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Environmental Protection Technology Series

DESIGN AND OPERATING PARAMETERS FOR EMISSION CONTROL STUDIES: Phelps Dodge, Morenci, Copper Smelter

Industrial Environmental Research Laboratory
Office of Research and Development
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

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DESIGN AND OPERATING PARAMETERS
FOR EMISSION CONTROL STUDIES:
PHELPS DODGE, MORENCI, COPPER SMELTER

by

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Contract No. 68-02-1405, Task 5
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A. INTRODUCTION AND SUMMARY

The purpose of this report is to present background design data on the Phelps Dodge Corporation, Morenci Branch smelter at Morenci, Arizona, in sufficient detail to allow air pollution control system engineering studies to be conducted. These studies are primarily concerned with lean SO_2 streams that are currently not being captured.

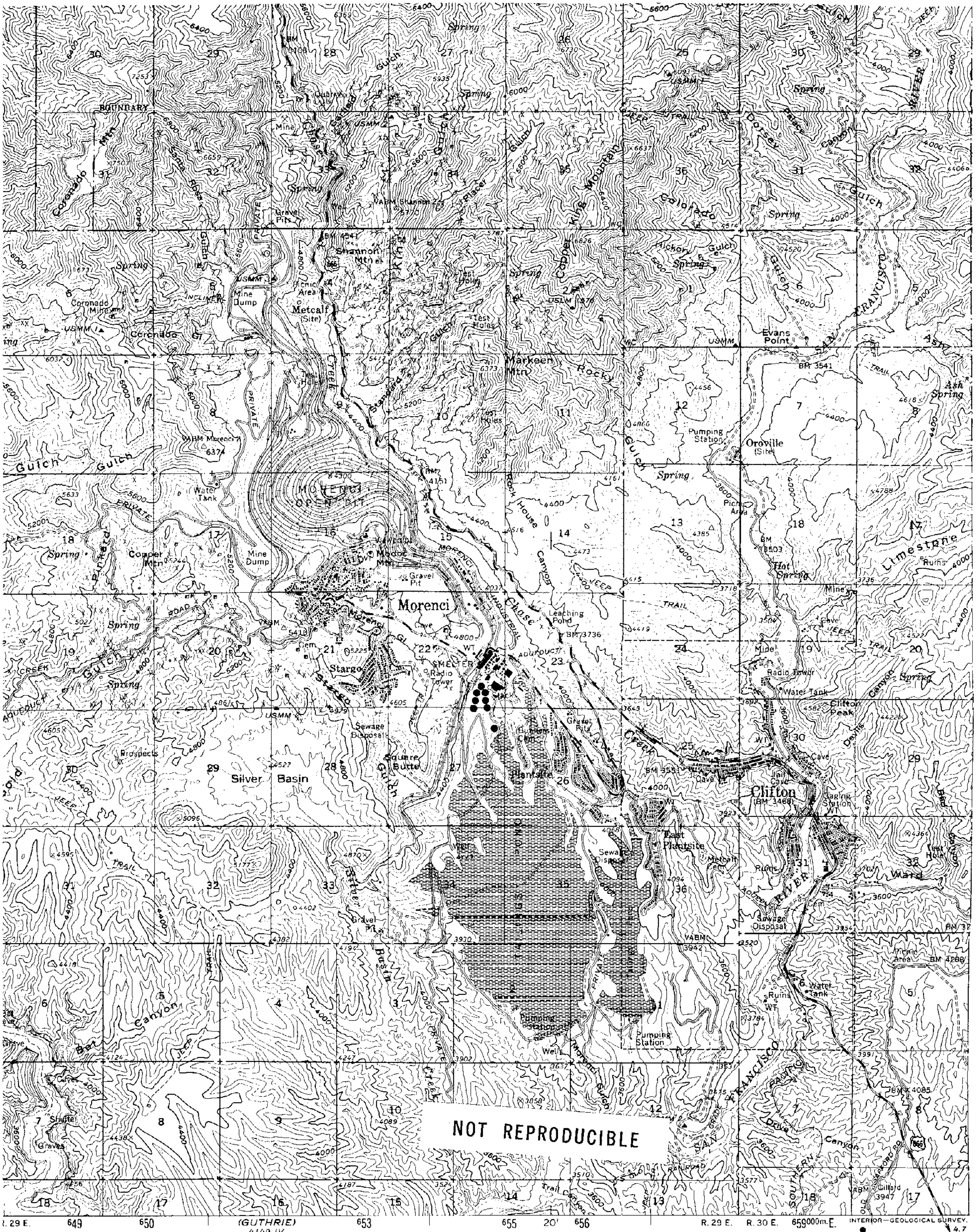
Physical layout of the smelter and surrounding area along with existing smelter and control equipment is presented. Ductwork that would be considered for future system tie-in is defined. Emissions from operating equipment, gas flow rates, temperatures, sulfur balance and process flow sheet are included. Utilities, stack dimensions, footing requirements, and solid waste handling are defined. Available area for new control equipment, gas characteristic variation and potential new control equipment installation problems are discussed.

