-2B-M	Evaporative Solution Pump Motor
42-P-3A	Sulfur Slurry Pump
42-P-3A-M	Sulfur Slurry Pump Motor
42-P-3B	Sulfur Slurry Pump
42-P-3B-M	Sulfur Slurry Pump Motor
42-P-4A	Reslurry Pump
42-P-4A-M	Reslurry Pump Motor
42-P-4B	Reslurry Pump
42-P-4B-M	Reslurry Pump Motor

42-P-5A	Sulfur Pump
42-P-5A-M	Sulfur Pump Motor
42-P-5B	Sulfur Pump
42-P-5B-M	Sulfur Pump Motor
42-P-6	Chemical Mix Pump
42-P-6-M	Chemical Mix Pump Motor
42-P-7A	Oil Pump
42-P-7A-M	Oil Pump Motor
42-P-7B	Oil Pump
42-P-7B-M	Oil Pump Motor
42-P-7C	Oil Pump
42-P-7C-M	Oil Pump Motor
42-P-7D	Oil Pump
42-P-7D-M	Oil Pump Motor
42-ME-1A	Expansion Joint (After Cooler Disch.)
42-ME-1B	Expansion Joint (After Cooler Disch.)
42-ME-2A	Expansion Joint (Gas Booster Comp.)
42-ME-2B	Expansion Joint (Gas Booster Comp.)
42-V-3A	Separator
42-V-3B	Separator

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EQUIPMENT LIST - UNIT 44

DESULFURIZATION PLANT (NITTEAU)

44-ME-1	Hot Gas Generator
44-E-1	Evaporator
44-E-2	Heater
44-E-3	Decomposed Gas Cooler
44-E-4	Condenser
44-E-5	Ejector Cooler
44-H-1	Furnace
44-TK-1	Quench Tank
44-TK-2	Recovered Solution Tank
44-TK-3	Antifoam Agent Tank
44-EJ-1	Steam Ejector
44-F-1	Inlet Filter Silencer (16")
44-BL-1	Air Blower
44-BL-1-M	Air Blower Motor
44-P-1A	Quench Pump
44-P-1A-M	Quench Pump Motor
44-P-1B	Quench Pump
44-P-1B-M	Quench Pump Motor
44-P-2A	Recovered Solution Pump
44-P-2A-M	Recovered Solution Pump Motor
44-P-2B	Recovered Solution Pump
44-P-2B-M	Recovered Solution Pump Motor
44-P-3A	Conc. Liquor Feed Pump
44-P-3A-M	Conc. Liquor Feed Pump Motor
44-P-3B	Conc. Liquor Feed Pump
44-P-3B-M	Conc. Liquor Feed Pump Motor
44-P-4A	Evaporator Circulation Pump
44-P-4A-M	Evaporator Circulation Pump Motor
44-P-4B	Evaporator Circulation Pump
44-P-4B-M	Evaporator Circulation Pump Motor

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EQUIPMENT LIST - UNIT 50

AIR SEPARATION PLANT

50-C-1	Main Air Compressor (Train 1)
50-C-1-T	Main Air Compressor Turbine
50-C-2	Main Air Compressor (Train 2)
50-C-2-M	Main Air Compressor (Train 2)
50-DM-1	Defrost Heater (Train 1)
50-DM-2	Defrost Heater (Train 2)
50-CB-1	Cold Box Assembly (Train 1)
50-CB-2	Cold Box Assembly (Train 2)
50-CH-1	Chlorine Ejector
50-CN-1	Condenser
50-E-1	Lube Oil Cooler (Train 1)
50-E-2	Lube Oil Cooler (Train 2)
50-E-3	Liquid Oxygen Vaporizer
50-E-4	Liquid Nitrogen Vaporizer
50-CT-1	Direct Contact Cooler
50-CT-2	Direct Contact Cooler
50-CT-3	Cooling Tower
50-CT-3-M-A	Cooling Tower Fan Motor
50-CT-3-M-B	Cooling Tower Fan Motor
50-CT-3-M-C	Cooling Tower Fan Motor
50-CT-3-M-D	Cooling Tower Fan Motor
50-CT-3-M-E	Cooling Tower Fan Motor
50-CT-3-M-F	Cooling Tower Fan Motor
50-CT-3-M-G	Cooling Tower Fan Motor
50-CT-3-M-H	Cooling Tower Fan Motor
50-F-1	Air Filter House (Train 1)
50-F-2	Air Filter House (Train 2)
50-F-3	Press Filter Cooling Tower By-Pass
50-MG-1	Motor Generator (Train 1)
50-MG-1-T	Turbine-Expander (Train 1)

50-MG-2	Motor Generator (Train 2)
50-MG-2-T	Turbine-Expander (Train 2)
50-S-1	Discharge Silencer
50-S-2	Discharge Silencer
50-TK-1	Liquid Oxygen Storage Tank
50-TK-2	Auxiliary Liquid Oxygen Storage Tank
50-TK-3	Liquid Nitrogen Storage Tank
50-TK-4	Scale Inhib. Tank
50-TK-5	Nitrogen Gas Trailer
50-AG-1	Scale Inhib. Agitator
50-AG-1-M	Scale Inhib. Agitator
50-P-1A	Liquid Oxygen Pump
50-P-1A-M	Liquid Oxygen Pump Motor
50-P-1B	Liquid Oxygen Pump
50-P-1B-M	Liquid Oxygen Pump Motor
50-P-2A	Make Up Water Pump
50-P-2A-M	Make Up Water Pump Motor
50-P-2B	Make Up Water Pump
50-P-2B-M	Make Up Water Pump Motor
50-P-3A	Cooling Water Pump
50-P-3A-M	Cooling Water Pump Motor
50-P-3B	Cooling Water Pump
50-P-3B-M	Cooling Water Pump Motor
50-P-3C	Cooling Water Pump
50-P-3C-M	Cooling Water Pump Motor
50-P-3D	Cooling Water Pump
50-P-3D-M	Cooling Water Pump Motor
50-P-4	Scale Inhib. Pump
50-P-4-M	Scale Inhib. Pump Motor
50-P-5A	Lube Oil Pump
50-P-5A-M	Lube Oil Pump Motor
50-P-5B	Lube Oil Pump
50-P-5B-M	Lube Oil Pump Motor
50-P-6A	Lube Oil Pump
50-P-6A-M	Lube Oil Pump Motor

50-P-6B	Lube Oil Pump
50-P-6B-M	Lube Oil Pump Motor
50-P-7A	Lube Oil Pump
50-P-7A-M	Lube Oil Pump Motor
50-P-7B	Lube Oil Pump
50-P-7B-M	Lube Oil Pump Motor
50-P-8A	Lube Oil Pump
50-P-8A-M	Lube Oil Pump Motor
50-P-8B	Lube Oil Pump
50-P-8B-M	Lube Oil Pump Motor
50-P-9A	Vacuum Pump
50-P-9A-M	Vacuum Pump Motor
50-P-9B	Vacuum Pump
50-P-9B-M	Vacuum Pump Motor
50-P-10	Chlorine Booster Pump
50-P-10-M	Chlorine Booster Pump Motor
50-P-11A	Direct Contact Cooler Pump
50-P-11A-M	Direct Contact Cooler Pump Motor
50-P-11B	Direct Contact Cooler Pump
50-P-11B-M	Direct Contact Cooler Pump Motor
50-P-12A	Direct Contact Cooler Pump
50-P-12A-M	Direct Contact Cooler Pump Motor
50-P-12B	Direct Contact Cooler Pump
50-P-12B-M	Direct Contact Cooler Pump Motor
50-P-13A	Condensate Pump
50-P-13A-M	Condensate Pump Motor
50-P-13B	Condensate Pump
50-P-13B-M	Condensate Pump Motor

