INDUSTRIAL HYGIENE SUMMARY REPORT

PERIOD JANUARY 1 - JUNE 30, 1963

The attached report reflects the increasingly pertinent role of industrial hygiene in the Chemicals-Olefins-Plastics Divisions' production and marketing efforts. In two instances, specific information utilizing accumulated industrial hygiene "know-how" was made available to assist customers in the use of our products. The manner in which more of this kind of customer service can be provided within the recognized medical-legal limitations is being explored on a continuing basis.

The Institute-South Charleston-Technical Center locations experienced a remarkably thorough three-day inspection of radiation facilities and employee exposure records. This inspection was conducted by an Atomic Energy Commission representative, accompanied by a member of the West Virginia State Health Department. Some items of noncompliance were found and have been corrected. The essential contributions of the location industrial hygiene programs in making possible the safe and legal use of radioactive materials was clearly demonstrated as a result of this detailed inspection. The Agricultural Chemicals Laboratory at Clayton, North Carolina and several of our plants were also inspected during this period by the AEC or responsible state agencies.

For the first time, pertinent items selected from reports of the Chemical Hygiene Fellowship at Mellon Institute have been included in this summary report. These welcome additions are especially valuable because they illustrate the important but complex relationship between the measurement of toxicity using animals and the evaluation of hazard to humans under actual working conditions. The items selected illustrate the important role of the toxicologist working together with the medical and industrial hygiene staffs in assuring the safe use of chemicals in our plants and the plants of our customers.

Reviewing engineering plans for new construction offers an opportunity to eliminate problems at the stage where they are easiest and cheapest to correct. This important aspect of an industrial hygiene service is being accomplished with steadily improving effectiveness. During this reporting period, significant contributions were made in the plans for the Tolylene Diisocyanate Unit being built at Institute, the Sorbic Acid Unit being built at South Charleston, and the rocket fuel production and firing facilities being built for the Research and Development Department at Blue Creek, W. Va.

A small committee was appointed at the suggestions of Mr. R. C. Hieronymus to study alternative methods for disposal of chemical wastes now being burned at the South Charleston City Dump. This culminated an intensive effort of the industrial relations departments in the

Institute-South Charleston-Technical Center area to bring into focus the long-standing safety, health, and public relations problems resulting from the incineration of chemicals at the dump.

Submitted by: N. H. Ketcham

N. H. Ketcham
Industrial Hygiene Consultant

NHK/dww
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CONTENTS

TECHNICAL CENTER

Mr. Fred Williams, Technical Center Industrial Hygienist, prepared the following summary of information contained in 11 pages of quarterly progress reports. Additional information may be obtained from Mr. Williams.

ROCKET PROPELLANTS The first phase for the production of a liquid fuel containing beryllium was completed during this period. Building 709 was remodeled to include facilities that were suitable for work with this type of material. The remodeling included an air filter system in which all exhaust air passed through an American Air Filter Company, Inc. "Roll-O-Matic" pre-filter and absolute filters. All water drains from the hoods, sinks, and floor were connected to a settling tank that emptied into a drain field of gravel covered with soil. The mixing was performed in a stainless steel drybox in a hood, and the reaction and distillation were done in an adjacent hood. Air sample and wipe test results show that the beryllium was confined to the drybox, hoods, and air filters. Even though some small fires occurred, there were no known personnel inhalation exposures and no significant releases of beryllium to the atmosphere.

AGRICULTURAL CHEMICALS Miticide Compounds 20047 and 21149 were processed and formulated without any serious exposure of personnel. Special precautionary measures were taken to prevent inhalation and skin contact during work with Compound 21149, a highly toxic material. Air-supplied hoods, special protective clothing, rubber boots, and rubber gloves were used to prevent exposures to personnel. Air sampling was done with Greenburg-Smith impingers containing 1:1 acetic acid solution. The analyses were performed by the Research and Development Department's Industrial Hygiene Laboratory.

RADIOACTIVE MATERIALS Film badges that had been subjected to known radiation exposures were used to evaluate the reliability of results reported by Tracerlab Twin-film Service. The results reported by Tracerlab were in serious error on the basis of the calibrated exposures. Corrected reports were later submitted by Tracerlab, after they were informed that the original results did not confirm the controlled exposures. The corrected results were within the limits of error for such a program.

