U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 74-63-364

CROMWELL PAPER CO.
CHICAGO, ILLINOIS

FEBRUARY 1977

I. TOXICITY DETERMINATION

It has been determined that workers exposed to vapors and mist generated when treating kraft paper with "Ferro-Pak W" or "Ferro-Pak MPI" coating liquids do experience moderate upper respiratory irritation and objectionable odor. Two workers studied had a history of "hay-fever-like" reaction to fumes from "Ferro-Pak MPI" which probably are allergic in nature. Substances sampled and analyzed which might have been released as fume or vapor during this treating processs (morpholine, dicyclohexlamine propylene glycol, butyl benzoate) were not detected in concentrations which could be considered toxic to exposed workers. This determination is based on analysis of atmospheric samples collected, the toxicological properties of substances contained in the coating mixtures, the limited duration and frequency for employee exposure, the results of employee physical examinations, pulmonary function tests and detailed medical interviews and personal examinations. The low order toxicity of substances contained in the coating liquids studied suggest that long term adverse health effects are unlikely to be experienced by exposed workers. Pulmonary function tests did not suggest long term effects on pulmonary function but numbers were too small to draw conclusions.

Recommendations for improved local exhaust ventilation, and use of proper personal protective equipment have been suggested to alleviate problems for those workers who may be sensitive to vapor emissions from "Ferro-Pak W" and "Ferro-Pak MPI".

II. DISTRIBUTION AND AVAILABILITY OF THE DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information 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. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office at the Cincinnati address.

Copies have been sent to:

a) Cromwell Paper Co., Chicago, Illinois
b) Authorized Representative of Employees
c) U.S. Department of Labor - Region V
d) NIOSH Regional Consultant for OSH - Region V

For the purpose of informing the approximately 29 "affected employees", the employer will promptly "post" the Determination Report in prominent places near where the affected employees work for a period of 30 calendar days.

III. INTRODUCTION

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

The National Institute for Occupational Safety and Health (NIOSH) received such a request from the Plant Manager for Cromwell Paper Co., Chicago, Illinois. The employer's original request was concerned with use of "Ferro-Pak MPI" coating material. The request alleged that one worker had complained of nausea whenever this coating material was used in the treating machine. This worker had requested reassignment when the process was run. Because of the similarity in name, the employer later requested that the Hazard Evaluation also include "Ferro-Pak W" in the investigation.

IV. HEALTH HAZARD EVALUATION

A. Plant Process - Conditions of Use

The area of interest at the Cromwell Paper Co. was the treating division. This division applies special coating materials to kraft paper. The coated or treated paper serves as a corrosion inhibitor wrapping material for metal parts. Depending on customer specification, different types of coating materials are applied. Paper treatment with oil, wax or Ferro-Pak W, MPI or B was scheduled according to customer demand. The Ferro-Pak W is only run for 1 or 2 consecutive shifts once or twice monthly. "Ferro-Pak MPI is run for a similar period but only once every several months.

The plant operates two 8-hour shifts per day, five days per week and employs approximately 170 production personnel. Twenty nine people work in the treating division, as an evenly split work force to cover the two work shifts. Job classifications include Treaters and Treater Helpers, Boiler Tenders, Crate Makers and Carpenters, Sheeters, Cutters and Cutter Helpers, Wrappers, Trimmers, Rewinders and Floormen.

Boiler tenders, crate makers and carpenters work in the basement where the chemicals for the coating materials are mixed, lab tested and held at operating temperature (apx 120^{o}F)in vats. When needed, the coating material is pumped upstairs to the treating machine where it flows into the bottom of a holding tank which is about eight feet long, seven feet wide and three feet high. The surface of the liquid is kept approximately 6 to 8 inches above the bottom of the tank during the treating process. Plant representatives stated that lines leading from the supply vats to the treating machine

are steamed out after use of a particular treatment and that all treatments were "compatible" with no special drying time required for the paper.

The kraft paper is unrolled and fed between rollers located above the holding tank, which transfer the treating liquid to the surface of the paper. The treated paper is collected on a metered take-up roll. Following the treating process, the paper roll is removed and run through several different machines to cut it to the sizes desired.

A large canopy exhaust hood was mounted over the treating machine. The open face of the hood was 8 feet wide, 11 feet long, and positioned 21 inches above the treating machine. The hood was also equipped with canvas side curtains to reduce cross drafts.

B. Evaluation Design

1. Environmental

An initial survey of the plant was conducted by NIOSH investigators on June 6, 1974. A previous review of the literature concerning the chemical substances used in mixing Ferro-Pak W and Ferro Pak MPI, showed that decomposition of the treating liquid might release nitrogen dioxide (NO_2) vapors. Air sample tests using, length of stain, NO_2 detector tubes positioned near the treating machine did not indicate the presence of NO_2 vapors. However, a visible mist was noticeable and the ventilation system did not appear to be drawing any of the mist up through the canopy hood. Smoke tube tests demonstrated that exhaust capture velocities were much too low to insure efficient operation and prevent dispersion of the mist into the work room air. After further inspection of the ventilation system, it was discovered that the exhaust fan blade had been removed for maintenance. A new blade was installed, but a subsequent check indicated that air flow exhaust volume was still not sufficient to fully capture all contaminated air.

