FILE NAME: Abex (ABX)

DATE: 0000

DOC#: ABX063

DOCUMENT DESCRIPTION: Excerpt from Plant Engineer's Conference

complication of silicosis.

The two greatest occupational hazards we are faced with in Brake Shoe are those due to dust and lead. I can perhaps best demonstrate the necessity for your greater familiarity with the activities of the Medical Department by describing our program with respect to these exposures. An appreciation of the dangers arising from them should constitute a good background for some of the discussions in this meeting.

Silicosis may technically be defined as a disease of the lungs due to breathing silicon dioxide dust, characterized anatomically by generalized nodular fibrotic changes throughout both lungs which are demonstrated by x-ray examination and by autopsy and resulting from any process of occupation involving inhalation of silicon dioxide dust. Silica or silicon dioxide (SiO_2) is the most common ingredient (60%) of the rocks and minerals which make up the earth's surface. It exists in two forms, "free" and "combined". As far as is currently known, only free silica can cause silicosis. Dusts produced from substances containing silica consist of particles of various size but only those below three microns in diameter (a micron is 1/25000 of an inch) are believed to be dangerous. This means that most of the visible dust is not of as much concern as the particles which are not seen by the naked eye. Silicosis is therefore likely to result only where there is sufficient exposure to dust which contains respirable sized particles of free silica (especially below three microns) over long periods of time (two to twenty-five years -- average 10).

As the dust particles are inhaled, most of the larger ones are trapped by the defensive mechanism of the upper respiratory tract and very few ever reach the alveoli or small air sacs of the lungs. Those particles below three microns, however, find easy access to the lungs and nature tries to get rid of them through ingestion by alveolar cells which in turn are transported by the lymphatic vessels toward the root of the lung. Along the way these cells become deposited about the lymph nodes and a slow chemical reaction occurs between the body fluids and silica particles in which the cell dies and the surrounding tissue is attacked. This results in destruction of lung tissue and consequent replacement by fibrous or scar tissue. As the process goes on and more and more silica is inhaled, the lymph drainage is blocked so that the process spreads throughout the lung, resulting in scattered areas of scar tissue which present a characteristic nodular pattern in the x-ray. If exposure continues over a long enough period, more fibrosis or scarring results and more lung tissue is destroyed. This eventually may result in disability particularly if infection (tuberculosis) complicated the picture.

SIDEROSIS

Grinding and burning operations in some of our cleaning rooms have produced an x-ray pattern in the chest films of a number of employees which presents quite a problem. The x-ray appearance closely simulates that of silicosis, but when checked with industrial hygiene surveys of these locations, not enough free silica of respirable size was found in the samples to account for it. It has been established in other industries here and abroad that iron oxide, when inhaled, will pigment the lungs to the extent that shadows are cast on the x-ray film. Our air samples showed a high percentage of iron in these operations, certainly enough to produce such shadows. Iron dust has been found to be incapable of causing fibrosis or damage to lung tissue. Its reaction is comparable to a tattoo mark on the skin - the skin is discolored but there is no impairment of function. This, however, has a definite implication from the health, economic and medico-legal angle.

In order to prove our contention that many of the cases of x-ray nodulation we have encountered in our plants are not silicosis but iron pigmentation,

we were able to locate defects in design.

We had two conferences with the manufacturer's representatives and pointed out the designing defects. They didn't know anything about dangerous exposure. They were talking in terms of silica and the problem was concerned with lead.

At Brakeblok, we were able to demonstrate to the unions that the exhaust system was well designed and was affording excellent protection against the various toxic materials used.

The men applying for insurance from the Prudential Insurance Company were assessed an extra premium because they worked in a supposedly hazardous plant. Dr. Hamlin and I met with the union stewards and explained the medical and industrial hygiene control program and pointed out the facts about lead poisoning and asbestosis.

The stewards felt that if the plant were safe we ought to be able to get their insurance premiums reduced. On the basis of our survey findings, we were able to demonstrate to the insurance company that the hazards were controlled and reduction in premium was immediatoly obtained.

A humerous incident occurred while we were meeting with the union stewards. I left the electrostatic precipitator at the asbestos weigh station in order to collect an air sample during the conference in order to save time. When I returned, the collector was full of asbestos. Someone had thrown a handful of the material into the tube to make sure I would find the place very dusty. I wouldn't have had that much dust if I left the sampler running for a year. Our medical director has just outlined the importance of the engineers' thinking in terms of health as well as production and cost. Dust and fume control constitute an important part of the correlation of medical and chest x-ray findings with exposure.

