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综述评论

多轴随机载荷下的疲劳寿命估算方法

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摘要 现代工业的发展使得更多的构件承受着复杂的载荷形式，将单轴疲劳模型应用到多轴载荷情况已不能满足现代工业的设计要求，多轴随机载荷下的疲劳寿命计算日益引起人们的重视．多轴随机载荷的寿命预测中，如何计算载荷循环次数是其基础，目前广泛使用的是雨流计数方法，现在已能成功的应用于多轴载荷的情况．累积的疲劳损伤分析在各种构件和结构的载荷历史中都起着重要的作用．自从线性损伤律提出以来已发展了数十种损伤律，变幅载荷引起的疲劳损伤可以由许多不同的累积损伤律来计算，虽然发展了许多损伤模型，由于问题的复杂性，每个模型的应用范围也是随具体情况而定．线性损伤律方法尽管有很多不足之处，但在设计使用中仍占有重要的位置．两载荷水平及模式下的损伤累积以及损伤与物理机制的关系在本文中也做了介绍．针对近年来提出的描述多轴随机载荷下疲劳寿命估算方法进行了详细的评述，对各模型的应用范围和预测能力进行了讨论，并对今后的工作提出了建议.

关键词 多轴疲劳, 非比例载荷 随机载荷, 雨流计数, 损伤律

分类号

FATIGUE LIFE EVALUATION UNDER MULTIAXIAL RANDOM LOADINGS

Abstract

The components of engineering structures are usually subjected to a complex loading. It is not always safe if a uniaxial fatigue model is used for fatigue design of structures under multiaxial loading. Fatigue life prediction under multiaxial random loading has been under study recently. In the course of the fatigue life prediction under multiaxial random loading, cycle counting is first to be considered. The rainflow counting method can be used to count the cycles in the multiaxial loading. Cumulative fatigue damage analysis plays a key role in the life prediction of the components and the structures subjected to load histories. Since the linear damage rule was proposed, many damage models have been developed. The fatigue damage due to random loadings can be determined by different damage models. But none of them is universally accepted. The applicability of each model varies from case to case. The linear damage rule is still dominantly used in design, in spite of its major shortcomings. The damage accumulation in two loading levels and modes, and the relationship between the damage and the physical mechanism are reviewed in this paper. The fatigue life prediction models under multiaxial random loading are reviewed in detail and the applicability of these models are discussed. Some suggestions are made for future research.

Key words multiaxial fatigue nonproportional loading random loading rainflow counting damage rule

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