The Study of Manufacture Processing for Dual Screw Vacuum Pumps

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ABSTRACT

The geometric design method of the rotor of dual-screw type vacuum pump is to combine several arcs or curves with the collinear principle of midpoints and continuous points of any two adjacent curves to form the contour of an male rotor. Then, the contour of female screw rotor conjugated with the male screw rotor is created through converting matrix and meshing equations. The object of this thesis is to construct a physical model of the screw rotor manufactured by the tools whose geometric contours are already designed with the Unigraphics CAD/ CAM software. Different processing modes are employed to program the path of tools and the processing parameters. Once the simulation results show that interference and undercut are avoided, NC codes will be produced through postprocessor and delivered to the machine to manufacture the screw rotor. Generally, the rotors of the screw vacuum pumps in mass production are processed by CNC rotor machine as milling and grinding works can be completed at the same time. However, product development concerns about the expense of the preproduction arrangements to order the forming multiple-cutting-edge tools of special outline curves and to manufacture the diamond-grinding wheel. In order to save development time and reduce production costs, two different kinds of processing techniques are employed for this research to analyze the feasibility of production method of the product development. First, install the turning tools and tool holders processed by CNC wire electric discharge machine in the CNC lathe. Then, the forming tool method is selected to process the PE plastics rotor. Second, a CNC five-axis machine is used to process the aluminum alloy (6061) rotor by the carving and milling process method. Finally, the helical grooves in two rotors are assembled and tested to ensure that the rotors can be operated smoothly.

Keywords : vacuum pump ; screw ; CNC ; five-axis machine

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