Before placement of an employee, Dr. Hamlin consults with me about exposure, and he makes use of our dust findings as an aid in the interpretation of chest films

This leads to an important point. The test of whether you have well designed a hood or exhaust system is whether you have protected the man. All your mathematics and ventilation guides will not give you the absolute answer. You may design according to good engineering practice, but the proof of a good job depends on whether it will pass a field test. Here we can help. For example: A wheelabrator is designed well enough for silica dusts but it is poorly designed for lead bearing dusts. The nature of the material you are exhausting is important.

The original designer thinks in terms of visible dust without consideration for the dust that cannot be seen with the eye. This demonstrates the need for the industrial hygienist's assistance. A system that is satisfactory for coal dust may be totally ineffective for mercury vapor.

Recently the Amsco Division became interested in buying a Do-All Saw for cutting manganese steel gates and fins. Before placing the order, they asked our department to test this machine for any dust and fume hazard while it was cutting some test castings. That's good common sense! You wouldn't think of buying the machine unless it could solve your production problem.

Sand Preparation: Where a mechanical sand preparation system is installed, the control of dust becomes a fairly simple matter. Usually the screens, belts and elevators can be easily enclosed or hooded, permitting the dust to be picked up right at the source and passed through a wet collector. I don't think anyone today would consider such an installation without a dust collector.

The problem becomes a little more difficult, however, where the sand is reconditioned in a Royer machine or something similar. The Royer is a portable machine consisting of a hopper to receive sand from a grab bucket, a set of moving grate bars to remove lumps and metal, and a belt traveling at high speed that aerates the sand by throwing it 30 or 40 feet into a pile on the floor. At New Castle, we have recently installed sprays on one of these machines, using a wetting agent in the water. Although no dust counts have been taken as yet, the Works Manager, as well as the men in the plant, are highly in favor of it and report the dust to be considerably lessened. The installation is very inexpensive, costing around $200.00 and is the most logical answer we have found yet to this particular operation.

Pouring: Smoke from our pouring operations is almost impossible to catch at the source since most of our tonnage is poured in an open area under a crane. We have contented ourselves with the installation of roof ventilators in an effort to keep the smoke diluted.

Shakeout: The shakeout operation is another one that is not too hard to control where a mechanical shakeout is involved, but is almost impossible where the molds are shaken out by the crane into a pile on the floor. At the present time, we have only one large mechanical shakeout in operation, and it is equipped with a side hood which does a fairly satisfactory job. Another one will be installed before the end of the year, and again, we are putting a side hood on it.

For smaller shakeouts, I believe a down draft would be more satisfactory, but with the sizes of molds we have to contend with, I question whether the down draft would be effective. The shakeout being installed this year at our Oakland plant has an 8' by 10' deck and the hood is being designed to allow clearance for a mold 8' square by 6' high. If any of you have any idea that a down draft would be effective on such an installation, I would like to discuss the matter with you.

Burning Operation: We are now getting into the cleaning room operations where I have already mentioned we are having our worst experiences with lung changes. The burning of heads and gates has, until recently, all been done on the floor or on a table with the burner usually leaning over his work, allowing the iron oxide fumes to rise right into his face. This is a case where the exhaust must be taken right at the source and we have so far come up with only a partial answer. At the Denver plant, we have put in an exhausted table using a down draft as well as a back hood, which does a swell job on the smaller castings that can conveniently be placed on the table. Dust counts taken near the operator's face while burning on the floor showed from 150 to 380 million particles per cubic foot. The use of the exhausted table dropped the dust count to 1.6 million particles per cubic foot, which is probably well below the general atmosphere in the cleaning room. This first table was about 4' by 6', and those going in at other plants at the present time are 4' by 10'. Even so, they will handle only about 50 per cent of the burning at the outside and we don't yet know what we are going to do about the larger castings. Any similar installation

An end grinder is similar to a swing grinder, but instead of grinding on the bottom of the wheel, it uses the front face of the wheel to grind against a more or less vertical surface. This problem was solved at Denver by installing a floor grill with an underground duct and showed good results.

All of the grinders mentioned so far can be exhausted one way or another. We don't yet know, however, quite what to do about the stiff shaft grinders. They are used for the biggest part of our heavy grinding work because, like a hand grinder, they can be used in various positions and can reach parts of the castings that would be impossible to grind with a swing grinder. We have 23 of them in operation at Chicago Heights against 7 swing and end grinders. In some cases, they are used on small castings that can be placed on a table, in which case a down draft table seems like the logical solution, although we have not as yet tried it. Most of their work, however, is on larger castings such as dippers where the casting is placed on the floor and the grinder hung on a jib crane is moved around in various positions. We have reached the point where something will have to be done about these machines and if any of you have any suggestions, I would like very much to have them.

