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柯恩达效应对涡轮叶栅气动性能及流场的影响

Conanda effect on aerodynamic performance and flow field of turbine cascade

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中文关键词: [涡轮叶栅](#) [柯恩达效应](#) [数值模拟](#) [柯恩达表面曲率](#) [马赫数](#) [射流参数](#)英文关键词: [turbine cascade](#) [Coanda effect](#) [numerical simulation](#) [curvature of Coanda surface](#) [Mach number](#) [jet parameters](#)

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中文摘要:

以某实际燃气轮机涡轮进口导向器叶栅为研究对象, 在出口为高亚声速及超声速条件下, 对具有不同柯恩达表面的环量控制叶栅进行二维数值模拟, 通过对比分析叶栅的气动性能和流场细节, 探讨了柯恩达效应在涡轮叶栅中的作用机理. 结果表明: 当叶栅出口马赫数为0.60时, 射流对主流有很好的携带作用, 损失小于原型叶栅; 叶栅出口马赫数增加到0.85时, 射流仍有较强的携带主流折转的能力; 当叶栅出口为超声速时, 在初始阶段小曲率的柯恩达表面上, 由于激波的作用, 射流向流道中心折转并提前脱离壁面, 初始阶段大曲率的柯恩达表面射流附壁较好, 但由于叶片吸力面与射流口之间圆角的作用, 射流与主流掺混不理想.

英文摘要:

Based on a real turbine inlet guide vane, the two-dimensional flow field of a turbine cascade was simulated by using the circulation control blade profile with different Coanda surfaces. At the cascade exit being high subsonic and supersonic conditions, the aerodynamic performance and the detailed flow fields of different blade profiles were explored. The mechanism of Coanda effect on turbine cascade was discussed. When Mach number at the cascade exit was 0.60, the jet entrained the mainstream well and the loss reduced. When Mach number at the cascade exit increased to 0.85, the ability of the jet carrying the mainstream was still fine. When the cascade exit was at supersonic flow condition, on the Coanda surface with a small curvature in front, the jet turned to the center of the flow channel and detached the wall in advance on account of the shock wave. On the Coanda surface with a large curvature in front, the jet adhered to the blade quite well. However, it did not mix with the mainstream for good due to the fillet between the jet exit and the suction surface.