The greatest source of uncontrolled SO_2 emissions at this smelter is the reverberatory furnaces.

There are presently 92,854 TPY of sulfur passing from the reverberatory furnaces to the stack (Ref. 2). This is equivalent to 836 TPD of acid. The major reduction in SO_2 emissions can be obtained by controlling the reverberatory furnaces. With both the roaster and the converters controlled by acid plants, the total sulfur captured is 62% (maximum). The remaining sulfur emissions are from the reverberatory furnaces.

B. PLANT LOCATION, ACCESS AND OVERALL GENERAL ARRANGEMENT

The Phelps Dodge Corporation Smelter is located adjacent to the town of Morenci, Arizona. The plant vicinity taken from a USGS map, with land contours is shown in Figure 1. Design altitude for the plant



SCALE 1:62500

0 1 2 3 4 MILES

3000 6000 9000 12000 15000 18000 21000 FEET

Figure 1.

is 4300 ft. with plant site coordinates of latitude 33° 05' N and longitude 109° 21' W.

Overall plant and smelter general arrangement are shown in Figure 2. The primary particulate emission sources are the crushing and screening operations, the roaster, the reverberatory furnaces and the converters. The primary sources of sulfur dioxide are the roaster, the reverberatory furnaces, and the converters. The smelter portion of the plant consists of initial ore handling and mixing equipment, contained in the bedding plant. A single fluid bed roaster produces calcines for two of the five reverberatory furnaces. The three remaining reverberatory furnaces are charged with green feed. Typically four of five reverberatory furnaces are operating. The copper matte produced in the furnaces is processed in nine Peirce Smith converters. Typically seven converters are operating at one time. Blister copper produced in the converters is sent to four anode furnaces and finally to two casting wheels where anodes are cast for shipment. Also operated at Morenci is a lime kiln and lime reactor, a precipitate kiln and concentrate dryers.

Pollution control equipment consists of wet scrubbers and baghouses for the concentrate dryers, precipitate kiln, lime kiln, and lime reactor. Roaster gases are treated in cyclones where the calcines are recovered, a wet scrubber, and finally a single contact acid plant for SO_2 removal before being discharged to a 605 foot tall stack. Gases from the reverberatory furnaces are passed through electrostatic precipitators and then discharged from a second 605 foot tall stack. No control of SO_2 from the reverberatory furnace gases is currently being attempted at Morenci. The converter gases, after cooling, are passed through an electrostatic precipitator, a humidifying tower, cooling tower, packed tower, an additional precipitator, a drying tower, and finally a new single contact acid plant with a rated maximum capacity of 2500 tons per day.

Figure 2, which shows the overall plant site and general arrangement, indicates that space for new control equipment could be found

FIGURE 2

GENERAL ARRANGEMENT DRAWING

(Located in envelope inside the back cover) at some distance from the immediate smelting operations. This would require the added expense of long ductwork.