Atmospheric area samples and personal breathing zone samples were collected near the treating machine during treatment with Ferro-Pak W and Ferro-Pak MPI. Interviews were conducted with four of the exposed employees. One of the employees had been transferred as a result of reported breathing difficulties (shortness of breath) when exposed to MPI vapors. The other three employees had no complaints.

Based on information provided by the plant manager concerning the contents of the Ferro-Pak W and MPI mixture, an attempt was made to determine if any of the substances contained in the mixture could be detected in the atmospheric samples collected during the initial survey. Although no detectable quantities were found in the samples, the possibility of employee irritation

or sensitization to the substances was further studied by obtaining additional employee interviews.

Seventeen additional employees interviews were obtained by NIOSH investigators on October 8, 1974. A review of the employee interview responses, indicated that further medical evaluation and environmental studies were needed to confirm the degree of the apparent problem. A medical investigator was assigned to assist in this follow up evaluation.

Because the analysis of the atmospheric samples collected during the initial survey failed to detect the presence of any known or suspected toxic substances that were contained in Ferro-Pac W or MPI, bulk samples were submitted to the Physical and Chemical Analysis Branch in Cincinnati, Ohio. A bulk sample of Ferro-Pak MPI was heated to the operating temperature used in the paper treating process to drive off and identify volatile substances which might be the cause of worker irritation.

2. Medical

On June 3-4, 1975, a preliminary visit was made by the NIOSH medical investigator to obtain employee medical histories. A subsequent medical and environmental evaluation was initiated July 22, 1975.

Evaluation consisted of a questionnaire and limited physical examination to obtain historical data about the individual worker's health and work history; and pre- and post-shift pulmonary function tests with associated questionnaires (Appendix A) for acute symptoms. The pulmonary function testing, physical examination, and questionnaires were done over a shift when Ferro-Pak MPI was being run and environmental samples were being taken. All workers from both shifts were to be included.

In all 29 workers were seen by either the Industrial Hygienist on his initial visit, by the doctor on either visit, or on more than one visit. In this group there were 26 men and 3 women. Their average age was 47.0 years (21-70) and average length of service was 15.1 years (1.5-39.5). Details by position and type of evaluation are included in Table I. Twelve (12) workers had pulmonary function testing pre and post shift on a shift when Ferro-Pak MPI was being run. Of these 12 there were 8 white males (4 cigarette smokers, 1 ex-smoker, and 3 non-smokers); 3 black males (2 smokers and 1 ex-smoker); and one non-smoking white female.

Besides the questionnaires and pulmonary function testing, the OSHA Log for the first half of 1975 was reviewed, and private physicians were contacted concerning medical problems reportedly work related.

Because there were a few complaints concerning the Ferro-Pak W, a return visit was made on June 15, 1976 to accomplish pre-and post-shift pulmonary function tests on the treating machine operators and the treating machine helper over a shift when Ferro-Pa W was being run. Because of a non-work related injury to one of the treating machine operators, the process only ran for one shift so only two men were tested.

1. Environmental

The environmental evaluation of employee exposure to vapors released from Ferro-Pak W and Ferro-Pak MPI was difficult due to lack of sampling procedures and analytical methods needed to accurately identify and determine actual airborne concentrations. During the initial survey, plant personnel ran the treating machine using Ferro-Pak W and then changed over to Ferro-Pak MPI to provide the NIOSH industrial hygienist the opportunity to collect atmospheric samples during both treating processes. Two area and 3 personal samples were taken for Ferro-Pak MPI, and 4 area and 2 personal samples were taken for Ferro-Pak W. Airborne vapors were collected by drawing air samples through glass tubes containing activated charcoal, using battery operated low flow sampling pumps. Air flow through the charcoal tubes was approximately 50 cubic centimeters (cc) per minute. All samples were analyzed for morpholine, dicyclohexlamine, and propylene glycol using a gas chromatograph. The presence of these substances in air near the treating machine were to serve as quantitative indicators for possible worker exposure.

No detectible quantities of morpholine, dicyclohexlamine, or propylene glycol were found in any of the charcoal tube samples. In the laboratory, charcoal tube vapor samples were taken directly above open jars of Ferro-Pak MPI and W liquid in order to saturate the charcoal tubes with detectible vapor concentrations. Nothing was detected or identified in any of the saturated samples.

Since methods to analyze atmospheric samples collected on the initial survey had given negative results, a bulk sample of Ferro-Pak MPI was heated to treating process temperature (Apx. 140°F) in an attempt to identify any volatile substance which could be collected and analyzed. Laboratory personnel found that butyl benzoate vapor was released at this elevated temperature and was accompanied by an objectionable odor. Although the physiological properties of butyl benzoate would indicate a low order of toxicity, it was decided that subsequent atmospheric samples taken at the plant would be analyzed for this substance and used as an indicator of atmospheric vapor concentration to help evaluate worker exposure.