PGW

EQUIPMENT LIST - UNIT 62

GAS COMPRESSION PLANT

62-C-1A	Gas Compressor
62-C-1A-T	Gas Compressor Turbine
62-C-1B	Gas Compressor
62-C-1B-T	Gas Compressor Turbine
62-C-2	Gas Compressor
62-C-2-M	Gas Compressor Motor
62-TK-1A	Reservoir
62-TK-1B	Reservoir
62-TK-2	Reservoir
62-E-1A	Oil Cooler
62-E-1B	Oil Cooler
62-E-1C	Oil Cooler
62-E-1D	Oil Cooler
62-E-2A	Oil Cooler
62-E-2B	Oil Cooler
62-E-3A	After Cooler
62-E-3B	After Cooler
62-E-3C	After Cooler
62-P-1A	Oil Pump (Compressor Driven)
62-P-1B	Oil Pump (Compressor Driven)
62-P-1C	Oil Pump (Compressor Driven)
62-P-1D	Oil Pump (Compressor Driven)
62-P-2A	Oil Pump
62-P-2A-M	Oil Pump Motor
62-P-2B	Oil Pump
62-P-2B-M	Oil Pump Motor
62-ME-1A	Expansion Joint
62-ME-1B	Expansion Joint
62-ME-1C	Expansion Joint
62-ME-1D	Expansion Joint
62-ME-1E	Expansion Joint

62-ME-1F	Expansion Joint
62-E-6A	After Cooler
62-E-6B	After Cooler
62-E-6C	After Cooler
62-ME-2A	Expansion Joint
62-ME-2B	Expansion Joint
62-ME-2C	Expansion Joint
62-ME-3A	Expansion Joint
62-ME-3B	Expansion Joint
62-ME-3C	Expansion Joint
62-ME-4	Crane (20 ton)

PGW

EQUIPMENT LIST - UNIT 64

GAS DEHYDRATION

64-TK-1	Glycol Gas Contactor
64-E-1	Glycol Cooler
64-TK-2	Glycol Still
64-B-1	Glycol Reservoir
64-F-1A	Glycol Filter
64-F-1B	Glycol Filter
64-E-2	Glycol Accumulator
64-P-1A	Glycol Circulation Pump
64-P-1A-M	Glycol Circulation Pump Motor
64-P-1B	Glycol Circulation Pump
64-P-1B-M	Glycol Circulation Pump Motor
64-SE-1	Separator
64-TK-3	Glycol Flash Tank

PGW

EQUIPMENT LIST - UNIT 72

WASH WATER SYSTEM

72-V-1A	Vacuum Receiver
72-V-1B	Vacuum Receiver
72-V-2A	Moisture Trap
72-V-2B	Moisture Trap
72-E-1A	Wash Water Cooler
72-E-1B	Wash Water Cooler
72-TK-1	Flocculation Tank
72-TK-2	Thickener
72-TK-3A	Settling Basin
72-TK-3B	Settling Basin
72-F-1A	Rotary Vacuum Filter
72-F-1A-M	Rotary Vacuum Filter Motor
72-F-1B	Rotary Vacuum Filter
72-F-1B-M	Rotary Vacuum Filter Motor
72-FA-1	Channel Fan
72-FA-1-M	Channel Fan Motor
72-FA-2	Settling Basin Fan
72-FA-2-M	Settling Basin Fan Motor
72-FA-3A	Fan-Vapor Extraction
72-FA-3A-M	Fan-Vapor Extraction Motor
72-FA-3B	Fan-Vapor Extraction
72-FA-3B-M	Fan-Vapor Extraction Motor
72-AG-1A	Agitator
72-AG-1A-M	Agitator Motor
72-AG-1B	Agitator
72-AG-1B-M	Agitator Motor
72-AG-2	Agitator (Flow Tank)
72-AG-2-M	Agitator Motor
72-P-1A	Sludge Pump
72-P-1A-M	Sludge Pump Motor

72-P-1B	Sludge Pump
72-P-1B-M	Sludge Pump Motor
72-P-1C	Sludge Pump
72-P-1C-M	Sludge Pump Motor
72-P-1D	Sludge Pump
72-P-1D-M	Sludge Pump Motor
72-P-2A	Thickener Sludge Water Pump
72-P-2A-M	Thickener Sludge Water Pump Motor
72-P-2B	Thickener Sludge Water Pump
72-P-2B-M	Thickener Sludge Water Pump Motor
72-P-3A	Washwater Return Pump
72-P-3A-M	Washwater Return Pump Motor
72-P-3B	Washwater Return Pump
72-P-3B-M	Washwater Return Pump Motor
72-P-4	Flocculation Dosing Pump
72-P-4-M	Flocculation Dosing Pump Motor
72-P-5A	Filtrate Pump
72-P-5A-M	Filtrate Pump Motor
72-P-5B	Filtrate Pump
72-P-5B-M	Filtrate Pump Motor
72-P-5C	Filtrate Pump
72-P-5C-M	Filtrate Pump Motor
72-P-6A	Vacuum Pump
72-P-6A-M	Vacuum Pump Motor
72-P-6B	Vacuum Pump
72-P-6B-M	Vacuum Pump Motor
72-P-6C	Vacuum Pump
72-P-6C-M	Vacuum Pump Motor
72-P-7A	Exhauster
72-P-7A-M	Exhauster Motor
72-P-7B	Exhauster
72-P-7B-M	Exhauster Motor
72-ME-3A	Settling Basin Scraper
72-ME-3A-M	Settling Basin Scraper Motor
72-ME-3B	Settling Basin Scraper
72-ME-3B-M	Settling Basin Scraper Motor

PGW

EQUIPMENT LIST - UNIT 74

WASTE WATER TREATMENT

74-TK-1	Equalization and Holding Tank
74-AG-1A	Equalization and Holding Tank Agitator
74-AG-1A-GE	Equalization and Holding Tank Agitator Reducer
74-AG-1A-M	Equalization and Holding Tank Agitator Motor
74-AG-1B	Equalization and Holding Tank Agitator
74-AG-1B-GE	Equalization and Holding Tank Agitator Reducer
74-AG-1B-M	Equalization and Holding Tank Agitator Motor
74-P-1A	Wastewater Transfer Pump
74-P-1A-M	Wasterwater Transfer Pump Motor
74-P-1B	Wastewater Transfer Pump
74-P-1B-M	Wastewater Transfer Pump Motor
74-MX-1	In Line Mixer
74-TK-2	Sludge Conditioner Tank
74-AG-2	Sludge Conditioner Tank Agitator
74-AG-2-GE	Sludge Conditioner Tank Agitator Reducer
74-AG-2-M	Sludge Conditioner Tank Agitator Motor
74-P-2A	Sludge Conditioner Tank Pump
74-P-2A-M	Sludge Conditioner Tank Pump Motor
74-P-2B	Sludge Conditioner Tank Pump
74-P-2B-M	Sludge Conditioner Tank Pump Motor
74-TK-3	Dilute Sulfuric Acid Tank
74-AG-3	Dilute Sulfuric Acid Tank Agitator
74-AG-3-GE	Dilute Sulfuric Acid Tank Agitator Reducer
74-AG-3-M	Dilute Sulfuric Acid Tank Agitator Motor
74-P-3A	Dilute Sulfuric Acid Tank Pump
74-P-3A-M	Dilute Sulfuric Acid Tank Pump Motor
74-P-3B	Dilute Sulfuric Acid Tank Pump
74-P-3B-M	Dilute Sulfuric Acid Tank Pump Motor
74-TK-4	Lime Slurry Tank
74-AG-4	Lime Slurry Tank Agitator
74-AG-4-GE	Lime Slurry Tank Agitator Reducer

74-AG-4-M	Lime Slurry Tank Agitator Motor
74-P-4A	Lime Slurry Tank Pump
74-P-4A-M	Lime Slurry Tank Tank Pump Motor
74-P-4B	Lime Slurry Tank Pump
74-P-4B-M	Lime Slurry Tank Pump Motor
74-ME-1	Lime Slurry Bag Dump
74-CV-1	Lime Slurry Bag Dump Feeder
74-CV-1-GE	Lime Slurry Bag Dump Feeder Reducer
74-CV-1-M	Lime Slurry Bag Dump Feeder Motor
74-TK-5	Polymer Make Up Tank
74-AG-5	Polymer Make Up Tank Agitator
74-AG-5-GE	Polymer Make Up Tank Agitator Reducer
74-AG-5-M	Polymer Make Up Tank Agitator Motor
74-P-5A	Polymer Make Up Tank Pump
74-P-5A-M	Polymer Make Up Tank Pump Motor
74-P-5B	Polymer Make Up Tank Pump
74-P-5B-M	Polymer Make Up Tank Pump Motor
74-TK-6	Neutralization Tank
74-AG-6	Neutralization Tank Agitator
74-AG-6-GE	Neutralization Tank Agitator Reducer
74-AG-6-M	Neutralization Tank Agitator Motor
74-TK-7	Oxidation/Flocculation Tank
74-AG-7	Oxidation/Flocculation Tank Agitator
74-AG-7-GE	Oxidation/Flocculation Tank Agitator Reducer
74-AG-7-M	Oxidation/Flocculation Tank Agitator Motor
74-ME-2	Gravity Settler
74-ME-2-GE-A	Gravity Settler Screen Reducer
74-ME-2-M-A	Gravity Settler Screen Motor
74-ME-2-GE-B	Gravity Settler Mixer Reducer
74-ME-2-M-B	Gravity Settler Mixer Motor
74-P-6A	Gravity Settler Waste Sludge Pump
74-P-6A-M	Gravity Settler Waste Sludge Pump Motor
74-P-6B	Gravity Settler Waste Sludge Pump
74-P-6B-M	Gravity Settler Waste Sludge Pump Motor
74-P-7A	Gravity Settler Recycle Pump

