U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICES
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION REPORT
HHE 79-65/98-748

WHEELING-PITTSBURGH STEEL CORPORATION
COKE PLANT
FOLLANSBEE, WEST VIRGINIA

October 1980

I. SUMMARY

On May 3rd and June 29th, 1979, the National Institute for Occupational Safety and Health (NIOSH) conducted a health hazard evaluation at the Wheeling-Pittsburgh Coke Plant (SIC 3312) in Follansbee, West Virginia to evaluate the effects of phenol, sulfur dioxide, hydrogen sulfide and ammonia in the boiler house; sulfur dioxide, hydrogen sulfide, sulfuric acid mist, coal tar pitch volatiles and benzene in the desulfurization control room; carbon monoxide, sulfur dioxide, hydrogen sulfide, ammonia, coal tar pitch volatiles and benzene in the desulfurization booster room; phenols in the coal handling field; and any polynuclear aromatics from the No. 8 battery nozzle. A comprehensive walk-through survey and environmental sampling were conducted, ventilation measurements were taken and non-directed medical interviews were given to determine possible employee exposures.

The eight-hour time-weighted average area air samples and detector tube grab samples were either non-detectable or well within the environmental criteria/standards for these aforementioned substances. Results of bulk analyses showed presence of phenol in the coal field sample and no polynuclear aromatics present in the No. 8 battery nozzle residue.

On the basis of data obtained in this investigation, NIOSH determined that the concentrations of the above substances measured were within acceptable limits for the air contaminants. Recommendations to minimize worker contact with irritating substances (SO_2, phenol) in the booster room, coal fields and batteries are presented on page 9.

II. INTRODUCTION

Under the Occupational Safety and Health Act of 1970*, NIOSH investigates the toxic effects of substances found in the workplace. The United Steel

Workers of America - District 23, Local Union No. 1190, requested such an investigation on March 21 and May 3, 1979, to evaluate the effects of various vapors, gases, mists and particulates to employees in several areas in the Wheeling-Pittsburgh Steel Corporation Coke Plant in Follansbee, West Virginia.

The NIOSH Regional Industrial Hygienist met with company and union representatives for the opening and closing conferences, walk-through survey and environmental sampling on May 3rd and June 29th, 1979. An Interim Report #1 - July, 1979 - was sent to both management and union representatives.

III. BACKGROUND

The following is a description of the operations and alleged problems in each of the concerned work areas.

The boiler house (three employees per shift - three shifts) located directly across from the biological treatment facility, contains coal and oil - fired boilers that produce steam to operate various machinery and for heating purposes. The employees in this facility claim that noxious odors have come into the boiler house from the biological treatment facility and/or surroundings. A previous NIOSH technical assistance survey of the biological treatment building did not reveal any problems; however, it was thought useful to sample within the boiler house again.

Employees have complained of experiencing nausea, sore throats, and eye irritation. Because of the location and nature of operations, phenol, sulfur dioxide, hydrogen sulfide, and ammonia are suspect as air contaminants.

The desulfurization control room (two employees per shift) monitors the temperature, pressure and flow rates of the coke gas desulfurization process. The desulfurization process involves the removal of SO_2 from the coke gas and its conversion to 92% industrial grade sulfuric acid on-site.

The union requested NIOSH to determine the presence and levels of sulfur dioxide, hydrogen sulfide, sulfuric acid mist, coal tar pitch volatiles, and benzene. Employees have not reported any adverse health effects in this area.

* Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health and Human Services, following a written request by any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The desulfurization booster room (two employees per shift) involves the use of turbine blowers to boost the pressure of the coke gas after desulfurization. This gas is then pumped over to be used as a fuel on-site and at the milling facility blast furnaces near this plant.

Again, the union requested NIOSH to determine the presence and levels of carbon monoxide, sulfur dioxide, hydrogen sulfide, ammonia, coal tar pitch volatiles and benzene. Employees have reported some throat and eye irritation in this area.

The coal-handling fields (nine employees per shift) involve the loading, sorting, and grinding of coal for distribution to the various coke batteries.

The union has reported cases of dermatitis of the hands and arms to employees who have handled coal which is covered with a groundwater-chemical infiltrate. The company believes that this infiltrate is phenol and water which is emanating from an adjacent chemical plant. Bulk samples were analyzed for phenols and other major constitutents.

