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General Dust Control File

Research & Engineering Center
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REPORT OF TRIP TO
TURNER BROS.

I am attaching copies of the report on my trip to Turner Bros. Please let me know whether I can supply any additional information.

J. Goldfield

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Research & Engineering Center
February 7, 1956

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REPORT OF TRIP TO TURNER BROS.
ASBESTOS CO., LTD.
REPORT NO. 1 OF 2
GENERAL AND HEALTH PROBLEMS

General

Turner Bros. is a company employing 5,000 people in several plants, the largest being in Rochdale and the Hendley-Green plant about twenty miles away. They manufacture asbestos textiles, sheeter materials, asbestos fabrics for brake lining and clutch facings, rubber rings, conveyor belting, V-belts, and fibre glass rovings which they weave into a cloth. The size of their operation may be appreciated from the fact that at Rochdale I saw a textile operation with 103 cards producing 70-90 lbs. per hour of yarn each. They had four fibre preparation systems each with a capacity of 3,000 lbs. per hour.

At Hendley-Green, the building, in which rubber rings and conveyor belts are made, has a floor area of 500,000 sq. ft.

The Turner Bros. company is a part of the Turner-Newall group, which employs 40,000 people, has yearly sales of about $300,000,000 and profits of about $22,000,000.

I spent a full week visiting at Rochdale and Hendley-Green. A program was prepared for my visit and faithfully followed. It is appended to the report as Enclosure 1. Enclosure 2 shows a list of some of the people whom I met and with whom I discussed numerous subjects of common interest.

In the interest of clarity, I have divided my report into two parts, this one on health problems and a second on production facilities.

Background of English Health Activities

Health activities in English asbestos factories date from 1931 when the Asbestos Industry Regulations were formulated. These regulations were spurred by a report issued in 1930 by Dr. Merewether, which showed that 80.9% of workers with 20 years or more service in the asbestos industries

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showed evidence of fibrosis. These figures are publicized by man in the industry together with figures that show a reduction to an incidence of 3% for employees starting after 1933.

The measures for controlling dust have been effective but not wholly so.

Health Committee

The health problems at Turner Bros. are supervised and monitored by a rather high level committee composed of the following personnel:

Mr. Hill, Managing Director of Turner Bros. reporting to Mr. Waddell; Mr. Hill is Chairman of the Health Committee.

Mr. Pierce, Director of Turner Bros., Production Manager in charge of the two plants.

Dr. Knox, Medical

Dr. Kearns, Medical

Mr. Rhodes, Rochdale Works Manager

Mr. Jackson, Bradley-Green Works Manager

Mr. Arnold, Central Personnel

Mr. Rushlin, Manager, Engineering Design

This committee meets about once every two months and focuses attention on the most important health problems. A meeting may be carried to the floor of the plant to investigate particular health problems.

Asbestosis Research Council

The asbestos manufacturers in England, especially Turner Bros., Cape Asbestos, and British Belting have established a joint council that permits exchange of health information and conducts joint research activities on health problems.

Role of the Doctor

Dr. Knox takes an aggressive role in the health program. His primary function is to give examinations and examine chest X-rays. He has the advantage that every asbestos worker who dies is autopsied. Fairly complete records are therefore being compiled on medical evidence found during autopsies and their relation to dust exposure.

He is convinced that there is a correlation between exposure to asbestos fibre - especially crocidolite and lung cancer.

He also goes into the plant and insists that bad conditions be corrected.

Dust Counting

The dust counting activities of Turner Bros. are outlined in two reports that I brought back - "Developments in Dust Sampling and Counting Techniques in the Asbestos Industry" by S. Holmes and "Asbestos Dust and Its Measurements" by C. C. Addingley.

The dust counting activities of Turner Bros. are on a much higher technical level than ours. Dr. S. Holmes, in charge of their Physics Research section, supervises these activities. They had used the Thermal Precipitator method for many years. In recent years they have developed a new method using membrane filters to catch samples. They count under a microscope, counting only fibres. A complete description of this method of dust counting is available in the reports mentioned above.

For very rapid, almost instantaneous monitoring, they are using a Royco instrument which is a sophisticated, electronic machine using scattered light to detect dust particles. This instrument can be used for day-to-day monitoring to insure that conditions do not deteriorate and to quickly check the efficiency of dust control changes. The instrument is worth $5-$10,000.

The dust counting done by Research insures that a constant check is made on the method used and constant attempts to improve and correlate with physiological data carried on.

They take a dim view of our use of the Greenburg-Smith impinger method of sampling, although I believe that the relative results obtained can be almost as useful as those obtained with their more accurate method. There is an advantage to carrying on one type of technique over long periods of time. We don't have the problem of getting correlations among various test methods.

There is an important difference in philosophy between the use made by Turner Bros. and Johns-Manville of the results of dust counts.