Machine Shop: As I mentioned above, most of our machine tools are equipped with grinding wheels due to the difficulty of machining manganese steel with tools. In the last couple of years, however, we have installed some tooling equipment, which has been working out most satisfactorily on some castings. This has reduced the dust in the machine shop to some extent, but unfortunately we are, so far, tooling only about 20 per cent of the work and still grinding the rest. Very little has been done to alleviate the dust in this department except for general ventilation.

General Considerations - Building Design: So much for the specific installations we have made. Before I stop I would like to bring up several points of interest that might be well to consider.

Since all of our dust control work to date has been in existing buildings, we have discovered that some building designs can make the job difficult and others can make it easy. For example, the leanto on the cleaning room building at Denver allowed us to exhaust their swing grinders at a minimum cost. On the other hand, the Chicago Heights cleaning room consists of three bays, side by side, with cranes in each and with no more than one foot between the crane clearance lines. Even if expensive sheet metal design did allow us to squeeze a long, thin, rectangular duct up between the cranes, the duct would emerge through the roof in a valley where drainage would be obstructed.

I would highly recommend that any new buildings, intended for operations where numerous exhaust systems will be required, be designed with several feet between the ends of adjacent cranes. The extra cost of such a building will probably be justified in the years to come.

Heating Costs: We have been somewhat concerned about the additional cost of heating our cleaning room buildings when and if we reach the point where all the grinders are properly exhausted. At Chicago Heights we have about 30 machines altogether which will require in the neighborhood of 5,000 cubic feet per minute each. Based on average winter conditions and heating the building to only 50° or 55°, the extra oil required because of the exhaust systems would amount to around $4,000 per season. One way this cost can be reduced is to install an individual exhaust unit on each grinder instead of using a central system.

stands are equipped with exhaust connections and these are connected into an exhaust system connected to a dry-type dust collector. The sand blast rooms are similarly provided with exhaust connections and, with proper exhaust as recommended by the manufacturers, no difficulties are experienced from this source. With the wheelabrators, however, we have been having considerable amount of contamination from both the insufficient amount of air exhausted from the machines and also our inability to keep the equipment in good mechanical order to properly seal the unit to prevent dust and fume from escaping. We have had this problem under surveillance for some time, and now believe that the answer to proper control of wheelabrators is to increase the suction on the machine to 200 per cent of rating recommended by the manufacturer, primarily for the control of metallic fumes, rather than dust; to provide an additional exhaust outlet on the opposite end of the cleaning barrel and to enclose the bottom of the machine so that all entering air for exhaust purposes must come through the natural leakage around the charging door. While these corrections have not as yet been made, they are in the plan stage and we hope to complete in the very near future. At the present time we have not provided exhaust hoods or ventilation for floor chipping. This problem, however, will be studied to see if we can install some system with sufficient flexibility for the type of work we handle on these floors.

The bench chipping has probably had as much experimentation for proper exhaust in this area as any other portion of our plant. We originally started out by replacing the old wooden bench with a bench having grilles in the top upon which work was placed, and a hopper under the grille to catch the heavy dirt, with an exhaust outlet in the side of the hopper to carry off excess dust and metallic particles. This was the first step in the control of the hazard from this source. Subsequently, we improved the construction details of this type of bench and incorporated similar exhaust features. The next step was the development of an entirely new type of bench which is now in operation in one of our plants. We hope in the very near future to have the same type of bench in the other old plants of our division. This new type of bench incorporates the original grille in the top of the bench with the hopper underneath and an exhaust outlet, and also a grille in the backboard of the chipping bench in a vertical position connected into the exhaust system. The greater percentage of the exhaust air from the chipping station is taken from this rear grille, and only sufficient air through the bottom grille and hopper to prevent kickbacks in dust dropping into the hopper. According to Medical Department tests, contamination from this area has been reduced below the maximum allowable concentration of metallic contamination.

The remainder of our exhaust systems and ventilation does not apply to all of our plants. Some of our larger plants have some departments that our other plants do not have, or perhaps we should say some of these departments are not as large in some plants as in others. All of our plants have some sort of reclamation department. Here we melt out returned bearings to remove the babbitt from the brass. In this operation considerable oil smoke is given off because the returned bearings are heavily coated with grease and oil. While this type of smoke is not harmful, it is highly irritating to the men working in those areas. Therefore, it has been necessary to provide exhaust hoods over our melt-out pots, as well as an exhaust hood over the area in which the melted out bearings are thrown after removal from the melt-out pot. These melted out bearings give off considerable smoke even after removed from the pot. As previously mentioned, the extent of our exhaust in the reclamation department depends upon the size of the plant as well as the size of the reclaim operation.

