

A Novel Machining Method and Tool-Path Generation for Bent Mandrel

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Abstract : Bent mandrel has been widely used as precise mould in automobile industry, shipping industry and aviation industry. To improve the versatility and efficiency of turning method of bent mandrel with fixed rotational center, an instantaneous machining model based on cutting parameters and machine dimension is prospered in this paper. The spiral-like tool path generation approach in non-axisymmetric turning process of bent mandrel is developed as well to deal with the error of part-to-part repeatability in existed turning model. The actual cutter-location points are calculated by cutter-contact points, which are obtained from the approach of spiral sweep process using equal-arc-length segment principle in polar coordinate system. The tool offset is set to avoid the interference between tool and work piece is also considered in the machining model. Depend on the spindle rotational angle, synchronization control of X-axis, Z-axis and C-axis is adopted to generate the tool-path of the turning process. The simulation method is developed to generate NC program according to the presented model, which includes calculation of cutter-location points and generation of tool-path of cutting process. With the approach of a bent mandrel taken as an example, the maximum offset of center axis is 4mm in the 3D space. Experiment results verify that the machining model and turning method are appropriate for the characteristics of bent mandrel.

Keywords : bent mandrel, instantaneous machining model, simulation method, tool-path generation

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