C. PROCESS DESCRIPTION

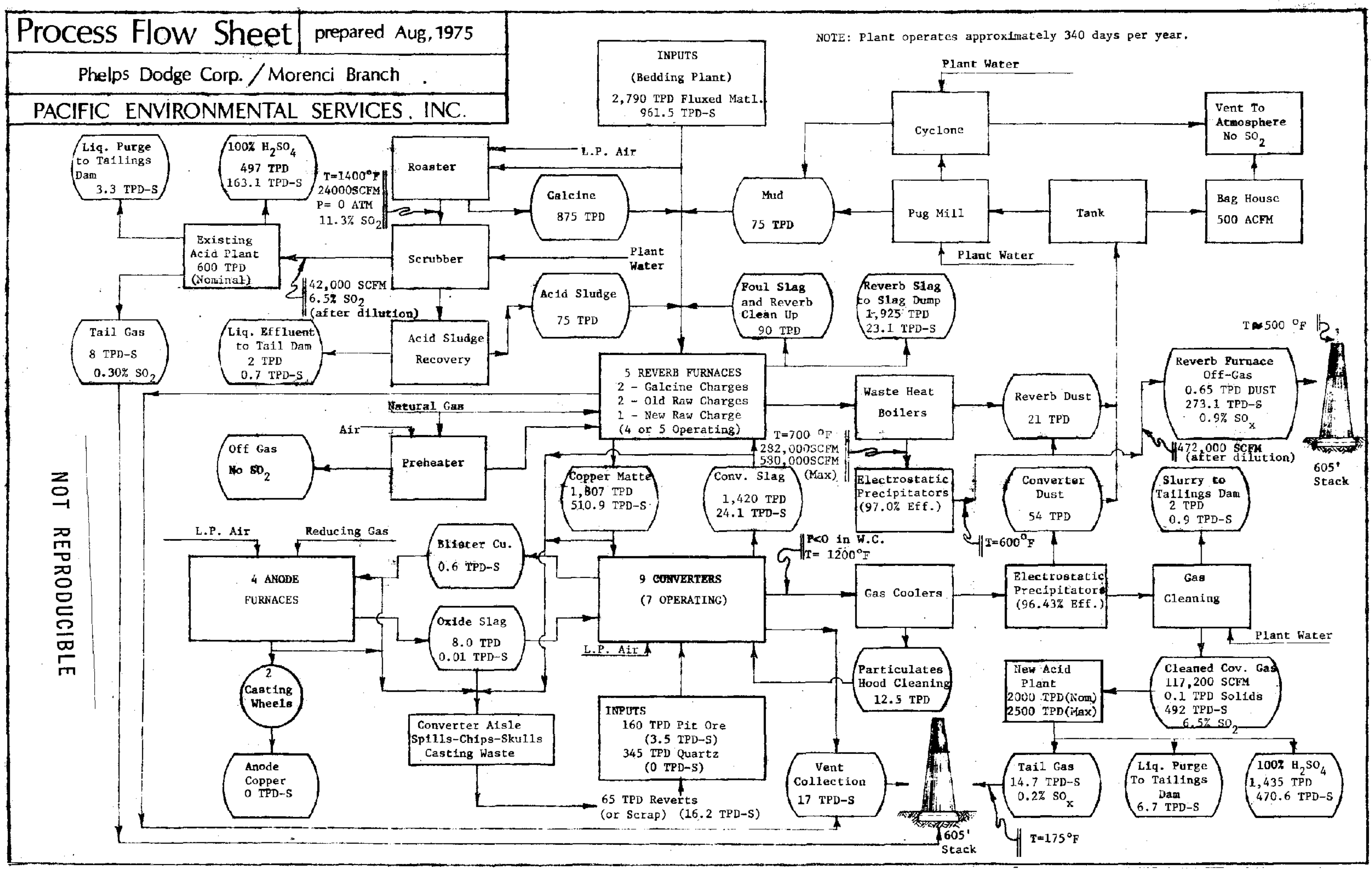
The smelter flow sheet diagram is shown in Figure 3. Feed for the smelter consists of precipitates, concentrates, lime, and flue dust. Two of the five reverberatory furnaces operate on calcined charge produced in the concentrate roaster. The roaster, a fluid bed design, is capable of handling about 35% of the total plant feed. The remaining three reverberatory furnaces are fed green charge, directly from the bedding plant. The furnaces use preheated air, flux, and natural gas fuel to produce slag and matte. Slag is removed to the dump.

The matte produced in the reverberatory furnaces is taken to the nine Peirce Smith converters where normally seven operate at any one time. The converters produce blister copper which is placed in one of the four anode furnaces. A reducing gas is burned to further refine the blister copper. Following the anode furnaces, two casting wheels cast the copper product into anodes for shipment.

Gases from the roaster pass through cyclones, a wet scrubber, an electrostatic precipitator, a 600 ton per day (rated) single contact acid plant and then out a 605 foot stack. Gases from the reverberatory furnaces pass through waste heat boilers, electrostatic precipitators and out a second 605 foot tall stack.

