1426-18
F.6 Industrial Hygiene Texas

PLAINTIFF'S EXHIBIT

TEX-154

INDUSTRIAL HYGIENE SURVEY

PORT ARTHUR WORKS

made by Allan E. Dooley, Industrial Hygiene Engineer

This report presents the results of a survey of certain operations and processes at Port Arthur Works from the industrial hygiene aspect. It is not a complete survey of all operations at that refinery. Other operations will be covered in future surveys. The report consists of three sections: (a) Summary of Findings, (b) Recommendations, and (c) Detailed Findings.

Summary of Findings

1. Lead burners were exposed to lead in excess of the maximum allowable concentration.

2. Unloading clay (Lena bentonite) produced exposures to dust in excess of the maximum allowable concentration.

3. Dumping of the contact filter presses resulted in exposures (skin contact and inhalation) to a black oily sticky dust. The effects of such exposures are not presently known but they must be considered as potentially hazardous.

4. Reclaiming insulation and ganister resulted in exposures to dust in excess of maximum allowable concentrations.

5. Lead exposures during the manufacture of lead naphthenate were found to be in excess of the maximum allowable concentration. While the exposures were intermittent so that the overall exposure was somewhat less than indicated by air sampling results, the operation cannot be considered non-hazardous.

6. Handling of litharge and litharge drums in the spiking of doctor sweetening solution was done without proper regard for health and economy.

7. The handling and use of solvents other than additives was found to be satisfactory from the health standpoint.

8. Additives were, in general, handled in a satisfactory manner with due regard for their toxicities. In the case of nitrobenzene spills, the procedure for insuring that the affected employe received immediate medical attention was not thoroughly worked out.

Recommendations

Recommendations based on the survey are summarized below. The full recommendations are stated in the detailed findings. Where periodic physical examinations are recommended, it is to be understood that they are to be compulsory.

Lead burning

1. Lead burners should be given periodic physical examinations.

2. Lead burners should wash their hands before eating lunch.

3. Washing facilities should be provided in the lead burning shop.

4. Housekeeping in the lead burning shop should be improved.

5. Consideration should be given to the installation of a local exhaust ventilation system in the lead burning shop, the system to have small hoods on flexible ducts so that the lead fumes can be removed at the source.

6. Consideration should be given to the use of a similar portable exhaust system to be used inside vessels.

7. Periodic surveys should be made to determine lead exposures during lead burning.

Filter plant operations

1. Employes should wear approved respirators while unloading clay from freight cars.

2. Clay unloaders should be given periodic physical examinations every 18 to 24 months.

3. Consideration should be given to having clay delivered to the refinery in covered hopper cars.

4. Employes should wear approved respirators when dumping contact filter presses.

5. Employes who dump the contact filter presses should be given periodic physical examinations with special reference to the lungs and skin.

Handling of solvents

No recommendations at this time.

Handling of additives

1. Employes who spill nitrobenzene on clothing should remove soiled clothing and wash immediately.

2. The foreman should be notified at once in the event of a nitrobenzene spill.

3. The foreman should notify the first aid room immediately in the event of a nitrobenzene spill.

4. If an employe who has spilled nitrobenzene is sent to the first aid room, he should always be accompanied.

5. The foreman should make a record of each nitrobenzene spill.

6. Before resuming the use of halowax 1014, the Health Division should be consulted as to recommended safe handling.

Storehouse handling of chemicals

1. A wash basin with hot and cold water, soap and towels should be installed in a readily accessible location in the wax basement.

2. Signs instructing what should be done in case of accidental exposures to chemicals should be posted in all storage locations.

3. Drums and other containers of hazardous chemicals should be so designated.

4. Periodic inspections should be made to detect leaky drums and other containers.

Car shop

1. Employes who clean or work on tank cars which have been used for ethylene oxide should avoid skin contact with even dilute solutions of this material.

2. Employes should avoid inhalation of vapors of such substances as methanol, ethylene dichloride, aromatic distillate, toluidine and other volatile solvents.

