

Higher Vocational Die and Mold Program Courses System and Talents Training Exploration Orienting the Regional Products Smart Manufacturing

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Abstract

Confronting the conditions of intelligent manufacturing, the mold program curriculum system and talent training need to be optimized and adjusted. As closely related equipment for product intelligence, the reform of the mold curriculum system must closely meet the needs of regional industries for skilled talents. The curriculum system investigates regional product intelligence and provides process attributes; builds a basic curriculum system rather focusing on professional competence; but building a professional curriculum system to serve regional industry centers; and building a practical teaching system for training in accordance with innovative talents; The results provided the decision-making basis for the training of high-level talents in engineering machinery and molds program education.

Keywords

Regional Products, Die and Mold Program, Courses System, Talent Training.

1. Introduction

Equipment manufacturing is the heavy weapon of the country, an industry that provides equipment support for all sectors of the national economy, and a basic support for the development of physical industries. The die and mold industry is the basic industry of the national economy and is regarded as the mother of all industries [1-3]. Die and mold is the basic process assembly of industrial production, in a specific form, through a certain production method, the raw materials are molded. Die and mold technology is widely used and directly serves the various industries of the national economy. The high precision and high consistency of mold production parts, high production efficiency and low energy consumption are incomparable to other processing and manufacturing methods.

Compared with other industries, the scale and output value of the mold industry are not pillar industries, but the improvement of the quality of pillar products depends heavily on the mold design level and manufacturing precision. Machinery, electronics, automobiles, pumps & valves and other national economic pillar industries require the development of the mold industry to adapt to it. For example, electronic products, automobile and motorcycle parts, pump valves, locks, lighters, plastic soles and other parts and components are inseparable from mold molding, so the mold manufacturing industry is the basics of machinery, electronics, automobiles, pumps, light industry and other industries [4-6].

With the rapid development of China' die and mold industry and the continuous improvement of mold technology content, high-skilled mold talents are increasingly scarce. On the one hand, mold graduates from various vocational colleges across the country cannot find suitable and satisfactory positions. On the other hand, in all parts of the country, especially in the mold manufacturing cluster, there has been a phenomenon of "high-paying and high-skilled mold talents mismatch". The talent demand of the mold professional has obvious regional

characteristics. The knowledge structure and skill requirements of the mold industry talents in the domestic mold industry cluster are different. Mold design and manufacturing mainly rely on design software and advanced manufacturing technology, and the design software and processing system used in each mold industry cluster are also significantly different.

The educational objectives, skill system and course structure of the die and mold program in higher vocational colleges are basically the same mode for many years. They have not developed with the development of the die and mold industry, and have not adapted to the needs of talents in the regional mold industry base. It is lagging behind the requirements of building China's high, fine and sharp mold manufacturing industry. It is believed that it is extremely urgent to build a die and mold program training model that meets the technological development of China's die and mold industry and has regional characteristics in order to cultivate advanced skilled talents with independent innovation capabilities.

2. Curriculum and Talents Training Scheme Initiation

Wenzhou Vocational and Technical College's talent training objectives is to cultivate technical skills and talents who understand product design requirements and ideas, master the relevant theories and methods of die and mold design, and master mold manufacturing skills. According to the students' wishes and specialties, the mold design and manufacturing specialty cultivates metal molds and plastic molds for electrical products, automobile and motorcycle products, pump valves, hardware locks, lighters, plastic soles and other products that support the pillar industries in southern Zhejiang Province. Due to the differences in product manufacturing and mold structure of regional products, how to carry out the basic knowledge and skills of die and mold design and manufacturing in the construction of curriculum system and talent cultivation, and to build the regional products for the manufacturing characteristics of the products, are essential. This works has been mainly conducts the following four aspects for the construction of the adaption of the regional product and the talents skills training in the die and mold program in higher vocational and technical colleague for advancing.

2.1. Embody the Properties of the Die and Mold Tooling Property, Summarize the Regional Product Manufacturing Related Die & Mold Types

Wenzhou has experienced more than 30 years of reform and opening up and secondary entrepreneurial development, and has become one of the famous manufacturing bases at domestic and abroad. It has won the China Electric Appliance Capital, China Electronic Component Industry Base, China Valve Township, China Automobile and Motorcycle Capital, China Precision Die and Mold Production Base. Among them, electrical appliances pump valves, auto parts, and electronic components manufacturing industries are all related to die and mold manufacturing technology. As the main production area of China's light industrial products, Wenzhou products include plastic products, lighters, glasses, hardware locks, razors, pens, etc. The Wenzhou shoe industry, which accounts for half of the domestic and international markets, also has its soles molded through molds. The above products or industries provide a huge market for Wenzhou die and mold manufacturing industry, and also put forward higher requirements for the mold manufacturing industry. The tooling property with relevant industry can be illustrated by figure 1.