74-P-7A-M	Gravity Settler Recycle Pump Motor
74-P-7B	Gravity Settler Recycle Pump
74-P-7B-M	Gravity Settler Recycle Pump Motor
74-ME-3	Sludge Thickener
74-ME-3-GE	Sludge Thickener Rake Reducer
74-ME-3-M	Sludge Thickener Rake Motor
74-F-1A	Gravity Polishing Filter
74-F-1B	Gravity Polishing Filter
74-F-2	Sludge Dewatering Filter
74-F-2-GE	Sludge Dewatering Filter Reducer
74-F-2-M	Sludge Dewatering Filter Motor
74-FA-1	Sludge Dewatering Filter Fan
74-FA-1-M	Sludge Dewatering Filter Fan Motor
74-P-8A	Sludge Dewatering Filter Feed Pump
74-P-8A-M	Sludge Dewatering Filter Feed Pump Motor
74-P-8B	Sludge Dewatering Filter Feed Pump
74-P-8B-M	Sludge Dewatering Filter Feed Pump Motor
74-ME-4	Wastewater Flow and Sample Chamber
74-ME-4-GE-1	Wastewater Flow and Sample Chamber Reducer
74-ME-4-M-1	Wastewater Flow and Sample Chamber Motor
74-ME-4-GE-2	Wastewater Flow and Sample Chamber Reducer
74-ME-4-M-2	Wastewater Flow and Sample Chamber Motor
74-ME-5	C. T. Blowdown Flow and Sample Chamber
74-ME-5-GE-1	C. T. Blowdown Flow and Sample Chamber Reducer
74-ME-5-M-1	C. T. Blowdown Flow and Sample Chamber Motor
74-ME-5-GE-2	C. T. Blowdown Flow and Sample Chamber Reducer
74-ME-5-M-2	C. T. Blowdown Flow and Sample Chamber Motor
74-P-9A	Coal & Ash Pile Basin Transfer Pump
74-P-9A-M	Coal & Ash Pile Basin Transfer Pump Motor
74-P-9B	Coal & Ash Pile Basin Transfer Pump
74-P-9B-M	Coal & Ash Pile Basin Transfer Pump Motor
74-TK-8	Coal & Ash Pile Runoff Basin
74-AG-8	Coal & Ash Pile Runoff Basin Agitator
74-AG-8-GE	Coal & Ash Pile Runoff Basin Agitator Reducer

74-AG-8-M	Coal & Ash Pile Runoff Basin Agitator Motor
74-CV-2	Belt Conveyor
74-CV-2-GE	Belt Conveyor Reducer
74-CV-2-M	Belt Conveyor Motor
74-P-10A	Sludge Dewatering Pump
74-P-10A-M	Sludge Dewatering Pump Motor
74-P-10B	Sludge Dewatering Pump
74-P-10B-M	Sludge Dewatering Pump Motor
74-P-11A	Oxidation/Flocculation Transfer Pump
74-P-11A-M	Oxidation/Flocculation Transfer Pump Motor
74-P-11B	Oxidation/Flocculation Transfer Pump
74-P-11B-M	Oxidation/Flocculation Transfer Pump Motor
74-P-12A	Sludge Thickener Disch. Pump
74-P-12A-M	Sludge Thickener Disch. Pump Motor
74-P-12B	Sludge Thickener Disch. Pump
74-P-12B-M	Sludge Thickener Disch. Pump Motor
74-P-13A	Coal Unloading Sump Pump
74-P-13A-M	Coal Unloading Sump Pump Motor
74-P-13B	Coal Unloading Sump Pump
74-P-13B-M	Coal Unloading Sump Pump Motor
74-TK-9	Demin. Equal. & Neutralizing Tank
74-AG-9	Demin. Equal. & Neutralizing Tank Agitator
74-AG-9-M	Demin. Equal. & Neutralizing Tank Agitator Motor

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EQUIPMENT LIST - UNIT 81

COOLING WATER SYSTEM

81-TK-5A	Chlorination Cylinders
81-TK-5B	Chlorination Cylinders
81-TK-5C	Chlorination Cylinders
81-TK-5D	Chlorination Cylinders
81-TK-8	Scale Inhib. Tank
81-F-2A	Pressure Filter - Cooling Tower Bypass
81-F-2B	Pressure Filter - Cooling Tower Bypass
81-CH-1	Chlorine Ejector
81-CH-2	Chlorine Ejector
81-AG-3	Scale Inhib. Agitator
81-AG-3-M	Scale Inhib. Agitator Motor
81-CT-1	Cooling Tower
81-CT-1-M-A	Cooling Tower Motor
81-CT-1-M-B	Cooling Tower Motor
81-CT-1-M-C	Cooling Tower Motor
81-ME-1A	Residual Chlorine Analyzer
81-ME-1B	Residual Chlorine Analyzer
81-P-5A	Cooling Tower Circulating Pump
81-P-5A-M	Cooling Tower Circulating Pump Motor
81-P-5B	Cooling Tower Circulation Pump
81-P-5B-M	Cooling Tower Circulation Pump Motor
81-P-5C	Cooling Tower Circulation Pump
81-P-5C-M	Cooling Tower Circulation Pump Motor
81-P-5D	Cooling Tower Circulation Pump
81-P-5D-M	Cooling Tower Circulation Pump Motor
81-P-6A	Cooling Water Pump
81-P-6A-M	Cooling Water Pump Motor
81-P-6B	Cooling Water Pump
81-P-6B-M	Cooling Water Pump Motor
81-P-6C	Cooling Water Pump
81-P-6C-M	Cooling Water Pump Motor

81-P-6D	Cooling Water Pump
81-P-6D-M	Cooling Water Pump Motor
81-P-7A	Scale Inhib. Pump
81-P-7A-M	Scale Inhib. Pump Motor
81-P-7B	Scale Inhib. Pump
81-P-7B-M	Scale Inhib. Pump Motor
81-P-8A	Chlorinator Booster Pump
81-P-8A-M	Chlorinator Booster Pump Motor
81-P-8B	Chlorinator Booster Pump
81-P-8B-M	Chlorinator Booster Pump Motor
81-P-8C	Chlorinator Booster Pump
81-P-8C-M	Chlorinator Booster Pump Motor
81-P-8D	Chlorinator Booster Pump
81-P-8D-M	Chlorinator Booster Pump Motor
81-ME-2A	Chlorinator
81-ME-2B	Chlorinator

PGW

EQUIPMENT LIST - UNIT 82

BOILER FEED WATER AND CONDENSATE RETURN SYSTEMS

82-CN-1	Condenser
82-TK-1	Condensate Tank
82-TK-2	Caustic Storage Tank
82-TK-3	Sulfuric Acid Storage Tank
82-TK-6	High Pressure Flash Tank
82-TK-7	Low Pressure Flash Tank
82-TK-9	Demineralized Water Tank
82-TK-10	Caustic Day Tank
82-TK-11	Sulfuric Acid Day Tank
82-TK-12	Phosphate Dilution Tank
82-TK-13	Ammonia Dilution Tank
82-TK-14	Hydrazine Dilution Tank
82-AG-4	Caustic Agitator
82-AG-4-M	Caustic Agitator Motor
82-AG-5	Acid Agitator
82-AG-5-M	Acid Agitator Motor
82-AG-7	Phosphate Dilution Agitator
82-AG-7-M	Phosphate Dilution Agitator Motor
82-AG-8	Ammonia Dilution Agitator
82-AG-8-M	Ammonia Dilution Agitator Motor
82-AG-9	Hydrazine Dilution Agitator
82-AG-9-M	Hydrazine Dilution Agitator Motor
82-DM-1A	Demineralizer
82-DM-1B	Demineralizer
82-B-1	Auxiliary Boiler
82-DA-1	Deaerator
82-DS-1	Desuperheater Station
82-DS-2	Desuperheater Station
82-E-1	Heat Exchanger
82-EJ-1A	Condenser Vacuum Ejector
82-EJ-1A-M	Condenser Vacuum Ejector Motor