Gases from the converters are cooled, pass through electrostatic precipitators, gas cleaning equipment, and through a new 2500 tons per day (rated) single contact acid plant. Tail gases are discharged to a 605 foot stack.

Temperatures, volumetric flow rates, and SO_2 percentages are indicated on the flow sheet.



Process Flow Sheet
prepared Aug, 1975
Phelps Dodge Corp. / Morenci Branch
PACIFIC ENVIRONMENTAL SERVICES, INC.
NOTE: Plant operates approximately 340 days per year.
INPUTS (Bedding Plant) 2,790 TPD Fluxed Matl. 961.5 TPD-S
Plant Water
Cyclone
Vent To Atmosphere No SO_2
L.P. Air
Roaster
Liq. Purge to Tailings Dam 3.3 TPD-S
100% H_2SO_4 497 TPD 163.1 TPD-S
T=1400°F 24000SCFM P= 0 ATM 11.3% SO_2
Calcine 875 TPD
Mud 75 TPD
Pug Mill
Tank
Bag House 500 ACFM
Existing Acid Plant 600 TPD (Nominal)
Scrubber
Plant Water
42,000 SCFM 6.5% SO_2 (after dilution)
Acid Sludge 75 TPD
Foul Slag and Reverb Clean Up 90 TPD
Reverb Slag to Slag Dump 1,925 TPD 23.1 TPD-S
Tail Gas 8 TPD-S 0.30% SO_2
Liq. Effluent to Tail Dam 2 TPD 0.7 TPD-S
Acid Sludge Recovery
5 REVERB FURNACES 2 - Calcine Charges 2 - Old Raw Charges 1 - New Raw Charge (4 or 5 Operating)
Waste Heat Boilers
Reverb Dust 21 TPD
Reverb Furnace Off-Gas 0.65 TPD DUST 273.1 TPD-S 0.9% SO_x
T = 500 °F
605' Stack
Natural Gas
Air
Off Gas No SO_2
Preheater
T=700 °F 282,000SCFM 580,000SCFM (Max)
472,000 SCFM (after dilution)
Copper Matte 1,807 TPD 510.9 TPD-S
Conv. Slag 1,420 TPD 24.1 TPD-S
Electrostatic Precipitators (97.0% Eff.)
Converter Dust 54 TPD
Slurry to Tailings Dam 2 TPD 0.9 TPD-S
T=600°F
L.P. Air
Reducing Gas
Blister Cu. 0.6 TPD-S
P<0 in W.C. T= 1200°F
4 ANODE FURNACES
9 CONVERTERS (7 OPERATING)
Gas Coolers
Electrostatic Precipitators (96.43% Eff.)
Gas Cleaning
Oxide Slag 8.0 TPD 0.01 TPD-S
L.P. Air
Plant Water
2 Casting Wheels
Particulates Hood Cleaning 12.5 TPD
New Acid Plant 2000 TPD(Nom) 2500 TPD(Max)
Cleaned Cov. Gas 117,200 SCFM 0.1 TPD Solids 492 TPD-S 6.5% SO_2
Converter Aisle Spills-Chips-Skulls Casting Waste
INPUTS 160 TPD Pit Ore (3.5 TPD-S) 345 TPD Quartz (0 TPD-S)
Anode Copper 0 TPD-S
65 TPD Reverts (or Scrap) (16.2 TPD-S)
Vent Collection 17 TPD-S
605' Stack
Tail Gas 14.7 TPD-S 0.2% SO_x
T=175°F
Liq. Purge To Tailings Dam 6.7 TPD-S
100% H_2SO_4 1,435 TPD 470.6 TPD-S

Figure 3.

D. EMITTING EQUIPMENT

a. Roaster

A fluid bed roaster capable of handling 35% of the total plant feed produces an average of 875 TPD of calcines, the charge for two of the reverberatory furnaces. The roaster feed consists of very fine, 6-10 mesh maximum size range, material from the bedding plant. No recycle material is put through the roaster. Approximately 84% of the total roaster charge is concentrate. The remainder consists primarily of silica and lime. The roaster gases, approximately 24,000 SCFM at 1400^{o}F, typically contain 11.3% SO_2.

b. Reverberatory Furnaces

There are four old and one new reverberatory furnaces operating at the Morenci smelter. The four original furnaces, built in 1942 and 1943, are side charged furnaces 24 feet 6 inches wide by 102 feet 6 inches long (inside dimensions)(Ref. 1). The new reverberatory furnace, Figure 4, is 36 feet wide by 115 feet 4½ inches long. The four old reverberatories of sprung silica arch construction are each fired with six 8 inch gas burners with a normal firing rate of 175,000 cubic feet of natural gas per hour. Fuel oil is a standby fuel, but is very seldom used.

