

CFD ANALYSIS TO INVESTIGATE THE EFFECT OF LEANED ROTOR ON THE PERFORMANCE OF TRANSONIC AXIAL FLOW COMPRESSOR STAGE

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Abstract

This paper describes the numerical study carried out to understand the impact of combination of forward and backward leaned rotor on the overall performance of a transonic axial flow research compressor of CSIR National Aerospace Laboratories (NAL), Bangalore. The analyses were carried out using commercial Computational Fluid Dynamics (CFD) solver Ansys-CFX. Initially CFD analysis was carried out for the baseline rotor configuration and validated the results with the experimental data. Then, three new configurations of combined Leaned rotors were modeled from the radially stacked baseline rotor by changing the circumferential curvature of original stacking line using three control points located at 0%, 50% and 100% of the blade span. Analyses were carried out for all the three configurations of modified geometries and the results were compared with the baseline configuration. The results revealed many interesting aspects which will be very useful for better understanding of the blade curvature effects on the shock and secondary losses within the transonic rotor. The discussions on the effect of combination of forward and backward leaned rotor and the consequent developments on the overall performance of the compressor are presented in detail in this paper.

Keywords: CFD, Lean, Transonic Compressor, Shock, Tip Leakage Flow