AT&T

PLAINTIFF'S EXHIBIT

ATT-451

March 15, 1982 -

Mr. D. J. Doyle
19-1A2

Dear Dan:

I have reviewed the material you provided regarding the suitability of the Mastercraft series of vacuum cleaners for use by motor vehicle forces performing brake and clutch work.

Based on the information provided, it appears that several of the Mastercraft Asbestos models would be suitable. The laboratory test data was obtained using the three stage filter array used on the smaller series of vacuum cleaners. The Model 1510DASB you specifically mentioned uses a similar set of filters, but in a larger size. It is reasonable to predict that this larger series of cleaners would perform as well as the smaller series.

The only precaution that I can recommend with this system is that of filter replacement. The manufacturer offers such a wide variety of filters and accessories that it would be relatively easy to order the wrong replacements. Unless the specific high efficiency asbestos filters are used, the vacuum system will not provide employee protection.

Please advise if we can be of further assistance.

James M. Degen
District Manager - Occupational
and Environmental Safety

CONFIDENTIAL

(PO 20656

Performance of Mastercraft Vacuum Cleaner System with New Filters 306177, 347515 and 347973 on Collection of Asbestos Dust

for:

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by:

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16 October 1978

Summary

The efficiency of a Mastercraft vacuum cleaner on asbestos dust has been determined. Clean, new filters were used for all tests: 306177 first stage filter, 347515 second stage filter, and 347973 third stage filter. Tests were made at inlet fiber concentrations ranging from 14 to 93 fibers per cubic centimeter of air, and average collection efficiency of the three stage filter system was found to be 99.2%.

Because collection efficiency normally increases as the filters become loaded with dust and because these tests were made with clean filters, the efficiency reported here is probably lower than that which would be found in practice. Fiber concentrations upstream and downstream of the vacuum cleaner were determined according to the OSHA procedure.

Introduction

In recent years asbestos dust has been clearly recognized as a health hazard. Stringent standards have been set for asbestos fiber concentration in workroom air by the Occupational Safety and Health Administration (OSHA). To meet these standards it is necessary to treat asbestos materials with care to see that as little as possible becomes airborne. An effective way to remove asbestos dust from the workspace is by means of a vacuum cleaner system which is properly designed and operated. Accordingly, tests were run using the Mastercraft vacuum cleaner system with three filter stages, to determine collection efficiency for asbestos dust.

Asbestos dust is composed primarily of fibers or bundles of fibers. The aerodynamic properties of a fiber are different from those of a spherical particle of equal mass, length, or surface area, so that it is not possible to say that asbestos fibers correspond to spherical particles of any fixed size. When oriented with long axis parallel to the direction of gas flow, relatively long fibers act like small particles, penetrate deeply into the lungs, and can cause lung disease.

Because of the peculiar aerodynamic properties of fibers, tests must be run specifically with asbestos dust to determine asbestos collection efficiency for a vacuum cleaner or any other air cleaning device. For this reason asbestos tests were run on the Mastercraft vacuum cleane system with clean, new filters

306177, 347515 and 347973 in series, to determine collection efficiency on asbestos dust.

