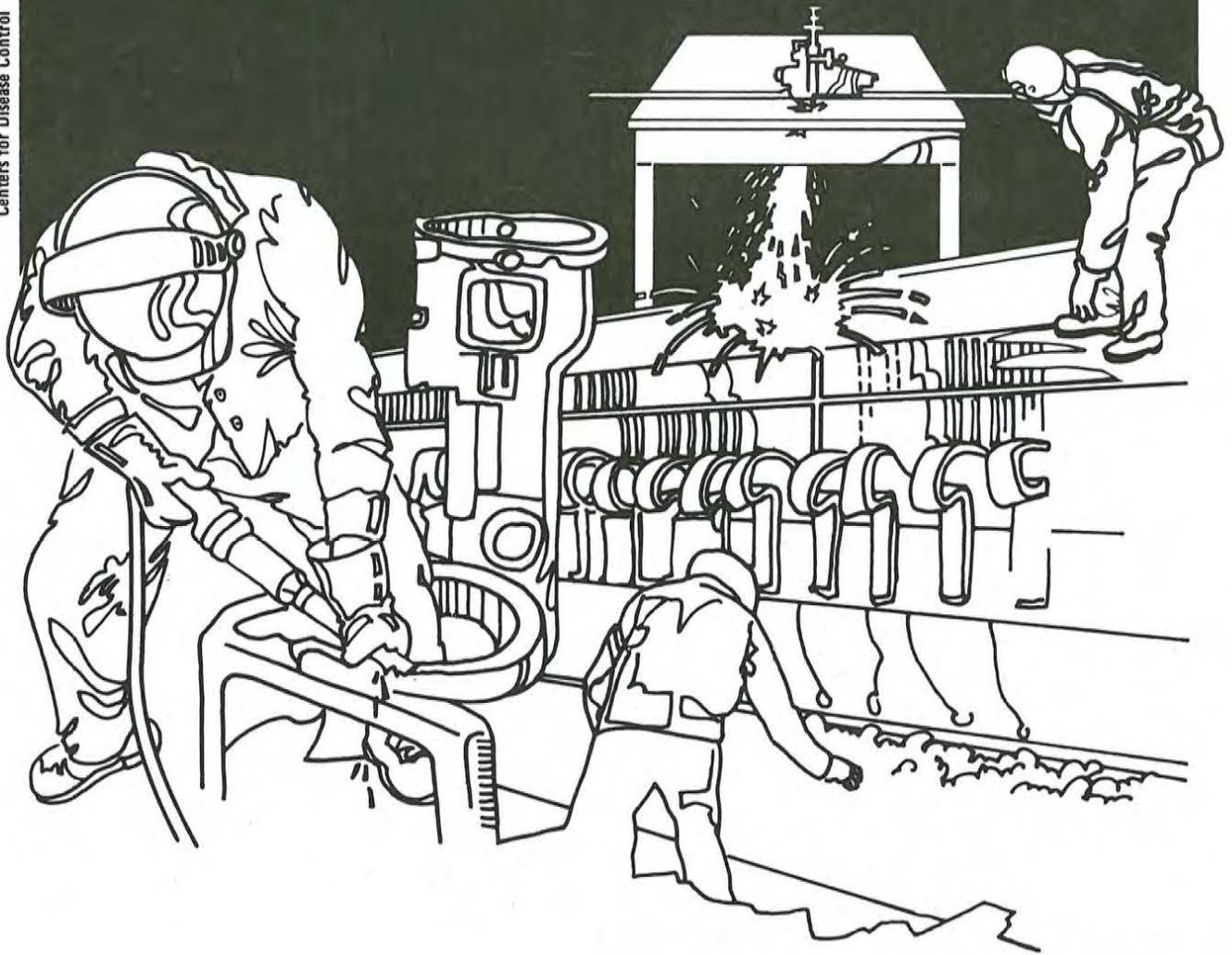


# NIOSH



## Health Hazard Evaluation Report

80-194-796

## PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 699(a)(6), which authorizes the Secretary of Health and Human Services, following a written request from 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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HE 80-194-796  
January 1981  
USS Novamont Inc.  
Florence, Kentucky

NIOSH INVESTIGATORS:  
Raymond L. Ruhe, IH  
Michael T. Donohue, PA

## I. SUMMARY

On July 3, 1980, the National Institute for Occupational Safety and Health (NIOSH) received a health hazard evaluation request from Local 501, International Chemical Workers Union, at USS Novamont, Incorporated, Florence, Kentucky to assess employees exposures to lead fumes and dust in the cracker house during normal operation and during cleaning of the reactor. On September 24 and October 7, 1980, environmental measurements were made to determine employee exposures to lead, and blood samples were analyzed for lead.

