

A COMPARATIVE STUDY OF PARTICULATE EXHAUST  
EMISSIONS FROM TWO DIFFERENT  
AGE OF VEHICLES

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ABSTRACT

*A study was conducted to quantify the amount of particulate emission from a new and a year old vehicles of the same engine capacity.*

*On average, the particulate emission during idling condition for both the new and the old vehicles were 4.35 mg/m<sup>3</sup> and 8.45 mg/m<sup>3</sup> respectively. While at 1500 rpm both the new and the old vehicles registered higher particulate emission of 9.33 mg/m<sup>3</sup> and 15.79 mg/m<sup>3</sup> respectively.*

*Studies showed that both the age and the engine mode have direct influence on the exhaust emission.*

## INTRODUCTION

Motor vehicles are said to be one of the most important sources of air pollution in the urban environment. In Kuala Lumpur alone, it was estimated (based on annual fuel consumption) that 92% of the air pollution burden was mainly due to auto-exhaust emission.<sup>1</sup> Rapid urbanization programs together with better mode of transportation has enhanced the vehicular population tremendously within the city area. Thus a special attention should be given on the probable impact of increased in vehicular population on the urban air quality.

A considerable amount of work has been directed toward the study of particulate emission from automobile exhausts emission elsewhere.<sup>2-4</sup> But there is almost none of the similar study being carried out in this particular region. In this present work, a simple sampling technique was used to quantify the particulate exhaust emission from two different age of gasoline powered vehicles of the same engine capacity. The study hopes to verify further that the age and the mode of operation are two of the few important factors that have direct influenced on the exhaust emission.

## METHODOLOGY

The hot and undiluted auto-exhaust emissions were samples using a simple sampling train consisting of a rotameter, a suction pump and a filter holder placed in a galvanized tin can (*21 cm height x 21 cm diameter*) as shown in Figure 1. The glass micro-fiber filters (*Whatman GF/A*) of 3.7 cm in diameter were employed to collect the sample. These filters were conditioned and weighted before and after sampling with three control filter.<sup>5</sup>

Two gasoline powered vehicles of the same engine capacity (1300 cc) of 1985 and 1986 models were each made to operate at two different modes of operation i.e idling and 1500 rpm. The exhaust gas was sampled directly from the tail-pipe into the sampling chamber. A sampling flow rate of 8.5 l/min was chosen for each mode of operating condition by means of a calibrated rotameter. The exhaust gas was sampled for 10 minutes after the system has reached a stable temperature. At first, each filter was made to face downward but later changed to upward position once this stable temperature was attained. Only than, the pump was switched on for sampling.

## RESULTS & DISCUSSION

Table I presents the results of the particulate exhaust emission concentrations sampled from the two different age of vehicles under the different modes of operation. On average, the new model (1986) exhausted  $4.35 \text{ mg/m}^3$  and  $9.33 \text{ mg/m}^3$  of particulate during idle and at 1500 rpm respectively. Meanwhile the old car model (1985) exhausted  $8.45 \text{ mg/m}^3$  and  $15.79 \text{ mg/m}^3$  of particulate during idle and at 1500 rpm respectively. Each car emitted approximately twice particulate concentration level at 1500 rpm as compared to the idling condition. In a similar fashion, the old car emitted nearly as twice particulate concentration as compared to the new model. Based on a two-sided t-test statistics, there was a significant difference ( $\alpha = 0.01$ ) between the two modes of operation for each of the vehicles. Similarly, there were significant differences between the old and the new car models under the two different modes of operation.

This study suggests that the older the car the higher the particulate concentration will be exhausted and an increased in speed will also increase the emission level. Both the age and the mode of operation are found to be two important factors that influence the automobile exhaust emission.

## CONCLUSION

The particulate exhaust emission from two different age of vehicles studied under two different modes of operation (i.e idling and at 1500 rpm) has been presented. It has been observed that both the age and the speed were two important factors that can influence the automobile exhaust emission. Both increase in age and speed will give higher amount of particulate exhaust emission level. A simple particulate sampling technique used in this particular study proved to be a success.

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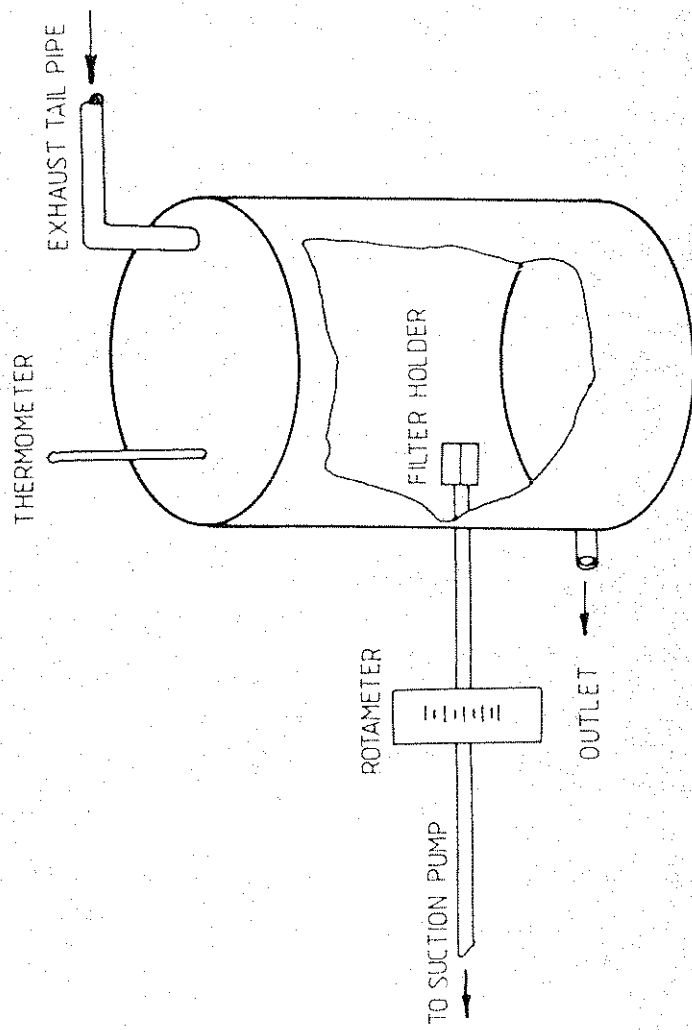


FIGURE 1 : The Auto-Exhaust Sampling Train

Table 1 : Particulate Exhaust Emission Concentrations

STATE TYPE	IDLE (mg/m <sup>3</sup> )	1500 RPM (mg/m <sup>3</sup> )	RPM/IDLE
NEW (1986 Model)	4.35 + 2.30 (10)	9.33 + 1.94 (9)	2.13
OLD (1985 Model)	8.45 + 1.88 (9)	15.79 + 6.08 (9)	1.87
$\frac{\text{OLD}}{\text{NEW}}$	1.96	1.69	1.14

( ) = No. of samples