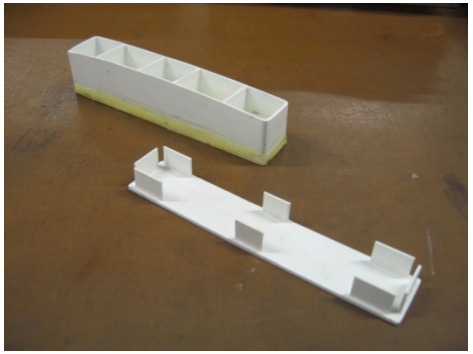
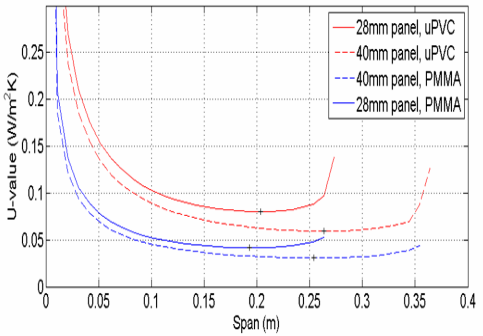
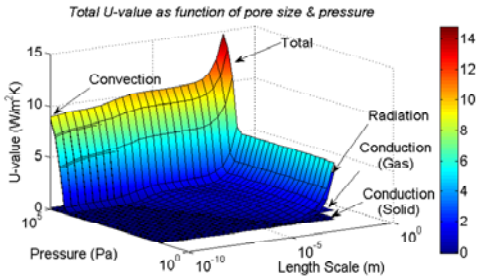
# *Actively Controlled High Performance Insulation*






MEng Student | *Alex Muir*
Supervisor | *Dr. Mauro Overend*

**Overview** | *A new generation of wall insulation is required in order to achieve high insulation levels within an economical wall thickness (i.e. low conductivity). This project explored the possibility of using actively controlled Vacuum Insulation Panels (VIPs) to achieve this. An analytical model was used to determine the relevant parameters and panel performance. Using the model, multi-objective optimisation and material selection helped to determine the design performance limits.*

**Main Outcomes** | *An analytical model has now been developed which calculates the structural and thermal performance of a given panel. Relationships and tradeoffs between relevant parameters have helped to optimise panel design. The theoretical model agrees with the experimental results obtained so far. The main finding is that without a fine porous filler material in the panel's cavities, the total conductivity is unacceptably high. However, the thermal performance of the optimum panel, as predicted by the model, is much higher than that achievable using conventional insulants.*

**Future Work** | *A wider range of experimental results, along with numerical modelling, will be used to validate and refine the model. The effect of permeation and outgassing in the panel should be modelled to help predict performance over time. In particular, water vapour permeation may prevent periodic depressurisation. A detailed economic appraisal of the entire vacuum insulation system will also be used to guide further material selection and detail design, and to assess the concept's viability compared to existing insulants.*