8. SUMMARIES AND FUTURE WORK

The aim of the project was to investigate how thermal conductivity and noise attenuation could vary as a function of porosity for thin sheets of foams containing closed pores and to determine if there was any pore size dependency of these properties.

This research began with a review of the many ways of manufacturing metallic foams containing large fractions of porosity and their applications. Such materials in principle combine good mechanical properties with a reduction in weight.

Previous models of metallic foams were summarized and their downfalls were determined. FORTRAN programs were written for the thermal conductivity of the tetrakaidecahedron, cube models and sphere models. To overcome the shortcomings a new simple-cube model was created and the thermal conductivity was calculated as a function of porosity and without disagreement with the more complex tetrakaidecahedron model. It showed that the thermal conductivities could be estimated for any level of porosity. The size dependency was also investigated using two smaller cubes within the cube model. This illustrated that there was no significant size dependency on thermal conductivity. A sphere model was also developed to see how shape could affect thermal conductivity, but the thermal conductivity could then only be calculated for small fractions due to stereological effects. The effect of gas pressure in the spheres on thermal conductivity was also investigated but it showed that pressure is independent of thermal conductivity, the work confirmed the absence of any effect of pore size on thermal conductivity.

Other future work could be to use the Avarmi extended volume concept, where the effect of pores overlap can be taken into account [33].

Finally the work on the acoustic properties was reviewed briefly and applied to study sound absorption as a function of frequency. The model showed that a porous metal has improved damping capacity compared to the metal it is generated from, but this interpretation is strictly on the frequency of the noise that requires to be damped.

In acoustic attenuation, other work could involve changing the porosity of the material and see at which porosity it will give greater damping capacity. Different parameters could be varied (e.g. the metals, damping constant) to determine which factors could have a significant effect on increasing the damping capacity.