82-EJ-1B	Condenser Vacuum Ejector
82-EJ-1B-M	Condenser Vacuum Ejector Motor
82-VE-1	Deaerator Tank Safety Valve
82-VE-2	Demineralized Water Tank Safety Valve
82-VE-3	Condensate Tank Safety Valve
82-ME-1A	Expansion Joint - 6"
82-ME-1B	Expansion Joint - 6"
82-ME-2A	Expansion Joint - 36"
82-ME-2B	Expansion Joint - 36"
82-P-1A	Condenser Condensate Pump
82-P-1A-M	Condenser Condensate Pump Motor
82-P-1B	Condenser Condensate Pump
82-P-1B-M	Condenser Condensate Pump Motor
82-P-2A	Tank Condensate Pump
82-P-2A-M	Tank Condensate Pump Motor
82-P-2B	Tank Condensate Pump
82-P-2B-M	Tank Condensate Pump Motor
82-P-2C	Tank Condensate Pump
82-P-2C-M	Tank Condensate Pump Motor
82-P-3A	Auxiliary Boiler Feedwater Pump
82-P-3A-M	Auxiliary Boiler Feedwater Pump Motor
82-P-3B	Auxiliary Boiler Feedwater Pump
82-P-3B-M	Auxiliary Boiler Feedwater Pump Motor
82-P-4A	High Pressure Feedwater Pump
82-P-4A-M	High Pressure Feedwater Pump Motor
82-P-4B	High Pressure Feedwater Pump
82-P-4B-M	High Pressure Feedwater Pump Motor
82-P-4C	High Pressure Feedwater Pump
82-P-4C-M	High Pressure Feedwater Pump Motor
82-P-5A	Low Pressure Feedwater Pump
82-P-5A-M	Low Pressure Feedwater Pump Motor
82-P-5B	Low Pressure Feedwater Pump
82-P-5B-M	Low Pressure Feedwater Pump Motor
82-P-5C	Low Pressure Feedwater Pump
82-P-5C-M	Low Pressure Feedwater Pump Motor

82-P-7A	Condensate Pump
82-P-7A-M	Condensate Pump Motor
82-P-7B	Condensate Pump
82-P-7B-M	Condensate Pump Motor
82-P-8A	Fuel Oil Pump
82-P-8A-M	Fuel Oil Pump Motor
82-P-8B	Fuel Oil Pump
82-P-8B-M	Fuel Oil Pump Motor
82-P-9A	Cation Reg. Pump
82-P-9A-M	Cation Reg. Pump Motor
82-P-9B	Cation Reg. Pump
82-P-9B-M	Cation Reg. Pump Motor
82-P-10A	Anion Reg. Pump
82-P-10A-M	Anion Reg. Pump Motor
82-P-10B	Anion Reg. Pump
82-P-10B-M	Anion Reg. Pump Motor
82-P-13A	Demineralized Water Pump
82-P-13A-M	Demineralized Water Pump Motor
82-P-13B	Demineralized Water Pump
82-P-13B-M	Demineralized Water Pump Motor
82-P-14	Caustic Metering Pump
82-P-14-M	Caustic Metering Pump Motor
82-P-15	Sulfuric Acid Metering Pump
82-P-15-M	Sulfuric Acid Metering Pump Motor
82-P-16A	Phosphate Dilution Pump
82-P-16A-M	Phosphate Dilution Pump Motor
82-P-16B	Phosphate Dilution Pump
82-P-16B-M	Phosphate Dilution Pump Motor
82-P-17A	Ammonia Dilution Pump
82-P-17A-M	Ammonia Dilution Pump Motor
82-P-17B	Ammonia Dilution Pump
82-P-17B-M	Ammonia Dilution Pump Motor
82-P-18A	Hydrazine Dilution Pump
82-P-18A-M	Hydrazine Dilution Pump Motor
82-P-18B	Hydrazine Dilution Pump
82-P-18B-M	Hydrazine Dilution Pump Motor

PGW
EQUIPMENT LIST - UNIT 83
FIRE WATER SYSTEM

83-P-1	Main Fire Pump
83-P-1-M	Main Fire Pump Motor
83-P-2	Jockey Pump
83-P-2-M	Jockey Pump Motor
83-P-3	Auxiliary Fire Pump
83-P-3-M	Auxiliary Fire Pump Diesel Engine
83-TK-1	Firewater Tank
83-TK-2	Diesel Fuel Tank

PGW

EQUIPMENT LIST - UNIT 84

POTABLE WATER AND PLANT WATER SYSTEMS

84-TK-1	Filtered Water Tank
84-TK-6	Flocculant Tank
84-TK-7	Coagulant Tank
84-CA-1	Sluice Gate
84-CL-1	Clarifier
84-CL-1-M	Clarifier Paddle Motor
84-F-1A	Gravity Filter
84-F-1B	Gravity Filter
84-F-1C	Gravity Filter
84-F-1D	Gravity Filter
84-F-1E	Gravity Filter
84-SF-1	Bar Screen
84-SF-1-M	Bar Screen Motor
84-SF-2A	Traveling Screen
84-SF-2A-M	Traveling Screen Motor
84-SF-2B	Traveling Screen
84-SF-2B-M	Traveling Screen Motor
84-AG-1	Flocculant Tank Agitator
84-AG-1-M	Flocculant Tank Agitator Motor
84-AG-2	Coagulant Tank Agitator
84-AG-2-M	Coagulant Tank Agitator Motor
84-P-1A	Filtered Water Pump
84-P-1A-M	Filtered Water Pump Motor
84-P-1B	Filtered Water Pump
84-P-1B-M	Filtered Water Pump Motor
84-P-2A	Makeup Water Pump
84-P-2A-M	Makeup Water Pump Motor
84-P-2B	Makeup Water Pump
84-P-2B-M	Makeup Water Pump Motor

84-P-2C	Makeup Water Pump
84-P-2C-M	Makeup Water Pump Motor
84-P-3	Flocculant Pump
84-P-3-M	Flocculant Pump Motor
84-P-4	Coagulant Pump
84-P-4-M	Coagulant Pump Motor
84-P-11A	Clarifier Sludge Pump
84-P-11A-M	Clarifier Sludge Pump Motor
84-P-11B	Clarifier Sludge Pump
84-P-11B-M	Clarifier Sludge Pump Motor
84-P-12A	Filter Water Backwash Pump
84-P-12A-M	Filter Water Backwash Pump Motor
84-P-12B	Filter Water Backwash Pump
84-P-12B-M	Filter Water Backwash Pump Motor

PGW

EQUIPMENT LIST - UNIT 85

INSTRUMENT AND PLANT AIR

85-C-1A	Plant Air Compressor
85-C-1A-M	Plant Air Compressor Motor
85-C-1B	Plant Air Compressor
85-C-1B-M	Plant Air Compressor Motor
85-TK-1	Air Receiver - 200 Ft^3
85-TK-2A	Air Receiver - 100 Ft^3
85-TK-2B	Air Receiver - 100 Ft^3
85-TK-2C	Air Receiver - 100 Ft^3
85-TK-2D	Air Receiver - 100 Ft^3
85-TK-2E	Air Receiver - 100 Ft^3
85-TK-3A	Oil Reservoir
85-TK-3B	Oil Reservoir
85-E-1A	Inter Cooler
85-E-1B	Inter Cooler
85-E-1C	Inter Cooler
85-E-1D	Inter Cooler
85-E-2A	After Cooler
85-E-2B	After Cooler
85-E-3A	Oil Cooler
85-E-3B	Oil Cooler
85-E-4A	Aux. Oil Cooler
85-E-4B	Aux. Oil Cooler
85-F-1A	Air Filter
85-F-1B	Air Filter
85-F-2A	Intake Filter
85-F-2B	Intake Filter
85-F-3A	Intake Silencer
85-F-3B	Intake Silencer
85-F-4A	Blow Off Silencer
85-F-4B	Blow Off Silencer