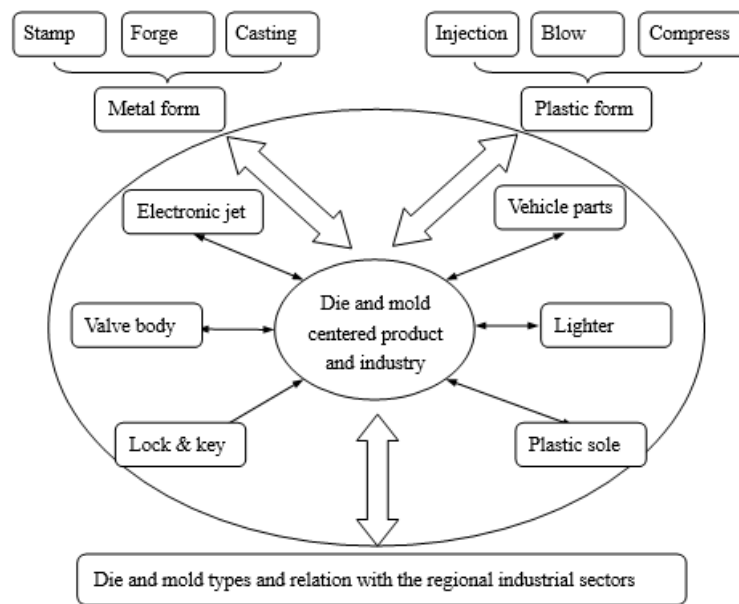


Figure 1. the die and mold relationship with the regional industries

Under the conditions of program sharing of basic knowledge and skills, combined with the characteristics of Wenzhou regional products, the die and mold type and structure are subdivided. According to the different raw materials, it is divided into metal material molding and plastic molding. On some electronic connectors and contacts with high functional requirements, metal thin stamping and forming molds are very important; on some structural parts, such as valve body, locks, hardware fasteners, metal volume forming. For some plastic parts that undertake electrical insulation function and surgical protection function, the molding production is mainly realized by injection molding, blow molding and compression molding.

As a process assembly for the production of electromechanical products, die and molds have many types and involve a wide range of technologies, and there are certain differences in the design methods and manufacturing processes of different types of molds. Under the background of China's manufacturing 2025 scheme, the intelligent automatic production line for die and mold automatic integration with automatic feeding and sending mechanism has achieved initial success in some scale enterprises. Investigating the mold-forming mold type of Wenzhou regional products under the condition of machine substitution will provide the basis for the mold professional curriculum system construction and talent training mode. Therefore, the curriculum plan and talent training mode can be tailored to meet the characteristics of professional technicians using mold process assembly attributes under new manufacturing conditions, and to serve regional product manufacturing.

2.2. Build a Fundamental Knowledge and Skill System Focusing on the Training of Professional Die and Mould Related Capabilities

There are many types of die and molds designed for the molding process of electromechanical products, but the main body is made of metal forming (stamping, forging and die-casting) and plastic molding (injection, blow molding and compression). The mold design and manufacturing process are basically similar. The workflow is usually: product design data - development of molding process - mold structure design - mold parts processing - mold assembly and debugging. The designer is based on the product (parts) design drawings (two-dimensional design drawings or three-dimensional digital models) provided by the customer, or the physical samples (the design drawings of the samples obtained by reverse mapping).

At present, computer-aided design, auxiliary manufacturing, digital technology and equipment have become an indispensable technical means for the mold industry. All technical means must be controlled by personnel. Therefore, mold manufacturers have better demand for technology application and high-skilled professionals than other mechanical products manufacturing industries. The quality of personnel is the fundamental guarantee for making precision molds. According to the technical characteristics of mold production, about 50% of the personnel who undertake the single-work type of mold parts, the training of this part of personnel should be completed by secondary vocational education and short-term technical training; undertake mold structure design and overall process implementation 3,5% of the mold management and mold production workshop management personnel, this level of personnel must go through specialized technical training such as advanced and professional education. How to integrate the professional ability necessary for the production position of electromechanical products under the conditions of new knowledge and new skills, and build a basic system of mold design and manufacture with solid foundation and wide caliber so that the cultivated talents can adapt to the regional pillar industries and featured products, is very critical for the success for the related fundamental knowledge and skill applied in the integrated core programs teaching.

