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INDUSTRIAL RELATIONS

INDUSTRIAL HYGIENE SUMMARY REPORT

JULY 1 - DECEMBER 31, 1963

During this reporting period the industrial hygiene services in the Chemicals-Olefins-Plastics Divisions continued to be utilized to an increasing extent. Especially gratifying progress has been made in assisting the engineering departments in recognizing and minimizing potential health and community air pollution problems at an early stage of the design of new production facilities. Specific examples included development of information and a method of air sampling to help assure the safe handling of ethylenimine at the Technical Center, application of accumulated knowledge to the design of new units for the production of tolylendiisocyanate and chlorocarbons at the Institute Plant, and consideration of air pollution abatement aspects in the design of catalyst production facilities at the Institute Plant.

Noteworthy progress was made in improving existing working environments by assisting plant engineering groups in the reduction of noise and the application of ventilation. An example of this is reported by the South Charleston Plant (Page 3) where a drastic reduction of potassium sorbate dust in the air resulted from the installation of a ventilated drum-filling station.

The marked tendency of the research and development activities of the Divisions to become market oriented is resulting in a much larger number of people making contacts with customers and prospective customers to supply them with information related to the potential health problems in the use of our products. Considerable effort is being required to keep up with the rapidly growing need for this information and to help make certain that it is given to the customer in a manner to minimize our legal liability. This is going to become an increasingly serious problem which will require the concerted attention of the Business Departments.

The continuing trend toward more governmental regulation of health and air pollution matters is being felt. One aspect of this is the probability that some of our production facilities will be inspected by the Food and Drug Administration. The U. S. Labor Department, largely as a result of interest from labor groups, is preparing to provide further control of radioactive materials under terms of the Walsh-Healey Act. In some locations, this would be a duplication of existing state control and it is being resisted by those states, including Texas and California. A table is attached to this report showing the "box score" status of bills now in Congress relating to occupational health, air and water pollution, foods and drugs, radiation, and pesticides. This table was prepared by the American Industrial Hygiene Association as a service to its members.

The severe noise problems and other occupational health problems in the Seadrift, Brownsville, and Texas City Plants were surveyed. The results of this study have been discussed with the plant managers and appropriate recommendations made.

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Twelve of the most toxic materials tested during the year 1963 by the Chemical Hygiene Fellowship at Mellon Institute are tabulated on Pages 15 and 16. This illustrates the continued trend to produce, process, and market increasingly toxic materials in order to remain competitive in certain market areas.

Page 4 lists a tabulation by the South Charleston Plant of dispensary visits analyzed to show what kind of industrial hygiene problems are encountered in the plant. It is believed that this is the first analysis of that nature undertaken by any of our major production facilities.

A complete listing of encapsulated radioactive materials, including radium, possessed by the Chemicals-Olefins-Plastics Divisions is appended to this report. The previous (initial) report of this data given a year ago did not include radium. Radium sources will be included in our future periodic reports of sealed radiation sources, as they are now subject to licensing in most of the states in which our plants are located.

Submitted by:

N. H. Ketcham

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Industrial Hygiene Consultant

NHK/dww
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SOUTH CHARLESTON PLANT

This information was written by Mr. B. L. Murray, South Charleston Plant Industrial Hygienist, as part of a 9-page progress report. Further information about these activities may be obtained from Mr. Murray.

PLANT-WIDE NOISE STUDY COMPLETED The plant-wide sound level study initiated in 1952 to assist the Engineering Department in recognizing, eliminating, or reducing potential noise problems was completed. Quantitative and qualitative information on the extent and magnitude of the noise conditions were submitted to unit supervision. Engineering control measures were established where feasible, and personnel protective devices recommended where necessary.

The noise exposure of employees in 254 units has been defined as not detrimental to hearing and ear protection is not required. Engineering control has eliminated the high noise level in 7 units and is under study in 66 units.

ELEVATED SOUND LEVELS FROM HIGH PRESSURE WATER JET CLEANING OMITTED FROM DECEMBER, 1963 ISSUE OF "CHEMICAL PROCESSING" FEATURE ARTICLE Unfortunately, this fine article dealing specifically with the economics and efficiency from high pressure water jet cleaning failed to mention the noise problem resulting from the machinery and jet spray operation. The sound level measurements recorded and reported in October, 1962 showed noise levels as high as 100 decibels in the 600-4800 cycles per second frequency. The operators use ear plugs for protection.

AIR DRYING OPERATION INSIDE TANK CAR SHOWS ELEVATED NOISE LEVEL The operator used plant air to dry the interior of an 8,000-gallon tank in approximately two minutes. The sound level measurement was 109 decibels in the 2400-4800 cycles per second frequency. Ear protectors were recommended until the condition could be corrected through engineering control.

TOXIC VAPOR TESTS ASSURE SAFE OPERATIONS At the request of unit supervision, toxic vapor studies were made in 10 units to determine the exposure levels. Routine air sampling of the working environment was made in 20 other units.

Toxic vapor checks were made inside 7 tanks to assure the Maintenance Department employees a safe operation, from the health standpoint. Two tanks which had contained ethylene dichloride and methyl CELLOSOLVE required additional cleaning and improved ventilation to assure a safe working atmosphere

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BENZENE VAPORS AT BREATHING LEVEL LESS THAN THRESHOLD LIMIT VALUE — Routine air sampling using the Drager Gas Detector to determine the concentrations of benzene vapor in the work atmosphere at the Refinery and Gas Separation Units showed readings less than the Threshold Limit Value of 25 ppm. The concentrations near the pump packing area ranged from 25 to greater than 420 ppm. The operating department was encouraged to continue the maintenance program of repairing the pump packing which helps to maintain a low level of vapor in the work room air.

NITROGEN DIOXIDE GAS RELEASES CONTROLLED AT THE GLYOXAL UNIT — The installation of a new cylinder manifold system has assured further control of NO_2 gas releases at the Glyoxal Unit, Building 134. Spot checking of the area with the MSA nitrogen dioxide gas detector and routine sampling of the atmosphere by the Industrial Hygiene Group show low concentrations in the work room atmosphere.