The No.8 battery nozzle (two employees per shift) involved the clean-out of residue build-up from nozzles. These nozzles provide for an even distribution of gas used to heat the coke ovens. The union says that employees have complained of skin irritation of the hands and arms from contact with the residue material. The residue material was analyzed for sulfide, PNA's, cyanides and other major constituents.

IV. EVALUATION DESIGN AND METHODS

Discussions with management involved the collection of information concerning process description, engineering controls, personal protective equipment and clothing, work practices, training programs, monitoring, recordkeeping and medical surveillance for the areas in question. Employee interviews focused in on the job description, work practices, training programs, and any associated health problems.

The area air samples for phenol vapors were collected in 0.1 N sodium hydroxide solution using midget impingers and portable pumps at a flow rate of 1.0 liter per minute. These samples were analyzed according to NIOSH Method S330 (Modified) using a gas chromatograph with a flame ionization detector.

Sulfur dioxide air samples were collected on "specially treated" charcoal tubes at a flow rate of 200 cc per minute using portable low-flow pumps. These samples were desorbed using a 0.003M Na_2CO_3/0.003M $NaHCO_3$ eluent and quantitated by use of ion chromatography.

Hydrogen sulfide gas was sampled for using a cadium sulfide/Stractan solution with midget impingers and portable pumps at a flow rate of 1.5 liters/minute. These samples were analyzed according to NIOSH Method No.S-4.

Air samples for ammonia gas were collected in a 0.1 N H_2SO_4 solution using midget impingers and portable pumps at a flow rate of 1.5 liters/minute. These samples were analyzed according to NIOSH Method No. P&CAM 205.

Sulfuric acid mist samples were collected on AA (0.8U) filters in a two-piece cassette using portable pumps at a flow rate of 1.5 liters/minute.

These samples were analyzed for sulfuric acid using ion chromatography.

Air samples of coal tar pitch volatiles and polynuclear aromatics were collected on silver membrane/glass fiber filters in a two-piece cassette using portable pumps at a flow rate of 1.5 liter/minute. These polynuclear aromatic compounds were analyzed by reverse-phase high pressure liquid chromatography in conjunction with an ultra-violet detector. The benzene soluble fraction was determined through benzene extraction and gravimetric techniques.

Benzene area air samples were collected on Lot #107 activated charcoal tubes using low flow portable pumps at a flow rate of 200 cc per minute. These samples were desorbed with carbon disulfide and analyzed by the chromatography according to NIOSH Method P&CAM 127 (Modified) with a flame ionization detector.

Carbon monoxide air samples were taken using detector tubes (10-55 ppm) manual grab sample pump. These samples were read out on the tubes using length of stain against concentration hash marks.

The bulk liquid sample (from coal handling fields) was submitted for gas chromatography mass spectrographic identification for presence of phenolic compounds.

A bulk sample of the No.8 battery nozzle residue was analyzed for polynuclear aromatics using ultrasonic extraction followed by high pressure liquid chromatography using both U.V. and fluorescence detectors.

Air velocity measurements in and around operations work areas were taken using a velometer and smoke tube kit.

V. EVALUATION CRITERIA[2-13] (Refer to Table I)

Toxicology

Ammonia[5]

Local - contact with anhydrous liquid ammonia or with aqueous solutions is intensely irritating to the mucous membranes, eyes, and skin. Eye symptoms range from lacrimation, eyelid closure or frequent winking to a rise of intraocular pressure, and other signs resembling acute-angle closure glaucoma, corneal ulceration, and blindness. These may be corrosive burns of skin or blister formation. Ammonia gas is also irritating to the eyes and to moist skin.

Systemic - Mild to moderate exposure to the gas can produce headache, salivation, burning of throat, loss of smell, perspiration, nausea, vomiting, and substernal pain. Irritation of ammonia gas in eyes and nose may be sufficiently intense to compel workers to leave the area. If escape is not possible, there may be severe irritation of the respiratory tract with the production of cough, glottal edema, bronchospasm, pulmonary edema, or respiratory arrest. Bonchitis or pneumonia may follow a severe exposure if patient survives. Vascular skin reactions are a rare allergic manifestation from inhalation of the gas.

Benzene[6,7]

Local - Exposure to liquid and vapor may produce primary irritation to skin, eyes, and upper respiratory tract. If the liquid is aspirated into the lungs, it may cause pulmonary edema and hemorrhage. Inflammation, sac-like bodies, and dry, scaly dermatitis may also develop from defatting of the skin.

