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基于水滴型带状前缘的涡轮端区损失控制数值研究

Numerical investigation of endwall losses control in turbine by leading edge fillet based on teardrop curves

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中文关键词: 带状前缘 水滴型 端区损失控制 二次流 涡轮 马蹄涡

英文关键词: leading edge fillet teardrop endwall loss control secondary flow turbine horseshoe vortex

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中文摘要:

探索了基于水滴型带状前缘的涡轮端区损失控制方法,研究了水滴型带状前缘对于涡轮二次流损失的控制机理.以典型的高负荷低压涡轮叶片T106叶栅为对象,对比分析了不同的端区叶片带状前缘造型设计参数对涡轮端区损失的控制效果.结果表明:带状前缘的向前延伸长度、吸力面延伸位置和压力面延伸位置对于带状前缘的总压损失系数有较大影响,最佳设计方案可以使T106叶栅总压损失系数减小约5.1%.水滴型带状前缘与余弦带状前缘相比,端区损失的减小量并没有明显差异,但是水滴型曲线与原叶型的光滑融合不会引起叶型表面压力的局部波动.

英文摘要:

To investigate the endwall losses control in turbine by leading edge fillet based on teardrop curves, and to study the control mechanism of secondary flow losses in turbine by leading edge fillet based on teardrop curve, the investigation was carried out with the well-known T106 cascade which was developed for highly loaded low pressure turbines. The effect of design parameters of different leading edge fillet of turbine endwall on endwall losses control in turbine was compared and analyzed. The results show that total pressure loss coefficient is obviously affected by extension length of leading edge fillet, extension location of on suction side and pressure side. The best configuration shows a reduction of total pressure loss coefficient of T106 cascade by about 5.1%. Moreover, compared with the leading edge fillet by cosine curves, the modification based on teardrop curves do not show much more reduction to endwall losses, but the latter obtain smooth connection with the original profile which causes no blades surface pressure fluctuation locally.

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