85-F-5A	Oil Filter
85-F-5B	Oil Filter
85-DR-1A	Instrument Air Dryer
85-DR-1B	Instrument Air Dryer
85-SE-1A	Moisture Separator
85-SE-1B	Moisture Separator
85-P-1A	Main Oil Pump (Compressor Driven)
85-P-1B	Main Oil Pump (Compressor Driven)
85-P-2A	Auxiliary Oil Pump
85-P-2A-M	Auxiliary Oil Pump Motor
85-P-2B	Auxiliary Oil Pump
85-P-2B-M	Auxiliary Oil Pump Motor

PGW

EQUIPMENT LIST - UNIT 91

FLARE AND RELIEF EQUIPMENT

91-ME-1	Main Flare Stack
91-ME-2	Main Flare Burner Package

PGW

EQUIPMENT LIST - UNIT 92

FLY ASH REMOVAL AND STORAGE

92-CV-1	Fly Ash Conveyor Belt - Belt 1 - Rotary Filter to Belt 2
92-CV-1-GE	Fly Ash Conveyor Belt - Belt 1 - Rotary Filter to Belt 2
92-CV-1-M	Fly Ash Conveyor Belt - Belt 1 - Rotary Filter to Belt 2
92-CV-2	Fly Ash Conveyor Belt - Belt 2 - Belt 1 to Belt 3
92-CV-2-GE	Fly Ash Conveyor Belt - Belt 2 - Belt 1 to Belt 3
92-CV-2-M	Fly Ash Conveyor Belt - Belt 2 - Belt 1 to Belt 3
92-CV-3	Fly Ash Conveyor Belt - Belt 3 - Belt in Building
92-CV-3-GE	Fly Ash Conveyor Belt - Belt 3 - Belt in Building
92-CV-3-M	Fly Ash Conveyor Belt - Belt 3 - Belt in Building
92-CV-4	Fly Ash Conveyor Belt - Belt in Building
92-CV-4-GE	Fly Ash Conveyor Belt - Belt in Building
92-CV-4-M	Fly Ash Conveyor Belt - Belt in Building
92-CV-5	Fly Ash Conveyor Belt - Belt 8 - Belt 1 to Belt 9A & 9B
92-CV-5-GE	Fly Ash Conveyor Belt - Belt 8 - Belt 1 to Belt 9A & 9B
92-CV-5-M	Fly Ash Conveyor Belt - Belt 8 - Belt 1 to Belt 9A & 9B
92-CV-7A	Fly Ash Conveyor Belt - Belt 10A - Reversible Belt
92-CV-7A-GE	Fly Ash Conveyor Belt - Belt 10A - Reversible Belt
92-CV-7A-M	Fly Ash Conveyor Belt - Belt 10A - Reversible Belt
92-CV-7B	Fly Ash Conveyor Belt - Belt 10B - Reversible Belt
92-CV-7B-GE	Fly Ash Conveyor Belt - Belt 10B - Reversible Belt
92-CV-7B-M	Fly Ash Conveyor Belt - Belt 10B - Reversible Belt
92-ME-1	Bifurcated Chute - Belt 1 to Belt 2 and Belt 8
92-ME-2	Slide Grate Valve - On Biforcated Chute Leg
92-ME-3	Transfer Chute - Belt 2 to Belt 3
92-M-1	Motor - Carriage Drive - Length of Building
92-GE-1	Reducer - Carriage Drive - Length of Building
92-M-2	Motor - Carriage Drive - Width of Building
92-GE-2	Reducer - Carriage Drive - Width of Building
92-ME-4	Belt Tripper - For Belt 3
92-CV-8	Fly Ash Conversion Belt - Belt 6 - In Trough
92-CV-8-GE	Fly Ash Conversion Belt Reducer - Belt 6 - In Trough
92-CV-8-M	Fly Ash Conversion Belt Motor - Belt 6 - In Trough

92-TK-1	Fly Ash Surge Hopper
92-RF-1	Rotary Feed Valve - Under Surge Hopper
92-RF-1-GE	Rotary Feed Valve Reducer - Under Surge Hopper
92-RF-1-M	Rotary Feed Valve Motor - Under Surge Hopper
92-ME-5	Carriage - Tripper
92-ME-6	Bifurcated Chute - Belt 8 to Belt 9A and Belt 9B
92-ME-7A	Slide Gate Valve - On Biforcated Chute Leg
92-ME-7B	Slide Gate Valve - On Biforcated Chute Leg
92-ME-8A	Transfer Chute - Belt 9A to Belt 10A
92-ME-8B	Transfer Chute - Belt 9B to Belt 10B
92-TK-2A	Surge Hopper - Belt 10A to Mill 1
92-TK-2B	Surge Hopper - Belt 10A and Belt 10B to Mill 2
92-TK-3	Surge Hopper - Belt 10B to Mill 3
92-RF-2A	Rotary Feed Valve - Mill 1
92-RF-2A-GE	Rotary Feed Valve Reducer
92-FF-2A-M	Rotary Feed Valve Motor
92-RF-2B	Rotary Feed Valve - Mill 2
92-RF-2B-GE	Rotary Feed Valve Reducer
92-RF-2B-M	Rotary Feed Valve Motor
92-RF-2C	Rotary Feed Valve - Mill 3
92-RF-2C-GE	Rotary Feed Valve Reducer
92-RF-2C-M	Rotary Feed Valve Motor
92-ME-9	Carriage - Reversing Belt

PGW

EQUIPMENT LIST - UNIT 94

SLAG REMOVAL AND STORAGE

94-CV-2	Slag Conveyor Belt - Belt 2
94-CV-2-GE	Slag Conveyor Belt Reducer - Belt 2
94-CV-2-M	Slag Conveyor Belt Motor - Belt 2
94-ME-1	Transfer Chute - GKT Belt 2 to Belt 3
94-CV-3	Slag Conveyor Belt - Belt 3
94-CV-3-GE	Slag Conveyor Belt Reducer - Belt 3
94-CV-3-M	Slag Conveyor Belt Motor - Belt 3
94-ME-2	Transfer Chute - Belt 3 to Belt 4
94-CV-4	Slag Belt - Belt 4 in Building
94-CV-4-GE	Slag Belt Reducer - Belt 4 in Building
94-CV-4-M	Slag Belt Motor - Belt 4 in Building
94-ME-2	Belt Tripper for Belt 4
94-CV-5	Slag Belt - Reversing Belt No. 5
94-CV-5-GE	Slag Belt Reducer - Reversing Belt No. 5
94-CV-5-M	Slag Belt Motor - Reversing Belt No. 5
94-M-1	Motor - Carriage Drive - Length of Building
94-GE-1	Reducer - Carriage Drive - Length of Building
94-M-2	Motor - Carriage Drive - Width of Building
94-GE-2	Reducer - Carriage Drive - Width of Building
94-CV-6	Slag Conveyor Belt - Belt in Trough - Belt 7
94-CV-6-GE	Slag Conveyor Belt Reducer - Belt 7
94-CV-6-M	Slag Conveyor Belt Motor - Belt 7
94-ME-3	Transfer Chute - Belt 7 to Screw Conveyor
94-CV-7	Slag Screw Conveyor - Transfer Chute to Surge Hopper
94-CV-7-GE	Slag Screw Conveyor Reducer - Transfer Chute to Surge Hopper
94-CV-7-M	Slag Screw Conveyor Motor - Transfer Chute to Surge Hopper
94-TK-1	Surge Hopper - Screw Conveyor to Loading
94-RF-1	Rotary Feed Valve - Surge Hopper to Unloading
94-RF-1-GE	Rotary Feed Valve Reducer - Surge Hopper to Unloading
94-RF-1-M.	Rotary Feed Valve Motor - Surge Hopper to Unloading
94-ME-4	Carriage-Tripper
94-ME-5	Carriage-Reversing Belt

