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"Industrial Aspects"

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The commercial exploitation of asbestos in the United Kingdom can be said to have begun in about 1880, following the discovery of chrysotile asbestos deposits in the Province of Quebec. Its use was mainly confined to textile processes at that time. Chrysotile - which is the white asbestos - comprises more than 90 per cent of the World's production and is the type of fibre with which I am most familiar. I should say at the outset that my main interest is related to the asbestos textile industry, and I will confine myself to it. Crocidolite - blue asbestos - has been used in textiles in small quantities, and in the factory in which I work, between 1911 and 1969, some of this material was handled.

Chrysotile is mined in Canada, Southern Rhodesia, the U.S.S.R. and there is also a mine in Cyprus. Crocidolite, which is the blue fibre, comes from the North West Cape Province in South Africa and also from the North Eastern Transvaal. The biological effects of the fibres from these two regions are apparently different and this is considered by many people to be very significant. Amosite comes solely, at the present time, from South Africa. In fact Amosite stands for the Asbestos Mines of South Africa. I believe there are deposits in India which are now being exploited. Anthophyllite comes from Finland, U.S.A., Africa. There are large deposits in Africa and they are not much exploited. This is another fibre which has very interesting biological effects in man. Although pleural plaques have been associated with Anthophyllite in Finland, mesothelioma has not.

Asbestos exposure is the common aetiological factor in the production of the pulmonary fibrosis known as asbestosis, in lung cancer and malignant mesothelioma of the pleuro-peritoneum. The first case of asbestosis was diagnosed in 1900 by Montague Murray who reported it in 1906 before the Departmental Committee on Compensation of Industrial Disease. Animal experiments which were conducted by Professor Beattie at the

Industry which to some extent has been fulfilled in the textile process but which has, unfortunately, not come true in other sections of the industry due to failure to recognise the importance of these concluding remarks. With regard to Part II of the Report, this detailed at least twelve engineering measures which were required to prevent the escape of harmful dust.

As a result of the recommendations which were contained in the Merewether and Price Report the Asbestos Industry Regulations were made in 1931 and these became effective in 1933. The Regulations required exhaust ventilation on carding engines and looms. In 1939 we applied damping in weaving; this was a great advance. In 1942 dust settling chambers in the ventilation system were replaced by sleeve filters. In 1946 damping was extended to yarn doubling. It was not until 1951 that, in this factory, routine measurement of the environment commenced. This was largely because until that time there were no technical means whereby it was possible to estimate the environment. Between 1953 and 1957 a number of improvements were made. The ventilation systems were redesigned, fibre-mixing on the floor was abolished and the process enclosed, and a solvent extracted mineral oil was introduced into the fibre mixture to suppress dust during further processing. In 1961 the method of dust estimation which is now in use was first applied, i.e. the membrane filter method. In 1964 impermeable bags for transport of fibre in the factory were introduced. These were nylon bags coated with PVC having a nylon zip fastener. In 1965 damping was extended to intermediate spinning.

The point I am trying to make is that improvements did not occur all at once in 1933. They took a long time to implement - over a period of 20 years, if not more. In fact modifications are still being made to the process. As a result, the industry as a whole has improved greatly. It did attempt to adhere to the 1931 regulations. Unfortunately, the 1931 regulations which were known as the Asbestos Industry Regulations, did not provide for the

University of Sheffield in 1912 confirmed that the inhalation of asbestos dust would cause a mild degree of fibrosis. Further cases were reported in 1924 and 1928 and this led to an investigation in 1929 by Dr. Merewether of the Medical Inspectorate of Factories and Mr. Price, an Engineering Inspector of Factories. They published their report in 1930 and this report concerned itself with the medical evidence available from the textile branch of the industry and some preliminary processes in other branches, and with the study of the methods of manufacture of asbestos products. Merewether examined 363 workers of whom 26.2 per cent showed definite fibrosis due to asbestos dust. Even Merewether had difficulty in diagnosing asbestosis because he excluded 21 workers with what he called "precurative signs" where a diagnosis could not definitely be established. Furthermore, the worst experience was that of workers with twenty years or more exposure, of whom 81 per cent developed pulmonary fibrosis. In his report Merewether also demonstrated that age was not a factor in the production of this condition, and he made it apparent that (before the antibiotic era) respiratory diseases such as pneumonia and tuberculosis often left their mark, thus complicating radiological findings. He stated "To sum up, therefore, it appears probable that concentration of dust and length of exposure as factors in the production of fibrosis are interdependent within certain limits." Merewether concluded that the necessary preventive measures should firstly, be directed specifically towards the suppression and control of the dust evolved and secondly, personal protection of those employed in the industry. He suggested that the disease could be controlled by periodical medical examination of the workers, by excluding those unfitted by health reasons from entering the industry, by detecting pulmonary fibrosis and pulmonary tuberculosis at the earliest moment. He further stated that the ultimate and only reliable test of the effectiveness of the preventive measures adopted in the industry would be found in the statistics derived from the records of periodical examinations of the workers. He ended his section of the Report on a note of optimism regarding the outlook for the