MOLTEN SALT BATH SYSTEM EVALUATED — A system was evaluated for cleaning used valves and parts with a 700°F molten salt bath containing 70 per cent sodium hydroxide with sodium nitrate and sodium nitrite added. The obvious heavy laden vapors and the irritating effects on the skin made it unnecessary to do air sampling. As an engineering control measure, a ventilation exhaust system was installed. The use of safety glass shields and protective clothing was recommended.

CONSTRUCTION PIPE LINE PIT CONTENTS SHOW HIGH CONCENTRATION OF BENZENE VAPOR — A mixture of hydrocarbon material leaking into a pipeline pit necessitated an evaluation of the potential danger to the personnel working inside the pit. Benzene vapors at breathing level were negligible; at the bottom of the pit the concentration was 100 ppm. It was recommended that respiratory and full-body protection with adequate clothing be provided when necessary.

DUST FALL STUDY AND AIRBORNE PARTICULATE MATTER RECORDED — Dust fall sampling results in the plant and community were recorded as tons per square mile per month. The heaviest dust concentration was recorded within the plant proper. The filter paper type samplers used to collect both the settled and suspended particles in air show results comparable to collections made during the past year.

AVERAGE CONCENTRATION OF SORBIC ACID DUST IN AIR AT THE OPERATORS' BREATHING ZONE - 6 mg/M^3 and ELEVATED SOUND LEVEL NOTED — An industrial hygiene study was initiated to evaluate possible health effects that sorbic acid might have on the operators. The 32 air samples showed an average concentration of 6 mg/M^3 of sorbic acid particulate in the operators' breathing zone. Unit supervision was advised to provide the employees with respiratory

(Continued)

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protection and vapor-proof goggles when they are transferring, handling, or sampling sorbic acid. The sound measurements taken in the drier room area showed that the operators' exposure time should be limited to six minutes without ear protection. Ear muffs were provided. Data from this study was utilized by the Design and Construction Department for the design of the new Sorbic Acid Unit, Plant No. 2.

DUST CONCENTRATIONS OF POTASSIUM SORBATE IN EMPLOYEES' BREATHING ZONE DECREASED THROUGH IMPROVED VENTILATION

Six air samples of potassium sorbate dust collected before the installation of a vented drum-filling booth showed 12 mg/M^3 in air. The improved ventilation system helped to reduce the concentration to 1 mg/M^3.

VENTILATION SYSTEMS FOR HANDLING TOXIC CHEMICALS TESTED - NEW SYSTEM INSTALLED

The drum-filling booths for handling toxic chemicals at the Shipping Department, the fume hoods in the plant laboratories, and the degreasing and welding operations in the Maintenance Shops were evaluated by air velocity measurements and air sampling. These performance tests and air sampling showed the efficiency of these systems to capture and remove the toxic materials. The importance of evaluating the employees' exposure and of obtaining the highest efficiency from this costly investment (ventilation systems) cannot be over emphasized.

DEGREASER VENT SYSTEM - ENGINEERING CONTROL MEASURES INITIATED

The ventilation system for handling perchloroethylene vapor at the Maintenance Electrical Shop in Building 307 is being renovated to assure further toxic vapor control.

WELDING FUME STUDY CONTINUING - VENT SYSTEMS STUDIED

The welding operations in the Maintenance Shop in Building 307 have been improved through the installation of roof fans. Further improvement using ventilation "snouts" to collect fumes at the source is being studied by the Engineering Department.

FUME HOODS TESTED AND EVALUATED

A study was initiated to determine the efficiency of the 69 fume hoods throughout the laboratory area. The hoods were classified as handling highly or moderately toxic chemicals.

TUNNEL AIR TESTED FOR TOXIC VAPORS AND VENTILATION

Four utility tunnels were tested for toxic vapors, oxygen content, and performance test on the ventilation systems. Two tunnels proved safe from the health standpoint; two others, located in Buildings 82 and 107, are under further study.

AMINE VAPORS CONTROLLED BY DRUM-FILLING BOOTHS FOR HANDLING TOXIC CHEMICALS

The Oilyard Shipping Department in Building 303 has two drum-filling booths for handling toxic chemicals. Ventilation and toxic vapor checks show the systems to be satisfactory for controlling the vapors.

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EMPLOYEE'S REPORT OF INJURY - CHEMICAL EXPOSURES CLASSIFIED — Two hundred eleven exposure cases taken from Dispensary visit records were studied and classified as follows:

Exposure	Injury	Number
Skin Contact	No burn	78
	Burn	14
	Blister	18
Eye Contact	No burn	51
	Burn	19*
Breathing Vapor		31
	Total	211

*Two hospital cases - sulfuric acid and diethylamino propylamine

USE OF RADIOACTIVE SOURCES INCREASING — The use of instrumentation containing radioactive sources is rapidly increasing. This necessitated a renewal of the radioisotope license issued by the Atomic Energy Commission to increase the quantity of radioactivity the South Charleston Plant can possess from 5.5 curies to 10.0 curies.

RADIOACTIVITY PROCEDURES APPROVED — A set of procedures for the Plant Instrument Department for handling, using, and transferring instruments containing radioactive materials has been prepared and approved.

HEALTH AND HYGIENE DATA FILES ISSUED — Individually prepared Health and Hygiene Data Files covering 11 chemicals were provided to production supervision upon request.

In cooperation with the General Industrial Relations Department, industrial hygiene data has been added to the Reactive Chemical and Hazardous Chemical Data Sheets.

$7,000 ANNUAL SAVINGS — The sanitation program for the standardization of purchased commodities showed an annual savings of $7,000.

NEW LOCKER ROOM — Efforts to provide ample sanitary facilities continues, as another new locker room was approved for the North Charleston Area.

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TECHNICAL CENTER

Mr. Fred Williams, Technical Center Industrial Hygienist, prepared the following summary of information reported in more detail in quarterly progress reports. Further information may be obtained from Mr. Williams.