3. Employes should avoid skin contact with such substances as caustic soda, sulfuric acid.

4. The medical and safety departments should be consulted as to proper safeguards if cars containing substances of unknown toxicity are received.

Hydrogen sulfide and sulfur dioxide exposures

1. Gas mask canister record cards should be revised so that each card will have small squares each representing 15 minutes of use, the total number of such squares to be determined by the normal life of the canister.

2. Each employe using a canister should check and initial a square for each use of 15 minutes or less. If the canister is used for a period longer than 15 minutes, the proper number of squares should be checked.

3. Consideration should be given to furnishing a canister to each employe who is assigned a facepiece and making each employe responsible for replacing his canister when necessary. The revised record card as described above should be used.

No recommendations concerning sulfur dioxide are made at this time.

Personal hygiene facilities

1. Deficiencies and inadequacies in the personal hygiene facilities described in the March 16, 1949 report by the PAW Safety Department should be corrected.

2. A continuing educational program should be developed to improve personal cleanliness and to aid in keeping facilities neat and clean.

3. Frequent inspections should be made to insure that all personal hygiene facilities are being maintained properly.

Medical services and facilities

1. Greater efforts should be made to develop a desire among a greater number of employes to have periodic physical examinations.

2. Continued efforts should be made toward reducing absenteeism due to illness and non-industrial injury.

Detailed Findings

Detailed findings of the various operations and conditions studied during the survey are given on the following pages. They are arranged so that if desired, the various sections can be distributed to those concerned with the particular operations.

Lead burning - Lead burning at Port Arthur Works was done both in the lead burning shop and inside certain vessels and units. Exposures were determined at both locations.

The lead burning shop itself was a building about 19 x 21 feet in size with a large door about 8 feet wide on the west wall and a similar one directly opposite it on the east wall. The two other walls had two windows each, and a fifth window was in the west wall. A large work table was placed along the south wall between the doors on the east and west walls. The shop had a rough wood floor.

The doors were kept open except during inclement weather. Housekeeping was fair, the floor being swept occasionally by means of a straw broom. At the time of the survey, six lead burners were employed, all on the day shift. They ate their lunches either in the shop or directly outside it. It was observed that several did not wash their hands before eating. No washing facilities were provided in the lead burning shop.

Samples were collected by means of an electrostatic precipitator and were analyzed for lead content by the Port Arthur Works laboratory by means of the polarograph. All samples were collected in the breathing zones of the lead burners. In the lead burning shop, concentrations ranged from 0.35 milligram per cubic meter of air to 1.56 mg. per cubic meter. Two samples collected in No. 40 separator during a patching job showed concentrations of 0.33 and 0.53 mg. per cu. m. (Details of the individual samples are given in the accompanying table.) All of these concentrations were in excess of the maximum allowable concentration of 0.15 milligram of lead per cubic meter of air.

It should be pointed out that the lead burners were not exposed to these concentrations over the entire shift each day. The time required for such operations as laying out and setting up work, cleaning bar lead, cutting lead sheet, preparing the surfaces and similar activities would result in somewhat lower daily exposures than indicated by the sampling results. However, even making allowances for these periods, when lead burning was not being done, the exposures of the lead burners must be considered as being hazardous to health. Accurate and up-to-date information as to the amount of lead absorption occurring among these employes was not available, considerable time having elapsed since they last had physical examinations. (Some of them reported that they had not been examined since the beginning of the war.)

Accordingly, the following recommendations are made for the purpose of reducing exposures to lead fume and dust, and to detect

signs of increased lead absorption:

1. All lead burners should be given periodic physical examinations, the frequency to be determined by the plant physicians.

2. As a part of the program of increased personal cleanliness among all employes, the lead burners should be required to wash their hands before eating lunch. It is realized that lead intake by ingestion is only a minor factor in industrial lead poisoning, however, the practice of washing hands before eating is an essential part of good personal hygiene.