control of certain processes, one of the exclusions being that, so long as such a process or work was carried on occasionally only and no persons was employed for more than eight hours per week the provisions did not apply. The operations to which the regulations applied were itemised in a schedule which appeared at the end of the regulations, and those areas to which they applied became known as "scheduled areas". The scheduled processes were solely in manufacturing and, in particular, they failed to include lagging and insulation work. It is interesting to compare Merewether's 1929 findings with the present position in the factory in which I work.

If one regards all the currently employed new cases which have been certified by the Pneumoconiosis Medical Panel as being equivalent to cases which Merewether diagnosed in a one-off study in 1929, where he found 95 cases of pulmonary fibrosis, we currently employ 8 asbestosis cases. Whereas Merewether had a group incidence of 81 per cent in this with 20 or more years' exposure, we had a group incidence of 4.4 per cent and 3 of these were exposed before the 1931 Regulations took effect so that they may very well have qualified for inclusion in Merewether's study. I think we can say that the 1931 Regulations in this textile factory have been effective. Whether they have been as effective as they could have been is another matter.

The insulation trade was producing, in 1969, 48 per cent of the new cases of asbestosis diagnosed in the United Kingdom. These were the people who were excluded by that "let out" clause in the 1931 Regulations. A lot of people were excluded.

The 1969 Regulations are called the Asbestos Regulations and the word "Industry" has disappeared. They apply to all areas where asbestos is used and where asbestos dust is given off in such concentrations as is liable to

be harmful to the health of exposed persons. One effect of these Regulations at our factory was the provision of changing rooms to prevent contamination of outdoor clothing with fibre and the wearing of this clothing back into the home. Since 1969 it has been forbidden to remove overalls from the factory premises and the reasons, of course, is the possibility of domestic exposure leading to the development of mesothelioma. We have not, to our knowledge, had any such cases in Rochdale but, they have been described elsewhere.

Since 1970, we have found a method of reducing dust on fibre rope which is used to wrap around pipes, ventilation systems have improved and we have developed a new process for making asbestos yarn. Carding engines are now in group enclosures with no access permitted between the cards without personal protection. The Plenum system provides air at the front of the card and the exhaust takes it away from the card and thus away from the card tender. This means that hopper-fillers at the back of the cards still have to wear respiratory protection.

It was decided in 1969 that if we were to keep our employees fully informed on all aspects of asbestos and health and pertinent legislation, we needed to conduct seminars on the subject for managers, supervisors, shop stewards and other workers' representative. We also published an explanatory booklet for the benefit of employees who were in the industry at the time and for the information of new starters. In 1974, five years after the 1969 Regulations, we held a further series of seminars, this time with audience participation, encouraged by the use of syndicate discussion and plenary sessions with feed-back from the syndicates. As a result it was decided to hold regular refresher courses and produce visual aids for education of all operatives and others concerned. The Health Committee, which has been in existence for twenty years, was reconstituted in 1972 to include senior shop stewards and factory supervisors and all members of the Health

Committee are kept fully informed of the dust levels in the factory, the disease incidence and the causes of death in asbestos workers.

The disease "asbestosis", is dose-related and it causes disability and shortens life. It progresses after removal from exposure at a certain stage which is as yet indefinable and the severity is possibly related to the type of asbestos. It is almost certainly preventable by practical dust control measures. There may be some individual susceptibility factors which have not as yet been fully investigated.

