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新型动静压挤压油膜阻尼器对转子系统振动的控制能力

祝长生

浙江大学电机系,杭州,310027

ABILITY OF AN ADVANCED HYBRID SQUEEZE FILM DAMPER TO CONTROL ROTOR SYSTEM VIBRATION

Zhu Changsheng

Department of Electrical Engineering, Zhejiang University, Hangzhou, 310027

摘要

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摘要 以改善传统的挤压油膜阻尼器 (SFD)油膜力高度非线性不足为目的,提出了一种新型的阻尼器,即动静压挤压油膜阻尼器 (HSFD)。在推导出无周向回油槽深油腔 HSFD油膜力近似解的基础上,以小孔节流的 HSFD为例,对其油膜力的动力特性进行了分析,并从理论及试验上研究了 HSFD对转子系统振动的控制作用。结果表明 HSFD不仅能够明显地改善 SFD油膜力的高度非线性特性,克服在 SFD系统中经常出现的具有极大振动的双稳态现象,而且还具有更有效的减振效果

关键词: 转子动力学 阻尼器 振动控制

Abstract: This paper presents an advanced hybrid (combination of hydrostatic and hydrodynamic)squeeze film damper (HSFD)concept which is used to improve the high nonlinearity of conventional hydrodynamic squeeze film dampers (SFD's). Based on the approximation solution of fluid film\|force of the deep recessed HSFD without axial slots, taking an orifice compensated HSFD with four deep recesses for example, the stiffness and damping behavior of HSFD are analysed, and the control ability of HSFD to reduce rotor vibration is studied both theoretically and experimentally with a rigid rotor supported on HSFD. It is shown that HSFD not only can improve significantly the high nonlinearity of fluid film\|force of the SFD and avoid the bistable operations with very large rotor vibration occurring in the SFD system, but also can effectively reduce rotor system vibration, especially for larger rotor unbalance and radial clearance ratio.

Keywords: rotor dynamics damper vibration control

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