On July 22, 1975, thirty four atmospheric samples were collected using charcoal tubes. The sampling was accomplished by NIOSH industrial hygienists during the first and second shifts. Workers exposed were given pulmonary function tests and medical examinations by the NIOSH physician. Personal breathing zone samples were collected from 18 workers wearing portable air sampling pumps which were drawing air samples through the charcoal tubes at a sampling rate of approximately 100 cc per minute for three hours. Ten charcoal tube area samples were collected in the vicinity of the treatment tank processing Ferro-Pak MPI. These were sampled at similar rates and times as the personal samples, except for three which had larger sampling rates and longer times. (Apx. 500 cc per minute for 4-5 hours). Six blank samples and four bulk samples were submitted with the atmospheric samples to aid in analysis. Vapors adsorbed on the activated charcoal were desorbed with carbon disulfide and analyzed with a gas chromotograph.

2. Medical

Pulmonary function tests were performed on a Vitalograph bellows-type spirometer. The best curve from five tries was utilized for each set of tests, and a worker's best effort from all tests was considered his baseline function. Forced Vital Capacity (FVC), Forced Expiratory Volume at 1 second (FEV_1), Forced Expiratory Flow 0.2 to 1.2 liters ($FEF_{02-1.2}$), and Mean Maximum Expiratory Flow between 25% and 75% of FVC (MMF_{25-75}) were measured.

Predicted values for pulmonary function test were calculated using the formulae of Morris[1] for white workers and Lapp[2] for black workers. This adjusts for differences in height, age, sex and race.

Due to language difficulties encountered, a Polish speaking public health nurse from the Chicago Health Department assisted with explanations and questioning at the beginning of the first shift when pulmonary function testing was done to test for effects of Ferro-Pak MPI.

D. Evaluation Criteria

1. MPI Coating Mixture: This mixture contains an inorganic oxidizing agent ($NaNO_2$), Sodium Benzoate, Butyl Benzoate, Propylene Glycol and Polyethylene Glycol, all of which may be mild primary irritants:[3,4] and Benotriazole which has caused some central nervous system depression with flacid paralysis in animals.[5] Sensitization would appear unlikely.[6]

2. W Coating Mixture: This mixture contains Propylene Glycol, Polyethylene Glycol which may be mild irritants;[3] Caprylic Acid, a relatively mild irritant with an unpleasant odor detectable at 0.008 ppm;[4] and Di-cyclohexylamine[7] and Morpholine[8] which are irritants to the skin, mucous membranes and respiratory tract and may cause sensitization. They may cause the body to release histamine and cause asthmatic attacks. Di-cyclohexylamine is an alkaline corrosive. Systemic effects from these two amines can include headache, nausea, faintness, and anxiety.

The American Conference of Governmental Hygienists (ACGIH) has set a Threshold Limit Value (TLV) for morpholine at 20 parts per million (PPM) or 70 mg/M^3, time-weighted average (TWA) concentration for an eight hour work day or 40-hour work week. Atmospheric concentrations below 20 PPM-TWA should be low enough to prevent irritation and harmful effects on the eyes and vision. Concentrated morpholine readily penetrates the skin thereby contributing to the overall exposure for the worker.[11] No hygiene standard has been established for the other substances contained in the two mixtures.

3. Pulmonary Function Testing: The FVC measures the total volume of air that can be moved in and out of the lungs. It is decreased in conditions which interfere with chest motion, the elasticity of the lungs (as fibrosis) or with the ability of the lungs to empty themselves (as emphysema). It is measured in liters.

The other three function tests are measures of the speed with which the lungs can get air out. The FEV_1 has been in use for the longest time, but it is felt to be somewhat effort dependent. To avoid this the $FEF_{0.2-1.2}$ has been proposed to give a measure of the steep portion of the flow curve and is felt to be less effort dependent. The MMF_{25-75} also avoids the initial effort dependent part of the flow curve and includes portions of the curve more dependent on the patency of small airways.

Following general practice,[9] 80% of the predicted value has been used as the lower limit of normal for FVC and FEV. As the $FEF_{0.2-1.2}$ and MMF_{25-75} are less well established test, the suggestion of Sobol and Weinheimer[10] is followed and only those values falling below the 95% Confidence Limit of the formula will be considered abnormal. (95% Confidence Limits equals $\pm$ 1.96 times the standard error of the estimate - S.S.E.) Also any drop in percent of predicted of greater than 10 percentage points over shift in FVC or FEV_1 was considered clinically significant. In evaluating changes in $FEF_{0.2-1.2}$ and MMF_{25-75} changes in 20 percentage points or less was not considered significant. To be considered significant both must <u>drop</u> at least 10 percentage points.

E. Evaluation Results and Discussion

1. Initial Observations

At the time of the initial walk through survey by the NIOSH physician a simple oil coating was being run on the treating machine. The odor of the hot oil was detectable throughout the Treating Division but not into the adjacent Laminating Division. The NIOSH physician did not find this irritating, nor were the fumes in the basement irritating. At the time the smoky haze from the vats in the basement was drifting into the area where the crater worked.

At the time the Ferro-Pak MPI was being run the NIOSH physician noted the odor of an organic ester originating from the treatment machine. He noted slight eye irritation at the first exposure, although this soon passed. By the end of the shift the odor had permeated the whole of the Treatment Division and the NIOSH phyician noted slight nasal irritation. The basement contained considerably less smoke than on the previous visit but the smoke that was present caused slight nasal irritation.

2. Results of Environmental Sampling

Atmospheric vapor sampling conducted during the initial survey revealed no detectable levels had been collected on any of the 13 charcoal tubes analyzed for morpholine, dicyclohexlamine and propylene glycol.