Film badges with known exposures were also sent to Nuclear-Chicago to evaluate their film badge service supplied to another group in the Technical Center. The results reported by this service were within acceptable limits of error.

An inspection was made by a representative of the Atomic Energy Commission to determine whether compliance with license agreement numbers 47-260-2, 47-260-3, 47-260-4, and 47-260-6 were being met. The inspector was accompanied by a representative

(Continued)

of the West Virginia State Health Department. Satisfactory reports were received for licenses47-260-2, 47-260-3, and 47-260-4. A violation has been cited on the committee license 47-260-6 as a result of improper disposal of tritium (hydrogen-3).

A new radiation source storage facility was completed and all sources moved from the former storage area at the South Charleston Plant. The sources were wipe tested for leaks, properly labeled, and the test date placed on each source with Dymo embossing tape.

The facility that houses 1600 curies of cobalt-60 pencils in Building 722 was surveyed in compliance with AEC regulations.

All X-ray units that are in operation were checked and found to be adequately shielded.

The number of cesium-137 encapsulated sources was reduced by the transfer of 12 sources with a total of 2760 millicuries to the licenses of the Institute and South Charleston Plants.

Increased utilization of unencapsulated radioisotopes in research and development work is anticipated. Carbon-14 has been the most commonly used radioisotope as a tracer during this period.

NOISE The results of a noise survey in an area using steam and air jets for fiber manufacture showed a narrow band noise that could cause damage to hearing. In fact, three of four employees assigned to this area showed hearing loss, part of which may be attributed to the noise.

INSTITUTE PLANT

The following excerpts from a ten-page summary report were written by Mr. R. E. Peele, Institute Plant Industrial Hygienist. More detailed information may be obtained from Mr. Peele.

"SEVIN" UNIT CARBON MONOXIDE HAZARD Carbon monoxide exposures and hazards, associated with the Synthesis Gas Department of the SEVIN Insecticide Unit, have been corrected. This has been achieved through the addition of more adequate ventilation and the successful use of a continuous air sampling instrument, a Mine Safety Appliances Company "Lira".

NEW TOLYLENE DIISOCYANATE UNIT Tolylene diisocyanate and the other hazardous materials to be used in the forthcoming TDI Production Unit are being identified and investigated. The engineering drawings for many phases of the design have been reviewed in an endeavor to disclose and correct hazards to health. Preparations are now being made to extend this preventive approach to include a complete air sampling and analysis program for the unit.

PLATINUM CATALYST Platinum concentrations in air are being evaluated in the catalyst lab of the Works Laboratory where chloroplatinic acid is used. This work has resulted in dermatitis and other reported symptoms that agree with those described for excessive platinum exposure.

FABRICATING INSULATION BLOCKS Inorganic dust exposures in the Construction Department's Fabrication Insulation Shop have been revealed to be excessive when fabricating certain makes of insulation blocks. Corrective action has been taken by the users to reduce the exposure in accordance with recommendations.

INSPECTION OF LICENSED RADIATION SOURCES The radiation program of monitoring and recording all licensed radioactive sealed sources was inspected by the Atomic Energy Commission. This was the first time that the Institute Plant has been visited by an AEC representative, and several incorrect procedures were uncovered. These are being corrected.

NOISE REDUCTION Noise reduction corrective action has been undertaken in two areas of the Maintenance Department. In one instance the department complied with recommendations and installed personal protective hearing devices for use in the Metalizing Shop. In the second instance, the Works Engineering Department adhered to recommendations and sought the assistance of noise reduction specialists, under the direction of Mr. E. C. Harry of Olefins Engineering, before proceeding with plans to move a sheet metal shop into an area adjoining an office.

AIR POLLUTION The Plant Managers of each of the three Union Carbide Corporation installations located in the Kanawha Valley established a committee to study and evaluate the problems associated with the disposal of chemical residues which are now being burned at the South Charleston City Dump. The Industrial Hygienist at the Institute Plant was selected to represent his location and initially was assigned the responsibility of completing the first objective of the committee, i.e., an accumulation of all available plant information on all identifiable residues. This objective has been completed.

Collection efficiencies on three of the total of nine collectors installed at the #1 Power Plant were determined and evaluated by George D. Clayton and Associates, Inc., an air pollution consultant firm from Detroit, Michigan. Sampling assistance was extended by the Industrial Hygiene Department in the interest of reducing the expense of the evaluation.