ROCKET PROPELLANTS The second phase in the production of a liquid fuel containing beryllium has been planned and construction has started on this HYBALINE "B" facility at the Blue Creek Site. Work was done in cooperation with personnel of the Engineering Department and Research and Development Department to design the facility, select equipment, and establish procedures for operations. Production is scheduled to begin May 15, 1964.

The HYBALINE "A" facility completed production on schedule without serious incident. However, six persons experienced exposure to pentaborane during a week end while cleaning pentaborane cylinders. All six related symptoms similar to those for pentaborane. An atmospheric inversion occurred in the area which concentrated the contaminant near the breathing level of personnel, and the material also entered the building through the air supply system.

The results of air samples taken to measure ferrocene (dicyclopentadienyliron) vapors from an additive in solid rocket fuels showed amounts that could be injurious to personnel. Ferrocene has a camphor odor, sublimes about 100°C and forms iron carbonyl as a decomposition product. The ferrocene did not give the qualities to the fuel that was desired; thus, eliminating the need for extensive control methods.

AGRICULTURAL CHEMICALS A survey was conducted to evaluate equipment and the possible contamination that could result from chloroform while producing "Instant SEVIN" at the South Charleston Plant by Research and Development Department personnel. The pilot-scale production was done without incident and plans are being made to produce larger quantities.

Compound 21149, a toxic chemical, continues to show promising results and increased industrial hygiene activities are anticipated.

The Agricultural Research Station at Clayton, North Carolina was visited. Measurements were made of the exhaust ventilation of all hoods and potential problems about current products and radiation handling procedures were discussed.

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RADIATION Carbon-14 was used successfully as a tracer in an ethylene oxide experiment. Special precautions were taken to prevent exposures from accidental releases. Air sample results showed that the carbon-14 emissions were kept well within AEC regulations.

Plans have been initiated to use potassium-42 as a radioactive tracer in addition to extended work with carbon-14.

NOISE A noise survey made during the operation of a Perkins-Southwick Bond Tester showed impact readings in excess of 110 decibels. The rapidity of the impact noises and the difficulty involved to engineer controls made ear muffs mandatory for the operator.

The results of a survey to evaluate the noise level created when a 100-pound rocket motor was fired showed that an impact noise in excess of 120 decibels was received at a distance of approximately three hundred fifty yards from the firing stand.

CHEMICALS, GASES, AND FUMES Special air sampling surveys and plans were made for handling the following materials in addition to the routine work that was conducted:

Surveys made to evaluate ozone concentration from a Lepel high-frequency generator that is used to cause oxidation on polyethylene sheets showed quantities in excess of safe operating limits. A spot exhaust system installed at the source of the ozone formation was recommended.

Hydrogen fluoride measurements were made to determine the quantity of material released as a decomposition product from a reaction involving vinyl fluoride. No significant quantities were detected.

Preparations have been made to make a polymer of ethylenimine and to construct a pilot facility to produce the monomer. An industrial hygiene program has been submitted and special reports will be issued upon completion of each operation.

The results of a survey show that excessive quantities of tolylene diisocyanate vapors were released during experiments to test the "burning" qualities of foam caused by exothermal heat while using different mixtures of polyol, iron, and water. A "Jectair" exhauster was used to remove the vapors.

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INSTITUTE PLANT

Mr. R. E. Peele, Industrial Hygienist for the Institute Plant, submitted the following summary. Additional information about the reported activities may be obtained from Mr. Peele.

This summary is being presented under two major headings, i.e., Industrial Hygiene and Air Pollution, since the Industrial Hygiene Department is responsible for both fields.

Industrial Hygiene

Eight major reports were submitted during this period, four of which merit specific identification:

Noise Problem at Shipping Racks: An extremely severe hazard to hearing was revealed to be in existence when drying out (with a compressed air stream) the interiors of empty chemical tank cars. Recommendations specified the immediate and continued use of ear plugs until the intensity of the noise could either be reduced or eliminated at its source.

Lighting Problem in the Instrument Shop: Complaints of poor lighting in the Maintenance Department's Instrument Shop were investigated. An evaluation of the actual conditions disclosed the existence of inadequate lighting in most areas of the shop and recommendations were submitted for eliminating these inadequacies by improving the lighting.

Dust Problem at Fabrication Insulation Shop: A third evaluation of the hazard to health from atmospheric dust was conducted and included a re-evaluation of two types of insulation blocks, and an initial evaluation of a third. Results revealed that a hazard to health exists when fabricating two of the three types of block under existing conditions.

Clothing Program at the Coal Hydrogenation Unit: An evaluation of coal product contamination on clothing revealed that the program is continuing to serve a valuable service. However, there are indications that revision of the program may be in order since adequate protection appears to be provided through the use of coveralls only.

Numerous letters were submitted in response to specific requests for information concerning various subjects such as:

Dimethyl Sulfate: Its relative hazard and toxicity.

Insulation Dust Conditions: A clarification of the conditions in the Fabrication Insulation Shop.

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Sealed Radiation Sources: The need for storage facilities.

Detector Tubes: Description of specific types of tubes for use by the new Alkylbenzene Unit.

Substantial time was consumed in investigating the layout of equipment (for both the TDI and Alkylbenzene Units) before installation; thereby attempting to anticipate and correct problems that could be identified as being potentially hazardous to health.

Extensive investigation of the atmospheric concentrations of phosgene and TDI in and around the TDI Unit was initiated. This program was in addition to existing benzene and platinum sampling programs involving periodic sampling for benzene in various areas of the #1 and #2 Styrene Units, the Gas Separation Unit, and the High Pressure Hydrogenation Unit, and extensive sampling for platinum in the Catalyst Area of the Works Laboratory Building.

Short investigations were conducted on a wide variety of subjects such as: the identification of solvents, spills of dinitrotoluene, disposal of cylinders of sulfur dioxide, complaints about odors in the Works Laboratory Building, complaints about noise in the Maintenance Welding Shop, and complaints about noise in the Fluorocarbons Unit.