We found that four employees, all of whom wore respirators, were exposed to airborne lead in concentrations ranging from 0.06 to 0.38 mg/M<sup>3</sup> (milligrams of substance per cubic meter of air). The OSHA standard is 0.05 mg/M<sup>3</sup> for an 8-hour time-weighted average (TWA). These same four employees had blood levels ranging from 6 to 30 ug Pb/100 ml (micrograms of lead per 100 milliliters of blood). The normal maximum blood lead level is 40 ug Pb/100 ml. All four were within the normal range.

The operators wore NIOSH approved respirators for airborne lead while performing their duties. The fact that a respirator was worn was not taken into consideration in calculating exposures. It can be assumed that exposures of these persons making proper use of prescribed respiratory protection were materially reduced from the calculated values.

Based on the results of this survey, it has been determined that four operators were exposed to levels of inorganic lead above the prescribed health and safety criteria. It appears, however, on the basis of their blood lead levels, that their actual exposures were lower than the measured values. Recommendations to aid in providing a safe and healthful working environment are presented in Section VII of this report.

KEYWORDS: SIC 2821, inorganic lead.

## II. INTRODUCTION

In July, 1980, NIOSH received a request from a representative of Local 501, International Chemical Workers, at USS Novamont, Incorporated, Florence, Kentucky to evaluate employee exposures to lead fumes and dust in the Cracker House, a facility that houses and controls the processes which reclaim monomer from scrap polymer.

Interim Report #1 was distributed on August 27, 1980 reporting the findings to date and the future actions to be taken.

## III. BACKGROUND

Novamont Corporation produces sheet materials from casting acrylic resins. The acrylic resin results from the polymerization of methyl methacrylate, catalyzed by a peroxide-free radical catalyst. The resins contain coloring agents and other modifiers which determine the exact nature of the product.

The manufacturing processes at Novamont generate substantial acrylic scrap material. Novamont has developed a technology for reclaiming monomer by a catalytic cracking process. The process involves the contact of scrap polymer in the form of small chips with molten lead, under an atmosphere of nitrogen. The polymer is broken down into fragments onto the monomer. The vaporized fragments are drawn off into a condenser. The monomer is returned to a liquid in the condenser and stored. When an appropriate amount of monomer is reclaimed, it is sent on to a distillation process. The purified monomer is then reprocessed.

The cracking process is carried out in a large kettle reactor. Novamont has one large and one small cracker. Both units are electrically heated and connected to the condenser.

The product of the cracking consists of a vapor mixture and a black fume. The vapor condenses and mixes with the solid from the fume, eventually clogging the condenser with a black viscous sludge. On an almost monthly basis the condenser must be shut down and cleaned. There are two condensers on the crackers so one can be down without disrupting the process.

Cleaning the condenser consists of removing the top and bottom of the condenser and reaming out the sludge. The pipes conducting the vapor and fume are also reamed.

Another operation which causes worker contact with lead fume is a process in which the agitator in the cracker is raised. This process and the changing of heaters contributes to the total lead exposure.

#### IV. EVALUATION METHODS

Personal breathing zone air samples were taken on all employees working in the Cracker House. These samples were collected on mixed cellulose ester filters using battery powered sampling pumps operated at 1.5 liters per minute and worn by workers through most of their shift. They were analyzed by atomic absorption spectroscopy.

Employees were interviewed regarding work histories and general physical condition. Blood specimens were collected by venipuncture for analysis for lead.

#### V. EVALUATION CRITERIA

##### A. Lead

Although capable of causing acute illness when absorbed in large amounts, lead poisoning is a chronic disease due to much smaller exposures repeated over a period of time. Lead and its inorganic compounds can be absorbed by inhalation of vapors, fumes or dust. Oral intake can also lead to poisoning, but absorption is not as complete. The systems most commonly affected by lead are: The nervous system; the bone marrow (red blood cell producer); the kidneys; and the reproductive system. Lead may adversely affect the normal development of either egg or sperm (mutogen), and it may also damage the unborn child (teratogen). The OSHA standard for lead in workplace air (effective February 1, 1980 for industries such as this) is 0.05 mg/M<sup>3</sup>.

