EFFECT OF FTC TREATMENT ON LUBE OIL SOOT LEVELS

Soot in lubricating oil is largely produced by inefficient combustion of diesel fuel. It is composed of the same particles as those escaping from the exhaust stack. There may be some contribution to oil soot from lube oil burning but this is of minor significance.

Combustion efficiency can be improved by catalysis using trace additions of ferrous picrate to the fuel.

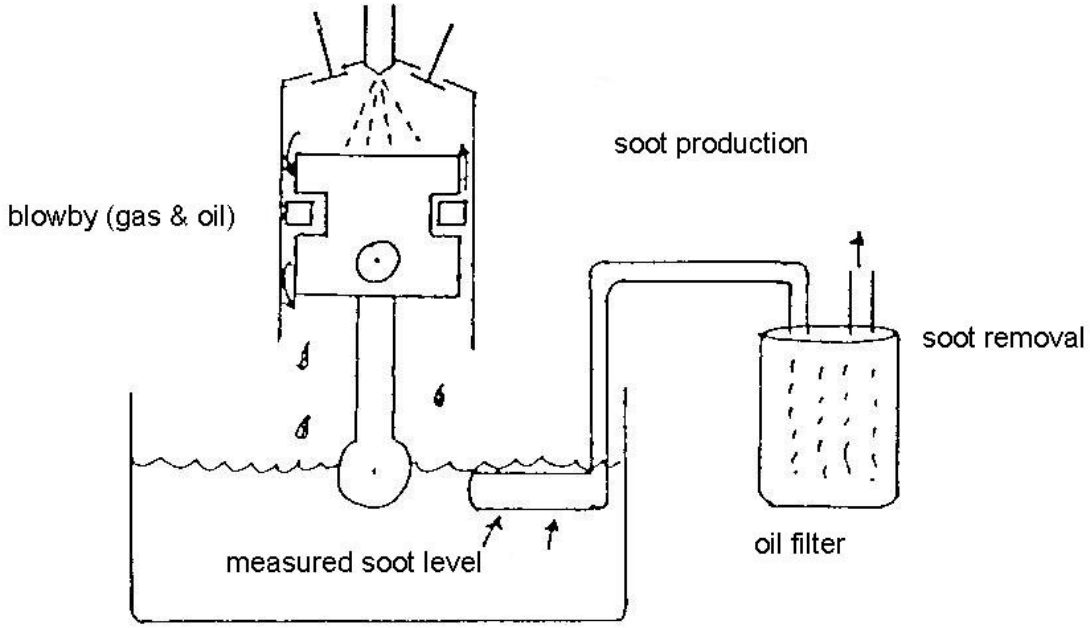
The presence of soot in engine lube oil is of importance because it is a major factor in causing abrasive engine wear. The rate of accumulation of soot in lube oil depends on the following factors:

1. *Rate of soot production* — occurs during the combustion process and is known to be reduced by the catalyst.

2. *Rate of gas blow-by* — past the piston rings and into the lube oil; known to be reduced by the catalyst. Change of oil brand/type may also have influence.

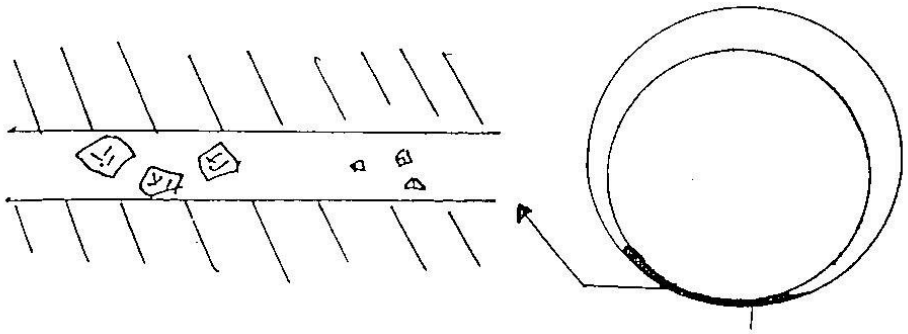
3. *Rate of removal of soot contaminants by the oil filter* — could be influenced by the soot particle size. Oil's dispercancy package may also have influence.

4. *Rate of removal and dilution of soot contaminants due to oil burning/make-up* — catalyst use is known to generally reduce oil consumption. Change of oil brand/type may also have influence.



Soot and Abrasive Wear

The contribution of soot to component wear depends on the size of the soot particles and their relationship to the minimum oil film thickness. For the same load, a bearing of smaller contact surface area will have to rely on a thinner oil film for lubrication. Abrasive wear due to soot will be more severe. For similar bearings under similar loads, the larger the soot particle size the more severe the abrasive wear. The same applies for all sliding surfaces.



The ferrous picrate catalyst FTC has long been known to reduce abrasive wear. In more severe operations 50 per cent reduction in liner wear has been measured.

Wear trends — Soot Levels

A review of oil analysis records generally shows the expected clear trend to reduced iron and lead profiles and in most, but not all, cases with reduce soot levels. Since the catalyst typically assists in reducing oil consumption by improved cleanliness in piston ring/groove areas, it is essential to factor all results for oil make-up to obtain an accurate assessment of performance.

Determination of Soot Particle Size and Influence

A study was undertaken to determine the effect of catalyst use on soot particle size. With the co-operation of a major mine operator and equipment dealer, eight used engine oil samples from a FTC treated site plus eight anonymous samples (to act as controls) were obtained for comparison. All samples were from same make engines using identical brand of diesel engine oil. The controls have come from sites not using the FTC catalyst.

Microscopic examination of all samples in conjunction with a stage mounted objective micrometer permitted estimation of soot particle size. Refer Tables I and II.

TABLE I: AVERAGE SOOT PARTICLE SIZE

Control Group		FTC Group	
Lab. No.	**Average Diameter (μ)**	**Lab. No.**	**Average Diameter (μ)**
11P448	0.60	11N315	0.17 - 0.20
11P229	0.42	11P544	0.17 - 0.20
11P437	0.60	11K334	0.17 - 0.20
11P341	0.70	11K336	0.17 - 0.20
11P537	0.60	11L330	0.17 - 0.20
11P436	0.42	11L314	0.20 - 0.25
11P230	0.55	11M334	0.17 - 0.20
11P340	0.70	11L329	0.17 - 0.20
Range 0.42 - 0.7 Average 0.57 micron		Range 0.17 - 0.25 Average 0.19 micron	

Because of the small particle sizes encountered in the FTC treated samples and the limited microscope power available, a more precise figure than that given was not possible.

The occurrence of larger soot particles was noted in both groups. The control group contained the largest soot particles observed.

TABLE II: LARGEST SOOT PARTICLE SIZE

Control Group		FTC Group	
Lab. No.	**Diameter (μ)**	**Lab. No.**	**Diameter (μ)**

11P448	1.7	11N315	1.0
11P229	1.4	11P544	0.8
11P437	2.1	11K334	1.4
11P341	1.4	11K336	1.4
11P537	2.1	11L330	0.8
11P436	1.4	11L314	1.4
11P230	1.7	11M334	1.0
11P340	1.0	11L329	1.7
Range 1.0 - 2.1 Average 1.6 micron		Range 0.8 - 1.7 Average 1.2 micron	

The results of this study are consistent with changes measured in exhaust gases and would appear to confirm that the catalyst has the effect of reducing the diameter of the majority of soot particles to 1/3rd (approximately). That is, the mass of the soot particles is reduced to 1/27th! It also appears to provide the explanation for the reduced wear metal profiles observed by FTC users.

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