Provision is made for charging silica flux into the bath in case the slag becomes too basic. There are four slag tap holes in each of the four old furnaces, two on each side tapping into cast copper launders which carry the matte into ladles in the converter aisle. Skimming of slag is through one sidewall tap close to the end of the furnace.

The new No. 5 furnace has five matte tap holes and two slag tap holes. Only four matte tap holes in the new furnace normally are used. All of the matte tap holes for the No. 5 furnace are enclosed in a room. The hole punching machine is also enclosed in this room which is then vented to the collection system. This minimizes fugitive emissions and appearsto be a promising control approach.

FIGURE 4

MORENCI SMELTER TRANSVERSE SECTION
LOOKING SOUTH

(Located in envelope inside back cover)

Considerable heat leaves the furnace roofs. The heat loss depends upon the insulation qualities of the refractory brick. No. 5 roof is limited to 15" thick magnesite brick because of structural considerations.

The reverberatory furnaces are normally operated at negative pressure of 0.5 to .01 inches w.c. (water column). Charging takes place approximately every hour for a period of about two minutes and tends to produce positive internal pressures resulting in an increase of fugitive emissions. Fugitive emissions are currently being encountered from the furnace waste heat boilers and uptake system. Hot patching of the furnace brickwork is done at Morenci. Silica rock with over 90% SiO_2 is sprayed by guns to maintain the furnace arches and sidewalls. This technique has been developed at Morenci to the point where indefinite life of the furnace brick structure is expected.

Of the five reverberatory furnaces, normally two receive calcine feed from the roaster and the remaining three receive green charge. One furnace may handle either green or calcine feed. Furnaces No. 1 and No. 2 use 175,000 SCFH of gas, furnaces No. 3 and No. 4 use 165,000 SCFH of gas.

Furnace No. 5 generates 240,000 SCFM of gas (Ref. 2). Of the 240,000 SCFM of No. 5 reverberatory furnace offgas, approximately 100,000 SCFM is dilution air that enters through openings in the furnace walls and roof.

The SO_2 concentration of the No. 5 furnace offgas is approximately 1.2%. A higher percentage of dilution air enters the four original reverberatory furnace offgas streams and resulting in an overall SO_2 concentration of 0.9 to 1.0% in the reverb offgas stream. No more than four furnaces can be operated at one time because the converter capacity is not sufficient to handle more.

The new No. 5 furnace cannot take calcines because it is fed by a rubber belt. The new furnace burner capability is not sufficient to operate a maximum furnace capacity. Preheated air must be used to make up the additional 15% heat generation capacity required to meet the design. The older furnaces do not use preheated air. The new furnace uses Hauck burners capable of burning any fuel from natural gas to No. 6 fuel oil. The burners are all automatic and can be adjusted to place the flame at optimum position in relation to the charge. Automatic chute return of the slag is provided. This chute enters the furnace during feeding and is withdrawn when not in use. This minimizes fugitive emissions.

c. Converters

A. total of nine Peirce-Smith converters are installed and operating. With this large number of converters the average number of converters blowing is 3.37 when seven units are active (Ref. 2). This can provide a relatively even SO_2 stream quantity and concentration to the acid plant. An average of SO_2 concentration of 6.5% is attained.

Close fitting hoods are used for all the converters, Figure 4. Hood pressure is maintained by a series of damper controls. Both a plug damper to completely shutoff the converter hood when not blowing and an opposed blade damper for volume and system balancing control are employed in the exhaust system for each unit. Remote closed circuit television is used to survey the uncollected emissions from the converter. Damper controlled reduction of hood pressure is used to eliminate uncollected emissions. The converters are 13 feet in diameter and 30 feet long with 52 tuyeres per converter. The converters are lined with burned basic brick which is not insulated from the shell. Magnetite lining of the converters has been done successfully. Three 60 ton cranes with dc motors service the converter aisle. With the matte grade averaging about 30% nearly all reverts are resmelted in the converters. Blister copper produced in the converter department is transferred by crane to the anode furnaces for further refining and casting into anodes.

d. Other Emitting Equipment

Four anode furnaces are operated at Morenci. Presently reducing gas introduced through tuyeres is used. Originally green oak logs were used for copper reduction. Two casting wheels are used to cast the molten copper into anodes for shipment. The anode furnace dimensions are 13 feet by 25 feet.

