Research on Customized Method of Post-processing of DMU125P Five-axis Machine Tool

Zheng Hao
Sichuan Vocational and Technical College, Suining, Sichuan, 629000, China
Email: tg667788@xzcstudio.com

Abstract: With the increasing improvement of China's industrial production technology, more and more attention is paid to the application of new five-axis CNC machine tools, and it is also urgent to strengthen the post-processing design. However, there are still many problems in the post-processing of DMU125P five-axis machine tools at this stage. The method is analyzed by combining the post-processing requirements of the DMU125P five-axis machine tool. At the same time, most studies in recent years have found that the use of post-processing application design is critical to improving the processing of complex mechanical parts. This study will analyze the post-processing customization method of the DMU125P five-axis machine tool, and provide a basis for the next step of work.

1. Introduction
At this stage, there is relatively little research on the post-processing customization method of DMU125P five-axis machine tools. Based on the current situation of the problem, effective measures are required to analyze and research, such as the effect of machine post-processing, NX post-processing constructor analysis, customizing methods for post-processing of machine tools, improving the processing efficiency of five-axis CNC machine tools, reducing labor input and improving precision machining accuracy, effectively controlling cost input and reducing excessive consumption. It has very important theoretical significance to explain the optimization design and effect analysis of the current DMU125P five-axis machine tool in China.

2. Overview of five-axis machine tools
With the rapid development of Chinese’s market economy, industrial production and parts processing are gradually transforming to modernization. As an important manifestation of high-tech and modern numerical control technology, five-axis machine tools are critical to manufacturing and industrial processing. The development of CNC machine tool industry to a large number of production and processing is relatively long. The five-axis linkage machine tool is based on the traditional CNC machine tool form, which has significantly improved the scientific and technological content, and has a higher degree of precision and professionalism. Five-axis machine tools are mainly suitable for processing relatively complex curved surfaces. Five-axis machine tools are also relatively broad in application fields, mainly suitable for high-end industrial fields, such as aviation, aerospace, scientific research industry, military industry and professional medical equipment industries. Its function value is considerable, and it is mainly suitable for processing impellers, blades, marine propellers, heavy generator rotors, steam turbine rotors, and large diesel crankshafts with a certain leading role in this aspect. In a narrow sense, a five-axis linkage machine tool is a technological upgrade that realizes linkage processing of five working axes. It can process relatively complex and high-precision
mechanical parts in a short time. The tool path file generated in the CAM system must be converted by using CAD/CAM software, which is the machine tool processing code. It can clarify the customization of the five-axis post-processing program of the Heide system.

3. Effect of post-processing on machine tool
NX/Post consists of at least three programs that deal with events *.tcl files, defining data formats *.def files and user interfaces that can edit post-processing files *.pui documents. As shown in figure 1, they convert the source rail into NC code.

![NX Post architecture](image)

Figure 1. NX/Post Framework

The post-processing device has a certain degree of integration. For the function of the five-axis linkage machine tool, the tool path generated by the system needs to be transformed according to the specific nature of the machine tool, and the G code related instructions that can be automatically recognized by the machine tool. It is necessary to pay attention to the combination in the development of related work, so that the post-processing function of the DMU125P five-axis machine tool can be reflected, and the main functions are as follows. The first is to play a role in the stable operation of the machine tool. At present, many mechanical parts require five-axis linkage machine tools for processing, which is mainly reflected in the complex structure and surface of the parts. However, specific programming is required in the tool path design to improve the recognition of the machine tool. The second is that the post-processing of the machine tool is one of the important components of the five-axis linkage machine tool. From the perspective of function, stability and safety, it is also very important to carry out technical improvement and systematic research on the post-processing of machine tools. Scientific and reasonable post-processing design can reduce tool orbital errors and improve the machining accuracy of complex mechanical parts [1]. The main C adopts the control system of NX software. This kind of numerical control system programming form and software module have become the main trend, and this system has certain integration characteristics. The programming function of this system mainly includes 3 axis, 5 axis milling processing, at the same time can carry on fast programming to its turning, wire cutting and other processing methods. NXCAN can generate tool path files for parts processing according to the requirements of the machine tool. This file mainly includes the position information that can carry out the interpolation movement to the processing tool, the non-interpolation movement information that can carry on the fast control to the machine tool, such as coolant control, tool change control [2].
However, after analysis, it is found that the tool path-related files cannot directly form a channel for the machine tool. At the same time, CNC machine tools often have different CNC programs, and different systems will cause problems. The machine tool drive cannot be directly formed and the efficiency of machining operations is reduced. The post-processing effect of DMU125P five-axis machine tool is highlighted, and the tool path needs to be set and processed, and it is converted into a recognizable code format for the CNC program of the machine tool. The machine tool post-processing program reads the tool path file, and processes the tool path file information according to the rules agreed by the post-processing program to generate G codes that can be recognized by the CNC system, as shown in figure 2.

