

Designing a car engine mount

Overview:

When an engine is mounted in a car, engine mounts are used to prevent vibrations being passed to the chassis. They are usually made of strong rubber and reduce the vibration of the engine and subsequently reduce the noise of the engine. This makes it more pleasant and quiet for the passengers riding in the car. This investigation simulates the problem by using a tuning fork as the engine, the base of a clamp stand as the chassis and a uLog sound sensor as the ears of a passenger.

Aim:

To measure the amount of sound a tuning fork makes connected directly to the base of a clamp stand and to subsequently investigate different isolating materials to reduce this sound. Then, suggest ideas for which material would make the best engine mount.

Equipment required: LogIT uLog sound sensor
Tuning fork (256Hz was used for this example)
Computer
Different materials eg foam rubber, thick cardboard, felt etc
Clamp stand
Rubber bung or similar to strike the tuning fork

Hazards:

Always check your local regulations or the school advisory service for guidance on the use of laboratory equipment. Students should be supervised at all times.

Method:

1. Connect the uLog sensor to the computer and start the SensorLab software.



2. Mount the uLog sound sensor onto the upright of the clamp stand as shown. Depending on the clamp stand used, you may need to lower or raise the sensor. Position a piece of card in front of the sensor to simulate the bulkhead of the car. You may also want to place the base on a book or similar.



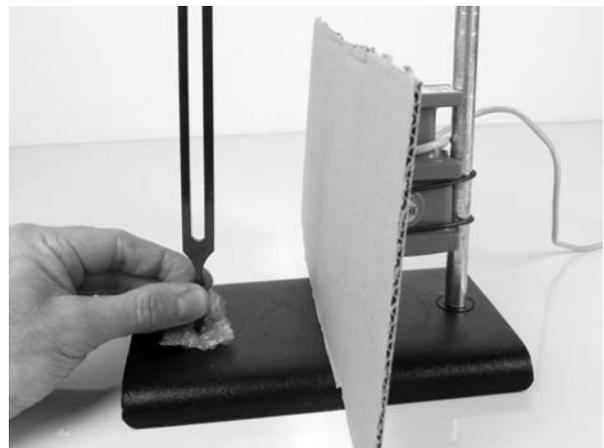
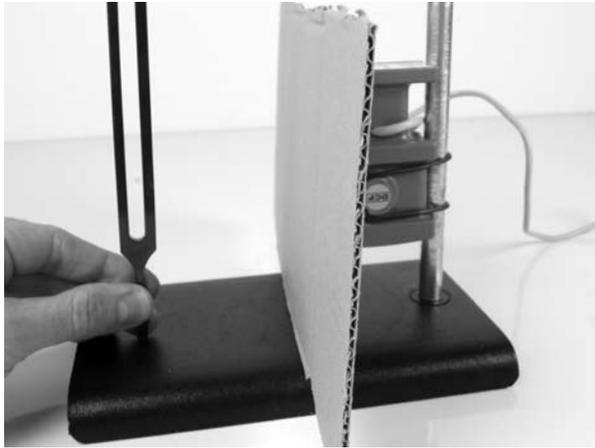
Designing a car engine mount - continued

3. Unlike the other investigations that simply use the logging defaults, you will need to setup the software to capture the sound quickly. To do this, perform the following steps:

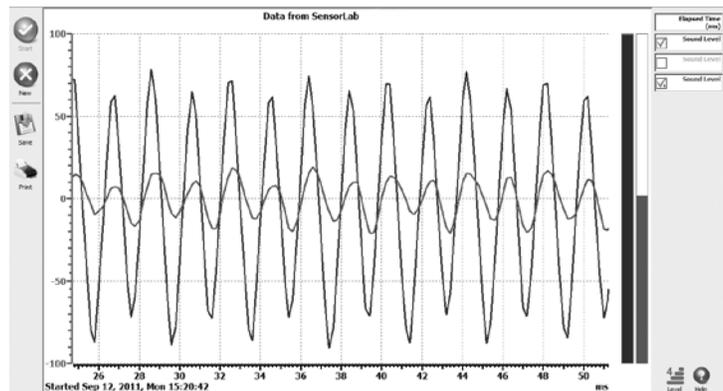
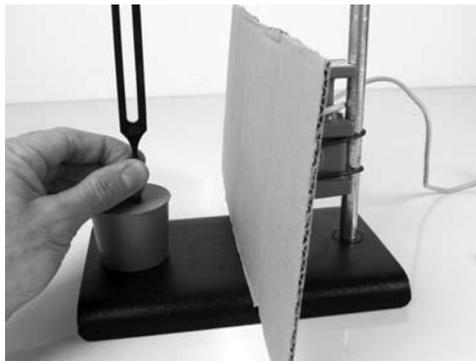
- Select 'Setup' from the first screen in SensorLab
- Select 'Fast with trigger (one sensor only)' and click 'Next'
- Select 'Scope (Quiet)' from the drop down menu and then click 'Next'
- Select '0.2 seconds' from the drop down menu or use the slider, then click 'Next'

SensorLab is ready to go, when ready click 'Start' to take the first readings.

4. Strike the tuning fork on the rubber bung (to prevent damage) and place the base of the fork onto the metal base of the clamp stand as shown. Click 'Start' in the software to take the first set of readings.



5. When ready, place a test material (engine mount) onto the base and repeat the experiment. To overlay onto the existing data, simply press 'o' on the computers keyboard after striking the tuning fork. If you make a mistake, you can delete a set of readings by using the right mouse button and select 'Delete channel' option in the menu.



Results:

When you have tested a range of insulating materials, have you been surprised by what you have found?

Is there a common link between the best insulating materials?

How could you improve the experiment? For example, could you design a chamber which simulates the separation of the engine bay to the passengers sitting inside?

Going further:

The test setup shown is simply a starting point. You may like to improve the investigation by building a more car like testing chamber, maybe even adding some rubber wheels. What effect might this have?

How might tiles used in the ceiling's of offices help?

Are there cars that do not have rubber isolating engine mounts? What might the advantage be of these? If you are stuck, have a look at racing car designs.