Systemic - Acute exposure to benzene results in central nervous system depression. Headache, dizziness, nausea, convulsions, coma, and death may result. Death has occurred from large acute exposures as a result of ventricular fibrillation, probably caused by myocardial sensitization to endogenous epinephrine. Early reported autopsies revealed hemorrhages (non-pathognomonic) in the brain, pericardium, urinary tract, mucous membranes, and skin.

Chronic exposure to benzene is well documented to cause blood changes. Benzene is basically a myelotoxic agent. Erythrocyte, leukocyte, and thrombocyte counts may first increase, and then aplastic anemia may develop with anemia, leukopenia, and thrombocytopenia. The bone marrow may become hypo- or hyper-active and may not always correlate with peripheral blood.

Recent epidemiologic studies along with case reports of benzene related blood dyscrasias and chromosomal aberrations have led NIOSH to conclude that benzene is leukemogenic. The evidence is most convincing for acute myelogenous leukemia and for acute erythroleukemia, but a connection with chronic leukemia has been noted by a few investigators.

Recent work has shown increases in the rate of chromosomal aberrations associated with benzene myelotoxicity (destructive to bone marrow). These changes in the bone marrow are stable or unstable and may occur several years after exposure has ceased. "Stable" changes may give rise to leukemic clones and seem to involve chromosomes of the G group.

Carbon Monoxide[8]

Local - none.

Systemic - Carbon monoxide combines with hemoglobin to form carboxyhemoglobin which interferes with the oxygen carrying capacity of blood, resulting in a state of tissue hypoxia. The typical signs and symptoms of acute CO poisoning are headache, dizziness, drowsiness, nausea, vomiting, collapse, coma, and death. Initially the victim is pale; later the skin and mucous membranes may be cherry-red in color. Loss of consciousness occurs at about the 50% carboxyhemoglobin level. The amount of carboxyhemoglobin formed is dependent on concentration and duration of CO exposure, ambient temperature, health and metabolism of the individual. The formation of carboxyhemoglobin is a reversible process. Recovery from acute poisoning usually occurs without sequelae unless tissue hypoxia was severe enough to result in brain cell degeneration.

Carbon monoxide at low levels may initiate or enhance heart attack individuals with restricted coronary artery blood flow and decreased myocardial lactate production.

Severe carbon monoxide poisoning has been reported to permanently damage the extrapyramidal system, including the basal ganglia.

Coal Tar Pitch Volatiles & Polynuclear Aromatics[9]

Coal tar pitch volatiles are the volatile substances emitted into the air when coal tar pitch is heated; these may contain several polynuclear aromatics among which may be anthracene, benzo(a) anthracene, benzo(b) chrysene, benzo(a) pyrene, pyrene, chrysene, fluoranthene, and benzo(e) pyrene.

Exposure to coal tar products may produce phototoxic effects, such as erythema (reddening of the skin) and burning and itching of skin, photophobia, conjuctivitis, and skin and lung cancer, in humans.

Benzo(a) pyrene, benzanthracene, chrysene, and phenathrene are by themselves carcinogenic substances. Anthracene, carbazole, fluoranthene, and pyrene may also cause cancer, but their cause and effect relationship have not been documented adequately.

The environmental criteria established for coal tar pitch volatiles and their polynuclear aromatics is designed to reduce the risk of lung and skin cancer. NIOSH has recommended that the permissible exposure limit be set at the lowest concentration that can be reliably detected by the recommended analytical method; however, NIOSH states that while this may reduce the incidence of cancer, no threshold of carcinogenic response can be established at this time.

Hydrogen Sulfide[10]

Local - Palpebral edema, bulbar conjunctivitis, keratoconjunctivitis, and ocular lesions may occur when hydrogen sulfide comes in contact with the eyes. Photophobia and lacrimation may also develop. Direct irritation of the respiratory tract may cause rhinitis, pharyngitis, bronchitis, and pneumonia. Hydrogen sulfide may penetrate deep into the lungs and cause hemorrhagic pulmonary edema. Hydrogen sulfide's irritative effects are due to the formation of alkali sulfide when the gas comes in contact with moist tissues.

