عنوان مقاله:

Investigation on the Mechanism of Blade Tip Recess Improving the Aerodynamic Performance of Transonic Axial Flow Compressor

محل انتشار:

دوماهنامه مکانیک سیالات کاربردی, دوره 14, شماره 2 (سال: 1400)

تعداد صفحات اصل مقاله: 12

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خلاصه مقاله:

The development of high-performance aero engines put forward higher performance requirements for compressor components, and the improvement of aerodynamic performance of compressors has important engineering application value. The blade tip recess has great potential and advantages in improving the aerodynamic performance of compressors. In order to better understand the effect of the blade tip recess on the compressor aerodynamic performance, in this paper, the influence mechanism of the blade tip recess on the aerodynamic performance of the isolated rotor of a transonic axial compressor stage is discussed. Under the premise that the numerical method's results are almost consistent with the experimental test results, the full three-dimensional unsteady numerical results show that the main reason for the original blade rotor stall is the leading edge of the blade tip blockage, which is caused by blade tip clearance leakage vortex breakage. After adopting the measures of the blade tip recess, the study shows that the blade tip recess can increase the rotor stall margin by ۲.۱۰% without reducing the rotor efficiency and the total pressure ratio. A detailed analysis of the blade tip flow field shows that the blade tip recess can reduce the intensity of the tip clearance leakage flow by increasing the turbulence intensity of the blade tip near the casing wall, and reduces the leading edge of blade tip blockage, improves the rotor blade tip flow field, thereby achieving the purpose of enhancing rotor stability.

کلمات کلیدی:

Axial flow compressor, Blade tip recess, Aerodynamic performance, Stability