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内切圆弦长法计算空心涡轮叶片蜡模壁厚

徐岳琳, 卜昆, 张定华, 黄胜利, 程云勇, 索瑞

西北工业大学 现代设计与集成制造技术教育部重点实验室, 陕西 西安 710072

Algorithm for Calculation of Wall Thickness for Hollow Turbine Blade Wax-patterns with Inscribed Circle Chord Length

XU Yuelin, BU Kun, ZHANG Dinghua, HUANG Shengli, CHENG Yunyong, SUO Rui

The Key Laboratory of Contemporary Design & Integrated Manufacturing Technology,Ministry of Education, Northwestern Polytechnical University,Xi'an 710072, China

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摘要 针对涡轮叶片精铸蜡模壁厚的快速、低成本测量问题,提出了基于光学测量的内切圆弦长的壁厚计算方法。以陶芯和蜡模外形的光学扫描测量模型为对象,将两测量模型进行配准并提取截面数据,拟合得到蜡模内外截面轮廓线,提出并研究了两种内外截面轮廓线内切圆弦长计算方法,进而在UG平台上进行二次开发计算得到蜡模壁厚。最后,通过实验将算法的实例计算壁厚与计算机断层成像(CT)测量壁厚进行了比较分析,结果表明,基于光学测量的内切圆弦长法计算壁厚与CT测量壁厚具有很好的一致性。

关键词： 空心涡轮叶片　内切圆弦长　壁厚　蜡模　光学扫描测量　配准

Abstract： To realize the high speed and low cost measurement of the wall thickness of the wax pattern of a turbine blade, a novel wall thickness calculation method is proposed based on the inscribed circle chord length between the inside and outside contour lines of the wax pattern wall. First, the optical scanning data registration of the wax-pattern and the ceramic core is studied, and the contour lines are extracted from the registration model. Then, two different computing models for the inscribed circle chord length of the contour lines are built. Finally, a sample application is presented for demonstration by comparing the method in this article with the computer tomography (CT) measured data. The result shows that the wall thickness calculated by the inscribed circle chord length method agrees well with the CT measured data.

Keywords： hollow turbine blade　inscribed circle chord length　wall thickness　wax-pattern　optical scanning measurement　registration

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