We use the results of the Greenburg-Smith impinger counts to determine whether we are above or below an arbitrary limit of 5,000,000 particles per cubic foot or 1,000,000 fibres per cubic foot. The English make the point that we have no basis for these limits. No one knows the lower limit of concentrations that will cause lung damage. They use their counts to determine that controls are remaining effective and to pick out the areas of worst exposure which they then concentrate on trying to improve even though the counts are well below the limits as might be set by us.

Methods Used to Control Dust

Housekeeping

The housekeeping in the textile plants is very good. Fibre is handled in closed containers only. There are no accumulations of fibre anywhere in the plant. There is very little evidence of air-borne asbestos dust.

Fibre Warehousing

Much of the fibre they use comes from Southern Rhodesia - non-pressure packed and in jute bags. They have recently determined that some of their worst counts are in the warehouse area and they don't know what to do about it.

Fibre Preparation

At Rochdale, there are four fibre preparation systems - each of 3,000 lbs. per hour capacity. A man places a bag on a turntable which is in a ventilated enclosure. He slits the bag on three sides and empties the bag onto an enclosed belt. When a batch of 1500 lbs. is made up, the contents of the belt are dropped into a completely enclosed mixer. Four (4) percent of a 50-50 solution of oil and water are added to the fibre through sprays in the shaft of the mixer. The spray must be added very uniformly.

Mixing is complete in about 30 minutes. The contents of the mixer are dropped into a live bottom bin of a different type than that with which we are familiar. From the bin a Redler conveyor carries the fibre to a Canadian type fibre willey and from there to a cyclone feeding four rotary screens. The prepared fibre is bagged in nylon-reinforced polyethylene bags with zippers.

It must be stressed that from the time the bag of fibre is slit to the time it is bagged, in an enclosed, well-designed bagging machine, the fibre does not see the light of day.

Cards

The asbestos fibre is brought to the cards in the enclosed, zippered bags. At the Hindley-Green factory they have installed a Redler conveyor system which will be described in a second report. This system can supply one blend to any of the 40 cards in that plant. The system was not as automatic as had been hoped and causes many maintenance problems. In addition, it can only carry one blend whereas a textile plant may use five, six or even more blends. Work is still continuing on developing this method.

The bags are emptied into feeders at the cards. There is only a 3 inch diameter dust pipe connected to the feed hopper. Its volume is inadequate to control dust when the feed hopper is opened for charging.

The enclosures on the breaker and finisher cards look similar to those in our plants. Both cards are in a line instead of side-by-side as in our plants.

In addition to the dust pipe on the feed hopper, there is a 3 inch pipe above the feed lattice, a second at the entrance to the feed roller, a 4 inch over the breaker cylinder and a 4 inch at the exit from the breaker cylinder. The finisher card has a 3 inch pipe above the finisher cylinder, a 3 inch at the finisher doffer and a 4 inch below the finisher cylinder.

The dust ducts look similar to those on our cards.

Cleaning under the cards is done by a higher than normal velocity dust system. However, this method is not considered satisfactory and they were very interested in our experience with high pressure vacuum cleaning systems. They are also investigating a sweeper conveyor developed by Saco, a U.S. textile machinery manufacturer, to continually remove fly from under the cards.

At Ermley-Crook, they definitely do not route the fly and the bag collector products in the blends for the textile operations. I got mixed replies to this question at Rochdale. I am inclined to believe that they do not route waste products.

Spinning and Doubling (Twisting)

The machines used for twisting and spinning are flyer frames. They are older types of machines than our ring frames. They have not been replaced because Turner Bros. cannot prove a financial pay-off. At Rochdale, I saw a few ring frame machines which were used for the finer cut yarns.

The flyer frames used for spinning had no methods of dust control on them. At this stage the yarn cannot be wetted. The oil added to the fibre in the mixers was the only dust suppressant used. All flyer frames used for twisting were equipped with means of wetting the yarn with water. The mechanism was simply a roll moving at a speed slower than the yarn. The roll dipped into a shallow trough in which a water level was maintained by means of a "ballcock feeder".

There were a few ring frames used for finer cut yarns. These machines had enclosures on the spindles and some ventilation. They also had "Pneumafil" systems for extracting loose yarns on the ring frame machines.

Looms

At Rockdale, there were 270 looms used for weaving cabactex cloth. The warp threads were fed both from beams and creels. They are looms where tension control is more important. It seems tension control is difficult with creels.

Eight braiding machines were used. These machines were being worked on to improve cloth. The drive systems were being modified to give constant thread winding speed. A hood with a 7 inch dust pipe had been added at the point where the yarns were guided. The 3 inch pipes ventilated the area at the beam where the threads were winding.

There were three 3 inch pipes under the seats.