![Figure 2. DMU125P Five-axis Machining Center](image)

DMU125P five-axis machine tool post-processing process for the CLSF of tool rail source, postprocessor, numerical control system and other [3].

4. **NX post-processing constructor analysis**

It is found that the processing builder is an important part of the NX software platform and a tool governed by the software. Its function is to quickly create and scientifically modify the post-processing program files. The processing builder mainly includes five modules. The first is the machine parameter design analysis module. The second is the control program and tool path parameter setting module, the third is the NX data information format setting module, and the fourth is the output data parameter setting module. The fifth is that the virtual information data controller module and other managers can make their own choices during the process, and use the flexible scheduling characteristics of the post-processing construction device to construct the format presentation content in the NC program. It also constructs successive processing methods, programs, etc., mainly including program header and end processing methods, tool change processing methods, and cycle processing methods. Based on the requirements and matching of the machine tool control system, the relevant processing definition content is constructed. The whole process part and resource integration of NX were used to effectively realize the post-processing of the DMU125P five-axis machine tool [4].

5. **Customizing method for post-processing of machine tools**

5.1. **Decision procedure**

It must pay attention to the combination, and fully reflect the functional role of the machine tool post-processing. First of all, the program name should be defined, and the program start sequence can be selected after entering the system. It can select the program to start, and set the program name definition under this module. Secondly, it can select the operation start option and set M129 in the automatic tool change program. It can cancel sharp tool tracking, use tool and other related sub-modules. Finally, it can select the tool path module to quickly edit the program module.
5.2. Definition of orbit
It should pay attention to its combination in the definition of track, design the direction and track of tool track reasonably in the post-processing of DMU125P five-axis machine tool, and analyze and study all kinds of problems affecting precision.

6. Effect analysis

6.1. Improve machining efficiency of five-axis CNC machine tool
Through the practical input test of the post-processing design, it is found that its overall operation capability is relatively stable, the reliability is good, and there is no successive impact and interference. In the process, the machining of complex curved mechanical parts is the main one, which is relatively stable in tool orbit operation and processing, and the processing speed is relatively fast comparing the traditional machine tool model. It mainly takes two kinds of five-axis linkage machine tools in traditional mode and optimized mode as examples. In the traditional mode, manual control or intervention supervision is the main method, and the post-processing cannot satisfy the optimized precision parts processing. In addition, the post-processing optimization mode is several times
redundant in terms of duration. The post-processing design optimization mode can quickly increase the processing speed of complex curved mechanical parts, and the operating efficiency is also significantly improved. This study is worthy of recognition in terms of operational effects [6].

![Figure 5. Comparative (%) of two modes of production and operation superiority](image)

6.2. Reduce labor input and improve precision processing
In the development of China’s CNC machine tools, a relatively complete technology upgrade system has been formed, focusing on the recognition and conversion of five-axis CNC machine tools. By optimizing the design of the post-processing, the controllable programming is implanted in the software, combined with the advantages of G code conversion, and the system control recognition is improved. Through the analysis, it is found that the optimized implementation of the post-processing design can promote the reduction of labor input and labor. Through the DMU125P five-axis machine tool post-processing, the substantive role of the DMU125P five-axis machine tool post-processing design is reflected. Optimize the shortcomings in the form of traditional CNC machine tools can reduce the investment in manual control. After analyzing the processed mechanical parts, it is found that the parts processed by the machine tool after the post-processing design optimization are relatively good.

6.3. Effectively control cost input and reduce excessive consumption
Through the design and implementation of the post-processing design of the DMU125P five-axis machine tool, it is found through actual tests that it has a higher value, which is mainly reflected in the cost control and consumption reduction. The cost input is relatively high, and it has a valuable impact on increasing production and efficiency and improving processing quality. From the perspective of comprehensive investment, there are many loopholes in the traditional CNC machine tool processing mode. This design and research system is relatively low in cost, and the additional investment in the later period is not high, and it has a certain sustainable application and use cycle. Through statistical analysis of various consumption levels, this design system has the effect of low consumption and production capacity, laying the foundation for energy saving and consumption reduction in the later period, and the application of green technology [7].

7. Conclusion
To sum up, the analysis and research on the post-processing customization method of the DMU125P five-axis machine tool mainly includes the effect of machine tool post-processing, NX post-processing constructor analysis, machine tool post-processing customization methods. It can improve the processing efficiency of five-axis CNC machine tools, reduce labor input and improve precision processing, effectively control cost input and reduce excessive consumption, etc. It can analyze the post-processing customization method of the DMU125P five-axis machine tool from many aspects and perspectives, and lay a solid foundation for the next step.
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