

Innovative Research on Numerical Control Machine from the Perspective of Service-Oriented Manufacturing

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Abstract: Service-oriented manufacturing takes the customers as the center and the comprehensive development of related enterprise as the objective. It is an innovative form of the integration of manufacturing and service. Service-oriented manufacturing is an inevitable choice for the transformation and upgrading of Chinese manufacturing industry. This paper analyzes the concept, characteristics and value creation mechanism of service-oriented manufacturing, and gives the innovative design of numerical control machine from the perspective of service-oriented manufacturing to provide references for relevant researchers.

1. Introduction

In recent years, China's manufacturing industry has been developing rapidly, but there are still some problems in its development, such as weak self-innovation capability, low added value of products and poor ability to resist risks. Under the influence of the international financial crisis, China's manufacturing industry has been greatly impacted, and some manufacturing enterprises have closed or even went bankrupt. In this context, the optimization and upgrading of the manufacturing industry has been highly valued by the government and enterprises. In the current environment of economic development, the development of industrial integration is a trend. China's manufacturing industry should gradually change from manufacturing to creation, from production - based manufacturing to service - based manufacturing. The connotation of manufacturing should include some points: conception, processing, use, and information connection between them. Conception: before processing, or front end; processing: in processing, the middle end is used: after processing, the back end. The product centric manufacturing industry is extending to the value-added services. The structure of manufacturing industry also takes product centered as the center to provide products and value-added services. This is the historical development and progress of manufacturing industry, and an important symbol of manufacturing industry's upgrading. Industrial design is not only the design of the shape of the product, but also the cooperation between the product and the surrounding environment. They could not afford to think that they could not afford to watch industrial products, and they should have cultural content and form a whole with the surrounding environment. The innovation technology of the product is humanized in the industrial design. In the innovative technology, we continue to integrate into the humanistic thoughts, continue to integrate into the humanistic care, and continue to integrate into all aspects of harmony. Industrial design should pursue the harmony of the relationship between the form and the connotation of the product, service and the whole process of the system.

2. Concept, Features and Value Creation Mechanism of Service-Oriented Manufacturing

2.1 Concept of Service-Oriented Manufacturing

Service manufacturing has a more complex meaning, not a simple integration of manufacturing and service can be covered. The concept of service manufacturing needs to be carried out from four

different angles: the core concept, the expression form, the organization form and the attribute four levels. From a conceptual point of view, service manufacturing is the product of historical integration of manufacturing and services under the new world economic conditions; it is based on manufacturing services and service-oriented manufacturing. In the form of expression, service manufacturing includes services for the manufacturing enterprise for the middle enterprise, the package solution and the service for the end consumer. From organization form and service type manufacturing to the fusion and mutual penetration between manufacturing enterprises and service enterprises, manufacturing enterprises expand and serve the penetration of manufacturing enterprises into the field of service. Integration is rooted in the interaction and outsourcing between enterprises, and the resources of manufacturing nodes are transferred to the core competitive advantages, and the links between enterprises are closer and shared resources, so that resources can be allocated dynamically and optimizes dynamically among the networks. From the value-added service oriented manufacturing services in the property, production from the previous focus on product function, to pay attention to customer demand service, through service value-added activities, which is attached to the product value increases greatly, the unit price increase, improve their ability to obtain the value of the. The acquisition and processing for the integration of knowledge resources and the consumption demand of signal source of innovation, the interactive impact of distributed knowledge resources through the integration of manufacturing services between the network and changes in the conditions of demand and development of the information, continue to produce the whole network to adapt to the new economic conditions of the information of the corresponding knowledge innovation ability is greatly improved.

2.2 Features of Service-Oriented Manufacturing

Service manufacturing can provide productive services and service production among enterprises, and introduce customers into cooperative producers, to create more value by integrating resources, efficiently collaborating and innovating. Service manufacturing is the polymer of knowledge capital, human capital and industrial capital, and becomes the adhesive of the two. The high aggregation of knowledge capital, human capital and industrial capital makes service manufacturing get rid of the image of low technology content and low value added in traditional manufacturing. It has distinct characteristics from all kinds of manufacturing methods in the past. In terms of value realization, service manufacturing emphasizes on the core of traditional product manufacturing, and provides transformation to product system that has rich service connotation until it provides the whole solution for customers. On the mode of operation, service oriented manufacturing from traditional manufacturing to product as the core to the human centered, emphasizing the customer, the operator's cognitive and perceptual knowledge, discovery and contact, through effective participation in mining needs, determine the enterprises in the product positioning system continuous spectrum in the production and personalized service. In the organization model, the coverage of service manufacturing is beyond the traditional manufacturing and service category, but it does not pursue the longitudinal body. Service oriented manufacturing is more concerned about the different types of subjects' perception of value through each other, and actively participates in the collaborative activities of the service manufacturing network. In the dynamic collaboration, the resource allocation is spontaneously formed, and a dynamic and stable service manufacturing system emerges. In the mode of operation, service oriented manufacturing emphasizes active service. Take the initiative to introduce the customer into the process of product manufacturing and application, to find the customer's needs and to carry out the targeted service. Based on business process cooperation, enterprises provide productive services and service production activities for upstream and downstream customers, and create value together.