Crushing and bedding equipment generate particulate matter. The crushing plant is controlled with wet scrubbers. Lime kiln emissions are controlled with a baghouse.

Ladles holding matte and slag produce fugitive emissions. Leaks in ducts and at various pieces of equipment are the source of SO_2 and particulate emissions.

E. EXISTING CONTROL EQUIPMENT

Roaster gases go through a series of cyclones for recovery of the calcines and then to a scrubber for dust removal before entering the old 500 ton per day acid plant. After dilution an average of 42,000 SCFM of roaster gas with an SO_2 concentration of about 6.5% enters the single contact acid plant. This acid plant with a nominal rating of 600 ton per day was built in 1965. The original design was for a 750 ton per day capacity, but even after years of continual modification and improvement, the average capacity is 560 tons per day (Ref. 4). The acid plant produces 100% H_2SO_4 with a tail gas SO_2 concentration of 0.2%. Approximately 150 tons per day of the acid produced is used in the plant with the remainder being sold. Operating time for this acid plant averages 21 hours per day. A 3000 Hp blower moves the acid plant gas at a rate of 18,000 to 24,000 SCFM.

Reverberatory furnace gases pass through waste heat boilers and then an electrostatic precipitator. Approximately 97% dust collection is accomplished neglecting sulfates (Ref. 3). At the precipitator inlet the gas flow ranges from 282,000 to 580,000 SCFM at $700^{\circ}F$ depending on the number and combination of furnaces operating. Typically four of five furnaces operate at one time. Reverberatory furnace gases after dust collection, and some dilution, are discharged from a 605 foot stack. A new precipitator was installed to control particulates from the No. 5 reverberatory furnace.

Converter gases are treated in gas conditioning equipment and then a new 2500 ton per day acid plant before being discharged to the atmosphere. After gas cooling the converter gases are passed through an electrostatic precipitator with a reported efficiency of 96.5% neglecting sulfates (Ref. 3). Additional dust removal by scrubbers occurs before entering the new acid plant. The acid plant, built by Chemico Corporation, is a single contact design. It was designed so that it is possible to add a double contact circuit (Ref. 2). Currently about 1500 tons per day of 100% H_2SO_4 is produced from the converter offgas. This indicates that additional capacity is available, or that the system is capable of handling wide fluctuations in input.

The new acid plant gas conditioning system consists of a humidifying tower, cooling tower, packed tower, precipitator, and drying tower followed by the remainder of the plant. Parallel gas systems are used after the initial hot gas precipitator immediately downstream from the smelter. Thus, the major portion of the acid plant is in two trains allowing independent operation of each side.

A preheater can be used to operate one side of the system to allow acid production even when gas stream concentration is as low as 2.5% SO_2. The plant is designed to make 93% acid using 6.5% SO_2.

Acid plant blowers deliver 89,000 ACFM at 110°F with a suction pressure of 11.3 PSIA and a discharge pressure of 17.7 PSIA. Acid plant tail gas is estimated to be 328,700 ACFM at 175°F.

Average yearly operating days for this smelter is 350.

Emissions from the lime kiln and lime reactor are controlled by baghouse collectors. The particulate emissions from the concentrate dryers and precipitate kiln are collected in wet scrubbers.

F. GAS SYSTEM DUCTWORK

Fluid bed roaster offgases pass through a series of cyclones for calcine recovery and then pass through a scrubber for final dust removal before entering a 500 ton per day acid plant. The acid plant tail gas is discharged to the 605 foot converter stack.

Four older reverberatory furnaces, arranged in line along a north-south line, are each equipped with a pair of waste heat boilers. The reverberatory furnace gases then travel through a common flue to two parallel electrostatic precipitators. The cleaned gases are discharged to the 605 foot reverberatory furnace stack.

The new No. 5 reverberatory furnace, located south of the Nos. 1-4 furnaces, is also equipped with a pair of waste heat boilers, Figure 4. Following the boilers the gases are passed through two parallel electrostatic precipitators. The gases travel by flue to the 605 foot stack where they join the offgases from the other four furnaces.

