

## ABSTRACT

Noise pollution has become another deleterious outcome of modern civilization, to be added to the others pollution of our environment. Noise affect by several different ways, the most deleterious of which are hearing damage and annoyance. So there is a need to reduce this noise pollution. Sound absorbing material is one of the most important common used to reduce the noise pollution and to make noise control.

The absorption quality of the material used as a sound absorber material depends on the determination method of sound absorption coefficient of this material, whether measured in standing wave tube (normal wave incidence) or in reverberation room (random incidence). Because the tested material used in standing wave tube has small size of diameter 10 cm for low frequencies or 2.9 cm for high frequencies, so that the major parameters that affect the sound absorption coefficient of material are its density, construction and thickness.

In reverberation room method, which gives actual measured absorption coefficient value, the tested material is affected by the surface area of the material beside the other parameters.

ISO 354 which is used to determine the absorption coefficient of material in reverberation room makes a condition to the standardized area of material to be measured which must be between  $10 \text{ m}^2$  and  $12 \text{ m}^2$  for room of volume less than  $200 \text{ m}^3$ .

This thesis estimated equations of the area effect and corrections between the non standardized areas and the standardized area by using a least squares fitting method.

This work was carried out by using experimental study to find out the absorption characteristics of some absorbing materials (foam, polyurethane, polyisoprene rubber and carpet) of different surface areas in the range between  $2 \text{ m}^2$  and  $14 \text{ m}^2$  at random sound incidences. The obtained results of different areas of each material were compared with that obtained from the reference standard area according to ISO 354.

The experimental data was treated statistically using the least squares fitting method where correction factor for the sound absorption coefficient from that of the reference standard area was presented. The effect of temperature and relative humidity of

the field during measurements has been taken into consideration.

The standard uncertainties for the measurements are very small; this means that our thesis is carried out in high accuracy measurements.

The absorption coefficient for polyurethane material increases as the thickness increases and give high absorption at low frequency and the real part of acoustic impedance for foam, polyurethane and polyisoprene rubber materials increases as the bulk density increases.