SUMMARY AND EVALUATION

Subject: Brief discussion of the various forms of asbestos and their effects on health. Of some interest.

Evaluation: This very short paper, running to three printed pages, was presented to provide background information to a conference on possible asbestos exposure to maintenance workers on auto brakes and clutches in Britain. The author points out that currently disc brake pads, brake linings and clutch facings contain 50 percent chrysotile asbestos. However, newer developments indicate that the percentage of asbestos in the mix is likely to decline, perhaps down to a minimum of 30 percent asbestos. Disc brakes require less asbestos fiber than drum brake linings, and it is estimated that more and more passenger cars produced in the U.K. will be equiped with disc brakes.

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Summary: As given above.

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ASBESTOS AND ASBESTOSIS*

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THE FORMS AND USES OF ASBESTOS

COMMERCIALLY important asbestos fibres fall into two main groups. The first of these is chrysotile, and the second comprises the amphiboles. Both groups are fibrous silicates, but they differ in geological origin, in chemical composition, in molecular structure, in fibre size and strength, and in other characteristics. Chrysotile, white asbestos, comes from many different places. There are slight chemical and physical variations in the fibres from different sources, but basically all have the same molecular structure. On the other hand, the amphiboles comprise at least three separate types, whose molecular structure is very similar, but whose chemical and physical properties differ more widely. Amosite (amber) and crocidolite (blue) are of commercial importance in this country, whereas anthophyllite is a Finnish fibre not used here.

The relative amounts of each fibre in world production is shown in Fig. 1 and the areas of main use in Fig. 2.

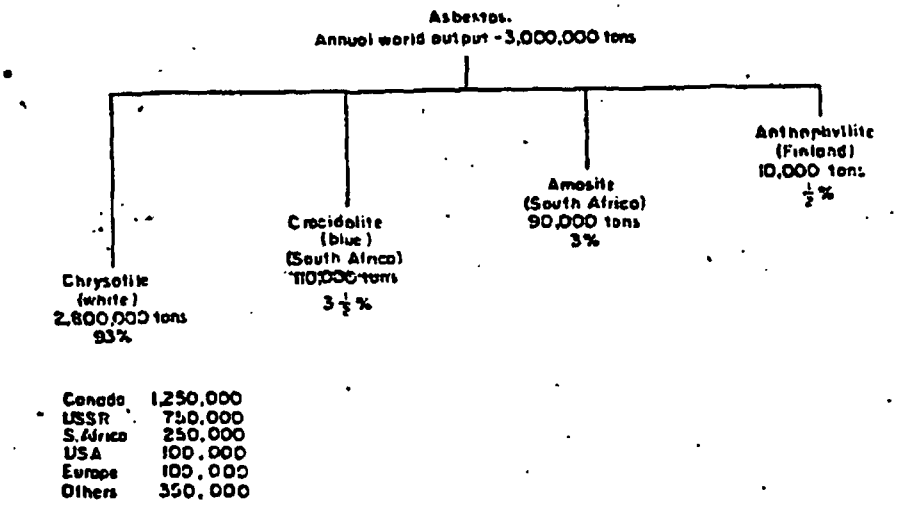

FIG. 1. World production of asbestos.

*This paper was originally presented at a Conference on Exposure to Asbestos during Brake and Clutch Maintenance, held at Brentwood, Essex, March, 1969.