Specific items of equipment were either investigated and/or evaluated, as for example: portable oxygen meters, a portable explosion meter (UNICO), and the new ventilation system for the TDI drumming station in the Polyols Shipping Building.

Lectures and demonstrations were presented on various subjects such as: an industrial hygiene health education lecture, a talk and film on noise and demonstrations of sampling equipment to personnel in both the TDI and Alkylbenzene Units.

Air Pollution

The majority of time expended in behalf of air pollution was distributed between three general categories of interest, i.e., attendance at meetings, participation in the discussion of problems and investigations of complaints, concepts, etc. Very little was accomplished in relation to atmospheric air sampling, although the regular flyash fallout samples continue to be collected as in the past.

Meetings of interest were comprised of committee meetings such as: "The Area Managers' Pollution Advisory Committee" (AMPAC), "The Committee on Residue Disposal", and "The Toxic Gas Emissions Committee".

Discussions of interest included: those held with the Executive Secretary of the West Virginia Air Pollution Commission, the residue disposal problem at Plant 512, and the application of the mass spectrographic techniques to air pollution.

Investigations of interest included: complaints resulting from odors, corrosion, irritation, flyash, etc., new concepts in control equipment for flyash, nitrous oxides and platinum,

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compilation of recorded weather data and residue data, and compilation and interpretation of accumulated flyash fallout data.

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RESEARCH AND DEVELOPMENT DEPARTMENT

INDUSTRIAL HYGIENE LABORATORY

The following information reported by Mr. J. N. Dermit is representative of work done by the Industrial Hygiene Laboratory on the development of analytical and instrumental methods for use with new products or processes. Some special analytical work in specific support of plant and Technical Center industrial hygiene programs was also undertaken. Further information may be obtained from Mr. Dermit.

ETHYLENIMINE - DETERMINATION IN AIR — A method of sampling and a colorimetric procedure for the determination of ethylenimine in air have been developed. The procedure will detect ethylenimine well below the Threshold Limit Value of 5 ppm by volume in air. Interferences from ammonia and other amines that would be expected at a production unit have been eliminated.

PHOSGENE - EVALUATION OF MSA "BILLIONAIRE" — The Mine Safety Appliances Company "Billionaire" has been evaluated and found satisfactory for the detection of phosgene in air for concentrations from 0.5 to 20 ppm by volume in air. The instrument response to phosgene is rapid, reproducible, and accurate. A radium foil (150 μg) causes a constant flow of ions to be produced inside a detector chamber. Phosgene when mixed with dimethylamine forms particles. These particles reduce the ion flow causing a bridge imbalance which is a direct measure of the amount of phosgene present in the air. This equipment is small, has virtually no mechanical parts, and uses a minimum of electronic components, thus should require little servicing for plant use. It responds to gaseous HCl, which might offer interference in some circumstances.

PHOSGENE - EVALUATION OF CONDUCTOMETRIC ANALYZER — The Special Instrumentation Department recently designed and constructed an instrument to measure phosgene in air by conductivity, which has also been evaluated. Air containing phosgene contacts demineralized water and is hydrolyzed to hydrochloric acid. Two legs of a sensitive bridge circuit are conductivity cells, one for the sample and the other for reference. The hydrochloric acid formed causes a bridge imbalance which is measured and recorded. The equipment is rather cumbersome and would probably require considerable servicing to keep it in operation. The initial response to phosgene is quite sensitive but slow, and the recovery time is excessive.

PHOSGENE - ANILINE COLORIMETRIC PROCEDURE — A method was developed for the colorimetric determination of phosgene, in air, in the 0.1 - 10 ppm range. Aniline in the presence of p-nitrobenzenediazonium fluoborate forms an intense red color. Phosgene

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reacts with aniline to form diphenyl urea. The decrease in the intensity of the red color is a measure of the phosgene present in the air.

MASS SPECTROMETER EVALUATION FOR DETERMINING ATMOSPHERIC CONTAMINANTS — Development by the Research and Development Department of a static cold trap method for introducing gas samples into a mass spectrometer has reawakened interest in using this instrument for the analysis of contaminants in air. Known concentrations of selected contaminants are being prepared in the laboratory and analyzed with the mass spectrometer. Methods of sampling which are being evaluated as part of this continuing study include use of syringes and plastic bags.

TETRAMETHYL SUCCINONITRILE (TMSN) - DETERMINATION IN AIR — During the polymerization of acrylonitrile, the Vazo catalyst (azobisisobutryionitrile) decomposes into two free radicals with the release of nitrogen. When the two free radicals combine, tetramethylsuccinonitrile (TMSN) is formed. TMSN is quite toxic and has been found in resulting products. TMSN has been successfully analyzed chromatographically. The sample is collected in methylene chloride containing a few drops of CARBOWAX. It is then evaporated to near dryness (several drops remaining), then diluted to 2 ml with methylene chloride and analyzed.

GLYCIDYL ACRYLATE - DETERMINATION IN AIR — A procedure for the determination of epichlorohydrin in air (38C-K2C4-R2.1) was found applicable for glycidyl acrylate (38C-K2C28-R2). The method is quite sensitive (0.3 to 13 ppm by by volume in air). The method is not specific, as any compound that can be oxidized to formaldehyde will interfere.

FERROCENE DETERMINATION IN AIR — Ferrocene (dicyclopentadienyliron) in air has been satisfactorily analyzed by modifying an existing Volume 38 procedure (38C-27P1-R2). Ferrocene is of interest to industrial hygienists because under some conditions of thermal decomposition it could yield toxic iron carbonyl.

BERYLLIUM SPOT TEST METHOD — A recently-published article described a spot test for beryllium. The test was evaluated by us and found to be rapid and simple with a lower limit of detection being 0.1 μg. A color is developed between beryllium and erichrome cyanine R that is easily discernible with the naked eye. Removal of interferences from sixty two other ions are described in the publication.