APPENDIX K

MOTOR LIST USED FOR TOTAL PLANT LOAD CALCULATIONS

APPENDIX K

	DESCRIPTION	MCC	HP	NO. RUN	NO. STDBY	L.F.	EQUIPMENT NO.
1.	Coal Car Shaker	CH-1	20	1	1	.1	10-ME-1A/B-M
2.	Vibrating Feeders	CH-1	5	4	4	.1	10-ME-4A-4H-M
3.	Belt Conveyors	CH-1	40	1	1	.1	10-CV-1 & 2-M
4.	Belt Conveyor	CH&P 4.16KV	300	1	-	.1	10-CV-3-M
5.	Vibrating Bottom Motor	CH-2	20	3	-	.1	10-ME-6A/B/C-M
6.	Vibrating Feeder Motor	CH-2	5	3	-	.1	10-ME-8A/B/C-M
7.	Belt Conveyor Motor	DL-1	1	1	-	.1	10-CV-4-M
8.	Coal Sampler Motors	P-3	1	1	1	.25	10-CS-1/2-M
9.	Vibrating Feeder	P-3	1	1	-	.25	10-ME-9-M
10.	Coal Sampling Crusher	P-3	15	1	-	.1	10-CR-2-M
11.	Crane Feeder	CH-1	BKR70A	-	1	-	
12.	Belt Conveyor	P-1	75	1	-	.25	10-CV-5-M
13.	Belt Tripper	P-2	7-1/2	1	-	.25	10-TR-1-M
14.	Oil Pumps	P-2	30	1	1	.25	10-P-1A/B-M
15.	Infrared Thaw Shed (Two 480V. LD. Centers Per Thaw Line)		3240KW	1	1	.05	10-1-1A/1B
16.	Coal DeLumper	DL 4.16KV	400	1	-	.1	10-CR-1-M
17.	Concentr. Pumps	CH-1	1/2	2	-	.05	15-P-1A/B-M
18.	Centr. Pump	CH-2	20	1	-	.05	15-P-2-M
19.	Solution Pump	CH-1	5	1	-	.05	15-P-3-M
20.	Spray Controller Heaters "A" Thru "9"	CH-2	3.5KW	7	-	.1	15-CM-1A Thru -1G
21.	Spray Controller Heaters 2A, B & C	CH-1	1.5KW	3	-	.1	15-CM-2A, 2B, 2C
22.	Spray Controller Heaters 3A Thru 3J	CH-1	8.5KW	9	-	.1	15-CM-3A Thru 3J
23.	Intake Water Filter	CH-1	5	1	-	.5	15-F-1
24.	Roof Vent Fan	CH-1	3	1	-	.8	15-FA-1-M
25.	Roof Vent Fan	CH-1	10	1	-	.8	15-FA-2-M
26.	Roof Vent Fan	CH-1	1-1/2	1	-	.8	15-FA-3-M
27.	Damper Motors	CH-2	1/6	3	-	.5	15-DP-1/2/3-M
28.	Dust Collector Fan	DL-1	20	2	-	.8	15-BF-1/3-F-M
29.	Double Dump Valve Motors	DL-1	1/3	2	-	.5	15-ME-12/15-M
30.	Pulverizer	P 4.16KV	350	2	1	.8	20-PU-1A/1B/1C-M-1/2/3
31.	Pulverizer Seal Air Blower	P-2	25	2	1	.8	20-PU-1A/1B/1C-BL-M
32.	Recycle Fan	P 4.16KV	300	2	-	.8	20-FA-1A/1B-M
33.	Rotary Feed Valve	P-3	1	8	-	.5	20-RF-1A-1H-M
34.	Pulverizer (Roller Drive)	P-2	10	2	1	.8	20-PU-1A/1B/1C-M-2

	DESCRIPTION	MCC	HP	NO. RUN	NO. STDBY	L.F.	EQUIPMENT NO.
35.	Pulverizer (Lube Pump)	P-2	5	2	1	.8	20-PU-1A/1B/1C-M-3
36.	Air Htr. Combustion Fan	P-3	30	2	1	.8	20-ME-8A/B/C-FA-M
37.	Pulverizer Coal Pump	P-3	20	2	2	.8	20-P-1A/B-2A/B-M
38.	Rotary Feed Valves	P-4	3/4	8	-	.5	20-RF-3A-3H-M
39.	Vibrating Feeder Motors	P-3	5	2	-	.5	20-ME-2A/2B-M
40.	Screw Conveyor Motor	P-3	10	2	-	.5	20-CV-1A/B-M
41.	Rotary Feed Valve	P-4	3	2	-	.5	20-RF-2A/B-M
42.	Coal Dust Double Screw	G-1	15	16	-	.8	30-ME-4A-4P-M
43.	PIV Gear	G-28	3	16	-	.8	30-GKT
44.	Quench Water Pumps	G-2B	25	1	1	.8	30-P-1A/1B-M
45.	Wash Water Recirculation Pumps	G-4C	25	2	-	.8	30-P-2A/2B-M
46.	Aux. Oil Pumps	G-4B	7-1/2	-	2	.8	30-GKT
47.	Fuel Oil Pumps	G-4C	7-1/2	2	-	.8	30-P-3A/3B-M
48.	Oxygen Blower	G 4.16KV	500	2	-	.8	30-BL-1A/1B-M
49.	Belt Conveyor	G-1	10	1	-	.8	30-GKT
50.	Disintegrator Motors	G 4.16KV	700	2	-	.8	30-ME-8A/8B-M
51.	Slag Extractor	G-4C	7-1/2	2	-	.8	30-GKT
52.	Coal Dust Feeder	G-2C	7-1/2	8	-	.8	30-ME-3A-3H
53.	Two Way Valves	G-4B	1-1/2	12	-	.1	30-GKT
54.	N_2 Seal Pots	G-2C	1	2	-	.1	30-GKT
55.	Steam Valve	G-2C	1	2	-	.5	30-GKT
56.	O_2 Valves (Upstream of Coal Dust Feeders)	G-2A	1	16	-	.8	30-GKT
57.	N_2 Valves (Upstream of Coal Dust Feeders)	G-4A	1	16	-	-	30-GKT
58.	N_2 Valve (Inlet to Waste Heat Boiler)	G-2C	1	2	-	-	30-GKT
59.	Steam Valve (To Hi Press. Steam Line)	G-2C	1	2	-	.8	30-GKT
60.	Raw Gas Valve (From Raw Gas Blower)	G-2C	1	2	-	.5	30-GKT
61.	Raw Gas Valve (To Raw Gas Holder)	G-4C	2	2	-	.5	30-GKT
62.	Screen For Flue Dust	G-2C	3	2	-	.2	30-GKT
63.	Raw Gas Startup Valve (To Flare)	G-4C	1-1/2	2	-	.1	30-GKT
64.	Sludge Pump	G-4C	50	1	1	.8	30-GKT
65.	Circulating Water Pump	G-4C	60	1	1	.8	30-GKT
66.	Wet Electrostatic Precipitator	G-4C	60KW	1	-	.8	30-PR-1
67.	Sludge Pumps	G-2C	25	2	2	.8	30-GKT
68.	Drainage Pump	G-2C	3	1	1	.8	30-GKT
69.	Flocculation Pumps	G-4B	3	1	1	.8	30-GKT
70.	Channel Fan	G-4C	25	1	-	.8	30-GKT
71.	Traveling Scrapers	G-4C	3	2	-	.8	30-GKT
72.	Belt Conveyor	G-1	5	1	-	.8	30-GKT
73.	Vacuum Filter	G-4B	7-1/2	1	1	.8	30-GKT
74.	Stirrer For Filter	G-4B	7-1/2	1	1	.8	30-GKT
75.	Compr. Air Fan Vacuum Filter	G-2B	30	1	1	.8	30-GKT
76.	Vacuum Pumps	G-2B	125	2	1	.8	30-GKT
77.	Vacuum Filter Sys. Exhauster	G-4A	30	1	1	.8	30-GKT

