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格栅非均匀分布效应对复合材料格栅加筋圆锥壳体稳定性的影响

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THE EFFECT OF NON-UNIFORM DISTRIBUTION OF GRID ON STABILITY OF ADVANCED GRID STIFFENED COMPOSITE CONICAL SHELL

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全文: PDF (982 KB)   HTML (1 KB) 输出: BibTeX | EndNote (RIS)   背景资料

摘要 研究格栅非均匀分布效应对先进复合材料格栅加筋圆锥壳体稳定性的影响。首先,基于格栅间距沿母线方向的变化特征和等效平铺模型推导了格栅加筋圆锥壳体的等效刚度阵。其次,采用Donnell 型扁壳理论推导了在均布外压作用下格栅加筋圆锥壳体稳定性分析的总势能表达式,利用最小势能原理得到了该壳体总体稳定性的临界载荷值,所得计算结果与实验结果十分吻合。最后,通过典型数例参数讨论,说明格栅非均匀分布效应对先进复合材料格栅加筋圆锥壳体稳定性的影响将随底锥角增大而显著。该文将为先进复合材料格栅加筋圆锥壳体的参数优化设计提供一种高效和可靠的分析方法。

关键词: 先进复合材料格栅加筋结构(AGS)   圆锥壳体   总体稳定性   等效刚度模型   格栅非均匀分布效应

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Abstract: The influence of grid's non-uniform distribution on the stability of advanced grid stiffened (AGS) composite conical shells has been studied. The distances between ribs of AGS conical shells vary along the shell longitudes, which ultimately results in the longitude dependence of the stiffness distribution. In this paper, the variable stiffness matrices considering various coupling effects along the longitudes were deduced based on equivalent stiffness model. Making use of Donnell form of relations for shells and the minimum potential principle, the critical load was predicted. The analytical result of AGS conical shells has a good agreement with the experimental data,indicating the validity of the analytical model and method provided. In addition, the non-uniform distribution of grid significantly influences the stability of AGS conical shells. Optimal study and design can be performed using the proposed method.

Key words: composite grid stiffened structure (AGS)   conical shell   general stability   equivalent stiffness model   effect of non-uniform distribution of grid

引用本文:

石姗姗,孙直,任明法等. 格栅非均匀分布效应对复合材料格栅加筋圆锥壳体稳定性的影响[J]. , 2012, 29(4): 43-48.

SHI Shan-shan,SUN Zhi,REN Ming-fa et al. THE EFFECT OF NON-UNIFORM DISTRIBUTION OF GRID ON STABILITY OF ADVANCED GRID STIFFENED COMPOSITE CONICAL SHELL[J]. Engineering Mechanics, 2012, 29(4): 43-48.

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