

## Optimisation of non-axisymmetric end wall contours for the rotor of a low speed, 1 1/2 stage research turbine with unshrouded blades

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### Abstract

Non-axisymmetric end wall contouring has become an established method for the reduction of the losses associated with secondary flow. To date, the majority of designs have been produced by the aeroengine manufacturing community and as a result access to specific design and methodological details is often limited. In contrast, whilst the details of non-embargoed work are more freely available, much of this work has been carried out in simplified environments, with the most common of these being 2-dimensional, linear cascades, and therefore do not include a number of features which are present in the flow field of a real turbine. Recent work by Snedden et al involved the introduction of “generic”, non-axisymmetric end wall contours, originally designed for a linear cascade (the so-called Durham cascade), into the rotor row of a low speed, 1 1/2 stage research turbine. While an increase in rotor performance was noted, a detailed inspection of the flow results suggested that even greater improvements could be obtained through the design of custom end walls for the turbine. This investigation therefore covers the design of custom non-axisymmetric end wall contours for the rotor row of an annular turbine rig with unshrouded blades (the same rig as that used by Snedden), using a modified version of an end wall design routine originally developed for the production of non-axisymmetric end walls for a linear cascade environment.