

Case study 5 -
The problem of measuring the vibration of rubber without adding inertial mass.

Close microphone measurements can be useful to give an indication of the vibration of the rubber. A typical setup is shown below. However a degree of averaging over the space between the surface to be measured and the microphone make mapping of a 30 mm wide region impossible. Even small accelerometers add significant mass to the surface to be measured so are impractical.

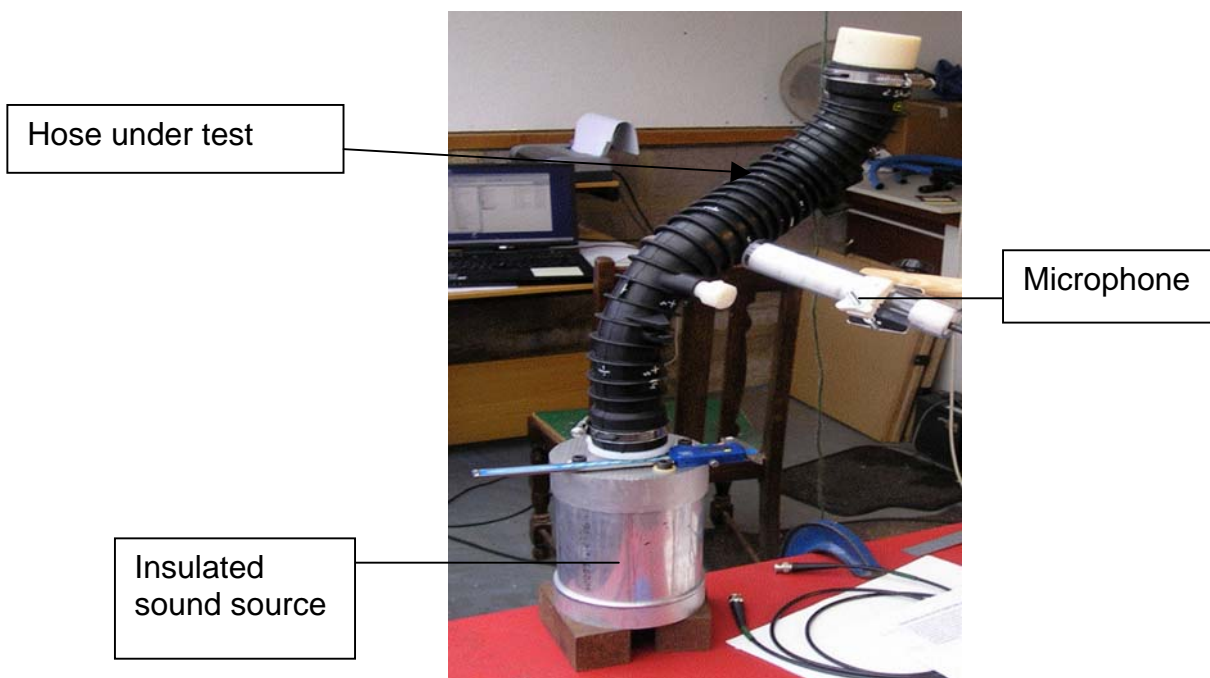


Figure 1. Close microphone for measuring the noise breakout in hoses

Laser methods exist but practical difficulties with rubber make their use somewhat limited.

The use of a traditional record player arm can give some very useful results. By using “ceramic” cartridges standard conditioning amps can be used (though ceramic cartridges are frowned upon by hi – fi enthusiasts). The arms measure velocity rather than acceleration and the frequency response is not linear. Various methods can be used to get the measurements properly calibrated over the range but generally products are being compared, and little further processing of the signal is needed.

A “mono” cartridge will give only vertical results but most of the better quality cartridges are stereo. With a stereo cartridge the 2 sensing elements are aligned at 45° to the surface to be measured. This means that adding the 2 signals gives the vertical movement and subtracting them gives a side to side movement which can be useful at times.



Figure 2, record player arm used to measure the vibration at a point on a hose

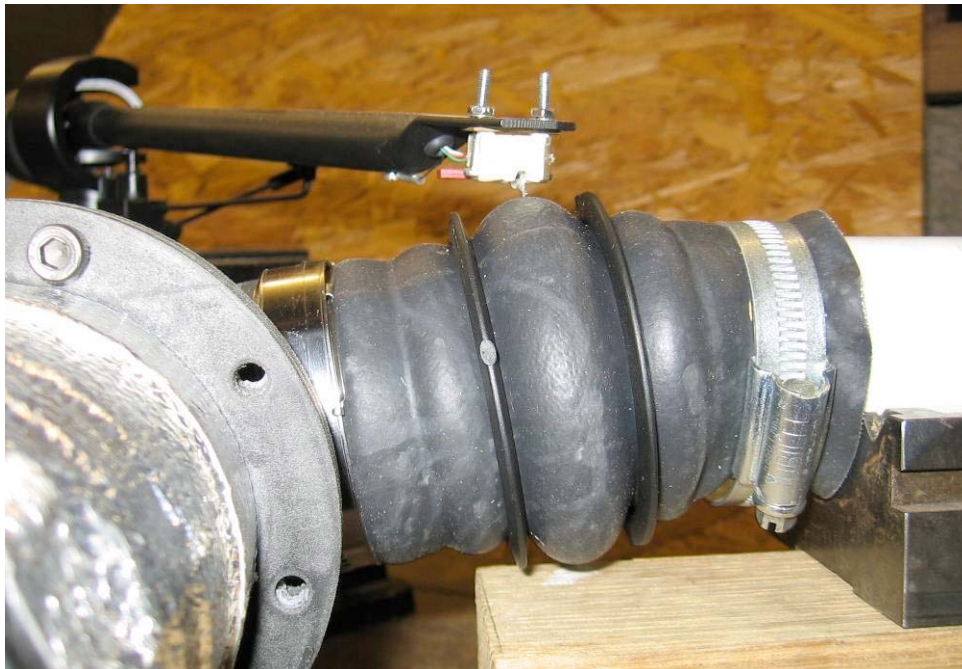


Figure 3, This shows the needle of the record player arm and how the surface of the material being tested can be mapped by moving the arm by small amounts.