	DESCRIPTION	MCC	HP	NO. RUN	NO. STDBY	L.F.	EQUIPMENT NO.
78.	Filtrate Pump	G-4B	7-1/2	1	1	.8	30-GKT
79.	Slag Belt Conveyor Motor	G-1	5	2	-	.8	30-CV-1A/1B-M
80.	Wash Water Sump Pump	G-2A	3	2	-	.8	30-P-4A/4B-M
81.	Settling Basin Fan	G-4C	20	1	-	.8	30-GKT
82.	Flocculating Mixer	G-5	3	1	-	.8	30-GKT
83.	Stretford Chemical Mix Tank	DS-1	3	-	1	.8	42-P-6-M
84.	Oxidizer Blower	DS 4.16KV	800	1	1	.8	42-BL-2A/2B
85.	Evap. Cooler Fan	DS-2	15	1	-	.8	42-E-2-F-M
86.	Solution Pumps	DS 4.16KV	1000	1	1	.8	42-P-1A/1B-M
87.	Evap. Cooler Pumps	DS-2	15	1	1	.8	42-P-2A/2B-M
88.	Sulfur Slurry Pumps	DS-2	3	1	1	.8	42-P-3A/3B-M
89.	Reslurry Pumps	DS-2	1-1/2	1	1	.8	42-P-4A/4B-M
90.	Sulfur Pumps	DS-2	5	1	1	.8	42-P-5A/5B-M
91.	Slurry Mixer	DS-2	40	1	-	.8	42-AG-1-M
92.	Reslurry Mixer	DS-2	10	1	-	.8	42-AG-2-M
93.	Centrifuge Motor	DS-1	50	1	-	.8	42-CE-1-M
94.	Reslurry Tank Stirrer Motor	DS-1	1-1/2	1	-	.8	42-TK-4-M
95.	Startup Heater	DS-1	5KW	1	-	.1	42-E-4
96.	Plate Coil Pit Heater	DS-1	5KW	1	-	.5	42-E-6
97.	Booster Gas Compressor	DS 4.16KV	2000	1	1	.8	42-BL-1A/1B-M
98.	Booster Gas Compressor Oil Pumps	DS-1	3	3	1	.8	42-P-7A/7B/7C/7D-M
99.	Quench Pumps	DS-1	5	2	-	.8	44-P-1A/1B-M
100.	Recovery Solution Pumps	DS-2	5	1	1	.8	44-P-2A/2B-M
101.	Conc. Liquor Feed Pumps	DS-1	15	1	1	.8	44-P-3A/3B-M
102.	Evap. Circ. Pumps	DS-1	40	1	1	.8	44-P-4A/4B-M
103.	Air Blower	DS-1	40	1	-	.8	44-BL-1-M
104.	Vacuum Pump Motors	AS-1	10	2	-	.8	50-P-9A/B-M
105.	ASU Air Compressor	AS 13.2KV	10000	1	-	.7	50-C-2-M
106.	Scale Inhib. Stirrer	AS-3	1/3	1	-	.8	50-AG-1-M
107.	Scale Inhib. Pump	AS-3	1/4	1	-	.8	50-P-4-M
108.	Liquid O_2 Pumps	Emerg.	25	1	1	-	50-P-1A/1B-M
109.	Cooling Tower Fans	AS-3	25	8	-	.8	50-CT-3-M-3A-3H
110.	Cooling Water Pumps	AS-1&2	150	4	-	.8	50-P-3A/3B/3C/3D-M
111.	Oil Pumps Main Air Comp.	Emerg.	20	1	1	-	50-P-5A/5B-M
112.	Oil Pumps Main Air Comp.	Emerg.	20	1	1	-	50-P-6A/6B-M
113.	Turbo Exp. Oil Pumps	Emerg.	3	1	1	-	50-P-7A/7B-M
114.	Turbo Exp. Oil Pumps	Emerg.	3	1	1	-	50-P-8A/8B-M
115.	Makeup Water Pumps	AS-2	10	2	-	.8	50-P-2A/2B-M
116.	Turbine Exp. Motor/Gen.	AS	250	2	-	.8	50-MG-1&2
117.	Direct Contact Recir. Pumps	AS-3	25	4	-	.8	50-11A/B-12A/B-M
118.	Chlorine Booster Pump	AS-3	1	1	-	.8	50-P-10-M
119.	MacLube Oil Heater	AS-1	50KW	2	-	.5	50-

	DESCRIPTION	MCC	HP	NO. RUN	NO. STDBY	L.F.	EQUIPMENT NO.
120.	Expander Lube Oil Heater	AS-2	12KW	4	-	.5	50-
121.	Reactivation Heater	AS-3	35KW	2	-	.5	50-
122.	Gas Compressor	DS 4.16KV	5000	1	-	-	62-C-2M
123.	Oil Pumps	DS-2	5	2	-	-	62-P-2A/B-M
124.	Glycol Circulation Pumps	DS-2	200	1	1	.8	64-P-1A/1B-M
125.	Filtrate Pumps	WT-6	5	2	1	.8	72-P-5A/5B/5C-M
126.	Vacuum Pumps	WT-2	125	2	1	.8	72-P-6A/6B/6C-M
127.	Rotary Vacuum Filter	WT-6	7-1/2	2	-	.8	72-F-1A/1B-M
128.	Agitator Motor	WT-6	5	2	-	.8	72-AC-1A/1B-M
129.	Exhauster Motor	WT-5	30	2	-	.8	72-P-7A/B-M
130.	Vapor Extractor Fan	WT-5	30	2	-	.8	72-FA-3A/B-M
131.	Agitator Motor	WT-4	2	1	-	.8	72-AG-2-M
132.	Flocculation Dosing Pump	WT-4	2	1	-	.8	72-P-4-M
133.	Sludge Pumps	WT-4	50	2	-	.8	72-P-2A/B-M
134.	Sludge Pumps (Settling Basin)	WT-5	20	2	2	.8	72-P-1A/B/C/D-M
135.	Wash Water Return Pumps	WT 4.16KV	600	1	1	.8	72-P-3A/B-M
136.	Channel Fan	WT-6	20	1	-	.8	72-FA-1-M
137.	Settling Basin Fan	WT-6	15	1	-	.8	72-FA-2-M
138.	Settling Basin Scraper	WT-5	30	2	-	.8	72-ME-3A/B-M
139.	Equalization & Holding Tank Agitator	WT-5	15	2	-	.8	74-AG-1A/B-M
140.	Waste Water Transfer Pump	WT-6	15	2	-	.8	74-P-1A/B-M
141.	Neutralization Tank Agitator Motor	WT-5	2	1	-	.8	74-AG-6-M
142.	Oxidation/Flocculation Tank Agitator	WT-4	1-1/2	1	-	.8	74-AG-7-M
143.	Gravity Settler Screen Motor	WT-4	1-1/2	1	-	.8	74-ME-2-M-A
144.	Gravity Settler Mixer Drive	WT-6	1	1	-	.8	74-ME-2-M-B
145.	Waste Water Flow & Sample Chamber	WT-5	1/3	1	-	.8	74-ME-4-M-1
146.	Waste Water Flow & Sample Chamber	WT-5	1/3	1	-	.8	74-ME-4-M-2
147.	Gravity Settler Waste Sludge Pump	WT-4	3	1	1	.8	74-P-6A/B-M
148.	Gravity Settler Recycle Pump	WT-6	7-1/2	1	1	.8	74-P-7A/B-M
149.	Sludge Dewatering Filter Drive	WT-4	3	1	-	.8	74-F-2-M
150.	Sludge Thickener Rake Drive	WT-4	3	1	-	.8	74-ME-3-M
151.	Sludge Dewatering Filter Fan	WT-4	3	1	-	.8	74-FA-1-M
152.	Sludge Dewatering Pump	WT-6	3	1	1	.8	74-P-10A/B-M
153.	Dilute H_2SO_4 Acid Tank Agitator	WT-3	1/4	1	-	.8	74-AG-3-M
154.	Dilute H_2SO_4 Acid Tank Pump	WT-4	3	1	1	.4	74-P-3A/B-M
155.	Lime Slurry Tank Agitator	WT-4	1/2	1	-	.8	74-AG-4-M
156.	Lime Slurry Bag Dump Feeder	WT-4	1-1/2	1	-	.2	74-CV-1-M
157.	Lime Slurry Tank Pump	WT-4	1-1/2	1	1	.4	74-P-4A/B-M
158.	Polymer Makeup Tank Agitator	WT-5	1/3	1	-	.8	74-AG-5-M
159.	Polymer Makeup Tank Pump	WT-4	3	1	1	.4	74-P-5A/B-M
160.	Sludge Conditioner Agitator	WT-4	1/4	1	-	.8	74-AG-2-M
161.	Sludge Conditioner Tank Pump	WT-4	3	1	1	.4	74-P-2A/B-M