Complaints of paint damage to cars located in the main parking lot were investigated.

Corrosion damage to the new interstate bridge located at Nitro, W. Va. was investigated. This was done at the request of the State Road Commission in the company of four members of the Commission, two representatives from the South Charleston Plant, and two representatives from the Institute Plant's Works Engineering Department.

PLANT AIR FOR BREATHING USE A plant air report, disclosing the policy and techniques utilized in providing air for breathing purposes through the use of the plant air system, was submitted to the Plant Managers at the request of Mr. S. C. Giambruno of the Industrial Relations Department. Incidents of contamination of this air supply have occurred.

SOUTH CHARLESTON PLANT

This summary was written by Mr. B. L. Murray, South Charleston Plant Industrial Hygienist, as part of a 10-page progress report. Further information may be obtained from Mr. Murray.

SOUND STUDIES The status of the plant-wide sound level study is: (1) the noise exposure of employees in 272 units has been defined as not detrimental to hearing; thus ear protection is not required, (2) engineering control in 27 units is under study to reduce noise levels defined as hazardous, and (3) exposure evaluation studies in 19 units are incomplete.

Magnetic tape recordings of noise in Buildings 25 and 41 (Gas Separation Unit No. 2) and Building 190 (Dispersion Resins Micro Atomizer Operations) were analyzed by use of a narrow-band spectrograph. The tape recordings were made by the Special Instrumentation Department and were helpful in further defining the degree of risk to hearing.

SAMPLING OF GASES, VAPORS, AND FUMES IN AIR As requested by unit supervision, toxic vapor studies were made in 15 units to determine the exposure levels. Routine air samplings of the working environment were made in 26 other units.

At the request of unit supervision, an industrial hygiene program was started at the new Glyoxal Unit, Building 134, to control the potential exposure to nitrogen dioxide gas. A nitrogen dioxide detector and tubes were provided along with applicable hygiene instructions.

A program was initiated to develop and explain, if possible, any minor health effects that sorbic acid might have on the operators. The initial studies defined preliminarily the vapor and particulate concentrations in air in Building 174 (Plasticizer-Esters Unit) and Building 156 (Fine Chemicals Unit). The air sampling is being continued and the results are being evaluated. A serious noise problem was found to exist in the drier room of Building 174. These data will be of assistance to the Design and Construction Department in formulating their plans for the new Sorbic Unit.

SAMPLING OF VAPOR IN VENT STACK Sampling of the stack gas at Building 152 (Vinyl Resin) for acetone revealed sufficient solvent discharge to justify engineering effort to reduce the amount lost.

SAMPLING OF DUSTS IN AIR Air-borne particulate contaminants were sampled in several locations and, where possible, recommendations were made to assist in obtaining a solution to the problems.

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The specific locations studied were: (1) community and plant areas, (2) South Charleston City Dump, (3) sorbic acid production, and (4) sandblasting operations.

VENTILATION STUDIES The performance of the chemical fume hoods in the Plant Laboratory and the ventilation of the arc welding and degreasing operations in the Maintenance Shops were evaluated under a variety of conditions. The evaluations included air velocity measurements, as well as atmospheric sampling. These studies clearly demonstrated a need for, and value of, periodic testing and maintenance of ventilation systems.

These ventilation problems have been referred to the Works Engineering Department; job orders have been issued, and, in most instances, field work has started.

RADIOLOGICAL HEALTH Results of an inspection made by the Atomic Energy Commission of the radioactive sources and procedures were gratifying. There were no items of non-compliance. The most recent inventory shows 46 radioactive sources in the plant.

Upon completion of a special training course in Radiological Monitoring, a kit was assigned to this plant by the Office of Civilian Defense. This kit will be used to provide timely and accurate information required for the proper analysis and evaluation of the radiological hazard in case of radiation fallout or an atomic attack.

TOXICITY AND INDUSTRIAL HYGIENE DATA Individually-prepared toxicity and industrial hygiene information files covering 30 chemicals were supplied to production supervisors upon request.

PERSONNEL ASSIGNMENT The industrial hygiene program received added impetus when Mr. J. B. Kessler, Quality Control Chemist, joined the industrial hygiene team at the laboratory to give added support to the plant hygiene function.

SANITATION PROJECTS The program for the Standardization of Purchased Commodities continues to show an annual savings of $6,000 to date.

