

航空风洞应变天平总体方案及关键部件设计与分析

摘 要

当今处在航空航天时代，人类进入空间开发的新时期。天平技术对航空航天事业的发展起着重要作用，然而国内的技术发展相较于国外起步晚，虽然取得了一定的有益成果但是与国外还是有一定的差距，天平技术需要不断创新发展。在充分学习应变天平工作原理的基础上，设计了浮动框、固定框和弹性连杆；设计了应变天平的工作量程；根据测力特性，完成六分量盒式应变天平的总体方案设计。同时，对关键部位进行校核。运用材料力学的知识校核了弹性连杆的受压、受弯等能力；基于 SolidWorks Simulation 的有限元分析，对弹性连杆和固定框上的悬臂梁进行了增加约束、增加力和力矩、形成网格图，得到受力位移图，最后，根据有限元分析结果提出了增加弹性连杆圆柱面积等改进措施。

关键词: 风洞天平，盒式天平，有限元

Design and Analysis of the General Plan and Key Components of the Strain Balance in the Aviation Wind Tunnel

Abstract

Today, in the era of aerospace, mankind has accessed a new cycle of space exploitation. Balance technology plays an vital role in the progress of aerospace industry. However, compared with fremdness, domestic technology progress begined late. Although some beneficial achievements have been achieved, there also have a certain difference with fremdness. On the basis of fully learning the working principle of strain balance, the floating frame, fixed frame and elastic connecting rod are designed. The working range of strain balance is designed. According to the characteristics of force test, the overall design of the six - component box strain balance is completed. At the same time, the key parts of the check. With the knowledge of material mechanics, the ability of elastic connecting rod to bear pressure and bend is checked. Based on the finite element method of SolidWorks Simulation, the cantilever beam on the elastic connecting rod and the fixed frame was subjected to additional constraints, additional forces and torques to form a grid diagram, and the force displacement diagram was obtained. Finally, according to the finite element analysis results, a number of perfection means such as increasing the cylinder area of the elastic connecting rod were proposed.

Key words: Wind tunnel balance, box balance, finite element numerical simulation, DME, EGR

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