	DESCRIPTION	MCC	HP	NO. RUN	NO. STDBY	L.F.	EQUIPMENT NO.
162.	C.T. Blowdown Flow & Sample Motor	WT-4	1/3	1	-	.8	74-ME-5-M-1
163.	C.T. Blowdown Flow & Sample Motor	WT-4	1/3	1	-	.8	74-ME-5-M-2
164.	Coal & Ash Pile Basin Transfer Pump	WT-6	5	2	-	.8	74-P-9A/B-M
165.	Coal & Ash Pile Runoff Basin Agitator	WT-6	10	1	-	.8	74-AG-8-M
166.	Sludge Dewatering Filter Feed Pump	WT-5	5	1	1	.8	74-P-8A/B-M
167.	Oxidation/Flocculation Transfer Pump	WT-5	50	1	1	.4	74-P-11A/B-M
168.	Sludge Thickener Disch. Pump	WT-3	5	1	1	.8	74-P-12A/B-M
169.	Coal Unloading Sump Pump	WT-3	10	1	1	.8	74-P-13A/B-M
170.	Belt Conveyor	WT-5	3	1	-	.8	74-CV-2-M
171.	Demin. Equal. & Neutralizer Tank Agitator	WT-5	2	1	-	.8	74-AG-9-M
172.	Caustic Feed Pump Motor	WT-5	3	1	-	.4	74-P-14-M
173.	H_2SO_4 Feed Pump	WT-5	3	-	1	-	74-P-15-M
174.	Cooling Tower Fan Motors	WT-3	125	3	-	.8	81-CT-1-M-A/B/C
175.	Cooling Tower Circulation Pumps	WT-1,2	200	3	1	.8	81-P-5A/B/C/D-M
176.	Cooling Water Pumps	WT 4.16KV	500	3	1	.8	81-P-6A/B/C/D-M
177.	Scale Inhib. Pumps	WT-3	1/4	2	-	.8	81-P-7A/B-M
178.	Chlorinator Booster Pumps	WT-6	1	2	2	.8	81-P-8A/B/C/D-M
179.	Clarifier Sludge Pump	WT-4	5	1	1	.8	82-P-11A/B-M
180.	Filter Backwash Pump	WT-5	10	1	1	.8	82-P-12A/B-M
181.	Anion Reg. Pumps	WT-6	10	2	-	.2	82-P-10A/B-M
182.	Cation Reg. Pumps	WT-6	10	2	-	.2	82-P-9A/B-M
183.	Auxiliary Boiler Feedwater	DS-1	20	2	-	.4	82-P-3A/B-M
184.	Condenser Vacuum Ejector	G-5	25	2	-	.4	82-EJ-1A/B-M
185.	Hi-Press. Feedwater Pump	G-5	150	2	1	.8	82-P-4A/B/C-M
186.	Low Press. Feedwater Pump	G-5	5	2	1	.8	82-P-5A/B/C-M
187.	Condenser Condensate Pump	G-5	7-1/2	1	1	.8	82-P-1A/B-M
188.	Condensate Pump	G-5	5	1	1	.8	82-P-7A/B-M
189.	Tank Condensate Pump	G-5	5	2	-	.8	82-P-2A/B-M
190.	Fuel Oil Pumps	G-5	1	2	-	.5	82-P-8A/B-M
191.	Caustic Metering Pump	G-2B	1/3	1	-	.4	82-P-14-M
192.	H_2SO_4 Metering Pump	G-2B	1/3	1	-	.4	82-P-15-M
193.	Caustic Agitator Motor	G-2B	1/4	1	-	.8	82-AG-4-M
194.	Acid Agitator Motor	G-2B	1/4	1	-	.8	82-AG-5-M
195.	Phosphate Dilution Agitator	G-2B	1	1	-	.8	82-AG-7-M
196.	NH_4OH Dilution Agitator	G-2B	1	1	-	.8	82-AG-8-M
197.	Hydrazine Dilution Agitator	G-2B	1	1	-	.8	82-AG-9-M
198.	Phosphate Dilution Pump	G-2C	5	1	1	.4	82-P-16A/B-M
199.	NH_4OH Dilution Pump	G-2C	5	1	1	.4	82-P-17A/B-M
200.	Hydrazine Dilution Pump	G-2C	5	1	1	.4	82-P-18A/B-M
201.	Neutralization Tank Agitator	G-2B	3	1	-	.8	82-AG-6-M
202.	Demineralizer Water Pump	WT-4	20	1	1	.8	82-P-13A/B-M

	DESCRIPTION	MCC	HP	NO. RUN	NO. STDBY	L.F.	EQUIPMENT NO.
203.	Fire Protection Pump	WT 4.16KV	500	-	1	-	83-P-1-M
204.	Fire Jockey Pump	WT-6	5	-	1	-	83-P-2-M
205.	River Water Makeup Pumps	WT-6	25	2	1	.8	84-P-2A/B/C-M
206.	Clarifier Paddle Motor	WT-6	10	1	-	.8	84-CL-1-M
207.	Flocculant Pump	WT-3	1/4	1	-	.8	84-P-3-M
208.	Coagulant Pump	WT-3	1/4	1	-	.8	84-P-4-M
209.	Floc. Tank Agitator	WT-4	1/3	1	-	.8	84-AG-1-M
210.	Coagulant Tank Agitator	WT-4	1/3	1	-	.8	84-AG-2-M
211.	Filter Water Pump	WT-6	20	2	-	.8	84-P-1A/B-M
212.	Traveling Screen	WT-5	10	2	-	.8	84-SF-2A/B-M
213.	Scale Inhib. Stirrer	WT-4	1/3	1	-	.8	84-AG-3-M
214.	Bar Screen	WT-5	5	1	-	.8	84-SF-1-M
215.	Plant Air Compressor	G 4.16KV	450	1	1	.5	85-C-1A/1B-M
216.	Plant Air Compressor Aux. Oil Pump	DS-1	3	1	1	.8	85-P-2A/B-M
217.	Fly Ash Conveyor Belt #1	P-1	100	1	-	.8	92-CV-1-M
218.	Fly Ash Conveyor Belt #2	P-3	75	1	-	.8	92-CV-2-M
219.	Fly Ash Conveyor Belt #3	P-4	75	1	-	.8	92-CV-3-M
220.	Fly Ash Conveyor Belt (in Bldg.)	P-2	30	1	-	.8	92-CV-4-M
221.	Motor Carriage Drive	P-2	7-1/2	2	-	.8	92-M-1/2
222.	Fly Ash Conversion Belt	P-4	100	1	-	.8	92-CV-8-M
223.	Rotary Feed Valve Motor	P-2	1-1/2	1	-	.4	92-RF-1-M
224.	Fly Ash Conveyor Belt #8 to #1	P-4	100	1	-	.8	92-CV-5-M
225.	Fly Ash Biface Chute	P-2	7-1/2	2	-	.8	92-CV-6A/B-M
226.	Fly Ash Conveyor Belt 10A	P-3	10	2	-	.8	92-CV-10A/B-M
227.	Rotary Feed Valve Motor	P-1	1-1/2	3	-	.4	92-RF-2A/B/C-M
228.	Slag Conveyor Belt Gasf. to #2	P-1	15	2	-	.8	94-CV-1A/B-M
229.	Slag Conveyor Belt #2	P-1	40	1	-	.8	94-CV-2-M
230.	Slag Conveyor Belt #3	P-1	25	1	-	.8	94-CV-3-M
231.	Slag Conveyor Belt #4	P-1	40	1	-	.8	94-CV-4-M
232.	Slag Conveyor Belt #5	P-1	15	1	-	.8	94-CV-5-M
233.	Motor Carriage Drive	P-2	7-1/2	2	-	.8	94-M-1/2
234.	Slag Conveyor Belt #7	P-2	60	1	-	.8	94-CV-6-M
235.	Slag Screw Conveyor	P-2	2	1	-	.8	94-CV-7-M
236.	Rotary Feed Valve	P-2	1-1/2	1	-	.4	94-RF-1-M