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基于两相流理论滑动轴承动力特性求解

Solution of dynamic characteristics of journal bearing based on two phase flow theory

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中文关键词： 滑动轴承 动力特性 计算流体力学 两相流 动网格

英文关键词：journal bearing dynamic characteristics computational fluid dynamics (CFD) two phase flow dynamic mesh

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作者	单位
孙丹	沈阳航空航天大学 航空航天工程学部,110136 沈阳
张楚	广东电网公司 电力科学研究院,510080 广州
郭瑞	东南大学 能源与环境学院 火电机组振动国家工程研究中心,210096 南京
杨建刚	东南大学 能源与环境学院 火电机组振动国家工程研究中心,210096 南京

中文摘要：

将计算流体动力学(CFD)两相流与动网格技术应用于滑动轴承动力特性数值求解,建立了基于CFD两相流滑动轴承动力特性求解模型,该模型无需设定油膜破裂边界条件且更能准确模拟滑动轴承流场特性.比较了单相流与两相流滑动轴承压力分布特性,计算分析了滑动轴承气穴分布特征及其影响因素,研究了两相流模型对滑动轴承动力特性的影响.计算结果表明:气化比例随着转速、偏心率和气化压力的增加而迅速增大,随进口压力的增加而缓慢减小.考虑两相流后,直接刚度系数增加,交叉刚度系数减小,直接与交叉阻尼系数均减小.随着偏心率的增加,单相流与两相流动力特性系数求解结果偏差增大.

英文摘要：

The computational fluid dynamics(CFD) two phase flow and dynamic mesh technologies were applied to the numerical calculation of dynamic characteristics of journal bearing. A new journal bearing dynamic characteristic solving model using the two phase flow theory of CFD model was established. The two phase flow theory of computational fluid dynamics for the journal bearing dynamic characteristics did not need to define the oil film rupture boundary condition, and it can generate more complementary and more accurate flow information. The pressure distribution characteristics of the sliding bearing were compared, and the cavitation characteristics and the effects of the journal bearing were calculated. Finally, the effect of the two phase flow theory of CFD model on dynamic characteristics of journal bearing was analyzed. Calculation results show that the cavitation ratio increases significantly with the increase of rotating speed, eccentricity, and vaporization pressure, and decreases slowly with the increase of inlet pressure. Using two phase flow, calculation results also show that the direct stiffness increases, the cross stiffness decreases and the direct and cross dampings decrease. The deviation between the single phase flow and the two phase flow increases with the increase of eccentricity.

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