Table V summarizes the results of sampling and analyses for atmospheric concentrations of butyl benzoate. Highest levels measured were for those area samples taken near the side of the treating machine tank and in the mixing room. The highest personal exposure noted was 1.6/mg/M^3 butyl benzoate collected over a three hour sampling duration. This level equals approximately 0.22 ppm under normal atmospheric condition (760 mm Hg & 25°C). As previously discussed under "Evaluation Methods", butyl benzoate was sampled as a tracer substance to obtain relative exposure data on total vapor concentration. It is possible that vapors not detectable through atmospheric sampling may exist at levels which could be objectionable or irritating for some exposed workers. However, the relative low levels of butyl benzoate detected, indicate that vapors of Ferro-Pak MPI released from the treating machine probably are not of sufficient concentration to present a toxic hazard.

3. Results of Medical Studies

Table II lists health problems considered work related by the workers. The non-directed question which was asked by both the Industrial Hygienist and by the Doctor queried "Do you have any health problems at work or you feel might be related to your work?" The most salient complaints involved the smoke and bad odor ("W" in particular) and the irritation of the throat. Considering both spontaneous complaints and systematic questioning 6 out of 29 workers had noted each of these complaints. There were two complaints of note. Two workers had a hay fever-like reaction to "MPI" in which their noses and sinuses became congested and in which they sometimes had difficulty breathing. One worker complained of wheezing when exposed to the "W".

Table III gives a breakdown of the workers opinion of their own general health by general job classifications. As with the health problems listed in Table II, there was no decernable trend towards any particular job area.

Three workers out of 12 complained of throat irritation both at the beginning of and at the end of the shift when MPI was being run. One of these three worked on the treating machine and showed slight redness in his throat on physical examination. The other two workers did not show abnormality in their throats on examination. However, one of them developed "a little" shortness of breath over the shift in addition to the irritation. Three other workers out of the 12 developed coughs over the shift. One, who worked on the treating machine, also developed a stuffy nose during the shift. On examination he had had some fine rales and altered breath sounds at the beginning of the shift which had improved by the end of the shift. Pulmonary function testing caused him to cough. One of the other workers who developed a cough over the shift worked in the basement and had complained of some tightness in his chest at the start of the shift.

Of the two workers seen over the shift when Ferro-Pak W was being run, one had some cough, chest tightness and a runny nose at the start of the shift. These improved over the shift, but the cough persisted. His major complaint concerned the bad odor of the treatment mixture. The other worker did develop some eye irritation and cough over shift, but did not show any physical signs of irritation.

Table IV gives the means of Percent of Predicted for each of the Pulmonary Function tests. Also the mean of the change over shift when Ferro-Pak MPI was being run is listed. Because of the small numbers, no statistical significance could be attached to differences between various job categories or between current cigarette smokers and non-cigarette smokers. However, the mean for each function for the smokers as a group was always lower than the mean for the non-smokers. Although the means of percent predicted for FEV_1 and MMF_{25-75} showed statistically significant drops over the shift, it was felt this was not significant clinically because the change was small (one third of what would be considered significant in an individual), the small number of workers tested, the lack of associated symptomatology and the effort dependancy of the tests.

Both workers tested over a shift when Ferro-Pak W was being run showed some improvement in their pulmonary functioning.

Six cases deserve discussion.

(1) Of the two cases complaining of hay fever-like reactions to MPI, neither worked on the treating machine. One was not available for pulmonary function testing or physical examination. However, contact with his private physician confirmed that he did repeatedly have trouble with nasal congestion, that it cleared well on antihistamines, and that his chest was clear at the time he had these complaints. The union representative mentioned that the last time MPI was run, this worker used an organic vapor cartridge respirator with alleviation of the problem.

The other case did receive pulmonary function testing. Although he did complain of some slight shortness of breath developing over shift, his pulmonary functions showed no appreciable change over shift.

These two cases appear to represent a nasal sensitivity to MPI.

(2) The one worker who complained of wheezing caused by "W" mentioned this only to the Industrial Hygienist on his initial visit, but failed to mention it either spontaneously or on systematic questioning to the doctor. He was not available for pulmonary function testing. The worker was seen once by a private physician for wheezing and was treated with expectorants and bronchodilators at that time. This worker was a smoker and gave a history of chronic cough. Although this worker may have had a pulmonary condition aggravated by the fumes from Ferro-Pak W, his history does not suggest that it is a sensitivity reaction. He did not work on the treating machine.

(3) The treating machine operator who had abnormal sounds in his chest which improved over shift did complain that Ferro-Pak, particularly the W irritated his throat and gave some chest discomfort. Over this particular shift he developed a stuffy nose and a cough. Pulmonary functions were in the low normal range for the most part, and did not decrease excessively over the shift. He was a smoker. He evidently does get irritation. Whether the W causes a sensitivity reaction could only be judged if he were seen at the time W was being run.

(4) One worker on the treating machine showed an abnormally low FEV_1. He was a confirmed smoker and has had non-job related chest complaints. Although his pulmonary functions dropped over the shift, it was not sufficient to be considered clinically significant. He did not develop any symptoms over the shift nor did he have any physical findings to suggest ill effects from the day's work.