3. Washing facilities to include hot and cold running water and soap should be provided in the lead burning shop.

4. The housekeeping of the lead shop should be improved. Dry sweeping normally produces more dust than vacuum or wet methods of cleaning, and if dry sweeping of the shop is to be done, it should be done when a minimum number of employes are in the shop.

5. Consideration should be given to the installation of a local exhaust ventilation and fume collector system in the lead shop, the system to have small hoods attached to flexible metal ducts so that the hood can be placed close to the point of generation of the lead fumes.

6. Consideration should also be given to the use of a portable exhaust system with a hood and flexible metal duct for use when lead burning is done inside vessels.

7. Periodic industrial hygiene surveys should be made to determine lead exposures during lead burning.

Table 1

Results of determinations of lead dust and fume concentrations during lead burning.

Port Arthur Works - June, 1949

Operation	Volume of air sampled cu. ft.	Lead concentration mg. per cu.m.	Remarks
Burning bead on lead plate in shop	30	1.56	Burner used 2½ lead bars during sampling.
Making 4" diameter lead flanges, 3/4" thick	84	0.53	Three flanges made during sampling. Hard lead (6 - 11% antimony) used.
Burning joint on large diameter lead sleeve	90	0.35	Work done near open door with slight air movement across work.
Burning joints on vertical lead plates	45 45	0.36 0.59	Work done at open doorway.
Patching lead plate in No. 40 separator	123	0.53	One burner working on vertical patch. Air blower in one opening at top.
Patching lead plate in No. 40 separator	81	0.33	General air in No. 40 separator. No burning except small amount of hole closing and some wire brushing of lead plates.

Note: Maximum allowable concentration for lead - 0.15 milligrams per cubic meter of air.

Filter plant operations - Dust exposures were determined for several operations in connection with the handling of clays. Samples were collected in the breathing zones of the employes by means of a midget impinger using distilled water as a collecting medium. Dust counts were made at a magnification of 100 diameters, using the standard light-field technique.

During the unloading of Lena clay from a freight car, the two employes were exposed to a concentration of 282.5 million particles per cubic foot of air. Unloading of a car required about 3½ hours. Respirators were provided for these employes but it was noted that they were not being worn. Lena clay, according to an earlier analysis by Washington University, St. Louis, contained about 12 to 13 per cent of free silica. Similar analysis showed that the Riverside fuller's earth contained about 7 per cent of free silica. The maximum allowable concentration of dusts containing 5 to 50 per cent of free silica has been set at 20 million particles per cubic foot of air. It is recommended that:

1. Employes should wear respirators while unloading clay from freight cars.

2. Clay unloaders should be given periodic physical examinations at 18 to 24 month intervals.

3. Consideration should be given to the plan of having the clay shipped to the refinery in covered hopper cars. This would reduce time required for unloading and reduce dust exposures.

On the third floor, kilnside of the filter plant, the general air in the area of the elevators and the conveyors contained 146.8 million particles per cubic foot of air. Normally no one worked for long periods in this area.

An inspection of the top floor of the filter building was made but no samples were collected because construction and repair work was in progress. However, the amounts of dust which had settled on equipment, beams, etc. showed that high dust concentrations occurred during normal operations.

The dumping of the contact filter presses resulted in exposures to a black oily, sticky dust. Each press was dumped at intervals of about 40 minutes, each dumping requiring about 5 minutes. A sample collected while No. 2 press (PGR-55) and No. 6 press (Wax dist. 10) were dumped showed a concentration of 65.3 million particles per cubic foot of air. The presses were dumped by swinging the bottom part of the shell downward and to one side so that the black oily spent clay would fall through an opening into cars beneath the press floor. Clay which adhered to the filter plates was dislodged by means of scrapers. During the operation, in addition to inhaling

the dust, the employes' work clothing and exposed body surfaces became rather heavily soiled with the spent clay. It was reported that under certain wind conditions, dust concentrations were higher than at the time of the sampling because up-drafts through the floor openings caused greater dispersal of the dust.