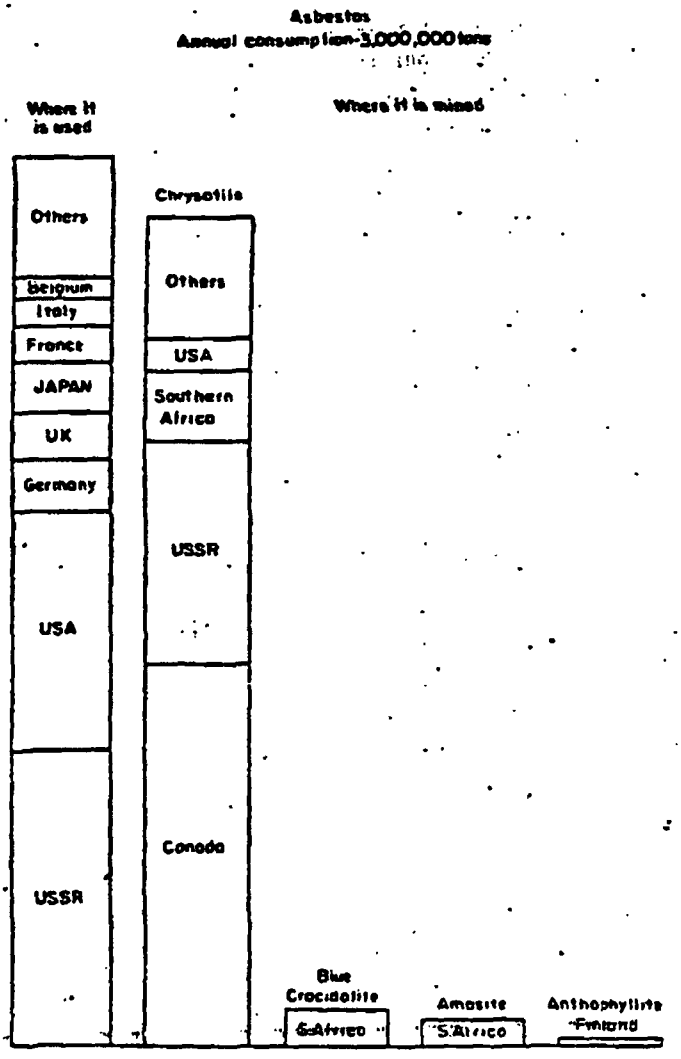

FIG. 2. Areas of use of asbestos.

The different characteristics of asbestos fibres dictate their uses, their applications and their mode of packing and handling. For example, amosite can be pressure packed and palletized, whereas chrysotile lends itself more readily to containerization. By far the greatest use of chrysotile is in the asbestos cement industry. Amosite is used mainly in insulation and building products. Crocidolite, due to its excellent acid resistance, finds its major application in the manufacture of battery boxes in this country. It is added to the pitch mixture in unopened dissoluble bags.

Very broadly it can be said that current friction materials, whether they be disc brake pads, passenger car and commercial vehicle brake linings or clutch facings, contain 50 per cent chrysotile asbestos. The new trends of development, particularly in the fields of disc brake pads and commercial vehicle brake linings, indicate that the percentage of asbestos included in the mix is likely to decline. Some new materials now contain approximately 40 per cent asbestos, and newer mixes can be foreseen with an even lower percentage, probably down to a minimum of 30 per cent. The pads for disc brakes require less asbestos fibre than conventional drum brake linings. It is estimated that more and more passenger cars produced in the U.K. will in future be equipped with disc brakes, particularly on the front wheels.

THE BIOLOGICAL EFFECTS OF ASBESTOS

The variation existing in the biological effects of the different types of asbestos is the subject of considerable interest and research, and the extent to which the physical and chemical characteristics of the asbestos itself influence biological effects is being investigated. The role of trace elements and contaminants associated with the fibres has also to be considered.

The chief biological effects of asbestos are confined to the lung and the pleura, or lining of the lung and chest cavity, and to the peritoneum, or lining of the abdominal cavity. A few cases of skin corns have occured in asbestos workers, but these are becoming much less common.

All types of asbestos, if inhaled in fairly high concentrations over a considerable period of time, may cause fibrosis of the lungs. This disease, called asbestosis, consists of thickening of the lung membranes with resultant stiffening of the tissues and interference with oxygen uptake. The interference with gas transfer is the reason for the shortness of breath which causes the disability associated with asbestosis.

The amount of exposure required to produce fibrosis of the pleura, with or without calcium deposition in the scars, is more debatable. It may be that shorter, less concentrated exposures, particularly in youth, leave this mark upon the pleura. In any event this particular effect of asbestos inhalation causes little or no disability in itself.

Exposure to asbestos may lead to further complications, e.g., heart failure, cancer of the lung, or, rarely, to malignant changes in the pleura or peritoneum, known as mesothelioma. Cancer of the lung has been shown to be more common in asbestos workers who smoke, just as it is in the general population. Mesotheliomas are very uncommon throughout the world, but in some areas they have been associated more frequently with exposure to crocidolite than to chrysotile, amosite or anthophyllite. The reasons for this are at present obscure, but are being sought intensively by investigators in many different countries.

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BRAKE LINING DECOMPOSITION PRODUCTS

In recent years, some individuals have pointed at brake lining wear as a probable source of asbestos contamination of the ambient air. In this paper, Jeremiah R. Lynch of the National Center for Urban and Industrial Health, HEW, refutes this theory by showing that in all but a few extremely severe automobile braking tests, less than one percent asbestos fiber could be found in the collected dust. He concludes that brake lining wear is "an inconsequential health factor in urban air pollution."