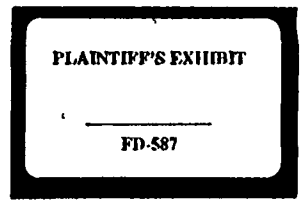
PLAINTIFF'S EXHIBIT

FD-587



DOYLE

September 20, 1973

Mr. Dann Lemerand
Ford Marketing Corporation
Rotunda Service Research
P. O. Box 4577
Dearborn, Michigan 48121

Dear Dann:

Enclosed are five copies of my analysis of the brakes mechanism cleaning investigation for your use and information. Please understand that in no way do I claim any expertise in either brake service or in parts cleaning.

However, I do feel that the present methods of air blasting "dry" brake systems and "wet" solvent cleaning of oily mechanisms are both inefficient and presumptively hazardous to personnel.

I do not see a practical approach to "dry" cleaning with air and a collection system even though it is possible. The cost, maintenance and disposal aspects present prohibitive complications for use by automotive service personnel in typical service operations.

The present "wet" wash-down of oily mechanisms is a better approach, but I feel that it can be vastly improved by relatively new equipment that would be easy to maintain, with simple disposal in cans. The wet method can be made very safe, simple, efficient and at reasonable equipment cost.

If I can be of further assistance please advise.

Sincerely,

DOYLE VACUUM CLEANER COMPANY

Jack

Jack Doyle

Enclosures

JD/lb

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DOYLE VACUUM CLEANER COMPANY
225 stevens street, grand rapids, michigan 49502, area code 616, phone 245-0455

ANALYSIS OF DUST CONTROL IN SERVICING DRUM BRAKES

PROBLEM: The essential problem is the accumulation of asbestos fibre dust resulting from wear of the brake shoe friction materials. This asbestos dust is mixed with ordinary road dust, iron dust and the residues of the binder (often epoxy materials) used in the friction material.

This dust covers the brake shoes, cylinder, springs and other brake mechanisms mounted on the backing plate in appreciable concentrations and is generally dry, except for those cases where leaking cylinders or axle seals create an oily residue.

The resultant problem arises from the customary habit of the mechanics in using compressed air to blow down the brake assembly, thus creating fairly heavy accumulations of this dust in the air around the vehicle and throughout the service shop.

This dust has a relatively high toxicity, due to the number of asbestos fibres that are left suspended in the atmosphere; which, if inhaled, can deplete respiration capability of the human lungs. Under OSHA Standards for handling asbestos fibres, the allowable 8 hour time weighted average exposure shall not exceed five fibres longer than 5 micrometers per cubic centimeter of air, and this will be reduced to two such fibres by July 1, 1976. The ceiling concentration for exposure shall not exceed 10 fibres longer than 5 micrometers per cubic centimeter of air at any time.

SITUATION: Since sample analysis of the dry dust encountered in a typical brake service job has shown at least 15% of the total dust volume is composed of asbestos fibres, the air dusting of brake mechanisms can be considered hazardous under OSHA standards.

The common use of air dusting guns has been found to be in operation at full line pressure, usually from 90 psi to 120 psi. Under other OSHA standards, this is not permissible and such air guns will have to be replaced

with suitable types which limit the output to 35 psi.

In practical analysis of a typical brake service job, it was found that the 35 psi "safety" air gun did not effectively remove more than about 50% to 60% of the loose dry dust in the brake mechanism. Thus, the use of safety regulated air pressure is not practically acceptable to accomplish the dust removal assuming that the control of the resultant air bourne dust is practical.

DRY DUST REMOVAL METHOD: This method involves the following elements:

1. Air removal of dust from the mechanism.
2. Air bourne dust collection.
3. Separation of dust from the air.
4. Disposition of separated dust.
5. Contamination control of collector equipment.

The approach envisions a sealed collector hood around the rim of the backing plate, safety locked and sealed to permit use of high pressure air jets, connected to an air mover and filtration system which can be safely disposed of when the filtering capacity is attained. It should be noted that such a system would require a safety interlock on the high pressure air gun to prevent use except in proper operating position and safe condition. Additionally, it would be necessary to provide means to seal the equipment between uses to prevent contamination spread since the entire system would be coated with potentially hazardous dusts on interior surfaces of the collector and filter. A fairly substantial air movement is required (in the order of 100 cfm or more) to effectively collect all dust generated. This would require a safety vent to provide "makeup" air since the high pressure air gun could not efficiently deliver this volume from the commonly available air supply. Separate or adjustable collector hoods would be required for different sized brakes.

Finally, the disposition of the collected dust, including decontamination of the collector and filter system, would have to be provided with an impermeable disposal container.

This dry method will only be effective on a "dry" mechanism and those service jobs involving a leak of the hydraulic fluid or introduction of differential lubricant through faulty axle seals will require a wet method of cleaning since an air blast is ineffective in such cases.

WET DUST REMOVAL METHOD: This method considers the following elements:

1. Very low pressure, wet misting.
2. Low pressure, high fluid volume washing.
3. Liquid collection.
4. Separation of residue and liquid.
5. Disposition of residue and contaminated liquid.

The approach involves an open funnel collector placed below the brake mechanism to catch a "flushing" or "washing" fluid as it drains off the brake mechanism. This collector is connected to a sedimentation container, a liquid filter, a "clean" liquid reservoir and a low pressure, high volume pumping means with delivery nozzle(s).

The aspect of ultra low pressure, low volume misting is an effective means of prewetting the dust without displacing same from the mechanism surfaces. The mist liquid should be a "safe" material.

This method will be effective on all types of brake mechanisms under all conditions. The use of a wet method obviates all necessity of a sealed system since at no time would there be any airbourne dust condition. The wet method equipment is self cleaning to eliminate contamination problems and disposal can be easily accomplished so long as the recovered dust debris is maintained in a wet or moist condition. The filter means can be easily back washed for repeated use and the liquid loss should be minimal over a long period of use.

The liquid used should be a safe solvent or emulsion type that has high "wetting" power and adequate deterging or solvent effect to remove the bond between the dust and the brake mechanism. The liquid should leave no "oily" film that would inhibit the frictional effort of the lining material.

NOTE: Means could be provided to flush the brake drum during the mechanism washing process.

CONCLUSION: The wet method is recommended since it provides for low-cost control of the dust by immediately reconditioning the dust to a wet condition which can be safely handled by a relatively simple process. The wet system is self-cleaning and disposal is simplified. There does not appear

to be any need for complicated safety interlocks to insure safe operation. The fixed operating cost appears low in terms of washable filters and reusable fluids. Probably, one collector funnel could service all sizes of brakes.

It would appear that the wet system could be devised by such firms as manufacture parts washers. If final drying of decontaminated brake mechanisms was required, a wet dry vacuum could then be used since there would not be any toxic dust materials remaining.

Dewey I. (Jack) Doyle, Jr.
Doyle Vacuum Cleaner Co.
September 10, 1973