



Intra Company

Scientific Research Staff

TO: Mr. E. H. Simpson

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cc: J. Gratch
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Subject: Asbestos in Brake Lining Wear Debris

It is estimated that an average of about 100g of chrysotile asbestos per car per year are consumed as a result of brake lining wear. This estimate is based on lining volume worn from various types of brakes using proving ground lining life experience, and assumes typical lining asbestos content and 10,000 miles of use per year. The average is weighted according to the 1968 Ford Motor Company passenger car product mix. (A previous estimate of 307g was based on unrealistically high wear volumes and rates.) For a U.S. population of 90 million cars, about 10,000 tons per year of brake lining asbestos would thus be worn away, with more of the wear being concentrated in regions of high car population density. Approximately 1 million tons of asbestos per year are consumed in the U.S. for all applications¹. According to Selikoff², the health hazard from asbestos which could be emitted to the atmosphere through brake lining wear is small compared to the hazard from asbestos dispersed in the air from other sources, such as insulation used in the building trades. Professor Selikoff is an accomplished worker in the field of asbestos disease epidemiology³⁻⁸.

Electron microscope studies by Lynch⁹ indicate that less than 1% of the brake lining wear debris generated during normal braking is fibrous asbestos -- the remainder of the asbestos initially present (about 50% of the lining) is decomposed into non-fibrous dust particles. Gatrell and Schreiber¹⁰ found asbestos decomposition products in wear debris by infrared analysis, although their work did not preclude the survival of some fibers. X-ray diffraction analyses of dust in our own laboratory have not indicated the presence of undecomposed asbestos. If, based on the work by Lynch, it is assumed that as much as 1% of the inorganic portion of the wear products ends up as undecomposed asbestos fibers, then about 1.4g of fiber per car per year would be emitted (139 ton/year in the U.S.).

* See attached Reference list.

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Asbestos has been implicated as a carcinogen³⁻⁸. It is suspected that this carcinogenic effect is associated with the fibrous nature of asbestos. I know of no studies on the physiological effects of asbestos decomposition products. However, it seems that the non-fibrous decomposition products would be perhaps less permanently implanted in the lung tissues if inhaled, and less likely to be a persistent source of localized irritation.

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REFERENCES

1. Brodeur, P., "The Magic Mineral," The New Yorker, October 12, 1968.
2. Selikoff, Prof. Irving J., M.D., Mount Sinai School of Medicine of the City University of New York, Private communication, Jan. 19, 1970.
3. Selikoff, Irving J., et al., "Mortality Experiences of Asbestos Insulation Workers, 1943-1968," International Conference on Pneumoconiosis, Republic of South Africa, Dept. of Mines, Johannesburg, April 21 - May 2, 1969, pp. 97-103.
4. Selikoff, Irving J., "Asbestos," Environment, Vol. 11, March 1969, pp. 3-7.
5. Selikoff, Irving J., et al., "Community Effects of Nonoccupational Environmental Asbestos Exposure," American Journal of Public Health, Vol. 58, September 1968, pp. 1658-1666.
6. Selikoff, Irving J., et al., "Asbestos Exposure, Smoking, and Neoplasia," Journal of the American Medical Association, Vol. 204, April 8, 1968, pp. 106-112.
7. Selikoff, Irving J., "Asbestos and Neoplasia," The American Journal of Medicine, Vol. 42, April 1967, pp. 487-496.
8. Selikoff, Irving J., "Asbestos Exposure and Neoplasia," Journal of the American Medical Association, Vol. 188, April 6, 1964, pp. 22-26.
9. Lynch, Jeremiah R., "Brake Lining Decomposition Products," Journal of the Air Pollution Control Association, Vol. 18, December 1968, pp. 824-826.
10. Gatrell, R. L., and Schreiber, T. P., "Chemical Changes at Brake Wear Surfaces," Society of Automotive Engineers, Mid-Year Meeting, Chicago, Illinois, May 15-19, 1967, Paper No. 670511.

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