CHARACTERISTIC VENTILATION PROBLEMS

AND SOLUTIONS IN BRAKEBLOK

F. E. Tayler, Jr.

Dr. Hamlin, in opening the meeting yesterday, pointed out the various occupational disease hazards confronting the Brake Shoe divisions.

We all are aware of the moral obligation that Brake Shoe has in reducing and preventing occupational disease. It is not only a moral matter, but if we fail to properly meet this obligation it becomes an economic problem.

Certainly without adequate dust control and ventilation it costs more to maintain our buildings, equipment and good lighting. Uncontrolled dust not only contributes to lower health standards, but also to a loss of time by the employee. Everybody loses when an employee is sick. A workman will be happier and produce more and better products if his work place is clean, properly ventilated and lighted.

Brakeblok's manufacturing processes may differ from those in your divisions, but we are, no less, confronted with the matter of occupational disease, particularly Asbestosis from inhalation of Asbestos, and Lead posioning from contact with lead compounds. We are handling other powders and solvents which must be rigidly controlled. We create dust and chips by our grinding and machining operations. We are favored to some degree in that our product in most instances, is small permitting closer hooding of the operation.

Because many of our dust control problems may be similar to yours, Mr. Weber asked me to tell you about some of them and the methods we are using.

Brake lining consists largely of Asbestos, powders, pulverized coal, resins and solvents. These are blended together in various compounding machines. Some formulae contain as many as fifteen different items, each of which has to be weighed out, transported, and loaded into mixing machines and each when weighed, transported or mixed creates either a dust or fume control problem.

The finished product is subjected to six or seven machine finishing operations, each presenting a dust control problem.

At present, our Detroit compounding department is equipped with about 45,000 cubic feet of air per minute in dust collector capacity, consuming approximately 160 horse power, and serving fifty dust and fume control hoods. The finishing department has 88,500 cubic feet of air per minute in collector capacity, consuming approximately 340 horse power, and serving one hundred and twenty dust control hoods. In all, the Detroit plant exhausts over 200,000 cubic feet of air per minute through dust and fume collectors. This represents a large sum of money in electric power to get the dust and fume laden air out and a considerable additional sum to heat the replacement air during the winter.

Brakeblok has provided itself with adequate dust control. To the best of my knowledge no case of occupational disease or sickness has ever been attributed to the dust other than mild cases of contact dermatitis. However, we feel there is still room for improvement. We are continually improving hood designs not only to increase collection efficiency, but also to reduce the quantity of air required to do the job.

close to $300,000.00 in these units. Could some outside party be interested in rebuilding these for us when a complete overhaul is needed? We have a very fine crew at Great Lakes, and I have seen trucks rebuilt that certainly worked as good as brand new ones. These units now cost about $7,000.00 each, and every effort should be made to get the maximum life out of every one of them.

Flasks: Being an expert foundry man I can now talk freely about flasks. These also have gone up sky high in price. In my visits to various plants I notice flasks that have not been used for years. Generally asking the superintendent why they are not scrapped, I always get the same answer: "We might get another order for those castings." Is it not possible to check with another division and see if they have flasks of the same size that could be loaned in case the order finally did arrive? Couldn't we scrap a large tonnage of old flasks when scrap of all kinds is so badly needed?

I really think it would be impossible for me to talk without bringing in good housekeeping. I shudder to think of how many times I have seen the Maintenance Department make either a minor or major repair and then walk off to another job, leaving all the scrap, and wire, and everything else right at the spot. It is the responsibility of the plant engineer to see to it that all waste material is removed at once and scrapped. I don't know how much old junk I have seen in all our plants that is put aside with the thought that sometime in the next ten or twenty years we might have use for it. Let's think of scrap at two cents a pound and turn it into real dollars for the Brake Shoe Company.

The only think I can think of to bring this home forcibly is to have all of you walk into Kempton Dunn's office and see one, two, five, and ten dollar bills strewn all over the floor. You probably would think he was a hell of a treasurer. Still and all, we have this very same condition in every one of our plants today.

I hope none of you ever have the "pleasant" experience we had in Chicago Heights of excavating our core room to a depth of two feet to put in a concrete floor, and after leveling off at that distance, of finding a nice concrete floor already there.

Thanks a lot!