The Camp Sanitation Program at the three camp locations and the Hunting and Fishing Club area necessitated a collection of over 100 stream samples and 19 well water samples for bacteriological examination. These data, in addition to the other sanitation findings, have enabled us to assist the Camp Directors in protecting the campers' health.

A general contamination of the city water supply throughout the Upper Island Area and the No. 3 Gas Separation Area was surveyed and corrected. Four other locations were detected for contamination of the drinking water. These areas were also surveyed and corrected.

We are assisting the Works Engineering Department in providing approved sanitary facilities for four barge dock locations, as was requested by the Bulk Handling Materials Department.

RESEARCH AND DEVELOPMENT DEPARTMENT

INDUSTRIAL HYGIENE LABORATORY

The work described below is representative of efforts made by the Industrial Hygiene Laboratory in support of programs being conducted by the plants and the Technical Center. Further information about this work or related services may be obtained from Mr. J. N. Dermit or Mr. N. H. Ketcham.

BERYLLIUM - ANALYSES FOR MONITORING PERSONNEL EXPOSURE — A National Spectrographic Laboratories' beryllium monitor was placed in service early in January of this year to accomplish rapid analysis of samples of air and settled dust. These analyses are performed as part of a contractual requirement to provide industrial hygiene monitoring of personnel working with beryllium-containing rocket fuels. Samples of air and settled particles are collected on filter paper and placed directly in the spectrometer. The analysis is read out in one minute. The instrument can detect <0.02 micrograms of beryllium and has proven to be a useful and reliable analytical tool.

SORBIC ACID - ANALYSIS IN AIR — Two methods for determining microquantities of sorbic acid in air were developed for use by both the South Charleston Plant and the National Dairy Products Corporation. This work was done at the request of Dr. C. U. Dernehl, Assistant Medical Director of Union Carbide Corporation, when it became known that National Dairy Products Corporation personnel were encountering eye and upper respiratory irritation and nosebleeds attributed to sorbic acid. Both methods, a colorimetric procedure and an ultraviolet absorption technique, have been given to the customer.

COMPOUND 21149 - ANALYSIS IN AIR — A method for the determination of microquantities of 2-methyl-2-methylthiopropionaldehyde N-methylcarbamoyloxime (Compound 21149) in air has been developed. Due to the unusually toxic effects of this agricultural chemical by inhalation or skin absorption it was necessary to take special precautions to minimize the exposure of personnel during preparation and field testing of this compound.

The procedure, a modification of a test reported by Feigle, detects as little as 1.0 microgram of Compound 21149 in air. The method is applicable to a number of related oxime compounds.

ANILINE - ANALYSIS IN AIR — The South Charleston Plant requested a procedure for the determination of aniline in air, capable of detecting a lower limit of at least 1 ppm. The requirements were met by a procedure employing a water-filled impinger as a scrubber and analyzing by ultraviolet absorption. A sensitivity of 0.01 ppm was obtained.

RADIATION HEALTH SERVICES — The periodic calibration of radiation survey meters used in the Charleston area was continued.

At this time all of our Company plants use, or plan to use, wipe test kits supplied by this laboratory to facilitate compliance with the periodic leak testing required by the Atomic Energy Commission and state licenses. The used wipe test kits are returned to this laboratory for counting and the results are reported by mail or telephone to the licensee.

At the request of Mr. Fred Williams, film badges from two commercial badge services were exposed to known radiation dosages and submitted to the contract film service companies for evaluation. The results reported by one of the companies were disturbingly inaccurate. A report of this study has been issued by Mr. Williams.

SHELF LIFE OF MSA CARBON MONOXIDE DETECTOR TUBES — Approximately 2 dozen carbon monoxide detector tubes which had been stored up to 3 years beyond the manufacturer's suggested shelf life were tested. Based on the tests, it was concluded that the tubes were still suitable for use. A slight loss of sensitivity was found. Because of this, a wait of approximately one minute, instead of the manufacturer's recommended waiting time of 35 seconds, is suggested to let the color develop before reading the final carbon monoxide concentration.

ANALYSIS OF ACETIC ANHYDRIDE IN THE PRESENCE OF ACETIC ACID — Our report 92E-F27 "Determination of Acetic Anhydride in Air", dated August 1, 1962 stated that acetic acid did not interfere. The statement was based on a literature reference and was not proven by our own work. Subsequent interest in this resulted in further work. Concentrations up to 1 part acetic acid to 1 part acetic anhydride were prepared and analyzed. It was found that acetic acid does not interfere.

