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空间弯管的回弹预测

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Spring-back Prediction of Non-planar Tube Bending

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摘要 管材弯曲卸载后将不可避免地产生一定回弹,严重影响弯管生产的精度与效率,因此回弹成为管材弯曲的重点研究对象。对空间非平面弯管回弹进行研究,将空间回弹问题转化为两个相互垂直平面上的回弹问题,通过纯弯曲回弹实验,建立弯管平面弯曲回弹前后半径之间的函数关系式,然后将两个平面上的回弹合并,对离散化的回弹弯管进行空间拼接,进而完成空间弯管成形过程的回弹预测,并进行了试验验证。结果表明该方法能够有效地预测管件弯曲回弹,以便修改模具型面,补偿回弹误差,保证弯管的几何精度。

关键词: 管材弯曲 空间弯管 回弹 弯曲模 预测

Abstract：The spring-back phenomenon of tube bending occurs consequentially after unloading, which reduces the accuracy of tube manufacturing and processing efficiency. Therefore, it becomes the focus of study in tube bending. In this paper, the spring-back of a non-planar bended tube is projected onto two mutually perpendicular planes. The mathematical relationship of the radii of the bended plane before and after the spring-back is built through a pure bending spring-back experiment, and then the spring-back on the special planes are transformed into 3D, partitioned non-planar tubes after the spring-back are merged in the space in accordance with a special law. Thus, the re-construction of the non-planar tube shape which takes into consideration the spring-back is determined based on the above process. This spring-back prediction method can be useful for the maintenance of the bending die. It will ensure that the new shape meets the requirements of geometric accuracy of the non-planar bended tube.

Keywords：tube-bending non-planar bended tube spring-back bending die prediction

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