

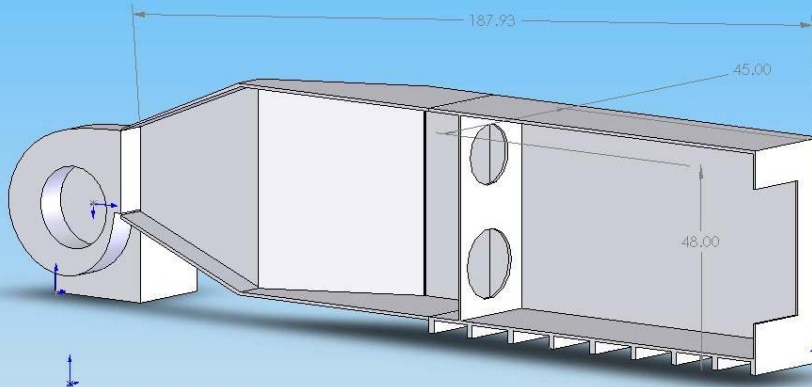
LOW-RE AXIAL FAN PERFORMANCE PREDICTION

Background

Low Reynolds number (Re) fans have either low rotational speed or small size. Despite widespread use (e.g. in vehicles and in electronics cooling) They are also, typically, of lower efficiency when compared with larger industrial fans.



Example of a low- Re axial fan used for automotive engine cooling



UWO Plenum Chamber

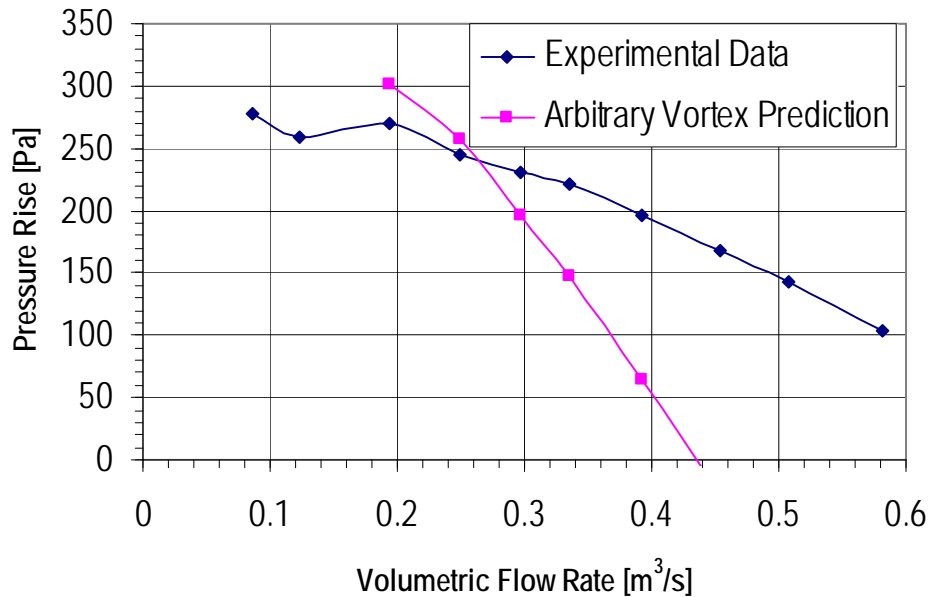
Cross section of the test chamber used to obtain fan data

Objective

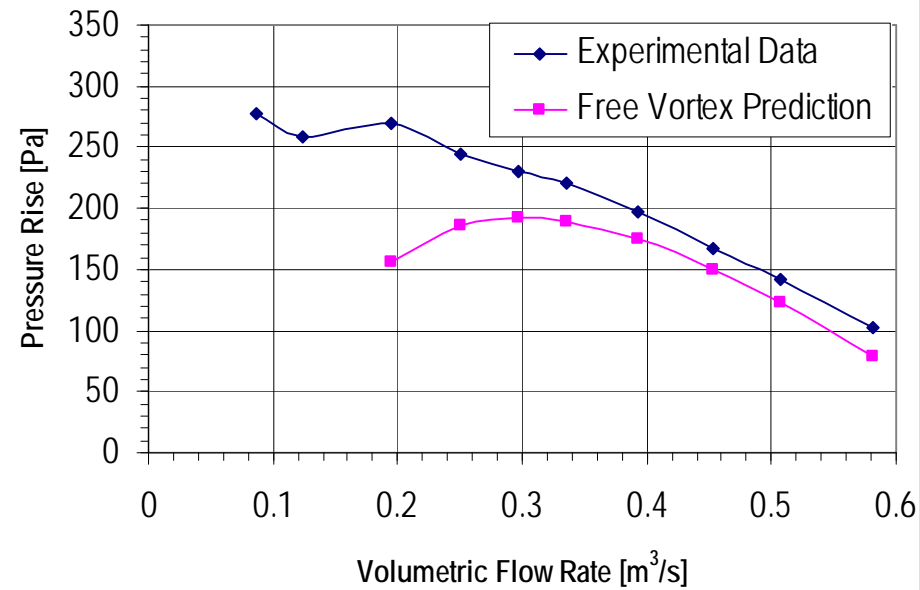
Evaluate existing design methods for low- Re axial fans and compare results to experimental data.

Research Carried Out

The classic design methods of R.A. Wallis were inverted for performance prediction and the results were applied to a 312 mm diameter automotive cooling fan.



Comparison of arbitrary vortex prediction with experimental data



Comparison of free vortex prediction with experimental data.

Key Findings

The free vortex method under-predicted the fan performance but followed the trend well for higher flow rates. The arbitrary vortex method showed promise for low flow rates.