The basic courses of mechanical drawing and CAD, mechanical design and 3D CAD software application in the electromechanical equipment skills enable students to combine the mold structure with automatic and intelligent production lines under the condition of machine substitution, and use the mold as a regional product. In the entire talent training program, how to determine the content and proportion of the basic curriculum system is related to the rationality of the entire subject system and the adaptability of the talent training program. Molds must be integrated into intelligent production lines under the conditions of new intelligent equipment, and become an environment in which they can fully utilize the Wenzhou Municipal People's Government to promote the "machine substitution", "intelligent manufacturing technology application" and "innovation and entrepreneurship" in the region. It is a good time to train and deliver more skilled and skilled personnel for the locality.

2.3. Build a Program Core Courses System with the Regional Products Centralized in Servicing the Local Smart Manufacturing

Due to the obvious characteristics of the expenditure industry in Wenzhou, the main dimensions, accuracy grades, assembly requirements and functional requirements of major products vary greatly. Corresponding mold structure design needs to be subdivided according to the geometrical dimensions, precision requirements and functional characteristics of the product. The structure of the mold is greatly different from small and medium precision progressive die, injection mold and forging die. However, all molds have basic knowledge and basic skills. These products require mechanical drawing and CAD for 2D assembly and drawing expression. Mechanical design is required for mechanical design and mechanical analysis. Practical 3D software is required to complete the formalization of molds and mechanisms.

In the mold design process, the basic process is to analyze the structural characteristics and size of the product, formulate the molding process plan, and design the mold structure. The design process must take into account factors such as the formability of the mold parts and the formability of the overall assembly of the mold. Due to the different scales or different types of molds produced by mold manufacturing enterprises, the setting of internal jobs in enterprise or enterprise mold centers is also different. Since the requirements for professional basic knowledge, basic skills and abilities are the same in different positions in the mold design and manufacturing industry, and the core professional competence is closely related to regional product characteristics, the difference is very large. In order to avoid the students in the traditional professional teaching process, the students will learn less, the knowledge is broad, the technical application ability and operation skills are relatively weak and the professional

core competence is not prominent. The design of the mold professional curriculum system is: combining regional pillar industries The product size, functional requirements and production batches of the electrical industry, automobile and motorcycle parts industry, pump and valve industry, hardware locks, lighters and plastic soles are first subdivided into two directions: metal material forming or plastic material forming. Among them, the metal material is formed, and depending on the type of the product in the region, the metal may be subjected to normal temperature or high temperature volume forming (cold rolling, forging), or normal temperature thin material stamping, or high temperature die casting. Volume forming corresponds to the contact forming of pump valve products, fastener products and electronic contact products. Thin material stamping corresponds to electronic connectors, electrical contacts and other core products of Wenzhou electrical industry. High-temperature die-casting is widely used in auto parts, locks and hardware. Therefore, in the mold program course, the metal can be subdivided into a program sub stream course.

On the basis of metal material molding and plastic molding, combined with Wenzhou electric products, it also integrates electrical circuit breakers, air switches and other electrical equipment such as metal conductive and plastic insulation, and combines the characteristics of two materials to form an elective course. Possibly, in the special development course of special students, we will build a product-centered mold tooling design model, combine metal molding and plastic molding, and carry out intensive mold design training in the form of mold center of large-scale enterprises in Wenzhou.

Guided by the job-based work process, the focus is on strengthening the professional core competence of the post. The curriculum system is divided into four parts: professional basic technology and skills, post-professional nuclear energy capability, post-development development knowledge, and comprehensive graduation practice. The practice links of each curriculum setting, the implementation time of classroom teaching and practice links are staggered, and the system is parallel. At the same time, we will set up the learning content of expanding knowledge and cultivate the ability of follow-up development of professional posts. Therefore, the curriculum system of this major has a system of core curriculum system, extended curriculum system and basic curriculum system. The professional courses and the elective course credit transferability interconnected the industrial technologies and the innovation driven practical training can be illustrated by figure 2.