(5) One worker, not working on the treating machine showed what would be considered a clinically significant drop in FVC and FEV_1 over the shift. The FEF and MMF were essentially unchanged. This was accompanied by a sore throat both pre- and post-shift and a history of becoming fatigued when working hard. There were no physical findings. This probably represents fatigue rather than a change in pulmonary function due to exposure to a noxious atmosphere. Even post-shift function tests were above the predicted values.

F. Conclusions

(1) Two workers have a "hay fever-like" reaction to the fumes from Ferro-Pak MPI, probably of an allergic nature. A respirator with organic vapor cartridge has proved adequate protection for one of the workers. This opinion is based primarily on history but includes confirmatory information from a private physician for one case.

(2) Both Ferro-Paks, particularly the Ferro-Pak MPI, are irritating when inhaled. This is based on personal observation, history from the workers, and some increased symptomatology over the shift. The upper respiratory tract is primarily involved. By history and by review of ingredients, Ferro-Pak W has an objectionable odor.

(3) One worker may have pulmonary problems with Ferro-Pak W. This is based on history alone and lacks confirmation.

(4) The low order of toxicity of substances contained in Ferro-Pak W and MPI and the fact that butyl benzoate vapor was the only substance detected in atmospheric samples collected near the treating machine, suggest that environmental exposures do not present a serious health hazard for exposed employees. Pulmonary function testing also suggests there is no serious hazard.

G. Recommendations

(1) Ventilation should be improved, particularly exhaust ventilation from the treating machine and the ventilation in the basement. The overhead canopy exhaust hood over the treating machine is not an efficient design for ventilation of large cross sectional area.

In order to provide the recommended 100 feet per minute capture velocity around the perimeter of the treating machine, the 8' x 11' canopy hood presently installed would require an exhaust volume of approximately 3000 cubic feet per minute.[12] A more efficient design utilizing slotted hoods or increased enclosures to reduce cross drafts would improve air quality in the treating department.

(2) Although ventilation improvement will probably alleviate any problems for most of the workers, the two workers with hay fever-like reactions to MPI may have to use appropriate respirators during MPI runs or be assigned outside the area. Workers who desire to use respirators should be instructed in the proper techniques to insure a good face fit.

(3) Although the Ferro-Pak W did not affect the pulmonary functions of the two workers tested, the third worker on the treatment machine was not evaluated. If he should have breathing problems felt to be due to Ferro-Pak W, it would be desirable to test him before and after a shift when the W is being run. In view of the lack of change in the other workers tested, this would appear to be an individual problem.

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VI. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By:

Stanley A. Salisbury
Asst. Regional Industrial Hygienist
Region V, NIOSH
Chicago, Illinois

Theodore W. Thoburn, M.D.
Medical Officer
Medical Services Section, HETAB
Cincinnati, Ohio

Originating Office:

Jerome P. Flesch, Acting Chief
Hazard Evaluation and Technical
Assistance Branch
Cincinnati, Ohio

Acknowledgments

Environmental Evaluation:

Richard S. Kramkowski
Regional Consultant
Region V, NIOSH
Chicago, Illinois

Charles H. Borcherding
Regional Industrial Hygienist
Region V, NIOSH
Chicago, Illinois

Thomas F. Bloom
Asst. Regional Industrial Hygienist
Region V, NIOSH
Chicago, Illinois

Medical Evaluation:

Roma Brostowski
Public Health Nurse
Chicago Health Department
Chicago, Illinois

G. Robert Schutte
Medical Technician
Medical Services Section, Support
Services Branch
Cincinnati, Ohio

Laboratory Analysis:

Staff, Physical and Chemical Analysis
Branch, NIOSH, Cincinnati, Ohio
Richard Kupel
Robert Larkin
John Holtz
Robert W. Kurimo
C.E. Neumeister

TABLE I

CHARACTERIZATION OF WORK FORCE INCLUDED IN THE SAMPLE

Cromwell Paper Company
Chicago, Illinois
June 4 and July 22, 1975

POSITION	INDUSTRIAL HYGIENIST'S INITIAL SURVEY	DETAILED MEDICAL QUESTIONNAIRE	PULMONARY FUNCTION TESTING AND PHYSICAL EXAMINATION	TOTAL
Treaters and Treater Helper	2	3	3	3
Boiler Tenders, Crate Makers and Carpenter	0	3	3	3
Sheeters, Cutters and Cutter Helpers	9	12	6	14
Wrappers, Trimmers, Rewind, Floormen, and Others	9	2	0	9
TOTALS	20	20	12	29

TABLE II

ILLNESS THOUGHT TO BE WORK RELATED BY WORKERS, CURRENT AND PAST

Cromwell Paper Company
Chicago, Illinois

June 4 and July 22, 1975

COMPLAINT	NUMBER GIVING RESPONSE ON NON-DIRECTED QUESTIONING*	ADDITIONAL NUMBERS GIVING RESPONSE ON SYSTEMATIC QUESTIONING**
None	14	2 less
Smoke or Bad Smell	4	2
Throat Irritation or Cough	4	2
Headache or Light Headedness	2	1
Hay fever-like reaction to "MPI"	2	0
Wheezing with "W"	1	(Complaint made to Industrial Hygienist, never mentioned to Doctor.)
Shortness of Breath or Chest Discomfort	0	3
Skin Problems	0	1
Injury, Strains, etc.	5	2