NIOSH recommends that a blood level value of 40 micrograms per 100 milliliters whole blood (40 ug/100 ml blood) be the maximum tolerated occupational blood lead level. The new OSHA lead standard has dictated that by the end of 1984 this will become the level at which a worker must be removed from further lead exposure until his blood lead level has dropped to below 40. The OSHA standard requires companies to remove overexposed workers from sources of excessive lead and transfer them to more protected jobs at no loss of pay or seniority. OSHA's aim is to keep as many workers' blood lead levels as possible below 40 ug/100 ml, the upper limit of blood leads in unexposed individuals.

#### VI. RESULTS AND DISCUSSION

Over the course of the past two and one-half years, OSHA has issued four citations concerning the cracking unit at USS Novamont. These citations concerned the use of improper respirators, poor housekeeping, shoveling lead from the pit, and a poor work clothes laundry system. The NIOSH team reviewed these areas and found proper respirators on site, fair housekeeping and maintenance procedures, excavation via a Bobcat of lead residue in the pit, and continued conflict regarding the laundering of work clothes.

Results of environmental samples collected on September 24 and October 7, 1980 for airborne lead are given in Tables I and II. Four personal and one general area samples were above the recommended environmental criteria. Other lead samples were within safe limits. Table III shows the results of the 8 blood tests. None of these samples exceeded 40 micrograms Pb/100 ml of whole blood (40 ug Pb/100 ml). These results can be attributed to the proper use of prescribed respiratory protection at USS Novamont or to infrequent exposure.

A review of company medical records detailed a pre-employment medical screening process. All new employees are given a physical examination which includes a medical history, audiogram, and a chest x-ray. No annual nor termination physical examination is given to the workers. Workers in the cracking unit operation are given a pulmonary function test, blood lead determination, and a chest x-ray on at least a yearly basis.

Interviews with eight workers performing duties in the cracking unit failed to identify definite work-related health problems in that specific work area.

Based on the environmental sampling results, five of the 14 samples exceeded the OSHA standard of 0.05 mg/M<sup>3</sup>. However, none of the blood lead levels exceeded the OSHA standard of 40 micrograms Pb/100 ml of whole blood, due to the respiratory protection plan or to the infrequent exposures.

## VII. RECOMMENDATIONS

1. Personal protective equipment should be provided for employees exposed to hazards which cannot be adequately abated by engineering controls. At no time should personal protective equipment be substituted for engineering controls when engineering controls are feasible and are in accordance with required practice.
2. Work clothing and shoes should not be taken home by employees. The employer should provide for maintenance and laundering of protective clothing.
3. No eating, drinking, smoking or snuff usage should be allowed in the cracking unit.
4. All areas should be vacuum cleaned instead of swept with brooms.
5. Workers should be given clean clothes at the beginning of each shift. These clothes should be removed and left at the facility at the end of the work tour.
6. Every worker should shower before leaving work. Each worker should be provided with two lockers - one for street clothes, and one for work clothes.
7. All dirty clothes bins should have a tight-fitting cover.

8. Better housekeeping is needed in the cracking unit area.
9. The practice of giving employees annual chest x-rays should be discontinued since there is a small theoretical risk (radiation), with no preventive health benefit in this setting.

VIII. REFERENCES

1. NIOSH Criteria for a Recommended Standard - Occupational Exposure to Inorganic Lead. Revised Criteria-1978, DHEW (NIOSH) Pub. No 78-158.
2. Ruhe, R.L. and M.T. Donohue. Health Hazard Evaluation Determination Report No. HE 79-4, DHEW (NIOSH), Cincinnati, Ohio, 1979.
3. Occupational Disease; A Guide to Their Recognition, DHEW (NIOSH), U.S. Government Printing Office, 1977.
4. Proctor, N.H. and J.P. Hughes. Chemical Hazards of the Workplace. J.B. Lippincott Company, 1978.
5. Ravel, P. Clinical Laboratory Medicine - Clinical Application of Laboratory Data, 3rd Ed., Year Book Medical Publishers, Inc., 1978.

IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

Evaluation Conducted and  
Report Prepared By:

Raymond L. Ruhe  
Industrial Hygienist  
Industrial Hygiene Section

Michael T. Donohue  
Physician Assistant-Certified  
Medical Section

Originating Office:

Hazard Evaluations and Technical  
Assistance Branch  
Division of Surveillance, Hazard  
Evaluations, and Field Studies  
Cincinnati, Ohio

Report Typed By:

Cheryl Maskulka  
Clerk-Typist  
Industrial Hygiene Section

X. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161.

Copies of this report have been sent to:

1. USS Novamont Incorporated, Florence, Kentucky
2. Local 501, International Chemical Workers
3. NIOSH, Region IV
4. OSHA, Region IV

For the purposes of informing the affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees, for a period of 30 calendar days.

TABLE I

Results of Breathing Zone and Area Samples For Lead  
During the Cleaning of the Reactor Inside the Cracker House

USS Novamont, Inc.  
Florence, Kentucky  
HE 80-194

September 24, 1980

<u>Job and/or Location</u>	<u>Sampling Period</u>	<u>Sample Volume (Liters)</u>	<u>Lead mg/M<sup>3</sup>*</u>
Lead Man	9:24-15:31	550	0.06
B-Operator	9:26-14:13	430	0.06
C-Operator	9:26-15:27	541	0.38
A-Operator	9:30-15:38	552	0.03
Cracker House Control Room	9:32-15:30	537	0.01
On Railcar Near Pit (Outside)	9:40-15:30	525	0.18
Cracker House	9:20-15:30	555	0.01
Environmental Criteria (mg/M <sup>3</sup> ), 8-hour TWA		0.05	
Limit of Detection (mg/M <sup>3</sup> )		0.0005	

\*mg/M<sup>3</sup> = Milligrams of substance per cubic meter of air

TABLE II

Results of Breathing Zone and Area Samples for Lead  
in the Cracker House During Normal OperationUSS Novamont, Inc.  
Florence, Kentucky  
HE 80-194

October 7, 1980

<u>Job and/or Location</u>	<u>Sampling Period</u>	<u>Sample Volume (Liters)</u>	<u>Lead mg/M<sup>3</sup>*</u>
Lead Man	9:22-15:20	528	N.D.**
B-Operator	9:24-15:25	541	0.10
C-Operator	9:26-15:27	541	0.01
A-Operator	9:35-15:21	519	0.02
Cracker House Control Room	9:24-15:22	537	N.D.
On Railcar Near Pit (Outside)	9:31-15:31	540	N.D.
Cracker House	9:30-15:25	532	N.D.

---

 Environmental Criteria (mg/M<sup>3</sup>), 8-hour TWA 0.05
Limit of Detection (mg/M<sup>3</sup>) 0.0005\*mg/M<sup>3</sup> = Milligrams of substance per cubic meter of air

\*\*N.D. = Less than detectable limits

TABLE III

## Blood Lead Concentrations

USS Novamont, Inc.  
Florence, Kentucky  
HE 80-194

September 24, 1980

<u>Job Description</u>	<u>Blood Lead Level</u>
A-Operator	17 ug Pb/100 ml*
Lead Man	6 ug Pb/100 ml
C-Operator	21 ug Pb/100 ml
B-Operator	22 ug Pb/100 ml
B-Operator	28 ug Pb/100 ml
C-Operator	30 ug Pb/100 ml
Lead Man	20 ug Pb/100 ml
A-Operator	14 ug Pb/100 ml

---

Normal Blood Lead Level (ug Pb/100 ml)      Below 40 ug Pb/100 ml

\*ug Pb/100 ml = Micrograms of lead per 100 milliliters of whole blood

DEPARTMENT OF HEALTH AND HUMAN SERVICES  
PUBLIC HEALTH SERVICE  
CENTERS FOR DISEASE CONTROL  
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH  
ROBERT A. TAFT LABORATORIES  
4676 COLUMBIA PARKWAY, CINCINNATI, OHIO 45226

---

OFFICIAL BUSINESS  
PENALTY FOR PRIVATE USE. \$300

Third Class Mail



POSTAGE AND FEES PAID  
U.S. DEPARTMENT OF HHS  
HHS 396