Each loom had a completely enclosed hopper below the warp threads. An 8 inch dust pipe was connected to the hopper. A slot connected to a 4 inch pipe ventilated the cloth at the point where it was formed. At Rockdale, all the warp threads were wetted. At Hartley-Green they can't wet the threads because they then cannot hold the necessary cloth tolerances required for brake linings and clutch facings.

Braiding was done with wetted yarns. The braiders had been slowed down to reduce noise. Dust, of course, was also reduced. They found no increase in operating costs. An operator could handle more machines and there was a big reduction in machine downtime. They drew the conclusion that increasing machine speeds does not necessarily reduce costs.

Knitting Yarns

Although wetting yarns is now used extensively, it was a difficult procedure to get started. One of the farmers, after trying to get it done for years, insisted that it be instituted during the Second World War. At that time ground conscripted supply and he felt a change in cloth appearance could be sold. Wetting the yarns does change the appearance of the finished product, making threads more dense and increasing size of voids in cloth. Production must learn to make the required products with different techniques when wetting is instituted. Nevertheless, they do not seem to have any trouble selling their output now. Their production must be several times as high as that of Johns-Manville.

Dust Systems

Hoods and dust systems are designed in conventional fashion. Carrying velocities used for design are only 3,000 ft. per min. The dusts are connected to dust that blow into horizontal bag collectors. Each plant had galleries which were on a reasonable elevation one side of the workshop. Numerous fans and bag collectors were installed in each gallery.

Each bag-house bag collector has about 3,000 sq. ft. of cloth and handles 30,000 to 35,000 CFM. With the fan, the collector costs $12,000. The bags are about 10 inches in diameter and about 10-12 feet long. They are arranged in two rows, each row having a group of three. Each group of three is connected together with a yoke on top. The yoke has a cable running over a pair of pulleys and a weight at the end. Shaking is accomplished by lifting and dropping the weights.

The collectors are about 8 ft. wide by 36 ft. long. There are two hoppers underneath with a series of polyethylene bags connected to the hoppers for catching the collected dust. To remove dust, the collector must be shut down and about 20 bags removed and replaced.

Hundreds of thousands of CFM of dust control air is handled by systems of the type described.

Air Pollution

The government authorities will not permit recirculation of air from the bag collectors, the bag collector failures are extremely close. Dust counts show lower values than outdoors.

They have extensive heated air make-up system to make-up the exhaust air and keep the plant under positive pressure.

They were very interested in my explanation of successful attempts at Amarillo and Toronto to recirculate air from bag collectors over the objections and finally with the approval of state and provincial authorities.

J. Goldfield

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Research & Engineering Center
February 7, 1956

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REPORT OF TRIP TO TURNER BROS.
ASHTON CO., LTD.
REPORT NO. 2 OF 2
PRODUCTION FACILITIES

Fibre Yard

Fibre is brought by ship to Liverpool or Manchester where, due to recent articles in British newspapers about health hazards, there have been labor difficulties in unloading. The fibre is brought in railway cars to Rochdale where a long conveyor carries the bags to the warehouse. The warehouse is multi-story and fibre is piled quite high on each. There is now about 18 months supply.

Most of the fibre was from Southern Rhodesia, although they told me that due to political problems they will not be able to get any from that source after February. The fibre from Southern Rhodesia was in jute bags and designated C and C1 and C and C2. I also saw some Bell 3FCO and Coogiar AA and AC. I saw a small amount of No. 1 Crude.

As I recall, they are having trouble continuing train delivery and are going to truck delivery at a considerable savings in freight cost.

Fibre Preparation for Textiles

As described in my previous report, the fibre is charged onto a turntable and a batching conveyor until 1000 lbs. is accumulated. Some of the batch contains reworked waste material. There is a waste treatment system that takes yarn that is reject, cuts it up and opens it in a hammer mill (Miracle mill).

The entire batch is dropped into a drum mixer of their own design. The mixer is about four feet in diameter and about 10 feet long. Two batches an hour can be mixed.

Through the shaft of the mixer a solution of a textile oil and water is sprayed into the fibre batch. The solution 4% by weight of the fibre batch. Thus, 60 lbs. of solution containing 30 lbs. of oil and 30 lbs. of water are added.

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After the predetermined time cycle, doors on the mixer automatically open and drop the mixer contents to a live bottom bin below.

The bin has a grate on bottom with heavy bars spaced about 3-1/4 inches apart. A shaft with spikes attached moves back and forth pulling fibre from the grate openings. Two such shaft assemblies cover the bin bottom as they traverse back and forth. I have a drawing of the spiked attachment to the shaft.

The bin was developed in cooperation with the Redler conveyor people. Original designs caused many problems which have been corrected.

