

# Porous structures and vortex shedding

Ian P Castro

Aeronautics & Astronautics, University of Southampton

In the context of Wind Engineering porous structures have a long history. Perhaps the best-known examples are windbreaks and shelter belts, which have been used for centuries and maybe millennia to protect crops and livestock from the more severe impacts of high winds. These are often relatively simple two-dimensional objects, for which the major parameter affecting the flow through them is their porosity  $\beta$  (the ratio of the object's open to total areas). For more general three-dimensional porous objects, however, there are other parameters of importance. In particular, the void fraction,  $\phi$ , or the permeability,  $K$ , may affect the flow. In this presentation, these parameters are defined and a few examples of flows through such three-dimensional objects are presented before attention is concentrated on flows through essentially two-dimensional porous structures. These include discs and flags and then, inevitably, shelter belts. This leads naturally to the second half of the talk, which presents a 21<sup>st</sup> century version of the author's first ever experiment (in 1969 and published in 1971), addressing some open questions regarding how porosity in a two-dimensional flat plate normal to an airstream affects the vortex shedding and other processes in its wake. The talk concludes by posing some remaining questions concerning flow through more general porous objects.