EVALUATION OF PHOSGENE - DETECTOR CRAYONS — Apparently the indicator used in the Aromil Phosgene Number 1 Detector Crayon has been changed by the manufacturer since our earlier evaluation of the crayon. The detector crayons now supplied are still extremely sensitive to phosgene, but should not be relied upon for quantitative measurement. They are, nevertheless, most useful for detecting the

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presence or absence of phosgene in the work area. It has been our experience that the effective shelf life of these detector crayons is one year longer than the date indicated by the manufacturer (if the crayon has been kept in the stoppered glass tube and not exposed to unusual heat).

EVALUATION OF PHOSGENE - DETECTOR TUBES — A new Drager Phosgene Detector Tube Number 0.25/b, which replaces Tube 1/a, has been evaluated and found satisfactory for a semi-quantitative measurement. Three minutes are required for the tube to reach a maximum color change in the 1 ppm range. In higher phosgene concentrations (5-15 ppm), less than one minute produces a color change.

NITROGEN DIOXIDE - DETECTOR TUBE EVALUATION — Nitrogen dioxide detector tubes purchased from Mine Safety Appliances Company (Tube Number 0.1-50), Drager (Tube Number 0.5/c), and Kitagawa (Tube Number 1-1000) were evaluated with known concentrations prepared in a dynamic system. The ranges covered were between 1.3 and 12.6 ppm NO_2 by volume in air. Drager and Kitagawa tubes both gave acceptably accurate and consistent results and are recommended for field use.

METHACROLEIN - DETERMINATION IN AIR — Methacrolein can be determined well below the suggested Threshold Limit Value of 0.1 ppm by volume in air using an ultraviolet absorption method. The sample is collected in 10 per cent glacial acetic acid and measured spectrophotometrically at a wavelength of 310 mμ.

ANALYSES IN SUPPORT OF PLANT AND TECHNICAL CENTER INDUSTRIAL HYGIENE PROGRAMS — In addition to industrial hygiene methods development work for new products or processes, we continued to do special analytical work for the plant and Technical Center industrial hygiene programs. Listed below is the approximate number of samples analyzed. Calibration of radiation survey instruments is included in this list.

Type of Analysis	Approximate No. of Samples	Work Requested By
Hydrogen fluoride in air	11	Tech. Center
Beryllium	283*	Tech. Center
Compound 21149 in air	2	Tech. Center
Radiation wipe tests	83	**
Carbon-14 in air	2	Tech. Center
Sorbic acid in air	10	So. Charleston
Tolylenediisocyanate in air	31	Tech. Center
Lead in urine	5	So. Charleston
Platinum in air	7	Institute
Ozone in air	3	Tech. Center
Tetramethylsuccinonitrile in air	12	Tech. Center
Cement dust in air	4	Tech. Center
Total sulfur in air	1	Tech. Center
Radiation survey instruments calibrated	11	**

*Includes analyses of wipe tests and air samples.

**South Charleston-Institute-Technical Center

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METHODS DEVELOPMENT REPORTS ISSUED

1. Sorbic Acid - Determination of Micro Amounts in Air, Research and Development Department, September 1963, File No. 1261.

2. Tolylene Diisocyanate - Determination in Air, Research and Development Department, December 19, 1963, File No. 1785.

LABORATORY MANUAL PROCEDURES PREPARED FOR VOLUME 38, INDUSTRIAL HYGIENE

Tolylenediisocyanate - Determination in Air, December 23, 1963, Method No. 38C-B22N2-R2.

Epichlorohydrin - Determination of Trace Amounts in Air, Using the Acetyl Acetone Method, December 27, 1963, Method No. 38C-K2C4-R2.1.

Glycidyl Acrylate - Determination of Micro Amounts in Air, December 30, 1963, Method No. 38C-K2C28-R2.

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RESEARCH AND DEVELOPMENT DEPARTMENT

CHEMICAL HYGIENE FELLOWSHIP

MELLON INSTITUTE OF INDUSTRIAL RESEARCH

PITTSBURGH, PENNSYLVANIA

The information described below was provided by Dr. C. P. Carpenter as being of particular interest to the readers of this summary report. Further information may be obtained from Dr. Carpenter.

HIGHLY TOXIC COMPOUNDS OF 1963 Twelve of the most toxic materials tested by the Chemical Hygiene Fellowship during the year 1963 are listed on the attached table. Persons working with any of these compounds should inform themselves of the nature of the hazard and take appropriate precautions.

PUBLICATIONS Continuing an established policy of reporting much of the work of the Fellowship in professional journals, five papers were published during 1963. The references are listed on an attached sheet.

PROPOSED FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT, S 362.8 An unpublished argument for adjusting the dust inhalation test level to a more appropriate figure has been prepared and distributed to selected Corporation personnel concerned with agricultural chemicals. A level of 0.2 mg/l (200 mg/cubic meter) is proposed as a realistic test level for making the decision whether the product should be classified as an economic poison highly toxic to man.

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CHEMICAL HYGIENE FELLOWSHIP

HIGHLY TOXIC COMPOUNDS OF 1963

	Single Peroral Doses, Rat LD50	Single Skin Penetration, Rabbit LD50	Inhalation, Rat	Skin Irritation Uncovered, Rabbit	Eye Injury, Rabbit
Allyl Methacrylate Report 26-11	0.43 gm./kg. as 1% in CO; 0.25 ml./kg. and killed 3/5.	0.50 ml./kg. und.	Conc. vapor: 15 min. killed 4/6, 7.5 killed 0/6.		
Isopropyl Morpholine Report 26-35	0.71 ml./kg.	0.10 ml./kg.			
Fumaroyl Chloride Report 26-120			Conc. vapor: 30 min. killed 3/3.		Grade 10
Quaternary Silicone Y-4542 Report 26-115	0.23 gm./kg. 5% W	0.035 ml./kg.			0.005 ml. killed within 5 min.
Methyl Isocyanate Report 26-75	0.071 gm./kg., 10% in Deobase.	0.22 ml./kg. und.	2 mg./l. killed 6/6 in 1 hr.		Grade 10
16/16 Guinea Pigs were sensitized by the intradermal test.					
Diketene 98% Report 26-82	0.56 ml./kg.				Grade 10
Compound 20081 2,3-Dichloroacrylonitrile Report 26-93	0.041 gm./kg., 1% in CO.	0.0050 ml./kg.	7.6 ppm. killed 5/6, 4 hrs. 3.9 ppm. killed 2/6, 4 hrs.		Grade 10
Quaternary Silicone Y-4543 Report 26-114		0.35 ml./kg.			0.1 ml. in eye killed within 1/2 hr.