TOLYLENE DIISOCYANATE (TDI) - ANALYSIS IN AIR — Because of widespread use of tolylene diisocyanate in foam work, this laboratory has been analyzing air for that material for several years. Our experience to date is summarized below.

The most satisfactory method of air analysis is that described by Marcali, Analytical Chemistry, 29, April, 1957. A stepwise procedure for inclusion in Volume 38 of the Laboratory Manual is being prepared. The Ranta method used commonly for the earliest studies does not attain the needed sensitivity of 0.02 ppm, by volume in air.

A TDI detector kit, sold by Union Industrial Equipment Corporation, uses the reagents described by Marcali. Use of the kit would be expensive if a large number of analyses were needed, and the range of TDI concentration which can be analyzed is limited. The color comparison standards used in the kit are harder to use than the standards used by Marcali. Under some circumstances, use of the kit could be recommended if it's limitations were understood and taken into account.

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Collection of TDI in isooctane and analysis by ultraviolet absorption, using a Beckman Model DK-1 spectrometer and 10-cm cells, results in a simple and rapid analysis but the desired sensitivity is not obtained. This method detects about 0.1 ppm.

METHODS DEVELOPMENT REPORTS ISSUED

Micro Determination of Beryllium in Air Samples and Wipe Test Smears, Research and Development Department, March 21, 1963, File No. 435.

Beryllium - Determination by Emission Spectroscopy for Monitoring Personnel Exposure, Research and Development Department, June 6, 1963, File No. 873.

Agricultural Chemicals - Compounds 21149 and 20047 and Other Oximes, Determination of Micro Quantities in Air, Research and Development Department, July 8, 1963, File No. 997.

LABORATORY MANUAL PROCEDURES PREPARED FOR VOLUME 38, INDUSTRIAL HYGIENE -

Beryllium - Micro Determination of Air Samples and Wipe Tests, March 28, 1963, Method No. 38C-29A4-R2.

2 Methyl-2-methylthiopropionaldehyde N-methylcarbamoyloxime (Compound 21149), Micro Determination in Air Samples, July 5, 1963, Method No. 38C-21V5-R2.

Ethylene Oxide - Determination in Air Samples Collected in Midget Bubbler or in Evacuated Flasks, March 29, 1963, Method No. 38C-K2B-R2.

Ethylene Oxide - Determination in Air Samples Collected in Silica Gel Absorption Tubes, April 1, 1963, Method No. 38C-K2B-R2.1.

Sorbic Acid - Determination of Micro Amounts in Air by the Thiobarbituric Acid Method, July 2, 1963, Method No. 38C-3F3-R2.

Sorbic Acid - Micro Determination in Air by the Ultraviolet Absorption Method, July 2, 1963, Method No. 38C-3F3-R2.1.

RESEARCH AND DEVELOPMENT DEPARTMENT

CHEMICAL HYGIENE FELLOWSHIP,

MELLON INSTITUTE OF INDUSTRIAL RESEARCH,

PITTSBURGH, PENNSYLVANIA

The following exerpts from recent Chemical Hygiene Fellowship reports were selected by Dr. C. P. Carpenter as being of special interest to readers of the Company industrial hygiene summary report. Further information on these or similar problems may be obtained by writing to Dr. Carpenter, Fellowship 274, Mellon Institute.

The Inhalation Hazards of UCON Lubricants 50-HB-400 and LB-385 at Elevated Temperatures, Report 25-19

"The results of these studies indicate the inhalation hazard of the vapors and decomposition products of at least two UCON lubricants is not only a function of the temperature during aeration but also of the presence or absence of oxygen. These results lead us to emphasize the necessity of evaluating the hazards of chemicals under conditions which simulate actual use conditions."

Comparative Inhalation Toxicities of Perchlorethylene, UCON Refrigerant 11 and UCON Fluorocarbons 112, 113, and 215, Report 25-49

"Although the four UCONS have been shown to be considerably less toxic to rats than perchlorethylene, it should be noted that because of their higher vapor pressures, they can produce higher concentrations. It is strongly suggested, therefore, that they be used with the same safety precautions as those employed for perchlorethylene."

