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Flow control in low pressure turbine blades using plasma actuators KARTHIK RAMAKUMAR, ARVIND SANTHANAKRISHNAN, JAMEY JACOB, University of Kentucky — An experimental study of plasma flow control actuators for flow separation control in low pressure turbine (LPT) blades is presented. The actuator arrangement consists of two copper strips separated by a dielectric medium with an input voltage of approximately 5kV and a frequency input varying from 3-5 kHz, creating a region of plasma used for boundary layer flow control. The effect of varying waveform on control efficacy is investigated using sine, square and saw tooth waveforms. The impact of duty cycle and forcing frequency on both displacement and momentum thickness are also examined. Boundary layer measurements are carried out using PIV while measurements of the wake downstream are performed using a 7-hole probe for Reynolds number ranging from 30,000 to 50,000. Separation is fully controlled in most configurations and boundary layer parameters reveal that the actuator entrains the free-stream flow at the actuator location and creates a region of high turbulence, essentially behaving similar to an active boundary layer trip. A small region of reversed flow near the surface indicates the presence of cross-stream vortical structures. The use of plasma synthetic jet actuators flow LPT flow control is also discussed.

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