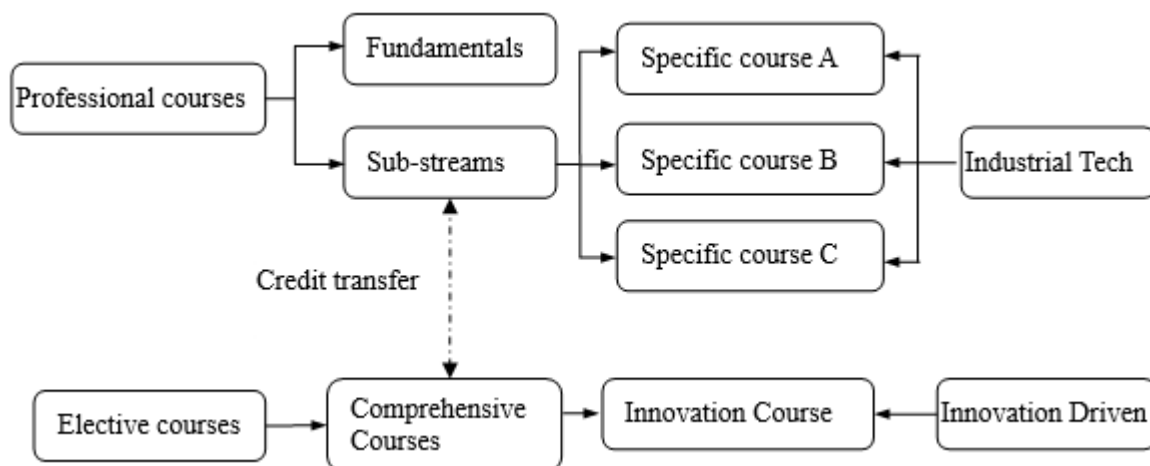


Figure 2. the die and mold program courses system for the regional industry and innovation personnel training

2.4. Build a “Practical Training-research Exploration-innovation & Creativity” Integrated Teaching System for Entrepreneurial Compound Skills

The die and mold course system for regional products is planned to be constructed in the mode of “professional basic course + regional product mold design + compound specialty course with emphasis”. Taking the post ability and skill requirements as the basis for curriculum development, the professional quality education, innovation and entrepreneurship education system is integrated into the teaching process. Focusing on the development of special courses for regional pillar industries and regional product core courses is the key to developing core competence. The development of professional courses should further refine and implement relevant professional knowledge, technical application capabilities and operational skills on the basis of further in-depth investigation of the specific technical and technical requirements that should be mastered in the work of the relevant personnel in the equipment manufacturing industry. Each major corresponds to the course and the training session. The related knowledge points, abilities and operational skills are combined into a number of course modules for teaching. Each module contains theoretical and practical teaching links. In the process of building each course module, the knowledge and skills are integrated. Each module clearly defines the skills that should be mastered. The skills are mastered and improved, and the necessary knowledge and training subjects and the final assessment method are determined.

Relying on the “practical training-research exploration-innovation & creativity” integrated base, the integration of student curriculum training and product development and mold structure innovation, from “learning to do” to “doing the middle of innovation” and “research and exploring”. Guide students to “innovation from doing” with real comprehensive practical projects, and study the comprehensive practice of graduation and regional enterprise R&D projects to combine “exploration and innovation”. The entrepreneurship education will be transformed from individual students to all students. Incorporate innovation and entrepreneurship into the process of talent cultivation, with different projects undertaker “practical training-research exploration-innovation & creativity” intelligent manufacturing public service center, mold innovation and entrepreneurship studio as the teaching organization, with the project as the carrier. Through the research platform, students to carry out differential and individualized training. We will carry out the model of “teachers and students research-exploration” to cultivate innovative and entrepreneurial talents. “Teaching students research is based on teachers projects, students are assistants, and teachers' research projects instruct students to participate in research and development. “Teaching guiding students to innovation” means taking students as the main body, teachers giving technical guidance, and cultivating students' innovative consciousness with scientific research and innovation. “Teaching students and teachers create a joint venture” means establishing a joint venture mechanism between students and teachers. Students are responsible for human resources, funds, and operations. The teachers are responsible for core technology development and jointly start businesses in the form of shareholding. Transforming, incubating and industrializing the new achievements of teachers and students in innovation and entrepreneurship into the platform of enterprises and industries.

3. Conclusion

Accurate positioning of talent training objectives in line with the development of regional mold industry is a prerequisite for the healthy development of mold professionals. It is necessary to target the market demand and position the talent training target to serve the local mold industry. Based on the previous research combined with the characteristics of mold design and manufacturing and the talent cultivation of regional characteristic industries, this topic explores how to construct a curriculum system for higher vocational molds under the new

historical conditions of manufacturing 2025 and smart manufacturing in China. As the basic equipment training talents experience and model of regional product manufacturing solutions, mold provides a feasible exploration path for the current high-level mold professional curriculum structure and talent training for regional products.

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