



预应力钢丝缠绕剖分-组合大型挤压筒的热应力分析

刘长勇^{1,2}, *张人佶^{1,2}, 颜永年^{1,2}, 林峰^{1,2}, 张磊^{1,2}

(1. 清华大学机械工程系, 北京 100084; 2. 清华大学先进材料成形制造教育部重点实验室, 北京 100084)

THERMAL STRESS ANALYSIS ON WIRE WINDED SUBDIVIDED- COMBINED LARGE EXTRUSION CONTAINER

LIU Chang-yong^{1,2}, *ZHANG Ren-ji^{1,2}, YAN Yong-nian^{1,2}, LIN Feng^{1,2}, ZHANG Lei^{1,2}

(1. Department of Mechanical Engineering, Tsinghua University, Beijing 100084, China; 2. Key Laboratory for Advanced Materials Processing Technology, Ministry of Education, Tsinghua University, Beijing 100084, China)

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摘要 预应力钢丝缠绕剖分-组合挤压筒与传统挤压筒相比具有重量轻、疲劳性能好、制造难度与成本低等优势。传统的预应力钢丝缠绕筒体理论计算方法忽略了温度的影响, 不适宜于热挤压筒的设计计算。该文采用线性热弹性理论、预应力钢丝缠绕理论以及弹性力学理论对挤压筒在预紧状态、预热状态和工作状态下的应力分布分别进行了分析, 得出应力分布的解析公式。理论分析和计算证明, 预紧系数、挤压筒内表面温度对稳态温度场下挤压筒的热应力分布起决定作用, 通过调整挤压筒的内表面温度和预紧系数可使热应力控制在许用范围内, 从理论上证实了在一维稳态温度场假设下预应力钢丝缠绕剖分-组合挤压筒的可行性, 目前该类型的挤压筒已应用于我国已建成的360MN/150MN垂直挤压机组中。

关键词: 稳态温度场 预应力钢丝缠绕 剖分-组合 热应力 挤压筒

Abstract: Wire wended subdivided-combined extrusion containers has a wide range of advantages over traditional extrusion containers such as lower weight, improved fatigue performance, easier to manufacture and lower cost. Classic analytical solutions are derived without considering the influence of temperature which apparently cannot be applied to design a hot extrusion container. The theoretical derivation of stress distribution based on the consumption of a one-dimensional steady state temperature field was conducted. The analytical solution was obtained using linear thermoelasticity, wire winding theory and elasticity. The theoretical analysis and calculations indicate that the pre-stress factor and inner surface temperature of the container have important influence on the thermal stress distribution of the container. Thermal stress can be reduced to a value which is lower than the allowed stress by adjusting the inner surface temperature and pre-stress factor. Extrusion containers designed by this method have been applied to the 360MN/150MN vertical extrusion equipments.

Key words: steady state temperature field pre-stressed wire winding subdivided-combined thermal stress extrusion container

收稿日期: 1900-01-01;

PACS:

引用本文:

刘长勇,张人佶,颜永年等. 预应力钢丝缠绕剖分-组合大型挤压筒的热应力分析[J]. , 2011, 28(5): 207-211.

LIU Chang-yong.,ZHANG Ren-ji et al. THERMAL STRESS ANALYSIS ON WIRE WINDED SUBDIVIDED- COMBINED LARGE EXTRUSION CONTAINER [J]. Engineering Mechanics, 2011, 28(5): 207-211.

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- [1] 肖楠;谢基龙;周素霞. 地铁车轮踏面制动疲劳强度评价方法及应用[J]. , 2010, 27(9): 234-239.
- [2] 张健;黄晨光. 三维瞬态方形管流的热流固耦合数值模拟[J]. , 2010, 27(6): 232-239.
- [3] 吴福麒;李子然;夏源明. 不同载荷和初始气压下滚动轮胎稳态温度场的测试与有限元分析 [J]. , 2008, 25(1): 0-060,.
- [4] 李东. 考虑水化热粘弹性应力影响的超长结构设计计算与分析 [J]. , 2007, 24(8): 0-110.
- [5] 管志川;赵洪山. 注汽井套管的三轴预应力设计[J]. , 2007, 24(4): 0-192.
- [6] 郭瑞平;范天佑. 含半椭圆表面裂纹圆柱壳体的三维热弹性动态断裂[J]. , 2006, 23(5): 29-33,3.
- [7] 许杨健;李现敏;文献民. 不同变形状态下变物性梯度功能材料板瞬态热应力[J]. , 2006, 23(3): 49-55,9.
- [8] 李仕华;王志松;刘全坤. 保角映射法求解扁挤压筒在内压力作用下的应力[J]. , 2003, 20(3): 89-93.
- [9] 刘杰;盖秉政. 二维半无限弹性平面内圆形腔孔表面的动态热应力分布[J]. , 2002, 19(1): 89-93.
- [10] 许杨健;赵志岗. 梯度功能材料薄板瞬态热弹性弯曲有限元分析[J]. , 2001, 18(1): 71-81.
- [11] 盛宏玉;高荣誉. 非均匀变温时两端固支叠层闭口厚柱壳的热应力分析[J]. , 2000, 17(4): 117-123.
- [12] 丁克伟;唐立民. 层合开口桩壳热应力问题的解析解[J]. , 1999, 16(3): 1-6,49.
- [13] 李国强;黄卫;邓学钧;杨树才. 水泥基复合路面材料微观热应力分析[J]. , 1998, 15(2): 69-75.