(Continued)

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CHEMICAL HYGIENE FELLOWSHIP

	Single Peroral Doses, Rat LD_{50}	Single Skin Penetration, Rabbit LD_{50}	Inhalation, Rat	Skin Irritation Uncovered, Rabbit	Eye Injury, Rabbit
Compound 22467 2-(p-chlorophenyl)-2,4,6-tris(chlorodifluoromethyl)-1,2-dihydro-1,3,5-triazine	0.0021 gm./kg. 0.01% in CO.			0.01 ml. killed 6/6 in uncovered application. N.B. This is on the order of 0.004 ml./kg. as a lethal dose by uncovered skin penetration!	0.01 ml. killed 1/1 within 24 hrs., 0.02 killed 1/1 within 6 hrs.
All the N-methyl carbamoyloximes are of extremely high toxicity. We list those that kill when small amounts are introduced into the rabbit eye. They are hazardous to handle!					
Compound 21825 2-methyl-2-methylsulfinylpropionaldehyde N-methylcarbamoyloxime Report 26-29	0.00088 gm./kg.-males; 0.0014 gm./kg.-females 0.1% in CO.	0.0049 gm./kg., 5% in PG.			100 mg. dry powder killed within 30 min.; 0.5 ml. of 5% PG killed within 25 min.
Compound 23527 2-methyl-2-nitrocyclopentanone N-methylcarbamoyloxime Report 26-119	0.0035 gm./kg., 0.1% in CO.	0.071 gm./kg., 5% in PG or acetone.			powder killed within 45 min.
Compound 22746 2-formamido-2-methylpropionaldehyde N-methylcarbamoyloxime Report 26-16	0.0020 gm./kg.-males; 0.0035 gm./kg.-females 0.1% W	0.025 gm./kg., 5% W			0.5 ml. of 5% W killed within several hrs.

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Papers Published in 1963

Psychopharmacological and Biochemical Effects of N-Methyl 3-Isopropyl Phenyl Carbamate (Compound 10354).
Goldberg, M. E., H. E. Johnson, J. B. Knaak, and H. F. Smyth, Jr.
Fed. Proceedings 22, paper 2091, 1963.

Industrial Hygiene in Retrospect and Prospect--Toxicological Aspects.
Smyth, H. F., Jr.
Amer. Ind. Hyg. Assoc. J. 24, 222-226, 1963.

Experimental Carcinogenicity and Acute Toxicity of Representative Epoxides.
Weil, C. S., Naomi Condra, Charles Haun, and J. A. Striegel
Amer. Ind. Hyg. Assoc. J. 24: 305-325, 1963.

Psychopharmacological Effects of Reversible Cholinesterase Inhibition Induced by N-Methyl 3-Isopropyl Phenyl Carbamate (Compound 10054).
Goldberg, M. E., H. E. Johnson, J.B. Knaak, and H. F. Smyth, Jr.
J. Pharm. Exper. Therapeutics 141, 244-252, 1963.

Relationship Between Short- and Long-Term Feeding Studies in Designing an Effective Toxicity Test.
Weil, C. S., and D. D. McCollister
Ag. Food Chem. 11, 486-491, 1963.

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BROWNSVILLE PLANT

The following was submitted by Mr. W. E. Warren, Industrial Relations Department Head. More detailed information may be obtained from him.

The Brownsville Plant requested Mr. N. H. Ketcham to visit and measure noise levels in the Oyxgen Plant. Mr. Ketcham had previously measured noise levels, plant-wide, on October 31, 1961. The request was based on apparently higher noise levels, which were caused by changes in operating conditions and equipment.

Mr. Ketcham visited the plant September 30, 1964. All suspect areas in the Oxygen and Utilities areas, which were measured in 1961, were again measured. As suspected, the noise level in the Oxygen Plant, 2 feet below a recycle line, which had been installed since the original survey (10-31-61) was 113-115 decibels.

As the result of the noise levels found, and the attendant recommendations, process revisions have been approved which should eliminate the specific problem in the Oxygen Plant. No significant changes were found in other areas in the plant.

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TEXAS CITY PLANT

Dr. R. E. Joyner, Plant Medical Director, reported the following information. Further details may be obtained from him.

Follow-up studies on urine cobalt excretion were run.

Several noise exposure studies were made as a part of a continuing hearing conservation effort.

Additional industrial hygiene work, which had been recognized as needing attention, could not be done because of lack of personnel. In order to obtain an accurate estimate of the volume and nature of work needing to be done, Mr. N. H. Ketcham was asked to survey the entire plant. This was done during a four-day period in October. The results of this survey have been reviewed with the plant management and appropriate recommendations made.

The use of encapsulated sources of radioactive materials in plant instrumentation is increasing rapidly. These sources are procured and used in accordance with the terms of a license issued by the Texas State Health Department. Mr. B. H. Clark is the plant's licensee representative and also serves as the plant Radiation Protection Officer.