* Twenty-nine workers done by Doctor and/or Industrial Hygienist

**Twenty of the twenty-nine workers done by the Doctor

TABLE III

WORKERS' ASSESSMENT OF THEIR GENERAL HEALTH

Cromwell Paper Company
Chicago, Illinois

June 4 and July 22, 1975

POSITION	GOOD	FAIR	POOR	TOTAL
Treaters and Treater Helper	1	2	0	3
Boiler Tenders, Crate Makers and Carpenter	2	1	0	3
Sheeters, Cutters, and Cutter Helpers	6	4	0	10
Wrappers, Trimmers, Rewind Floormen and Others	2	2	0	4
TOTALS	11	9	0	20

TABLE IV

PULMONARY FUNCTION TESTS - MEAN OF PERCENT PREDICTED

Cromwell Paper Company
Chicago, Illinois

June 4 and July 22, 1975

	FVC	FEV_1	$FEF_{0.2-1.2}$	MMF_{25-75}
Mean of % Predicted (n=12)	102.8	109.9	117.2	111.9
95% Confidence Limits	± 12.0	± 14.7	± 25.0	± 24.1
Mean of Change in % of Predicted Over Shift (Post - Pre) (Ferro-Pak MPI)	-2.2	-3.5	-8.7	-5.3
95% Confidence Limits	±3.1	±2.5	±18.2	±4.9

Note: None of the above changes are considered to be clinical significant.

TABLE V

Environmental Sampling for Butyl Benzoate
Cromwell Paper Company
Chicago Illinois
June 4 and July 22, 1975

Sample	Type	Concentration (mg/M^3)	Location
C1*	Area	0.14	Work bench south of Tank
C2*	Area	6.06	Side of Tank
C3*	Area	0.64	25 ft. north of Tank
C4	Personal	1.61	Treating Machine Operator
C5	Personal	0.85	Treating Machine Helper
C6	Blank	ND	-
C7	Blank	ND	-
C8	Personal	0.03	Scoring Operator
C9	Personal	< 0.13	Carpenter
C10	Personal	0.04	Cutter Helper
C11	Personal	0.04	Sheeter
C12	Personal	0.04	Chemical Mixer/Boiler Tender
C13*	Area	0.46	Work bench south of Tank
C14*	Area	9.37	Side of Tank
C15*	Area	0.55	25 ft. north of Tank
C16	Personal	0.94	Treating Machine Operator
C17	Personal	1.42	Treating Machine Helper
C18	Blank	ND	-
C19	Blank	ND	-
C20	Personal	<0.03	Scoring Operator
C21	Personal	<0.03	Cutter Helper
C22	Personal	<0.24	Sheeter
C23	Personal	<0.03	Chemical Mixer/Boiler Tender
C24	Area	0.17	Basement-Mixer Room-Door Area
C25	Personal	<0.03	Cutter Helper
C26	Personal	0.38	Treating Machine Operator
C27	Personal	<0.02	Boiler Tender/Crate Maker
C28	Personal	0.66	Treating Machine Helper
C29	Personal	<0.03	Cutter Operator
C30*	Area	0.19	Work bench south of Tank
C31*	Area	0.63	Side of Tank
C32*	Area	0.42	25 ft. north of Tank
C33	Blank	ND	-
C34	Blank	ND	-

< = Less than
ND = None Detected
* Approximately 3 hour samples collected at 500 cc/min.
All other samples collected at 100 cc/min for 3 hours.

(APPENDIX A)

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
522 POST OFFICE BUILDING
CINCINNATI, OHIO 45202

CONSENT

I voluntarily agree to participate in a study at the Cromwell Paper Company, Chicago, Illinois, conducted by the Public Health Service, to evaluate possible health effects from work with Ferro-Pak "W" and Ferro-Pak "MPI" volatile corrosion inhibitor wrapping paper. I understand that the medical evaluation will consist of my answering questions about my health and a limited physical examination of head, chest, and skin, and measurement of my height. If deemed necessary by the physician, a test of lung functioning may also be done.

I understand that my participation in this study is voluntary and that all information obtained will be considered confidential in accordance with U.S. Public Health Service Regulation (42 CFR Part 1). The information will be utilized statistically, but I will not be identified as an individual without my expressed consent. I am free to withdraw from the study at any time.

DATE_____ SIGNATURE_____

AUTHORITY TO GIVE MEDICAL REPORT

In addition to notifying me whether my tests are normal or need further study, I agree to allow the Public Health Service to inform:

A. My Personal Physician Yes___ No___

Name_____

Address_____ _____
Signature

City_____

B. Plant Physician Yes___ No___

Address_____ _____
Signature

City_____

of any significant results of this study.

Information obtained in this study will be kept confidential in accordance with U.S. Public Health Service Regulation (42 CFR Part 1).

