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论文

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### 多点“三明治”成形及其在风洞收缩段形体制造中的应用

王仲仁<sup>1</sup>, 董国庆<sup>2</sup>, 滕步刚<sup>1</sup>, 张琦<sup>1</sup>, 苑世剑<sup>1</sup>, 沈济全<sup>2</sup>

1. 哈尔滨工业大学 材料科学与工程学院, 黑龙江 哈尔滨 150001; 2. 中国航空工业空气动力研究院, 黑龙江 哈尔滨 150001

### Multi-point Sandwich Forming and Its Applications in Manufacturing Contraction of Wind Tunnel

WANG Zhong-ren<sup>1</sup>, DONG Guo-qing<sup>2</sup>, TENG Bu-gang<sup>1</sup>, ZHANG Qi<sup>1</sup>, YUAN Shi-jian<sup>1</sup>, SHEN Ji-quan<sup>2</sup>

1. School of Materials Science and Technology, Harbin Institute of Technology, Harbin 150001, China; 2. Chinese Aerodynamics Research Institute of Aeronautics, Harbin 150001, China

摘要

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**摘要** 大型风洞收缩段形体板厚较大,成形较困难,而风洞收缩段形体制造精度对气流品质有很大影响,由于收缩形体中各个瓣片的形状差异较大,所以采用传统模压工艺需要很多模具,势必增加成本和制造周期,因此,提出了低速风洞收缩段型面制造的一种新方法,即多点“三明治”成形方法。通过对收缩段曲面坐标变换和曲面离散,确定出多点“三明治”成形模具顶杆的高度,为了确保瓣片的尺寸加工精度,减少实验工作量,成形前,需要通过数值模拟对弹复量进行预报,试压后,测量瓣片的实际尺寸,重新调节模具顶杆的高度。研究表明,多点“三明治”成形适于制造大曲率半径曲面工件。采用此种新工艺已在一套模具上为某风洞收缩段形体制成200多种双曲率瓣片。

**关键词:** 收缩段 多点“三明治”成形 风洞 成形

**Abstract:** Thickness of the petals for constructing contraction of low speed wind tunnel is larger and forming the petals is relatively difficult. Precision of manufacturing the petals makes more contribution on the quality of the air flow. Because the shape of these petals is different, it will increase the cost and lead time for manufacturing die set if traditional die forming is adopted. Hence, a new method of manufacturing curved surface in contraction of low speed wind tunnel is presented, which is the multi-point sandwich forming. The heights of adjusted pins in die set are determined by conversion of coordinate and discretized curved surfaces that belong to the contraction during this process. Before forming, the spring-back is predicted by numerical simulation to ensure the forming precision of the petal. After testing, the heights of pin need be adjusted again according to measurement results. Research shows that multi-point sandwich forming is suitable to form the workpieces with large radius of the curvature. Furthermore, more than two hundred hyperboloidal petals with different size and shape have been formed using this process with only one die set.

**Keywords:** contraction multi-point sandwich forming wind tunnel forming

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