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TABLE I

LICENSED ENCAPSULATED RADIATION SOURCES

Inventory as of December 31, 1963

Manufacturer's Name and Type of Housing	Kind of Isotope	No. of Sources	Amount in Each Source* (millicuries)	Total Amouht* (millicuries)	Required Frequency for Leak Test	Responsible Agency
BROWNSVILLE PLANT						
Ohmart HM-8	Cs 137	1	750	750	6 mos.	Texas
U.S. Rad. Lab-713-E	Ra 226	1	0.1	0.1	6 mos.	Texas
SEADRIFT PLANT						
Ohmart SHRM	Cs 137	1	125	125	3 yrs.	Texas
Ohmart SHRM	Cs 137	6	150	900	3 yrs.	Texas
Ohmart SHRD	Cs 137	2	300	600	3 yrs.	Texas
E. K. Cole SKS 101/233	Co 60	1	0.03	0.03	6 mos.	Texas
Ohmart HM-8	Cs 137	2	750	1500	3 yrs.	Texas
U. S. Nuclear Source G 223	Co 60	1	1	1	3 yrs.	Texas
Ohmart RTSN	Ra 226	2	0.025	0.050	3 yrs.	Texas
Ohmart RTSN	Ra 226	1	0.100	0.100	3 yrs.	Texas
SOUTH CHARLESTON PLANT						
Ohmart SHRM	Cs 137	11	100	1100	3 yrs.	AEC
Ohmart SHRM	Cs 137	4	50	200	3 yrs.	AEC
Ohmart SHRM	Cs 137	4	150	600	3 yrs.	AEC
Ohmart SHRM	Cs 137	1	1000	1000	3 yrs.	AEC
Ohmart SHRM	Cs 137	3	20	60	3 yrs.	AEC
Ohmart HM-8	Cs 137	1	1000	1000	6 mos.	AEC
Ohmart LASR-3	Cs 137	1	500	500	6 mos.	AEC
Ohmart ASR-3	Cs 137	1	500	500	6 mos.	AEC
Jordan Meter	Sr 90	1	0.003	0.003	6 mos.	AEC
Ind. Nucleonics LS-101	Cs 137	1	25	25	6 mos.	AEC

(Continued)

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TABLE I (Continued)

Manufacturer's Name and Type of Housing	Kind of Isotope	No. of Sources	Amount in Each Source* (millicuries)	Total Amount* (millicuries)	Required Frequency for Leak Test	Responsible Agency
			SOUTH CHARLESTON PLANT (Cont'd)			
Ind. Nucleonics DH-3	Sr 90	1	500	500	6 mos.	AEC
Comp. Cell	Ra 226	5	0.1	0.5	None **	None **
Comp. Cell	Ra 226	1	0.05	0.05	None	None
Pipe Wall Gauge 101-T	Ra 226	1	0.2	0.2	None	None
Gamm-O-Switch	Ra 226	1	0.25	0.25	None	None
Gamm-O-Switch	Ra 226	2	0.5	1.0	None	None
			TECHNICAL CENTER			
AECL KCP-1 and C-129 pencils	Co 60	39	up to 250 curies ea.	1600 curies	6 mos. (water)	AEC
Tracerlab R-31	Co 60	1	1.1	1.1	6 mos.	AEC
Ohmart SHRM	Cs 137	1	20	20	3 yrs.	AEC
Ohmart SHRM-P	Cs 137	1	20	20	3 yrs.	AEC
Ohmart SHRM-P	Cs 137	1	50	50	3 yrs.	AEC
Ohmart SHRM-P	Cs 137	1	100	100	3 yrs.	AEC
Ohmart SHRM	Cs 137	3	150	450	3 yrs.	AEC
Ohmart SHRH	Cs 137	3	200	600	3 yrs.	AEC
Ohmart SHRM	Cs 137	1	200	200	3 yrs.	AEC
Nuclear-Chicago Model 506	Cs 137	1	450	450	6 mos.	AEC
Ohmart HM-8	Cs 137	1	500	500	6 mos.	AEC
Ohmart SHRH-A	Cs 137	2	1000	2000	3 yrs.	AEC
Nuclear-Chicago Model 506	Cs 137	1	1750	1750	6 mos.	AEC
Jordan Meter	Sr 90	1	.003	.003	6 mos.	AEC
USRC foil 2230	Sr 90	1	0.1	0.1	6 mos.	AEC
RSC Chromatograph-foil	Sr 90	1	10	10	6 mos.	AEC
USRC Foil 369	Sr 90	2	20	40	6 mos.	AEC
Ind. Nucleonics C-5	Sr 90	1	20	20	6 mos.	AEC

(Continued)

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TABLE I (Continued)

Manufacturer's Name and Type of Housing	Kind of Isotope	No. of Sources	Amount in Each Source* (millicuries)	Total Amount* (millicuries)	Required Frequency for Leak Test	Responsible Agency
TECHNICAL CENTER (Cont'd)						
Foil	Ra 226	1	0.001	0.001	None**	None**
Foil	Ra 226	3	0.005	0.015	None	None
Foil	Ra 226	1	0.026	0.026	None	None
Foil	Ra 226	5	0.1	0.5	None	None
Foil	Ra 226	2	0.5	1.0	None	None
Pellets	Ra 226	4	0.1	0.4	None	None
Pellets	Ra 226	32	1.0	32.0	None	None
Zero Source	Ra 226	3	0.1	0.3	None	None
Zero Source	Ra 226	3	0.15	0.45	None	None
Zero Source	Ra 226	1	0.2	0.2	None	None
Zero Source	Ra 226	2	0.3	0.6	None	None
Zero Source	Ra 226	1	0.5	0.5	None	None
Zero Source	Ra 226	2	1.0	2.0	None	None
Zero Source	Ra 226	1	1.6	1.6	None	None
Zero Source	Ra 226	1	2.6	2.6	None	None
Screw	Ra 226	1	.002	.002	None	None
Salts	Ra 226	1 sealed pkg.	Unknown	Unknown	None	None
TEXAS CITY PLANT						
Ohmart SHRM	Cs 137	4	50	200	3 yrs.	Texas
Ohmart SHRH	Cs 137	1	200	200	3 yrs.	Texas
U. S. Radium Corp.	Ra 226	5	1	5	6 mos.	Texas
United Engr.	Ra 226	1	1	1	6 mos.	Texas
U. S. Radium Corp.	Ra 226	1	0.150	0.150	6 mos.	Texas
TORRANCE PLANT						
Ohmart SHRM	Cs 137	12	50	600	6 mos.	Calif.
Jordan Meter	Sr 90	1	0.001	0.001	6 mos.	Calif.