2/21/75

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

DATE_____

1. NAME_____
Last First Middle

2. CURRENT ADDRESS: (Number, Street or Rural Route, City or Town, County, State, Zip Code)

_____

_____

_____

3. PHONE NUMBER_____ 4. SOCIAL SECURITY NO._____

5. BIRTHDAY (Month, Day, Year)_____

6. AGE LAST BIRTHDAY_____ 7. SEX: ___Male ___Female

8. RACE: ___White ___Black ___Other

JOB HISTORY

9. DEPARTMENT_____ 10. SHIFT_____

11. JOB TITLE_____

12. CURRENT ASSIGNMENT_____

13. USUAL ASSIGNMENT_____

14. YEARS WITH COMPANY _____Years _____Months

PAST JOBS (back to time of being a full time student)

	INDUSTRY & LOCATION	YRS OF EMPLOY. From	To	SPECIFIC JOB	ANY MEDICAL PROBLEM RESULTING FROM THE
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

EMPLOYEE'S OWN HEALTH APPRAISAL

15. HOW WOULD YOU DESCRIBE YOUR GENERAL HEALTH:

_____Good _____Fair _____Poor

16. DO YOU HAVE ANY HEALTH PROBLEMS WHICH YOU BELIEVE ARE RELATED TO YOUR WORK?

If so, describe. _____

_____

_____

_____

_____

17. DO YOU HAVE ANY OTHER HEALTH PROBLEMS?

If so, describe. _____

_____

_____

_____

SMOKING HISTORY

18. DO YOU NOW SMOKE CIGARETTES? ____YES ____NO

    IF "YES" GO RIGHT TO QUESTION 34.

19. HAVE YOU EVER SMOKED CIGARETTES? ____YES ____NO ____NA

    IF "NO" GO RIGHT TO QUESTION 39.

20. HAVE YOU SMOKED AT LEAST AS MANY AS FIVE PACKS OF CIGARETTES, THAT IS, 100 CIGARETTES DURING YOUR ENTIRE LIFE? ____YES ____NO ____NA

    IF "YES" GO ON TO QUESTION 34.

    IF "NO" GO TO QUESTION 39.

21. HOW OLD WERE YOU WHEN YOU STARTED SMOKING CIGARETTES REGULARLY?

    _____
    Age in years

    IF AN EX-CIGARETTE SMOKER, ASK:

22. HOW OLD WERE YOU WHEN YOU LAST GAVE UP SMOKING CIGARETTES?

    _____
    Age in years

23. DURING THE YEARS YOU WERE SMOKING CIGARETTES, DID YOU EVER QUIT FOR A YEAR OR MORE? ____YES ____NO

24. IF "YES" HOW MANY YEARS? _____YEARS

25. HOW MUCH DO/DID YOU SMOKE ON THE AVERAGE? (1 pack = 20 cigarettes) (Use "did" only for ex-smokers)

    _____
    Cigarettes per day

26. DO YOU OR DID YOU SMOKE CIGARS? ____ YES ____NO

    A PIPE? ____ YES ____ NO

27. IF "YES" HOW MANY YEARS? _____YEARS

28. ARE YOU STILL SMOKING A PIPE OR CIGARS? ____ YES ____ NO

SYSTEMATIC C LONING

HAVE YOU HAD ANY OF THE FOLLOWING PROBLEMS

PROBLEM	NO	RELATED TO WHAT	IF RELATED TO WORK: HOW OFTEN EXPOSED	DURATION OF EXPOSURE	DURATION OF SYMPTOMS	DOES IT ALWAYS CAUSE SYMPTOMS?	ANY PROBLEM TODAY
30. THROAT IRRITATION							
31. EYE IRRITATION							
32. NASAL IRRITATION							
33. NASAL STUFFINESS							
34. SINUS PROBLEMS							
35. PROBLEMS WITH TASTE OR SMELL							
36. HEADACHES							
37. DIZZINESS OR LIGHTHEADEDNESS							
38. COUGH OR PHLEGM PRODUCTION							
39. CHEST DISCOMFORT							
40. WHEEZING OR WHISTLING							
41. SHORTNESS OF BREATH							
42. HEART TROUBLE							
43. HIGH BLOOD PRESSURE							

TIONNAIRE C

SYSTEMATIC [illegible]TIONING

HAVE YOU HAD ANY OF THE FOLLOWING PROBLEMS

PROBLEM	NO	RELATED TO WHAT	IF RELATED TO WORK: HOW OFTEN EXPOSED	DURATION OF EXPOSURE	DURATION OF SYMPTOMS	DOES IT ALWAYS CAUSE SYMPTOMS?	ANY PROBLEMS TODAY
44. ANEMIA, PALENESS OR BLUENESS							
45. SICK TO STOMACH NAUSEA OR VOMITING							
46. OTHER STOMACH PROBLEMS							
47. PAINFUL URINATION							
48. KIDNEY PROBLEMS							
49. ACNE OR EXCESSIVELY OILY SKIN							
50. DERMATITIS OR OTHER SKIN PROBLEMS							
51. FEVERS							
52. FATIGUE MUSCLE WEAKNESS							
53. WEIGHT LOSS							
54. ANXIETY, JUMPINESS							
55. OTHER							

Additional Notes: _____

DO YOU HAVE ANY PRESENT PROBLEMS FOR WHICH YOU ARE SEEING A DOCTOR?