Procedure

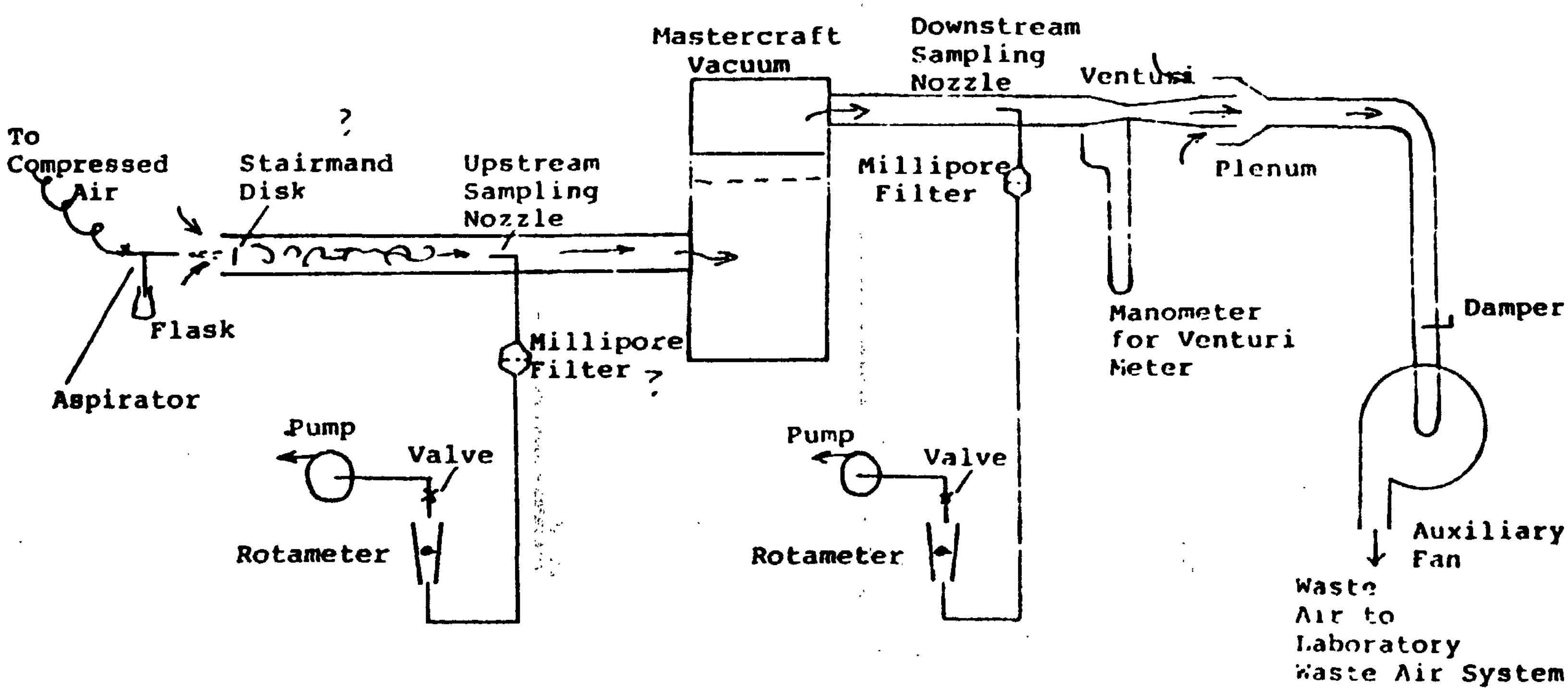
Description of Equipment - The Mastercraft vacuum was placed in the test rig shown schematically in Figure 1. Asbestos dust supplied by Johns-Manville Corporation was aspirated pneumatically from a small flask and fed into a 3 inch i.d. duct leading to the Mastercraft vacuum. A Stairmand disk just inside the entrance to the duct was used to generate turbulence in the air stream and mix the asbestos dust thoroughly with the air before going to the vacuum. The aspirator used to feed asbestos dust and the Stairmand disk are shown in Figure 2.

The dust and room air are well mixed by the time they travel approximately five duct diameters downstream of the Stairmand disk. At this point a sample of dust was taken isokinetically from the dusty air stream; that is, the sample was taken in such a way that the velocity of the gas in the sampling nozzle was the same as the velocity of the gas in the duct. The i.d. of the upstream sampling nozzle was 0.187 in. When sampling particles larger than several micrometers in diameter it is essential to sample isokinetically to be sure that a representative sample is obtained.