Addendum on UCON 122, Report 25-72

"These data indicate the single-dose toxicity of UCON 122 to be essentially the same as that of perchlorethylene, and also the symptomatology followed a fairly consistent dose-related pattern of loss of coordination, anesthesia and death."

Additional Safety-Evaluation Studies of Perchlorethylene and UCON Fluorocarbons 112, 113, and 215, Report 25-89

"The suspicion that the relative hazard of perchlorethylene and UCONS 112, 113, and 215 to human life should not be predicted solely from toxicity (predetermined ppm) data has been confirmed by these studies. However, a hazard prediction based solely on these saturated vapor studies should also be questioned, because in practice, massive quantities of UCONS 113 and 215 would have to be evaporated in a relatively closed space to produce atmospheres considerably more hazardous than that of perchlorethylene.

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Therefore, we repeat our suggestion, presented in Report 25-49, that UCONS 112, 113, and 215 be used with the same safety precautions as those employed for perchlorethylene. Canister-type gas masks usually rated for a maximum of 20,000 ppm for all gases and vapors except ammonia, should not be used when spillage occurs with any of these solvents. Air-line or tank-supplied respirators should be available at all times in areas where these solvents are most likely to be accidentally spilled during bulk handling."

The Feasibility of Using Methyl Isocyanate as a Warning Agent in Liquid Carbon Monoxide, Report 26-23

"Methyl isocyanate (MeI) has been suggested as a warning agent in the shipment of liquified carbon monoxide. It was selected on the basis that it would cause minimum adulteration in the immediately planned use of the CO.

Only 3 of 7 subjects could detect 5 ppm MeI by odor. Furthermore, there was no consistent relationship between odor detection and vapor concentration. All subjects who perceived an odor reported olfactory fatigue. The only unanimous responses consisted of eye irritation and tear formation at 5 ppm vapors in 50 seconds or less. All responses disappeared within 3 minutes after exposure.

It is apparent MeI would fulfill its role as a warning agent by virtue of its lacrymatory properties rather than because of its odor. If we select 1 ppm MeI as the 5-minute warning level, and a permissible level of 200 ppm carbon monoxide in the event of a spill, there would be present 0.2290 mg CO and 0.00233 mg MeI per liter of air. Assuming that all the technical problems mentioned in the first paragraph have been solved, the theoretical proportion of MeI to CO in the liquid phase would be $\frac{0.00233}{0.2290}$ or 1.02% (W/W) MeI in liquified CO.

In view of the foregoing data and discussion, we feel that MeI is not a feasible warning agent for the liquified carbon monoxide transport problem. A substance with a low odor threshold and minimal additional physiological properties would appear to be more suitable. Lists of substances with odor thresholds ranging down to 0.001 ppm and lower are available. These lists include such substances as butyl mercaptan, diphenyl ether, ethyl mercaptan, ethyl sulfide phenyl isocyanide, and thiophenol which have corresponding odor thresholds of 0.001, 0.001, 0.0003, 0.003, 0.001, and 0.0003 ppm. Naturally, the choice of an odorant would have to be made with consideration of the technical problems previously mentioned and its lack of interference in the proposed use of the CO."

A Basis for Projecting the Probable Inhalation Hazards of UC 21149 to Humans Under Field Use Conditions, Report 26-32

"An attempt to predict the probable hazard of a pesticide under field use conditions involves the consideration of many factors. These include a knowledge of the actual airborne concentration and a reasonable extrapolation of experimental animal data to probable human response. Because of the lack of information on the actual airborne concentration of UC 21149, the following assumptions and calculations have been made:

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Assume that a field worker sprayed UC 21149 at the rate of 1/2 pound active agent per acre on a windless day and that most of the spray remained within a 6-foot layer above the ground. What would be the theoretical concentration of active agent in this 6-foot layer?

1 acre = 43,560 square feet
Volume of 6-foot layer = 43,560 x 6 cu.ft.
1 cu. meter = 35.3144 cu.ft.
Therefore volume of 6-foot layer over an acre =

$$\frac{43,560 \times 6}{35.3144} \text{ or } 7400 \text{ cu. meters}$$

0.5 lb. = 226,796 mgs.
Therefore concentration of UC 21149 (active agent) in the 6-foot layer would be:

$$\frac{226,796}{7400} = 29.83 \text{ mg./m}^{-3}$$

Assuming that only 5% of the sprayed UC 21149 remained airborne and respirable, we obtain a probable exposure concentration of 1.5 mg./$\bar{m}^3$.

