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INVESTIGATIONS INTO ALTERNATIVE FORMS OF CONTROL FOR DUST GENERATED DURING THE CLEANING OF BRAKE ASSEMBLIES AND DRUMS*

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INTRODUCTION

THE MOST usual method of removing the accumulated dust from brake drums and assemblies is by "blowing off" with a compressed air stream. This, of course, generates a dust cloud in which the operator works, proportionate in size to the drum/assembly being cleaned. We therefore investigated two alternative methods of controlling dust generated at a maintenance operation on commercial vehicles, as representing maximum likely exposure.

Enquiries at the beginning of the investigation indicated that the removal of dust is to allow inspection of the mechanism, rather than being a maintenance procedure in itself. Our efforts were, therefore, directed towards the removal of loose dust from the parts of the brake mechanism which needed inspection, rather than achieving total cleanliness.

The criteria for evaluating the two methods devised were firstly, that the alternative method did not take significantly longer than the method already in use, secondly, that it was not more difficult to carry out, and thirdly, that very little extra equipment was needed.

ALTERNATIVE METHODS EXAMINED

The alternative methods examined were a vacuum funnel, and a vacuum brush.

Vacuum funnel

The funnel (see Fig. 1) comprised a steel cone with a connection point at its apex for an industrial vacuum cleaner; a flexible skirt, with a draw string attached at its periphery; and a small-bore side-entry for the injection of compressed air. In use, the funnel was secured over the backplate of the brake assembly or over the drum and compressed air was injected to dislodge dust while the vacuum cleaner extracted dust-laden air. The assembly was rotated around the total circumference to complete the cleaning operation.

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Vacuum brush

The vacuum brush shown in Fig. 2 consisted of a circular nylon bristle brush mounted on an angled handle and fitted via the handle to the same vacuum cleaner. In use, the brush was used to remove dust from drums and assemblies under vacuum.

EXPERIMENTAL PROCEDURE

In order to determine which of these two methods was the better, the performance of each was compared with the traditional blow-off method, in two separate experiments shown in Table 1.

TABLE 1. EFFECT OF CLEANING METHODS ON DUST CONCENTRATIONS

Hour		1	2	5	6	6
Activity		Back-ground	Blow-off	Back-ground	Funnel cleaning	Brush cleaning
Personal sampler	particles/cm³	116	422	107	415	
	fibres/cm³	0·96	5·35	0·95	3·5	
Static sampler	particles/cm³	161	72	162	210	
	fibres/cm³	0·45	0·52	0·41	0·75	
Peak sample	particles/cm³		41750		759	
	fibres/cm³		87		1·04	
Personal sampler	particles/cm³	125	635	140		158
	fibres/cm³	0·16	0·84	0·09		0·22
Static sampler	particles/cm³	129	155	110		122
	fibres/cm³	0·10	0·16	0·20		0·18
Peak sample	particles/cm³		41750			310
	fibres/cm³		87			0·57

During the first hour of the day air samples were collected to determine background concentrations; during this period the near side front road wheel was removed. In the second hour samples were collected during dust removal from the near side brake assembly by blow-off. Further background samples were taken during the fifth hour while the off side front road wheel was removed, and during the sixth hour dust determinations were made while either the funnel or the brush cleaning methods were used.

The personal samples were collected from the breathing zones of mechanics engaged in the work and static samples were collected concurrently to simulate exposure of mechanics working in an adjacent repair bay. Short duration samples were also collected by means of a Dräger pump from the operator's breathing zone at the peak period of dust generation.

All the samples were subsequently analysed for fibres in accordance with the technique laid down in the *Hygiene Standard for Chrysotile Asbestos* published by the British Occupational Hygiene Society (1968). Particle counts were limited to particles greater than 1 μ dia.



FIG. 1. Funnel method of dust control.

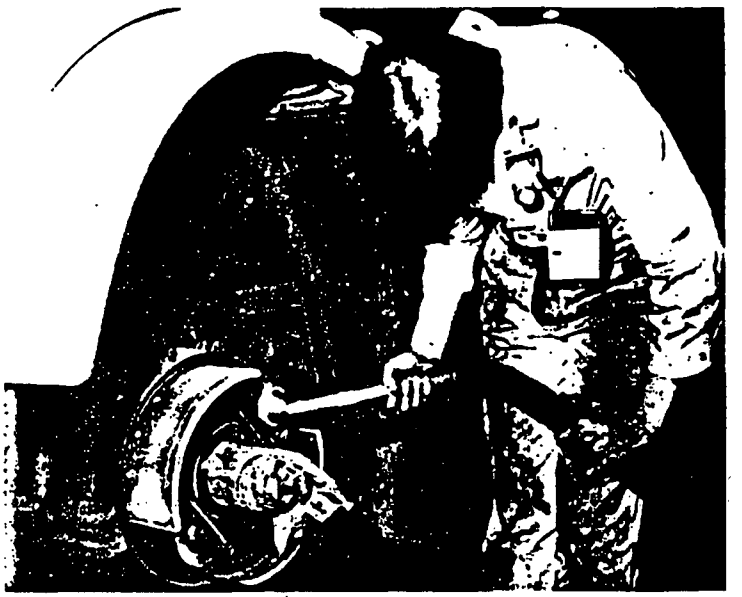

FIG. 2. Vacuum brush method of dust control.

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DISCUSSION

The results for the vacuum funnel *vs.* blow-off experiment and for the vacuum brush versus blow-off are shown in Table 1. It can be seen that the background concentrations during the fifth hour had re-established at the original level after a 2 hr latent period and therefore the blow-off operation carried out during the second hour did not affect the concentrations observed in the vacuum funnel samples collected in the sixth hour. The funnel appears to reduce personal exposure by 2 per cent for particles and 40 per cent for fibres; concentrations observed in the adjacent bay are increased and a reduction in peak concentrations of about 80:1 was achieved.

During the second experiment there was more variability in the background concentrations between the first and fifth hours but the effect of blow-off on the vacuum brush test may be discounted. Personal exposure by use of the brush is reduced by 75 per cent for both particles and fibres and the static samples show a reduction of 20 per cent for particles but an increase of 12 per cent for fibres. A reduction of 80:1 in peak concentrations was again observed.

CONCLUSION

The experiments demonstrated that the vacuum brush was better in reducing operator's exposure; it had the added advantages over the funnel of being easier to handle, consisted of fewer, simpler parts and was much quicker than the vacuum funnel.

There are three major reasons for the relative inefficiency of the funnel; its use increased brake cleaning time (and thus exposure time) by a factor of 8, it was difficult to obtain a good seal at the skirt, and imbalance occurred between the necessary air input and the capacity of the available exhaust system, with resulting leakage of dust.

REFERENCE

Committee on Hygiene Standards, British Occupational Hygiene Society (1968) *Hygiene Standards for Chrysotile Asbestos Dust*. Pergamon Press, Oxford.