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# 前后掠风扇叶片颤振特性对比分析

# Comparison of flutter characteristics of forward/ backward swept fan blades

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中文关键词: 前掠 后掠 颤振 能量法 模态 叶间相位角

英文关键词:forward swept backward swept flutter energy method mode shape inter blade phase angle

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中文摘要:

采用基于能量法的流固耦合数值预测方法对比研究了模态、叶间相位角对前后掠风扇转子叶片气动弹性稳定性的影响.结果表明:对于两种掠形叶片,在所研究的前3阶振动模态下,前掠叶片对应于弯扭耦合振型的气动模态阻尼比最大,其数值为0.801%,而后掠叶片对应于弯扭耦合振型的气动模态阻尼比最小,其数值为0.248%;叶间相位角对两种掠形叶片气动模态阻尼比都有显著影响,在1阶振动模态相同叶间相位角(节径)下,前掠叶片前行波对应的气动模态阻尼比小于逆行波对应的气动模态阻尼比,而后掠叶片与此相反;1阶振动模态所有叶间相位角下,前掠叶片比后掠叶片气弹稳定性更好.

英文摘要:

The effects of mode shape and inter blade phase angle(IBPA) on aeroelasticity stability of forward and backward swept blades were investigated through numerical flutter analysis and comparison based on the energy method.Results show that,for the first three vibration modes,aerodynamic modal damping ratio(AMDR) of forward swept blades corresponding to the coupling mode has the highest value of 0.801%,and that of backward swept blades corresponding to the coupling mode has the lowest value of 0.248%.IBPA has significant effects on AMDR for two kinds of swept blades.AMDR corresponding to forward travelling wave is lower than that corresponding to backward travelling wave for forward swept blades vibration in the 1st flapping mode at the same IBPA,while it is contrary for the backward swept blades;forward swept blades have better aeroelasticity than backward swept ones at arbitrary IBPA when blades vibrate in the 1st flapping mode.