Fibrosis of the pleura may occur alone or combined with asbestosis. When it occurs alone it does not appear to be a cause of severe disability. The prognosis, however, needs further study with regard to its association with possible malignancy. It is, however, also probably preventable by practical dust control.

The first association between asbestosis and lung cancer was noted by Lynch and Smith in the United States of America in 1955. It was subsequently confirmed by Merewether in 1945 and it is now well known that there is an excess mortality from lung cancer in those suffering from asbestosis. The view most widely held in Great Britain is that the excess of lung cancer is associated with asbestosis and not merely asbestos exposure. It has been quite clearly shown that cigarette smoking vastly multiplies the cancer risk and the opinion has been expressed by one research worker that non-smokers who work with asbestos have almost no increased risk of lung cancer. It has been shown by Doll that at our factory the incidence both of asbestosis and of lung cancer associated with asbestosis has been progressively less as the number of years during which men were exposed to the pre-1933 conditions has decreased. It has also been shown by Knox et al that men and women whose exposure at T.B.A. for 10 years or more commenced after the 1st January, 1933 had a mortality experience close to the national

average. They pointed out, however, in 1968 that firm conclusions could not be drawn because the data was insufficient to estimate the extent of the remaining risk.

On review of the "Doll cohorts" as at 31st December, 1974 there still appears to be some possible slight excess lung cancer incidence. This, of course, is not entirely surprising. Conditions were still not entirely satisfactory after 1933 and therefore this probably does not reflect in any way modern working conditions. However, it does indicate that the conditions in the factory have only steadily been improving and have not, even at this time, reached the best conditions that could be practically achieved.

At this particular time we still have to be cautious and state that the numbers are small and we have to follow up this cohort for a very much longer period. We must be absolutely certain that the conditions under which people are working are safe.

What we also have to do, as well as dust control, is to stop people smoking. I nearly brought the works to a standstill when I actually achieved the removal of cigarettes from the vending machines for 24 short-lived hours, but with the threat of withdrawal of labour and the breakdown of joint consultation they were put back in again.

The Hygiene Standard for Chrysotile asbestos is 2 fibres per cc. and in March 1975 there were still a few areas where we were getting dust counts above this level.

Finally, may I just say that the control of a major hazard in industry requires the best use to be made of available resources. At T.B.A. the annual revenue costs for our entire health and safety programme amount to approximately £260,000.

This sum includes expenditure on the Medical Centre, Industrial Hygiene Section, Engineering Design, and Dust Control plant. Capital expenditure on plant to control asbestos dust was £41,000 in 1974 and our average annual capital expenditure over the 5 years 1969 - 1973 has been £44,000. Asbestos is a dangerous substance when its manufacture and its use are not properly controlled. The example of T.B.A. and the determination which this particular Company has displayed over the years to control the hazard, and to continue to use this valuable material, could well be followed by the rest of the World. If the funds are not available to pay the price of dust control then the job should be left to those with the money and the skill to do so and not endanger the lives of employees unnecessarily.

DISCUSSION (After Paper 1)

Q. (from the audience). Dr. Levinsohn, has any work been done along the lines suggested in the current issue of Health Trends, where right at the end of the article there is a reference to an excess of W27 antigen among patients with asbestos? etc. Do you have any information on that and how does it relate to your statement that the majority of personnel are actually susceptible?

A. (Dr. Levinsohn). Could I ask Dr. Evans to answer that question, please?
Dr. Evans: I will be pleased to.

(More conversation in the audience)

Dr. Levinsohn: Whichever you prefer. It was a question.

May I just say that the reason I asked Dr. Evans is because we are at the present time collaborating in a study on HLA antigens in our cases of asbestosis and a controlled population, and his knowledge of the subject is far greater than mine.

Q. Could I ask a simple question. When I visited TBA some years ago I saw asbestos yarn made with the wet process and I made a point of asking this question in London the other day... Has the firm made any effort to extend that wet process through the whole of its manufacturing?

A. Dr. Levinsohn: I don't think that at the present time it is possible to extend it to the whole of the textile manufacturing operation although in the course of time we would hope that manufacturing yarn by this process will allow us to do so. There are technical difficulties. It is an entirely different yarn; it has different physical properties. Also, a lot of the customers have to be convinced that they can use it.