

## Experimental study of noise level for car engines

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**ABSTRACT** – In all driving conditions, engine will continuously generate unwanted noise and vibration. Excessive noise may cause discomfort to the driver and passengers. The purpose of this study is to investigate engine noise in two different engine operating conditions; engine loading and unloading. Simple approach is used to examine the noise level which is by using sound intensity probe that is integrated to a software. Test has been carried at different engine speed for both engine operating conditions; loading and unloading. Results show that noise level is higher when engine in loading condition.

### 1. INTRODUCTION

Throughout the century, automotive industry has been growing rapidly all over the world. Nowadays, every car manufacturer is trying to come out with products that able to meet customer demands and expectations in order to survive in this industry. With the change of our lifestyle, these demands and expectations are progressively changed. Other than safety and performance, comfort has become one of the most desirable criteria for car buyers. Because of that, most of the car manufacturers spend abundant amount of money and efforts to reduce any discomfort issues.

One of the main issue that relates to comfort is the unwanted noise. It is mainly produced by the engines. In this study, identified the noise level was identified by using sound intensity probe that is integrated with software. There are two engine conditions that are chosen for this study which are unloading and loading conditions. Unloading refers to the condition when the engine is operating ideally, and for loading condition is when the engine is operating by switching on the air conditioning system. Additionally, this test is carried at two different engine speeds; idle speed at 1000 revolution per minute (RPM) and 2000 RPM.

### 2. RESEARCH METHODOLOGY

This study was conducted at Faculty of Mechanical Engineering Laboratory. The procedure of this study is illustrated in Figure 1.

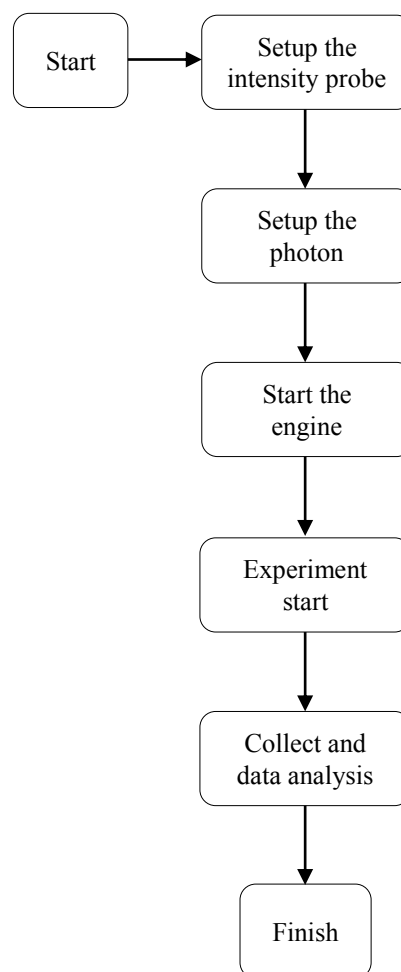


Figure 1 Procedure of this study

### 3. RESULTS AND DISCUSSION

In this section, results of the test will be discussed in details. Data for two different engine conditions; unloading and loading are taken at two different engine speeds which are at idle speed of 1000 RPM and 2000 RPM. Figure 2 and Figure 3 are the results of engine noise at different engine speeds with both engine conditions.

By referring to Figure 2, the loading condition produces higher noise level from frequency of 1 Hz up to 9 kHz compared to unloading condition. However, the significant difference of noise level between two engine loading conditions only occurs at low frequency. At higher frequency, the difference declines. It is because, during loading condition, engine needs to produce more power to support the air conditioning system but maintaining the same speed. The rate of combustion inside the chamber and the rate of air fuel intake are also increases. These factors may contribute to the increase of noise level.

This same phenomenon occurs at second measurement in which the engine operates at 2000 RPM as shown in Figure 3. The noise level is higher compared to when the engine is running at idle speed. But, it shows the same trend. The difference of noise level between two engine loadings decreases as the frequency increases.

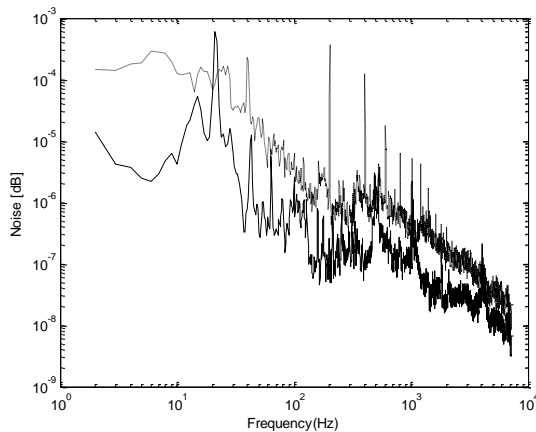


Figure 2 Noise levels at 1000 RPM; straight line for unloading and dotted line for loading.

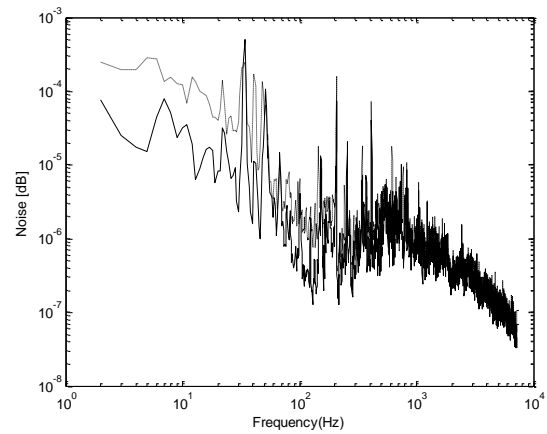


Figure 3 Noise levels at 2000 RPM; straight line for unloading and dotted line for loading

#### 4. SUMMARY

At the end of the study, the objectives were achieved. The noise levels of car engine have been examined using sound intensity probe technique. On the other hand, the noise level is proportional with rotation speed of engine and also the loading condition of the car. In this study, the loading condition refers when the engine is loaded with air conditioning system.

#### REFERENCES

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