From the bin the fibre drops onto a vibrating conveyor which in turn feeds a Redler conveyor. The Redler conveyor maintains a hopper above a textile type feeder full of fibre. The Redler lifts the fibre from below the live bottom bin to the fibre feeder located above a Canadian-type fibre willow. The willow is on the same elevation as the bottom of the live bottom bin. A low pressure air system conveys the willowed fibre to a cyclone located on an upper level. The cyclone feeds a Redler conveyor which carries the fibre to four feeders each feeding one rotary screen. The Redler conveyor keeps the feeders full. The fourth feeder must be run constant under capacity because there is no storage in this system.

The feeders above the screens are Williams-Patterns units.

The fines from the screening operation are discarded. The fibre retained on the screen drops to the floor below, where it is bagged in slippered, nylon-reinforced, PVC bags.

At Hartley-Dixon they installed a Redler conveyor system to take fibre from the live bottom bin to feed 40 cards. It forms a complete loop around a work area about 150 ft. wide by 300-400 ft. long. The Redler conveyor is simply a series of steel scrapers pulled by a chain running in a rectangular box. The box has holes on bottom for dropping out the fiber into chutes above each card. It had been thought that as the chute filled, the conveyor system would stop feeding and fibre would be carried to the next card. This concept worked well for four cards but not for any larger number. They have had to add slide dampers below the Redler at each card. These must be manually opened and closed.

The chute from the Redler drops the fibre onto a small slat conveyor. This conveyor starts and stops when a swinging gate below is pushed sideways by the fibre when the feeder to the card is full. As the feeder empties, the swinging gate starts the slat conveyor and feeds fibre to the card feeder. When the feeder is full, the swinging gate is pushed aside and a microswitch stops the slat conveyor.

The system is not considered completely successful due to the need for a man opening and closing the gate valve under the Redler, high maintenance of the conveyor, and the ability to feed only one blend.

Cards

The card feeder feeds the fibre into a weigh hopper which accurately weighs the fibre onto a fibre feed conveyor. After the fibre, cotton is introduced in the form of a lap. The lap is very carefully prepared on machines that have several stages of picking and felting. The weight is also automatically controlled across the width of the cotton lap.

The carefully controlled lap, fed into the card, ensures uniformity of cotton content in each foot of yarn. They couldn't understand how we could insure such uniformity without feeding lap into the cards.

The remainder of the finisher and breaker cards looked very similar to ours except that both cards were in line instead of side-by-side. Also they use tape condensers instead of ring doffers.

The apron conveyors are made of chrome leather.

Card Capacity

At Hamley-Green, I was told the cards rate 75-90 lbs. per hour of yarn. The same must be true at Rochdale. They have four fibre preparation systems - each with a capacity of 3,000 lbs. per hour. There are 103 cards. If each card produced 50 lbs. per hour, three fibre preparation systems would handle the production with one as stand-by.

Spinning and Doubling

As mentioned in my previous report, practically all spinning and doubling is done on flyer-frames. A few ring frames are available for finer cut yarns. I don't know whether their system of measurement is the same as ours, but they told me they regularly made 70 cut yarn. They also told me that they had once made 200 cut yarn.

Looms

At Rochdale, there were 170 looms weaving cloth. They tried shuttleless looms but don't consider them satisfactory for asbestos cloth.

At Hamley-Green, I saw cards, flyer frames and looms working on crocidolite yarn and cloth. The operations looked dusty and unsafe.

At Hamley-Green, numerous looms were making thick cloth consisting of several plies held together with a binder thread. The binder thread was lubricated by an oil solution. The thick material, as much as 3/4 inch, are used for brake linings. Some looms were weaving a spiral cloth which was falling in circles around a mandrel. This cloth is used for clutch facings.

Rubber and Belting Shop

A rubber shop at Hanley-Green had two No. 3 Banburys - one driven by a 150 HP and the second by a 250 HP motor. From the Banbury they drop the rubber onto a sheeting mill. The slabs are attached to a conveyor and run through sprays to prevent adhesion of piled slabs. The slabs are run back and forth hanging from a trolley conveyor near the roof to give them some retention time for cooling. The slabs were carried back down to the mill operator for piling.

A rubber extrusion process, set-up very much like the one in Knoxville, was in use. A strip cut off a rubber mill was automatically feeding an extruder.

Flat conveyor belting and V-belts were made in this same shop.

Miscellaneous

I formed several impressions that are probably old news to people used to dealing with Europeans but new to me.

The English are quite formal in their business dealings. In the week I spent at Rochdale, I received a first-name basis with only one man, although all my contacts were exceedingly cordial.

They are much more position-conscious than we are. There were several dining rooms at Rochdale for various levels of plant personnel. The men's rooms were similarly segregated. One bathroom I used was marked for managers only. Individual towels on hooks with the man's name on the hook were provided.

The men I met at Turner Bros. were quite a competent group. I was favorably impressed with their knowledge of the operations and their air of assurance and cordiality.

J. Caldfield

J. Caldfield - MIT, Fisheries