BRITISH FRICTION MATERIALS COUNCIL

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AIR MAIL

362/m/BFMC

8th December, 1971.

The Society of Automotive Engineers, Inc.,
2 Pennsylvania Plaza,
New York, N.Y.10001,
U.S.A.

Dear Sirs,

We have been asked by our members in the British friction materials industry in the U.K. to put their views to you on the proposed Illinois State Regulations concerning asbestos and asbestos products. We enclose herewith their comments on the friction material aspect of these draft Regulations.

We have no doubt that the American lining manufacturers will be making strong representations to the Illinois authorities for amendments to the proposals and we shall be grateful if you could make our views known as set out in this enclosure.

Yours faithfully,

Secretaries

Enc.

PROPOSED ILLINOIS STATE
BAN ON ASBESTOS-BASED BRAKE LININGS

The British friction materials industry views with deep concern the proposed ban on the use of asbestos in brake linings by the State of Illinois.

It is not aware of any medical evidence that could possibly justify such legislation. On the contrary it would have the effect of withdrawing from the market products that were used to promote road safety, without producing any significant improvement in the levels of urban atmospheric pollution. It would expect any of the known alternatives to asbestos to produce general particulate pollution of a measurable amount.

1. Whatever materials are used for brake linings the current state of the art is such that the action of braking will generate products of wear. The asbestos content of conventional brake linings is almost entirely converted by the action of braking into forsterite or other amorphous, inert materials which are no longer asbestos. On the other hand, if non asbestos alternatives are used (e.g. iron powder, sintered metal, ceramics, steel wool etc.,) the resulting wear products will be released unchanged.

2. Measurements have been made of the amount of free asbestos fibre left in brake lining dust. It is an insignificant proportion of what is in any case a minute amount of total dust.

   The amount of free asbestos fibre that has been found in brake lining dust from vehicles, is about 1% of the total products of wear. (1). Indeed estimates vary down to 10^{-9}g/g, i.e. for each gramme of wear products only 10^{-9} grammes of free asbestos may may remain.

3. We assume that the risk of contracting mesothelioma is the principal cause of environmental concern - there is clearly no possibility whatever as a result of vehicle braking, of a community risk of asbestosis or lung cancer, which are solely occupational risks. For technical reasons only chrysotile asbestos is used in the manufacture of brake linings and disc brake pads. This is not the type of asbestos with which mesothelioma has been mainly associated.

4. Measurements of chrysotile asbestos in the ambient air in an industrial centre in the United Kingdom have shown that the level must be less than 10^{-7} g/m^3 because of the limitations of the method used. This means that they must be a thousand times lower than the British Government acceptable level for occupational exposure. Current investigations using a more sensitive method indicate levels of 10^{-9} to 10^{-10} g/m^3, i.e. 2 or 3 orders lower still. (2).

   Brake lining wear cannot therefore be a serious source of atmospheric pollution.

5. In one of the largest brake testing laboratories in the world, housing many dynamometers engaged 24 hours a day in wearing away friction materials, the average monthly asbestos count is 0.2 fibres /cc, a tenth of the British Government's occupational standard.

Footnotes

1. Hickish D.E. and Knight K.L. (1970) Annals of Occupational Hygiene Vol.13, No.1, page 20.

2. Letter to Nature attached.

British Friction Materials Council
26th November, 1971.

Chrysotile Asbestos in Urban Air

The industrial use of chrysotile asbestos is increasing and the question of whether its concentration in urban air constitutes a hazard has been raised. But measurements of asbestos in air near asbestos factories have proved negative with present analytical methods, so under the sponsorship of the Asbestosis Research Council we are developing a more sensitive technique. This article is a preliminary account of the estimation of chrysotile near a large asbestos textile factory at Rochdale, Lancashire. There are several uncertainties in the technique, so we were expecting to obtain only an order of magnitude estimate. Nevertheless this would have been an important figure to have because of the lack of data on the amount of asbestos in air. As it happened, we were only able to determine an upper limit for the chrysotile concentration which turned out to be three orders of magnitude lower than the threshold value for occupational exposure set by asbestos regulations. Obviously even more sensitive techniques are required and are now being developed.

We used an X-ray diffraction technique based on the measurement of the integrated area under the (002) peak of chrysotile. The equipment, which consisted of a Phillips 1010 generator, a vertical goniometer with a step scanning attachment, and a proportional counter with pulse height discrimination, could be reliably calibrated down to 10 μg of chrysotile compared with the 1 to 10 mg range reported by Crable[1], and was cross-checked by estimating the magnesium content of the calibration samples by atomic absorption spectroscopy. Sampling involved the collection of airborne solids from 1,000 m^3 (10^6 l.) of air by an electrostatic device (H. Litton Systems Inc.) in which up to 10,000 l. min^{-1} are drawn through a 20 kV corona discharge. Particles in the air are electrostatically precipitated onto a plate and concentrated into ~100 ml. of liquid.