Systemic- Acute exposure may cause immediate coma which may occur with or without convulsions. Death may result with extreme rapidity from respiratory failure. Post-mortem signs include a typical greenish cyanosis of the chest and face with green casts found in viscera and blood. The toxic action of hydrogen sulfide is thought to be due to inhibition of cytochrome oxidase by binding iron which is essential for cellular respiration. Subacute exposure results in headache, dizziness, staggering gait, and excitement suggestive of neurological damage, and nausea and diarrhea suggestive of gasritis. Recovery is usually complete although rarely polyneuritis may develop as a result of vestibular and extrapyramidal tract damage. Tremors, weakness, and numbness of extremities may also occur. Physicians may observe a "rotten-egg" breath and abnormal electrocardiograms in victims. Systemic effects from chronic exposure to hydrogen sulfide have not been established.

<u>Phenol</u>[11]

Local - Phenol has a marked corrosive effect on any tissue. When it comes in contact with the eyes it may cause severe damage and blindness. On contact with the skin, it does not cause pain but causes a whitening of the exposed area. If the chemical is not removed promptly, it may cause a severe burn or systemic poisoning.

Systemic - Systemic effects may occur from any route of exposure. These include paleness, weakness, sweating, headache, ringing of the ears, shock, cyanosis, excitement, frothing of the nose and mouth, dark colored urine, and death. If death does not occur, kidney damage may appear.

Repeated or prolonged exposure to phenol may cause chronic phenol poisoning. This condition is very rarely reported. The symptoms of chronic poisoning include vomiting, difficulty in swallowing, diarrhea, lack of appetite, headache, fainting, dizziness, dark urine, mental disturbances, and possibly, skin rash. Liver and kidney damage and discoloration of the skin may occur.

<u>Sulfur Dioxide</u>[12]

Local - Gaseous sulfur dioxide is particularly irritating to mucous membranes of the upper respiratory tract. Chronic effects include rhinitis, dryness of the throat, and cough. Conjunctivitis, corneal burns, and corneal opacity may occur following direct contact with liquid.

Systemic - Acute over-exposure may result in death from asphyxia. Survivors may later develop chemical bronchopneumonia with bronchiolitis obliterans. Bronchoconstriction with increased pulmonary resistance, high-pitched rales, and a tendency to prolongation of the expiratory phase may result from moderate exposure, though bronchoconstriction may be asymptomatic. The effects on pulmonary function are increased in the presence of respirable particles.

Chronic exposure may result in nasopharyngitis, fatigue, altered sense of smell, and chronic bronchitis symptoms such as dyspnea on exertion, cough, and increased mucous excretion. Transient stimulation of erthropoietic activity of the bone marrow has been reported. Slight tolerance, at least to the odor threshold, and general acclimatization are common. Sensitization in a few individuals, particularly young adults, may also develop following repeated exposures. There is some evidence that some individuals may be innately hyper-susceptible to SO_2. Animal experimentation has also indicated that sulfur dioxide may be a possible co-carcinogenic agent.

Sulfuric Acid Mist[13]

Local - Burning and charring of the skin are a result of the great affinity for, and strong exothermic reaction with, water. Concentrated sulfuric acid will effectively remove the elements of water from many organic materials with which it comes in contact. It is even more rapidly injurious to mucous membranes and exceedingly dangerous to the eyes. Ingestion causes serious burns of the mouth or perforation of the esophagus or stomach. Dilute sulfuric acid does not possess this property, but is an irritant to skin and mucous membranes due to its acidity and may cause irreparable corneal damage and blindness as well as scarring of the eyelids and face.

Systemic - Sulfuric acid mist exposure causes irritation of the mucous membranes, including the eye, but principally the respiratory tract epithelium. The mist also causes etching of the dental enamel followed by erosion of the enamel and dentine with loss of tooth substance. Central and lateral incisors are mainly affected. Breathing high concentrations of sulfuric acid causes tickling in the nose and throat, sneezing, and coughing. At lower levels sulfuric acid causes a reflex increase in respiratory rate and diminution of depth, with reflex bronchoconstriction resulting in increased pulmonary air flow resistance. A single overexposure may lead to laryngeal, tracheobronchial, and pulmonary edema. Repeated excessive exposures over long periods have resulted in bronchitic symptoms, and rhinorrhea, lacrimation, and epistaxis. Long exposures are claimed to result in conjunctivitis, frequent respiratory infections, emphysema, and digestive disturbances.

