

王培屹, 李琳. 用于失谐叶盘动力学特性分析的减缩计算方法[J]. 航空动力学报, 2014, 29(6): 1395~1402

## 用于失谐叶盘动力学特性分析的减缩计算方法

### Reduced order computational method for analysis of mistuning bladed disk dynamics characteristic

投稿时间: 2013-11-06

DOI: 10.13224/j.cnki.jasp.2014.06.020

中文关键词: [周期对称](#) [谐波平衡](#) [失谐叶盘](#) [减缩模型](#) [块循环矩阵](#)

英文关键词: [cyclic symmetry](#) [harmonic balance](#) [mistuning bladed disk](#) [reduced order modeling](#) [generalized Fourier matrix](#) [blocked cyclic matrix](#)

基金项目:

作者	单位
<a href="#">王培屹</a>	<a href="#">北京航空航天大学 能源与动力工程学院, 北京 100191</a>
<a href="#">李琳</a>	<a href="#">北京航空航天大学 能源与动力工程学院, 北京 100191</a>

摘要点击次数: 38

全文下载次数: 56

中文摘要:

提出了一种用于失谐叶盘动力学特性分析的减缩计算方法. 该方法采用基于周期对称的谐波平衡法, 建立非线性的迭代方程, 能够基于单扇区的矩阵求解整个失谐叶盘的强迫响应, 且不存在任何截断误差, 因而效率高于部件模态综合法但精度并不降低. 从周期对称结构理论出发给出了方法原理的数学推导, 在此基础上通过一个失谐叶盘有限元模型算例对该方法的效率与精度进行了讨论. 结果表明: 相较于部件模态综合法, 周期对称谐波平衡法矩阵维度减小59.5%, 计算复杂度减少93.4%, 计算时间节省57.4%.

英文摘要:

A reduced order method was proposed to analyze the dynamics characteristic of mistuning bladed disks. Based on cyclic symmetry and harmonic balance method, a non-linear iteration equation was formed, of which the matrix scale was the same to the matrix size of a single sector and was solved without any truncate error, consequently its efficiency was higher than the component mode synthesis method without losing any accuracy. The mathematical deduction was given based on cyclic periodicity theory. Furthermore, the efficiency and accuracy of this method were investigated by performing a numerical study on a finite element model of mistuning bladed disk. The results show that, compared with component mode synthesis method, the matrix size of the method proposed is reduced by 59.5%, the computational complexity is lowered by 93.4%, the computational time is saved by 57.4%.

[查看全文](#) [查看/发表评论](#) [下载PDF阅读器](#)

关闭