The collection efficiency depends on the size distribution of the particles and the sampling rate, but the size distribution of chrysotile in the atmosphere is not known. Therefore we estimated the collection efficiency indirectly by running the sampler in part of the asbestos factory where a low concentration of asbestos is known to occur (Fig. 1) and we found the collection efficiency to be almost 100% when the air is sampled at about 2,000 l. min^{-1}, dropping to between 25 and 50% at the rate of 10,000 l. min^{-1}, depending on the actual size distribution present. As we were aiming at only an order of magni-

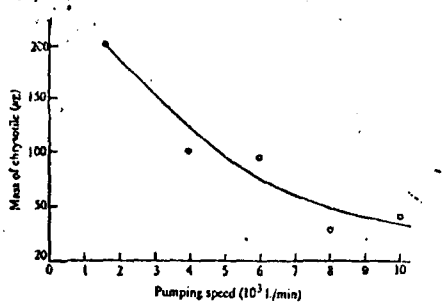

Fig. 1 Observed amounts of chrysotile in 5,000 l. of factory air, sampled at different rates.

tude assessment of asbestos in urban air, we were prepared to accept this uncertainty in the collection efficiency.

The map (Fig. 2) and Table 1 show the location of the sampling sites and the conditions in which the samples were obtained. The factory is in a hollow, and sampling site No. 2 is at the same height as the roof of the filter gallery, which is the chief air o t from the factory. Sampling site No. 1 is about 30 foot higher than site No. 2. Sites 3 and 4 were in the gardens of houses, site 3 being about 5 km upwind of the factory and site 4 being about 300 m downwind.

All the diffraction traces (for example, Fig. 3) contained strong lines of kaolinite and quartz, probably from the local soil, which made the assessment of chrysotile difficult because the broad (001) line of kaolinite (7.18 Å) is close to the major (002) line of chrysotile (7.36 Å). Fortunately chrysotile is easily decomposed by boiling in 1 N hydrochloric acid whereas kaolinite is unaffected, so it should be possible to measure the amount of chrysotile present by subjecting the samples to acid leaching and measuring the corresponding reduction of the intensity of the composite X-ray band. The fact that this process led to no reductions in band intensity for any of the samples indicated that the amount of chrysotile present was below our detection limit.

We ought to have been able to detect 10 μg of chrysotile by itself, but clearly the presence of kaolinite may have reduced

Table 1 Weather Conditions during Sampling

Date (1970)	Site	Wind	Weather
April 22	1	SW moderate	Broken cloud
April 24	1	SW slight	Ground haze
April 27	1	NE moderate	Ground haze
April 29	1	SW moderate	Ground haze
May 6	1	S strong	Ground haze
May 13	1	N fresh	Ground haze
May 28	3	W light	Overcast, dull
May 28	3	W light	Overcast, dull
May 30	4	W light	Overcast, dull
May 30	4	W light	Overcast, dull
June 3	2	SW light	Overcast
June 10	2	SW slight	Heat haze
June 10	2	SW slight	Heat haze
October 23	1	W moderate	Broken cloud
October 23	1	W moderate	Broken cloud
October 23	1	W moderate	Broken cloud
October 28	1	N light	Broken cloud
October 28	1	N light	Broken cloud
October 28	1	N light	Broken cloud

the sensitivity. But the addition of 100 μg of chrysotile to our collected samples could easily be detected, so we can say that our samples collected from 1,000 m^3 of air contained less than 100 μg of chrysotile—in other words, there was less than 0.1 μg of chrysotile per m^3 of air. The threshold limit for occupational exposure set by the 1969 Asbestos Regulations[2] is 0.1 mg m^{-3}.

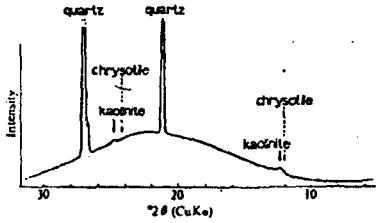

Fig. 3 X-ray diffraction pattern from a typical dust sample near the Rochdale factory.

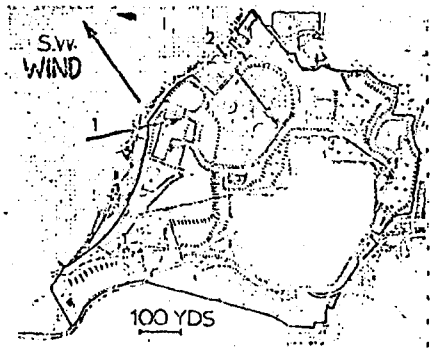

Fig. 2 Plan of T.B.A. factory, Rochdale. The sampling sites are indicated by the arrows 1 and 2. F, Position of the chief filter gallery exhausts.

A more sensitive method for estimating chrysotile is required, and we are developing a technique based on electron microscopy. Preliminary examinations under the electron microscope of samples collected by the Litton sampler indicate that the actual chrysotile level may be a further three orders of magnitude below the X-ray detection limit (that is, about 0.1 ng).

The samples have so far been collected in the close vicinity of the Rochdale factory. It is now proposed to sample air at certain representative urban and rural locations in UK and estimate their chrysotile content.

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[1] Crable, J. V., *Amer. Ind. Hyg. Assoc. J.*, 27, 293 (1966).
[2] *Standards for Asbestos Dust Concentration for Use with the Asbestos Regulations 1969, Technical Data Note 13* (H.M. Factory Inspectorate, 1969).