VI. RESULTS AND DISCUSSION

Results of the eight-hour time-weighted average area samples and detector tube grab samples were well within the environmental criteria and standards for each of the air contaminants tested. A listing of the individual substances and values obtained are presented in Table II.

The bulk sample of groundwater-chemical infiltrate from the coal-handling fields substantiated the presence of phenol; and the No.8 battery nozzle residue material was found to contain sulfur dioxide, sulfate, some arsenic and no polynuclear aromatics.

Ventilation measurements taken at each work station showed <25 feet/minute of air movement.

Safety glasses, hard hat, safety shoes, and coveralls are provided and used by the employees in each of the areas in question.

Non-directed interviewsof three employees in the boiler house revealed: headaches - one case, nausea - one case; and two of the three employees responded - no symptoms.

Non-directed interviews of two employees in the desulfurization control room revealed no symptoms; two employees in the desulfurization booster room showed: eye irritation - two cases, throat irritation - two cases.

The company and union both acknowledge skin irritation problems associated with worker contact with groundwater-chemical infiltrate (coal-handling fields) and battery nozzle residue material.

On the basis of data obtained in this investigation, NIOSH has determined that no air contaminant hazard exists from exposure to the toxic substances tested.

However, reports of skin irritation from contact with groundwater-chemical infiltrate (phenol) and battery nozzle residue (SO_2) in the desulfurization booster room warrant the following recommendations.

VII. RECOMMENDATIONS

The following recommendations were given in Interim Report #1 and are restated here with the intent of minimizing worker contact with the following irritating substances. Area air samples and bulk residue samples did not provide any significant findings and therefore further recommendations are not necessary.

1. "Gas" leakage in the desulfurization booster room at the very least, presents a discomfort problem by causing minor throat and eye irritation. This could be minimized by increasing the overall ventilation or number of changes of air per hour by providing effective general ventilation and control of gas leakage.

2. The groundwater-chemical infiltrate on the coal has caused skin irritation problems which can be contained through the use of proper personal protection; in this case, long-sleeved gloves or barrier creams impervious to phenols would be most appropriate; and/or pre-washing stage prior to processing would at least "clean" the coal.

3. The residue material from the No. 8 battery nozzle has caused skin irritation problems which can be alleviated through the use of "appropriate" long-sleeved chemical gloves or barrier creams and a full-chemical-face shield.

VIII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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IX. DISTRIBUTION AND AVAILABILITY

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, OH 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address.

Copies of this report have been sent to:

1. Wheeling-Pittsburgh Steel Corporation, Coke Plant, Follansbee, WVA.
2. United Steel Workers of America, District 23, Local Union 1190, Steubenville, OH.
3. NIOSH Region III
4. OSHA Region III

For the purpose of informing the approximately 10 employees of the results of the survey, the employer shall promptly "post" for a period of 30 calendar days the Determination Report in a prominent place(s) for their perusal.

X. REFERENCES

1. NIOSH Manual of Sampling Data Sheets, 1977 Edition, DHHS, PHS, CDC, NIOSH March 1977.
2. General Industry, OSHA Safety and Health Standards, 29 CFR OSHA 2206, Revised January 1976.
3. Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1979, American Conference of Governmental Industrial Hygienists, Cincinnati, OH.
4. Occupational Diseases: A Guide to Their Recognition, DHHS, PHS, CDC, NIOSH, Publication No. 77-181, Revised June 1977.

5. Criteria for a Recommended Standard....Occupational Exposure to Ammonia, NIOSH Publication #74-136.
6. Emergency Temporary Standard For Occupational Exposure to Benzene, Notice of Hearing, 29CFR1910, Occupational Safety and Health Standards, Federal Register, Volume 42, No. 85.
7. NIOSH Revised Recommendation for an Occupational Exposure Standard for Benzene, USDHHS, PHS, CDC, NIOSH, August 1976.
8. Criteria for a Recommended Standard....Occupational Exposure to Carbon Monoxide, NIOSH Publication #73-11000.
9. Criteria for a Recommended Standard....Occupational Exposure to Coal Tar Products, NIOSH Publication #78-107.
10. Criteria for a Recommended Standard....Occupational Exposure to Hydrogen Sulfide, NIOSH Publication #77-158.
11. Criteria for a Recommended Standard....Occupational Exposure to Phenol, NIOSH Publication #76-196.
12. Criteria for a Recommended Standard....Occupational Exposure to Sulfur Dioxide, NIOSH Publication #74-111.
13. Criteria for a Recommended Standard....Occupational Exposure to Sulfuric Acid, NIOSH Publication #74-128.

