



航空学报 » 2013, Vol. 34 » Issue (8) : 1980-1989 DOI: 10.7527/S1000-6893.2013.0119

材料工程与机械制造

最新目录 | 下期目录 | 过刊浏览 | 高级检索

<< 前一页 | 后一页 >>

### 考虑油滴变形和二次油滴效应的轴承腔壁面油膜流动分析

陈薄, 陈国定, 王涛

西北工业大学 机电学院, 陕西 西安 710072

#### Flow Characteristics Analysis of Wall Oil Film with Consideration of Oil Droplet Deformation and Secondary Oil Droplet Deposition in Aeroengine Bearing Chamber

CHEN Bo, CHEN Guoding, WANG Tao

School of Mechanical Engineering, Northwestern Polytechnical University, Xi'an 710072, China

摘要

参考文献

相关文章

Download: PDF (3324KB) HTML OKB Export: BibTeX or EndNote (RIS) Supporting Info

#### 摘要

航空发动机轴承腔油气两相流动状态下的壁面油膜分布和流动速度直接影响其润滑和换热特性。考虑油滴变形和二次油滴沉积效应作用,通过油滴变形和运动、油滴/腔壁碰撞过程质量和动量转移以及二次油滴运动和沉积分析,获得油滴沉积过程的质量和动量转移;在此基础上利用根据力平衡原理和质量守恒原理建立的壁面油膜分布和流动的力学模型获得壁面油膜的厚度和速度分布。分析和探讨了油滴变形对油滴速度和运行轨迹的影响,变形和二次沉积效应对油滴质量和动量转移以及壁面油膜厚度和速度分布的影响。计算结果表明:考虑变形后油滴所受阻力增加,其运动速度减小,运行轨迹更加弯曲,一次质量转移增加,一次动量转移减小;二次油滴的数量很大,其沉积质量和动量转移是轴承腔中油滴质量和动量转移的主要部分;油滴变形和二次沉积效应作用下壁面油膜的厚度和流动速度都明显增大,润滑油加速排出。

关键词: 航空发动机 轴承腔 变形 二次油滴 壁面油膜 油气两相

#### Abstract:

The thickness and velocity profiles of a wall oil film under air/oil two-phase flow conditions in an aeroengine bearing chamber have a strong and direct influence on the performance of lubrication and heat transfer of the chamber. This paper takes into consideration the deformation of primary oil droplets and the deposition of secondary oil droplets, and then determines the mass and momentum transfers in the process of deposition of oil droplets. The analysis contains droplet deformation and motion, mass and momentum transferred to the wall film with impingement of droplets/wall, and motion and deposition of secondary oil droplets. Based on the knowledge so obtained, the wall film thickness and velocity are subsequently calculated using a film flow model established by force balance and mass conservation. The effect of deformation on droplet velocity and trajectory is analyzed, and the effects of deformation and secondary droplet deposition on mass and momentum transfers and wall film thickness and velocity are discussed. The calculation results show preliminarily that droplet velocities decrease and trajectories become more bent due to the effect of deformation. When taking no account of secondary oil droplet deposition, the mass transfer of deformation droplets increases and the momentum transfer decreases in relation to those of spherical droplets. The number of secondary oil droplets is much larger, and the total mass and momentum transfers are mainly obtained from the secondary deposition. Film thickness and velocity increase significantly due to the influence of droplet deformation and secondary deposition, and lubrication oil is accelerated to exit the chamber through the seavenge port.

Keywords: aeroengine bearing chamber deformation secondary oil droplet wall oil film air/oil two-phase

Received 2012-10-22; published 2013-02-01

#### Fund:

国家自然科学基金(50975233,51275411)

#### Service

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ Email Alert
- ▶ RSS

#### 作者相关文章

- ▶ 陈薄
- ▶ 陈国定
- ▶ 王涛