The nine converters, laid out along a north-south line, are equipped with hoods which collect the offgases, Figure 4. The gases pass through gas coolers and are combined in a header. Four parallel electrostatic precipitators clean the converter gases prior to final cleaning and conditioning in a scrubbing plant. The gases then are ducted to a new acid plant. Acid plant tail gases are discharged to the 605 foot converter stack.

G. SULFUR BALANCE AND GAS COMPOSITION AT SYSTEM EXIT

A typical sulfur balance for the Morenci smelter is shown in Table 1. At a total sulfur input of 981.2 TPD, presently 668.4 TPD of sulfur are captured (645.3 TPD captured in the acid plants and 23.1 TPD are discarded with the slag and solid wastes). This represents an overall capture efficiency of 68%. It is estimated that

TABLE 1. PHELPS DODGE MORENCI SMELTER

Average Sulfur Balance Summary*

Sulfur Input	Roaster		Reverb		Converter		Slag & Solid Waste	Fugitive Emissions	Present Sulfur Captured	Stack Emissions
TPD-S	$\%SO_2$	TPD-S	$\%SO_2$	TPD-S	$\%SO_2$	TPD-S	TPD-S	TPD-S	TPD-S	TPD-S
981.2	11.3	175.1	0.9	273.1	6.5	492.9	23.1	17.0	668.4	295.8

*Reference 2

295.8 TPD of sulfur are emitted from the reverberatory furnaces which are presently uncontrolled for SO_2. Fugitive emissions account for approximately 17 TPD of sulfur.

An average of 42,000 SCFM of roaster gases after dilution to 6.5% SO_2 are treated in the old acid plant. The acid plant tail gas at an SO_2 concentration of approximately 0.3% is discharged from a 605 foot stack. The converter gases after cooling, dust removal and treatment in the new acid plant are also vented to the same 605 foot stack as roaster gases. Converter gases average 117,200 SCFM with an SO_2 concentration after treatment in the acid plant of 0.2%. It is reported that at the 275 foot level in the stack, the gas temperature is 360^{o}F, and the particulate emission rate is 29.2 pounds per hour or 118.8 tons per year (Ref. 3). The stack gas volume averages approximately 350,000 SCFM due to dilution and addition of the vent system gases.

Reverberatory furnace gases are discharged after dust removal from a separate 605 foot stack. After dilution a stack gas flow rate of 472,000 SCFM is estimated. At the 275 foot level in the stack the temperature is reported to be 530^{o}F with a particulate emission rate of 33.3 pounds per hour or 135.5 tons per year (Ref. 3). The SO_2 concentration in the stack gas is estimated to be 0.9%.

Table 2 presents gas stream characteristics reported by the Phelps Dodge Corporation (Ref. 5).

H. GAS CHARACTERISTIC VARIATION

It can be expected that SO_2 concentration in the offgas from the reverberatory furnaces will vary significantly with time. This results from the variation in time required for decomposition or reaction of the various sulfide ores charged to the furnace. This variation in SO_2 content has been known to vary as much as 10 to 1 within a given charging time cycle. While no data are yet available from this smelter concerning this point, it should be considered for control system design. The gas composition at the stack also depends on the number and combination of furnaces operating. The reverberatory furnaces charged with calcines from the roasters generate a lower SO_2 concentration in the offgases.

Table 2. GAS STREAM CHARACTERISTICS
OF
PHELPS DODGE CORPORATION
MORENCI COPPER SMELTER

SO_2 Source		Flow Rate	Concentration Percent			Particulate		Disposition of Gas Stream			Product Disposition		Plant Age	Remarks
Weak	Strong	Scfm @ 70^oF 14.7 Psi	SO_2	SO_3	O_2	Treatment	Outlet Loading gr/ACF	Plant	Type	Capac-ity TPD	Used	Sold		
Reverb.		285,000	1.5	0.1	5	Precipit.	0.2 gr	Emitted through stack Temp. 450^oF					1943	Physical size and congestion in plant would make installation of additional units extremely difficult
	Roaster	20,000	15	0.1	2	Cyclones Scrubber	Nil	Acid	Single Absorp-tion	750	X			
	Conv.	78-234,000	4-6	0.1	10-12	Precipit. Scrubbers	0.2 gr Nil	*Acid Dual Train	Single Absorp-tion	2500	X Small quantity of acid is sold bal-ance is used or neutralized			*Control units be-ing installed at the present time.