The response of the rats followed a fairly consistent time and dose-related pattern. Note that the typical anticholinesterase symptomatology commenced in only 90 minutes at the 1.91 mg./$\bar{m}^3$ level, which is not significantly higher than the estimated value of 1.5 mg./$\bar{m}^3$ for field use conditions. (Previous experience with anticholinesterases in this laboratory has shown that cholinesterase levels were depressed before the onset of the typical cholinesterase symptoms.) Deaths occurred at the 35.13 mg./$\bar{m}^3$ level in one hour and at the 7.61 mg./$\bar{m}^3$ level in approximately 8 hours.

If man's response parallels that of rats to 21149 and parathion, it appears that 21149 should be used under stricter regulations and safety precautions than those that apply for parathion. The validity of this recommendation is strengthened by the fact that to the best of our knowledge the proposed concentrations of 21149 for field use are considerably higher than those recommended for the sample of parathion 15 WP which we studied, viz., 1/4 to 1 pound 21149 active per 100 gallons of water versus 1-1/2 to 2 pounds parathion 15 WP (0.225 to 0.30 pound active) per 100 gallons of water."

RESEARCH AND DEVELOPMENT DEPARTMENT

TARRYTOWN DIVISION

TARRYTOWN, NEW YORK

The following information relating to a customer service activity was supplied by Mr. W. B. Leighton.

CUSTOMER SERVICE - METHANOL VAPOR MONITORING

On the recommendation of the Tarrytown Division and the New York Office Toxicology Department, the Detroit District Sales Office made available to the Rochester Paper Company a Davis Emergency Equipment Company detector tube kit to monitor methanol vapors in plant process areas. Outright presentation of this relatively low-cost detection unit promoted customer good-will and at the same time placed the customer in a position to maintain a continuing safety check through use of the instrument by their own personnel.

TORRANCE PLANT

Mr. W. E. Knight, supervisor of the Torrance Plant Laboratory, reported the following. Further information may be obtained from Mr. Knight.

COMPLIANCE WITH STATE RADIATION REGULATIONS — Wipe tests were conducted on all cesium-137 holders in compliance with the new California regulations. The swabs were submitted to the Research and Development Department for counting. No leakage was found.

COMPLIANCE WITH STATE NOISE CONTROL REGULATIONS — Sound survey measurements have been made in several of the plant areas where noise levels are high. The State of California has adopted regulations covering sound, so regular measurements will be made to determine if the limits are exceeded. In the one area where ear protection is mandatory under the new regulations, ear plugs are provided for Carbide, as well as contract, personnel who work in the area.

TEXAS CITY PLANT

The following items were submitted by Dr. R. E. Joyner, Texas City Plant Medical Director. Further information may be obtained from Dr. Joyner.

OXO UNIT - COBALT EXPOSURE Urinary cobalt determinations in persons exposed to the Oxo process have continued. We have averaged running about 4 or 5 patients every other week since the beginning of the year. A total of approximately 85 urine samples have been analyzed. The problem of high urinary cobalt values in laborers cleaning filter presses continues to plague us and the ultimate solution has not yet been found.

NOISE CONTROL Sound surveys were made at 4 sites in our plant. One of these surveys was for the purpose of establishing background noise at the proposed site of the No. 3 power plant.

PUBLICATIONS AND PROFESSIONAL ACTIVITIES

(Not including Chemical Hygiene Fellowship, Mellon Institute)

Publications

None during this report period.

Professional and Educational Meetings

Mr. Fred Williams, Technical Center Medical Department; Mr. J. N. Dermit, Research and Development Department; and Mr. R. E. Peele, Institute Plant Medical Department, attended the American Industrial Hygiene Conference for 1963 in Cincinnati, Ohio, May 1963.

Mr. B. L. Murray and Mr. C. G. Copley, South Charleston Plant Medical Department, attended a four-day training course on Insect and Rodent Control, given at South Charleston, W. Va. by the U. S. Public Health Service.

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Mr. P. W. Gregory, Jr.
Mr. E. C. Harry
Dr. F. Johnston
Mr. W. A. Katholi
Mr. J. W. Perry
Dr. B. Phillips
Dr. J. B. Reid
Mr. S. H. Rose, Jr. (2)
Mr. H. T. Sessions
Mr. Fred Williams