COMPUTATIONAL INVESTIGATION OF EFFECT OF CASING WALL MOTION ON FLOW AND LOSSES IN AN ANNULAR TURBINE ROTOR IMPULSE CASCADE

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Abstract

The present paper presents computational results of effect of casing wall motion on three dimensional flow and losses in an annular turbine rotor impulse cascade. The flow at the inlet of the rotor cascade is radially non uniform, which is simulated by means of an upstream nozzle blade row. Commercial CFD software is used for the computations. No slip condition is used for the case of stationary casing, whereas relative wall condition is used for the case of rotating casing. Streamlines, velocity vectors, contours of static pressure on blade tip, contours of total loss coefficient at blade exit, spanwise variation of lift coefficient, circumferentially averaged flow angles and total pressure loss coefficient and axial variation of mass averaged total pressure loss coefficient are presented for both cases. There are minor differences in the spanwise variation of various parameters for both cases. The casing wall motion reduces the losses in the region near to casing but increases in the region far away from the casing. The blade loading and lift coefficient are increased with increase in casing wall motion near the casing and reduced away from the casing. The casing motion causes a slight reduction of losses associated directly with the leakage vortex. However total losses remain nearly same.

Keywords: Annular cascade; Turbine rotor impulse cascade; Non-uniform inlet flow; Computational investigation; Tip clearance; Losses