While there is no information available on the effects of inhalation of, or of prolonged skin contact with this spent clay dust, the presence of the heavy black oily materials does not permit this dust to be classed as a mere nuisance dust. Therefore, it is recommended that:

1. Exposed employes should be required to wear approved type respirators.

2. Periodic physical examinations should be made on this group of employes with special reference to the lungs and skin.

Time did not permit an appraisal of other operations involving exposures to clay and fuller's earth dust. Because of the fact that these dusts are capable of producing pneumoconiosis, it is recommended that:

1. Periodic physical examinations every 18 to 24 months should be made of all employes exposed to dusts in the filter building.

Reclaiming insulation and ganister - One employe on the day shift was exposed to high concentrations of dust during the reclamation of insulation and ganister. These two materials were fed into a hammer mill and the crushed materials were discharged into a closed bin. At intervals, when the bin was filled, the material was removed and bagged. The bin was fitted with a natural-draft stack which extended to above the roof of the Quonset building which housed the operation.

The operator fed pieces of insulation into the hammer mill by hand. The action of the mill caused dust and fragments of insulation to be discharged through the feed hole. The operator held a piece of burlap over this opening to reduce the amount of dust emitted into his breathing zone. This was not an effective means because a sample collected while the employe was feeding insulation into the mill showed a concentration of 175.7 million particles per cubic foot of air.

The crushed insulation was shoveled into an upright drum mounted on trunnions, an empty bag placed over the top of the drum and the whole thing upended so that the material dropped into the bag. A dust sample taken during this work showed a dust concentration of 165.1 million particles per cubic foot of air.

The insulation handled was known as 85 per cent magnesia insulation. This material contained 85 per cent of magnesia and 15 per cent asbestos. Asbestos dust, if inhaled in sufficient amounts and for a prolonged period, will cause a lung fibrosis termed "asbestosis". The maximum allowable concentration of asbestos dust in the breathing zone of workers has been set at 5 million particles per cubic foot of air. Naturally, the percentage of asbestos in the dust to which the employe was exposed during crushing and bagging of insulation would be low because of the high magnesia content of the material. Even so, assuming that the dust contained 15 per cent of asbestos, the exposures during the crushing and bagging of insulation were in excess of the maximum allowable concentration.

Dust exposures during the reclamation of ganister were not determined because this material was not being processed during the survey. However, because the same equipment was used and the fact that the ganister is much harder, it is reasonable to assume that its processing would also produce high dust concentrations. The percentage of free silica in ganister was not determined but it is essentially a refractory clay. Most clays have been considered as relatively harmless when inhaled but recent reports have indicated that some of them are capable of producing disabling lung pathology.

The respirator which the employe had been using for many years was one which has never received approval under the standards established by the U. S. Bureau of Mines. It consisted of a white rubber facepiece containing a small sponge which was supposed to be kept moistened with water to remove dusts. It did not fit the employe's face properly because he had stuffed a handkerchief around the edges. The ineffectiveness of this respirator was explained to the operator by the area safety engineer and, while the employe insisted that the white rubber type was the only satisfactory respirator, he agreed to try an approved respirator for one week. After a week's trial he reported the new respirator was so superior to the old one that he wondered how he had gotten along for so many years and requested that his thanks be conveyed to the area safety engineer.

The reclamation of insulation and ganister was a steady operation and the employe was exposed to high dust concentrations over the entire shift. Respirators are normally recommended only for exposures which are intermittent and of relatively short duration. For exposures occuring over the whole shift day after day, control of the dust at its point of generation is the preferred method. Therefore, it is recommended that:

1. Local exhaust ventilation and dust collecting system should be installed for the insulation and ganister reclamation operation.

2. Until such time as this dust control system is installed, employes should be required to wear respirators approved for protection against pneumoconiosis-producing dusts.

3. Periodic physical examinations should be made of employes engaged in crushing and bagging ganister and insulation at intervals of 18 to 24 months.