Note: The plant generates its own power from waste heat steam and direct fired boilers. Water supply is limited. Uniform Smelting charge characteristics

Reference 5.

SO_2 concentration in the converter offgas will also vary considerably for an entirely different reason. The operation of a converter includes several, usually three, slag blows and one copper blow. Between these blows the converter may be rolled out for slag pouring or material charging. When the converter is not blowing the hood above the converter is closed off by dampers so that the gases do not pass through the collection system to the acid plant. The average number of converters blowing is 3.37 when seven converters are active. This provides a relatively even SO_2 stream quantity and concentration to the acid plant. Usually a converter will be provided with 25,000 to 30,000 SCFM to the tuyeres. An additional 100% of dilution air is generally estimated to be added to this gas flow resulting in a total gas flow from each converter in the range of 50,000 to 60,000 SCFM. When a converter is blowing there will usually be approximately 60,000 SCFM at an SO_2 content of 6.5%.

Because of the normal fluctuation in converter feed and operation, the SO_2 concentration can vary over a relatively wide range. In addition, the gas volume flow from the converter line to the control system acid plant can usually vary over a wide range from maximum to zero. Operation of the control system must be conducted in a manner to compensate for these fluctuations. Acid plant operation at this smelter appears to be typical providing reasonably satisfactory control.

I. STACK DESCRIPTION

Roaster/Converter/Acid Plant Stack (Ref. 3).

Height 605 feet

Diameter* 32.27 feet

Gas temperature* $360^{\circ}F$

Gas Velocity* 13.2 feet/sec.

Reverberatory Furnace Stack (Ref. 3)

Height 605 feet

Diameter* 29.69 feet

Gas temperature* $530^{\circ}F$

Gas Velocity* 19.2 feet/sec.

*At the sampling point 275 feet above the ground

J. PRESENT TECHNIQUE FOR SOLID WASTE HANDLING

Slag from the reverberatory furnaces is disposed of in a slag dump at an average rate of 1925 TPD. Reverberatory furnace and converter flue dusts collected in the precipitators are conveyed to a pug mill where they are processed to allow handling for feeding to the reverberatory furnace.

The liquid effluent from the acid plants are discharged to the tailings pond.

K. FOOTING AND STRUCTURAL REQUIREMENTS

No local codes apply. The National Uniform Building Code is used. Seismic zone 2, a wind load of 20 PSF, and a snow load of 15 PSF are used for design. Ambient temperature range is 107°F to 19°F.

L. EXISTING AND POTENTIALLY AVAILABLE UTILITIES

The power plant utilizes both waste heat and four boilers which can burn either natural gas or diesel fuel. Natural gas is normally used at a rate of ten million cubic feet per day. The diesel fuel, actually a number 4 fuel oil, is used only when natural gas is not available. Each of four boilers has a separate stack. The plant includes six 12,500 kw units.

M. POTENTIALLY NEW CONTROL EQUIPMENT INSTALLATION PROBLEMS

There appears to be sufficient space adjacent to this smelter for additional control equipment. Water supply may be a problem if the control system requires a large quantity of makeup water.

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4. Information in support of petitition for conditional permit-Morenci Smelter, Phelps Dodge Corporation, October 14, 1970.

5. Letter from John H. Davis, Jr., Chief Mechanical Engineer, Western Engineering Department, Phelps Dodge Corporation, February 12, 1975.

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

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EPA Task Officer for this report is R. Rovang, 919/549-8411, Ext 2557.

16. ABSTRACT The report gives background design data for a specific copper smelter. The data is sufficiently detailed to allow air pollution control system engineering studies to be conducted. These studies will be concerned primarily with lean SO2 streams that currently are not being captured. Physical layout of the smelter and the surrounding area is presented, along with existing control equipment. Ductwork that would be considered for future system tie-in is defined. Emissions from operating equipment, gas flow rates, temperatures, sulfur balance, and a process flow sheet are included. Utilities, stack dimensions, footing requirements, and solid waste handling are defined. Available area for new control equipment, gas characteristic variation, and potential new control equipment installation problems are discussed.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Air Pollution	Air Pollution Control	13B
Copper	Stationary Sources	07B
Smelters	Emission Control	11F
Design	Operating Data	
Sulfur Dioxide	Solid Waste Handling	
Utilities	Wastes	

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