TABLE I

The following environmental standards or criteria were considered in this report: [2, 3]

Substance	NIOSH	ACGIH	OSHA
Ammonia	50 ppm ceiling* (5 minute)	25 ppm TWA** (1.8 mg/M^3) 35 ppm Stel*** (27 mg/M^3)	50 ppm (8-hr TWA)
Benzene+	1 ppm ceiling (60-minute)	10 ppm (8-hr TWA) (30 mg/M^3)	10 ppm (8-hr TWA) 25 ppm (15 min. ceil.)++ 1 ppm (8-hr TWA) 5 ppm (15 min. ceil.)
Carbon Monoxide	35 ppm (8-hr TWA) 200 ppm ceiling (15 minutes)	50 ppm TWA (55 mg/M^3) 400 ppm Stel (440 mg/M^3)	50 ppm (8-hr TWA)
Coal Tar Pitch+ Volatiles and The.. PNAs	0.10 mg/M^3 (8-hr TWA) (Cyclo-hexane solubles)	0.20 mg/M^3(8-hr. TWA) (Benzene Solubles)	0.20 mg/M^3 (8-hr TWA) (8-hr TWA) (Benzene Solubles)
Chrysene+	To be controlled as a potential occupational carcinogen (lowest "reliable" detection limit)		
Hydrogen Sulfide	15 mg/M^3 ceiling (N 10 ppm) (10 minutes)	10 ppm TWA (15 mg/M^3) 15 ppm Stel (27 mg/M^3)	20 ppm acceptable 50 ppm max. ceiling (10 minutes)
Phenol	20 mg/M^3 (8-hr TWA) (5.2 ppm) 60 mg/M^3 ceiling (15.6 ppm) (15 minutes)	Skin-5 ppm TWA (19mg/M^3) 10 ppm (38 mg/M^3)	5 ppm 8-hr TWA (skin)
Sulfur Dioxide	0.5 ppm (8-hr TWA) (1.3 mg/M^3)	5 ppm (TWA) (13 mg/M^3)	5 ppm (8-hr TWA)
Sulfuric Acid	1 mg/M^3 (8-hr (TWA)	1 mg/M^3 (TWA)	1 mg/M^3 (8-hr TWA)

* Ceiling = For OSHA, 15 minute sampling time to be legally enforceable.
= For NIOSH and ACGIH cannot be exceeded at any time unless specified.
** TWA = Time-weighted average.
*** Stel - Short-term exposure limit.
+ Industrial substance suspect of carcinogenic potential for man.
++Current OSHA Standard.

TABLE II

Results of Area Sampling for Air Contaminants at Work Stations of the Wheeling-Pittsburgh Coke Plant, Follansbee, West Virginia

June 28, 1979

Contaminant	Location	Samples No.	Sampling Time (min.)	Concentration
Ammonia	Boiler House	WP-23	425	0.06 ppm
	Desulfurization-Booster Room	WP-24	431	3.3 ppm
Benzene	Desulfurization-Control Room	WP-7	427	0.05 ppm
	Booster Room	WP-8	431	0.18 ppm
Carbon Monoxide	Desulfurization-Booster Room	WP-31	(Detector Tube) Grab Sample Instantaneous	11.0 ppm
Coal Tar Pitch Volatiles (Benzene Solubles)	Desulfurization-Control Room	WP-11	427	None Detected*
	Booster Room	WP-12	431	0.031 mg/M^3
Polynuclear Aromatic Hydrocarbons (B(a)P, Chrysene, Pyrene, B(a)A, Fluorathene	Desulfurization-Control Room	WP-11	427	None Detected*
	Booster Room	WP-12	431	
Hydrogen Sulfide	Boiler House	WP-15	425	
	Desulfurization Control Room	WP-16	427	0.001 ppm
	Booster Room	WP-17	431	0.030 ppm
Phenol	Boiler House	WP-27	425	None Detected*
Sulfur Dioxide	Boiler House	WP-1	425	0.015 ppm
	Desulfurization Control Room	WP-2	427	0.092 ppm
	Booster Room	WP-3	431	0.075 ppm
Sulfuric Acid	Desulfurization Control Room	WP-21	427	0.014 mg/M^3

*None detected = Below the reliable limit of detection for the analytical method used.