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TABLE I (Continued)

Manufacturer's Name and Type of Housing	Kind of Isotope	No. of Sources	Amount in Each Source* (millicuries)	Total Amount* (millicuries)	Required Frequency for Leak Test	Responsible Agency
			WHITING PLANT			
Ohmart SHRM	Cs 137	1	150	150	3 yrs.	AEC
Ohmart SHRM	Cs 137	1	100	100	3 yrs	AEC
Ohmart SHRM	Cs 137	1	50	50	3 yrs.	AEC
Ohmart SHRM	Cs 137	4	100	400	3 yrs.	AEC
Ohmart SHRM	Cs 137	8	50	400	3 yrs.	AEC
Ohmart SHRM	Cs 137	10	50	500	3 yrs.	AEC
Comp. Cell	Ra 226	1	.05	.05	None **	None **
			INSTITUTE PLANT			
Ind. Nucleonics BB-0041	Cs 137	1	150	150	3 yrs.	AEC
Ind. Nucleonics BBS-10051	Cs 137	1	50	50	3 yrs.	AEC
Ind. Nucleonics BBS-10073	Cs 137	1	1,000	1,000	6 mos.	AEC
Ohmart Lab 236-CI-4	Cs 137	1	200	200	3 yrs.	AEC
Ohmart Lab 236-CI-4	Cs 137	2	500	1,000	3 yrs.	AEC
Ohmart Lab 236-CI-4	Cs 137	4	20	80	3 yrs.	AEC
Ohmart LS 101	Cs 137	1	500	500	3 yrs.	AEC
Ohmart LS 102	Cs 137	1	50	50	3 yrs.	AEC
Ohmart LS 102	Cs 137	1	250	250	3 yrs.	AEC

*Amount of activity at time of purchase. No decay correction has been made.

**Radium usage is not licensed by the AEC or by the State of West Virginia. Both the South Charleston and Whiting Plants and the Technical Center control the procurement and use of radium in the same manner as required by the states which license its use.

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LEGISLATIVE BOX SCORE - 88th Congress

H = Hearings
R = Reported

P = Passed
C R A = Conference Report Accepted

SUBJECT	Bill No.	H House	H Senate	R House	R Senate	P House	P Senate	C R A House	C R A Senate	SIGNED
Air Pollution	* H.R. 3507									
	H.R. 3765									
	* H.R. 4061									
	* H.R. 4415									
	* H.R. 4750									
	* H.R. 5024									
	H.R. 6518		X	X	X	X	X	X	X	X P.L. 88-206
	H.R. 8884									
	* S. 432		X		X					
	S. 444		X							
	* S. 1009		X							
	S. 1040		X							
	S. 1124		X							
	S. 1472									
Food, Drugs and Cosmetics	H.R. 1235									
	H.R. 6788									
Occupational Health and Safety	H.R. 23	X								
	H.R. 133	X								
	H.R. 1926									
	H.R. 9000			X						
	S. 1949									
Pesticides	* H.R. 6828	X								
	* H.R. 6913	X								
	* H.R. 7336									
	H.R. 7353									
	S. 1250		X							
	S. 1251		X							
	S. 1605	X	X		X		X			
Radiation	H.R. 4899									
	* H.R. 7455									
	S. 1754									
Water Pollution	H.R. 2105									
	* H.R. 3166	X								
	* H.R. 3167									
	* H.R. 3819									
	* H.R. 3867									
	* H.R. 4571	X								
	* H.R. 5740									
	* H.R. 5848									
	* H.R. 5911									
	H.R. 6494									
	* H.R. 6497									
	* H.R. 6675									
	* H.R. 7727									
	S. 649	X	X		X		X			
	* S. 1118									
	S. 1183		X							

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SUBJECT	Bill No.	H House	H Senate	R House	R Senate	P House	P Senate	C R A House	C R A Senate	SIGNED
Animal Care	H.R. 4620									
	H.R. 4840									
	H.R. 4843									
	H.R. 4856									
	H.R. 5430									
	* H.R. 8077									
	S. 533									
	S. 1041									
Workmen's Compensation and Social Security	H.R. 5210									
	H.R. 5211									
	H.R. 6201									

* H.R. 3507 - Identical to S. 432 as reported in the last legislative digest.
* H.R. 4061 - Identical to S. 432 as reported in the last legislative digest.
* H.R. 4415 - Similar to H.R. 6518 as reported in the last legislative digest.
* H.R. 4750 - Identical to H.R. 4415 as reported in the last legislative digest.
* H.R. 5024 - Identical to H.R. 4415 as reported in the last legislative digest.
* S. 432 - Similar to H.R. 6518 as reported in the last legislative digest.
* S. 1009 - Identical to S. 1124 as reported in the last legislative digest.
* H.R. 6828 - Identical to S. 1605 as reported in the last legislative digest.
* H.R. 6913 - Identical to S. 1605 as reported in the last legislative digest.
* H.R. 7336 - Identical to S. 1605 as reported in the last legislative digest.
* H.R. 7455 - Similar to S. 1754 as reported in the last legislative digest.
* H.R. 3166 - Action taken on identical bill, S. 649 (Before House Committee).
* H.R. 3167 - Similar to S. 649 as reported in the last legislative digest.
* H.R. 3819 - Similar to S. 649 as reported in the last legislative digest.
* H.R. 3867 - Similar to S. 649 as reported in the last legislative digest.
* H.R. 4571 - Identical to H.R. 2105 as reported in the last legislative digest.
* H.R. 5740 - Similar to S. 649 as reported in the last legislative digest.
* H.R. 5848 - Similar to S. 649 as reported in the last legislative digest.
* H.R. 5911 - Similar to S. 649 as reported in the last legislative digest.
* H.R. 6497 - Identical to S. 1183 as reported in the last legislative digest.
* H.R. 6675 - Identical to H.R. 2105 as reported in the last legislative digest.
* H.R. 7727 - Similar to S. 649 as reported in the last legislative digest.
* S. 1118 - Similar to S. 1183 as reported in the last legislative digest.
* H.R. 8077 - Similar to H.R. 4620 as reported in the last legislative digest.

NOTE: The information in this table was compiled by the American Industrial Hygiene Association.

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