2.3 Value Creation Mechanism of Service-Oriented Manufacturing

Service manufacturing emphasizes production service enterprises, service production enterprises, and customers' dynamic game process based on self-interest demands under the network environment. It is self-realization of customer demand, customer knowledge, collaborative manufacturing

enterprise resources, the integration of knowledge resources and service resources, the emergence of top-down service-oriented Pareto optimal manufacturing system, through the needs of professional mining, product innovation, manufacturing, services and other business activities to create value. The service manufacturing mode, by introducing customers into cooperative producers, spontaneously creates demand creation, and gets rid of the traditional operation mode that regards market demand as exogenous variables and passively answers market changes. Traditional manufacturing activities, technical orientation is obvious, the manufacturer occupies the dominant position in the value chain, the market and the customer are the passive recipient of the product. Although the manufacturer also introduces the customer to the process of value creation through market investigation, the effect is not obvious to a limited extent. Service oriented manufacturing model oriented to customer needs, through the interaction between enterprise and external actors, to guide customers to participate in product design, manufacturing and service process, continuously improve product system, improve customer satisfaction, product innovation and market innovation. Therefore, service manufacturing is more of a kind of manufacturing mode created by independent demand. The service - based manufacturing model is a new model of value innovation. On the one hand, technology oriented technology innovation mode in traditional manufacturing system is strengthened because of close collaboration between business partners based on business processes. On the other hand, customers become cooperative producers and drive user driven innovation. In the process of technology driven innovation and user driven innovation, service has become the carrier of communication between value chain participants, and is at the core position of product system innovation.

3. Innovative Design of Numerical Control Machine from the Perspective of Service-Oriented Manufacturing

3.1 Innovative Design of Unit Components

The design of numerical control lathes should be focused on meeting the requirements of ergonomics, and the modeling should be based on the convenience of users. The humanized design of unit components is the focus of the appearance design of control machine lathe. Although the left fixed cover is not a machine part often touched by operators, it is an important factor that affects the overall modeling style. It is the main body of control machine lathe, the left fixed cover of control machine lathe. Lathe sliding door is an important modeling unit for the appearance modeling of lathe, and has many contacts with machine operators. Whether its size and structure are reasonable has an important influence on the ease of operation of lathe. The design of lathes is not only compatible with the fixed hood of the lathe, but also the size of the drawing door. The size of the sliding door should ensure that the maximum space of the drawing door is larger than the maximum workpiece size of the machine tool, and the corresponding allowance is left out, which is usually handled by the operator. For the lathe with the largest workpiece with smaller size, a single door is usually used, and a double door is often used for the largest lathe with the largest machining work. When necessary, you must use the cylinder to control the door switch. When the lathe works, the operator often stands in front of the protective door, observing the work of the workpiece through the movement of the head and the eye. Therefore, the observation field of the operator is an important reference element in the design of the observation window.

3.2 Innovative Design of Control Panel

The control panel is generally divided into two parts, one is the operation panel of the control machine system and the other part is the operation panel of the machine tool. The person sees the display data of the display through the vision, and makes the judgment and decision. Good display can quickly and accurately analyze and explain the transmission from ergonomics perspective. The position of display should be placed in the best vision area of human. The horizontally in the vertical direction, the horizontal direction is right and right in the middle of the eyes. To be good, the sight distance is within fifty cm. At present, the keys of the keyboard are mostly thin film switches, which

have the advantages of small size, light weight, full function and low price. The shape of the key should be in accordance with the ergonomics, the key must have the appropriate resistance, the layout is in line with the general cognitive law. For example, the distribution of the numeric keys conforms to the regular distribution, and the key, used keys are arranged in the best field of view and the best control area of the operator. The main function of machine tool operation panel is manual control and operation of machine tools, including machine tool feed, tool selection, lighting and cooling control. It is also the main operation area for people to machine tools. The satisfaction of users depends on the comfort and safety of the product controller, the type, size and space of the controller, as well as the control display ratio and the layout of the controller. The controller types include button, slide switch, toggle switch, rocker switch, knob, finger wheel, a crank, steering wheel and so on. We should design the corresponding control types according to the characteristics of the controller and the characteristics of the human operation.

3.3 Innovative Design of System Software

In the design of the software interface, it mainly includes the structure of the software, the form of the software interface, the design of the font, the design of the icon and so on. The structure of the system software should be complete and clear. This is the case with the previous command interface or the graphical window interface and the menu interface. The structure of the menu interface should be designed according to a certain logical relationship or functional classification, which can be divided into a single menu, a linear menu, a tree menu, and so on. The rationality of the menu design helps to improve the speed of the system selection and the efficiency of the human learning operation, as well as to reduce the occurrence of disoperation. The software interface should follow the principle of consistency based on cognitive model. It is necessary to use the human-computer interface that is consistent with your own experience and knowledge to reduce the time of learning and avoid errors and ambiguity. The internal interfaces of the system have similar appearance, layout, human-computer interaction and letter display format and so on. The spatial layout of the interface should be concise and reasonable, and the feedback information should be provided as far as possible to reduce the occurrence of disoperation. Icons are simple, abstract signals that represent entity letters. It is a powerful tool to express the information quickly and intuitively by using a realistic image to represent the command entity after the action. The graphic coding of icons is like the shape of the target. To express clearly, it can be used to draw the shadow and outline the outline. The icons designed by the operating system software are vivid and concise, which greatly improves the operability of the software. In font design, the choice of font and color has a great influence on the visual effect of the interface.

4. Conclusions

Under the globalization of manufacturing network and service network, the development of the two industry is the inevitable trend of mutual restriction and influence on the development of the manufacturing industry and the service industry. Service manufacturing is a new format and model after the integration and development of the two industries, which is beneficial to the transformation and upgrading of the manufacturing industry. In the future, we will further refine the innovative design of control machine tools in the view of service manufacturing.

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