56. HEART PROBLEMS ___ YES ___ NO

57. LUNG PROBLEMS ___ YES ___ NO

58. STOMACH PROBLEMS ___ YES ___ NO

59. KIDNEY PROBLEMS ___ YES ___ NO

60. SKIN PROBLEMS ___ YES ___ NO

61. OTHER PROBLEMS--SPECIFY_____ ___ YES ___ NO

62. ARE YOU PRESENTLY TAKING ANY MEDICATION? ___ YES ___ NO

63. IF "YES" - WHAT MEDICATION?_____

DO YOU HAVE OR HAVE YOU HAD IN THE PAST ANY ALLERGIES?

	NONE	PRESENT	PAST	IF PRESENT OR PAST DID YOU HAVE THIS BEFORE WORKING IN THE PLANT?	
64. HAY FEVER?	___	___	___	___ YES	___ NO
65. DUST?	___	___	___	___ YES	___ NO
66. POLLEN?	___	___	___	___ YES	___ NO
67. CHEMICALS?	___	___	___	___ YES	___ NO
68. DRUGS?	___	___	___	___ YES	___ NO
69. FOOD?	___	___	___	___ YES	___ NO
70. SKIN CONDITION?	___	___	___	___ YES	___ NO
71. SINUS PROBLEMS?	___	___	___	___ YES	___ NO
72. ASTHMA?	___	___	___	___ YES	___ NO

IF ANY POSITIVE RESPONSES -

73. IF THE PROBLEM STARTED SINCE YOU STARTED WORK HERE, DO YOU THINK IT IS RELATED TO YOUR WORK?

_____

_____

PHYSICAL EXAMINATION

	NORMAL	ERYTHEMA	OTHER
74. CONJUNCTIVA	_____	_____	_____
75. NASAL MUCOSA	_____	_____	_____
76. PHARYNX	_____	_____	_____

77. SKIN: NORMAL____ EXCORIATION____ CUTS____ ECZEMATOID CHANGES____

OTHER_____

78. CHEST

Adventitious Sounds (Auscultate areas 3,4,9,10 only)

MOIST COARSE RALES? (Gurgling) NO___ YES___ IF YES, WHERE?_____

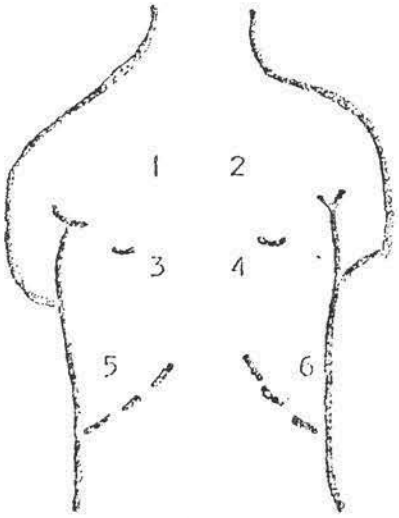
MOIST CREPITANT RALES? (Medium) NO___ YES___ IF YES, WHERE?_____

MOIST FINE RALES? (Crackling) NO___ YES___ IF YES, WHERE?_____

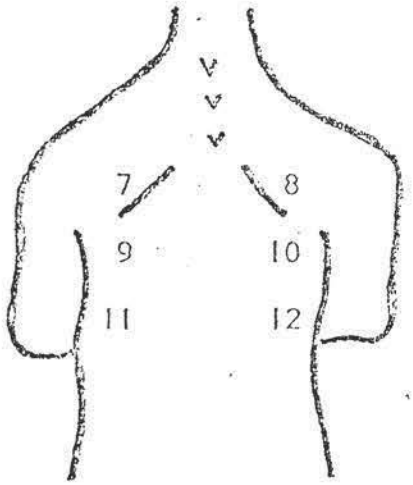
DRY COARSE RALES? (Rhonchi) NO___ YES___ IF YES, WHERE?_____

DRY FINE RALES? (Wheezes) NO___ YES___ IF YES, WHERE?_____

OTHER CHEST FINDINGS_____



ANTERIOR



POSTERIOR

79. NOTES:_____

PRE-SHIFT TESTING Study # _____

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

Name _____
Last First Middle

Do you presently have any of the following problems?

dry throat or sore throat	☐ Yes	☐ No
burning or itching eyes	☐ Yes	☐ No
tearing of the eyes	☐ Yes	☐ No
stuffy nose	☐ Yes	☐ No
runny nose	☐ Yes	☐ No
coughing	☐ Yes	☐ No
chest tightness, soreness, or heaviness	☐ Yes	☐ No
wheezing or whistling in your chest	☐ Yes	☐ No
shortness of breath	☐ Yes	☐ No

How many cigarettes have you smoked today? _____

Instructions to Subject

Please keep an approximate count of the number of cigarettes you smoke today.

ght _____
Test Team _____

POST-SHIFT TESTING

Study # _____

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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CINCINNATI, OHIO 45202

Name _____
Last First Middle

During the day did you develop any of the following problems?

dry throat or sore throat	☐ Yes	☐ No
burning or itching eyes	☐ Yes	☐ No
tearing of the eyes	☐ Yes	☐ No
stuffy nose	☐ Yes	☐ No
runny nose	☐ Yes	☐ No
coughing	☐ Yes	☐ No
chest tightness, soreness, or heaviness	☐ Yes	☐ No
wheezing or whistling in your chest	☐ Yes	☐ No
shortness of breath	☐ Yes	☐ No

many cigarettes have you smoked since you took the breathing test this ...ning? _____