From the upstream sampling location, the asbestos laden air flowed into the Mastercraft vacuum. The vacuum pump in the Mastercraft unit was used to move air through the test system. Before each test, all three filters in the vacuum were changed so that clean, new filters were used for each test. The entire

Figure 1

Schematic Diagram of Apparatus for Testing
Mastercraft Vacuum on Asbestos Dust



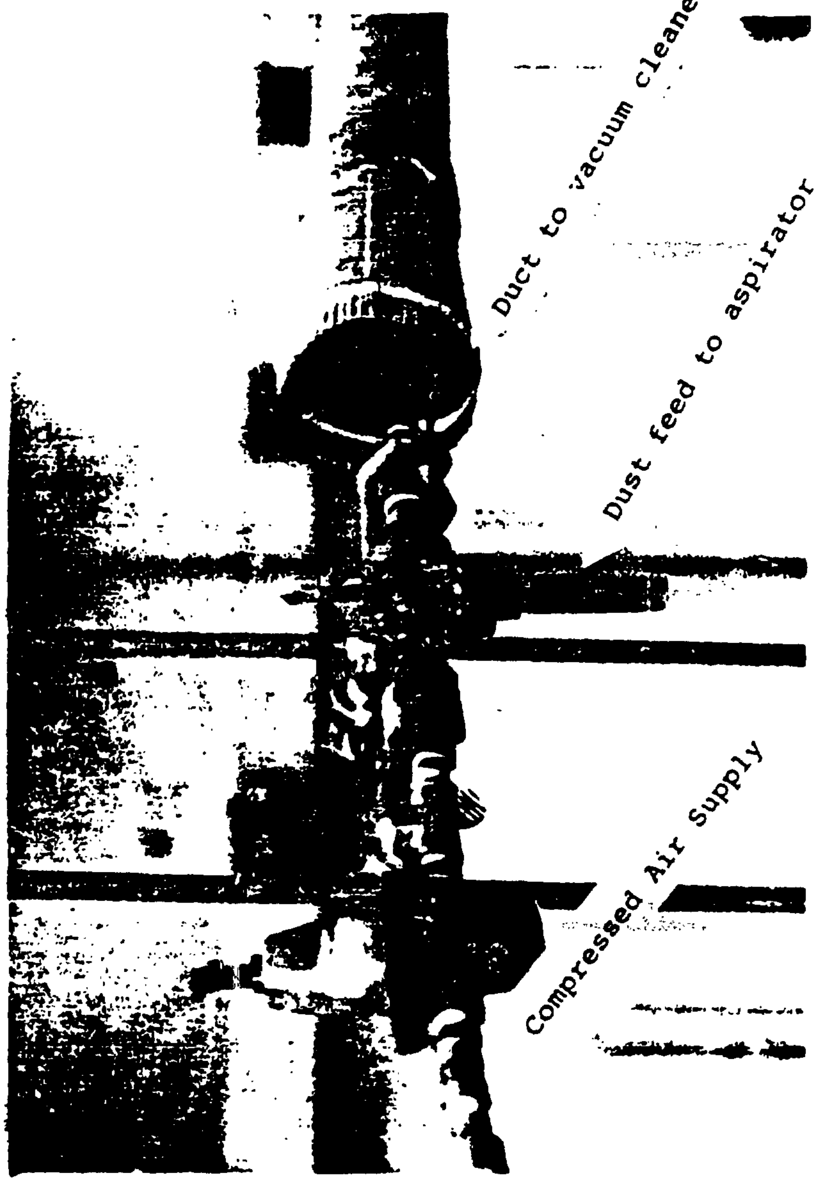
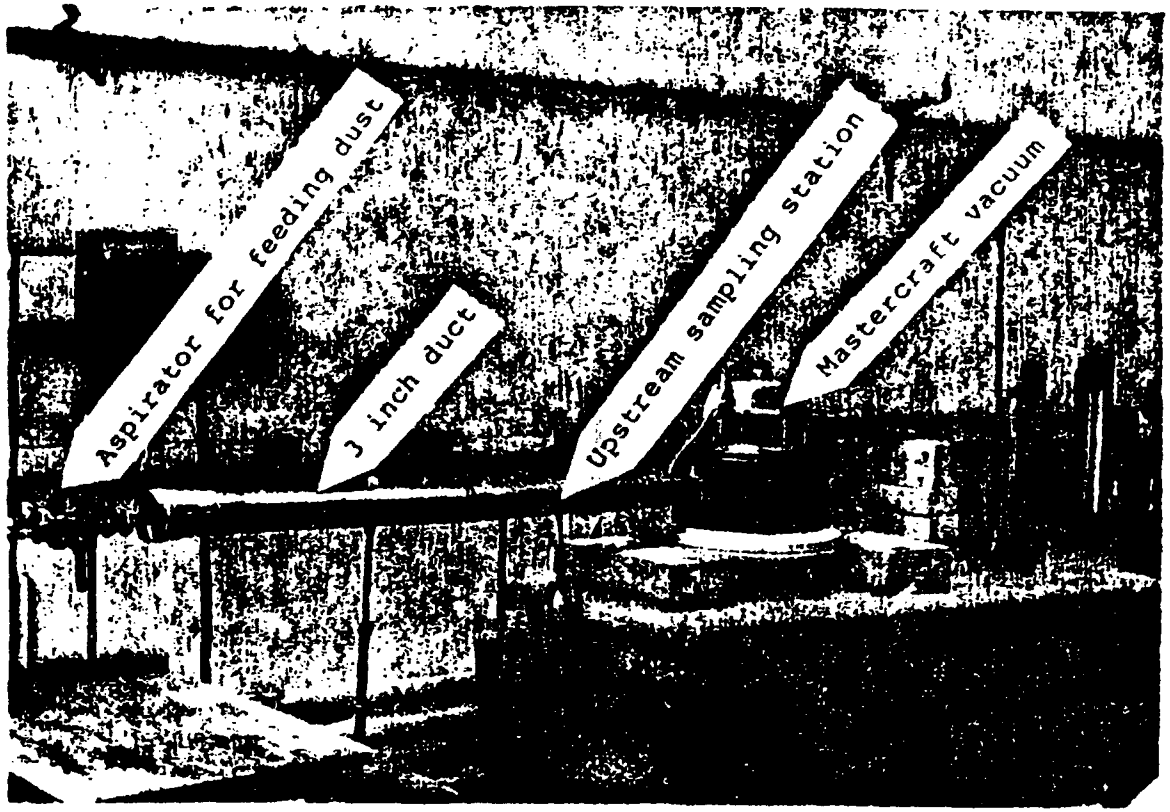


Figure 2

Aspirator Used to Feed Asbestos Dust

Figure 3

Upstream Portion of Test Rig



upstream duct system and the Mastercraft unit are shown in Figure 3.

From the vacuum, the cleaned air flowed past a downstream isokinetic sampling nozzle similar to the upstream nozzle except that the inside diameter was 0.250 in. The larger nozzle diameter was used downstream so that a larger gas flowrate could be used and more asbestos fibers gathered for analysis on the downstream sampling filter.

The gas stream next passed through a calibrated venturi meter so that the total flow of air through the unit could be determined. Pressure difference across the venturi meter was read on a manometer as shown in Figure 4 and related to flowrate through the system using the relationship: $cfm = 44\sqrt{\Delta P}$, in which ΔP was venturi pressure differential in inches of water. This calibration had been done previous to the present tests.

From the venturi the cleaned air stream passed freely into an open 6 inch i.d. plenum as shown in Figure 5. The plenum was connected to an auxiliary fan which was regulated so that the total flow through the plenum was considerably greater than the flow through the vacuum system alone. In this way, a net flow of air from the room into the plenum could always be maintained, whether the vacuum cleaner was turned off or turned on. The discharge plenum decoupled the vacuum system from the laboratory waste gas system so that fluctuations in the operation of the laboratory system did not affect operation of the vacuum.