Multilateral Coordination of Government-Industry-University-Research to Promote Innovation

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Abstract: Facing the industrial chain of automobile intelligent manufacturing in the development zone, research and development of complex and special-shaped pieces of intelligent manufacturing pilot base coordinates with the government, enterprises, schools, and research institutions multilaterally to build a platform for the service of technologies and skill innovation, which accurately meets the needs of micro, small and medium-sized enterprises, and to carry out scientific and technological services such as design, processing, testing and pilot. The base promote cooperation among schools, governments, enterprises and research institutions through preferential policies such as "Science and Technology Innovation Service Vouchers" and "transfer tax exemption", establishes a professional and part-time team flow operation mechanism, passes ISO9001 certification, and builds a "platform, team, system" scientific research and achievement transformation system. It promotes learning through research and competition, and combines teaching, training, service, competition, research and development to vigorously promote the integrated development of industry, education, research and innovation.

1. Background of the Case

In order to promote the high-quality development of vocational education in the new era and accelerate the modernization of vocational education, the National Implementation Plan for Vocational Education Reform clearly launched the construction plan for high-level vocational colleges and specialties with Chinese characteristics. The Ministry of Education and the Ministry of Finance jointly issued the Opinions on the Implementation of the Construction Plan for Building High-Level Higher Vocational Schools and Specialties with Chinese Characteristics (hereinafter referred to as the "Double High Plan"). "Double High Plan" attaches great importance to the construction of technology and skill innovation service platform, and proposes in its overall goal "to build a highland for talents related to technology and skill training and a new service platform for technology and skill innovation to support the development of national key industries and regional pillar industries, and lead vocational education in the new era to achieve high-quality development" [1]. At the same time, "to build technology and skill innovation service platform" is listed as one of the 10 major construction tasks.

Technology and skill innovation service platform is served as an important support for the high quality development of higher vocational education. Adhering to the "collaborative innovation, opening and sharing" concept, my university has cooperated with the Science and Technology Innovation bureau of Beijing Economic-Technological Development Area to conduct overall planning, optimize resources, build the research and development of complex and special-shaped pieces of intelligent manufacturing pilot base, which precisely connects with micro, small and medium-sized enterprises in the development area, and provide scientific and technological services such as design, processing, testing and pilot, giving full play to its social service function.

2. Content Overview

1) Build an innovation service platform, featuring cooperation among government, industry, university and research

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Since the establishment of the pilot base was approved by the Science and Technology Innovation Bureau of Beijing Economic-Technological Development Area, it has built a platform for the transformation of scientific and technological achievements in three cities and one district, set up projects like policy services, instruments and equipment, experimental facilities, and technical services, and collected the service direction and technological advantages of each pilot base. In addition, it introduced *Measures for the Administration of University-Enterprise Cooperation of the Beijing Economic-Technological Development Area* and preferential policies like "science and technology innovation service vouchers" and "transfer tax exemption", carried out the application and accreditation of the joint training base of talents in the economic development zone, and specially hold the matching meeting of government-industry-university in the development area (Figure 1), and promote the multilateral cooperation of school, government, enterprises and research institutions, which precisely connects with micro, small and medium-sized enterprises in the development area on the "three cities and one district platform". Identifying the development orientation of the regional intelligent manufacturing industry, the base has cooperated with a number of scientific research institutions of the national and local joint engineering laboratories of automobile mould intelligent manufacturing technology, and built an innovation service platform, forming a joint force of government, industry, university and research institutions, and highlighting the characteristics of the pilot base.

Figure 1: The matching meeting of government-industry-university in the development area

2) Build a core research team and clarify the team construction mechanism

Combined with the development needs of the regional intelligent manufacturing industry, an interdisciplinary and structured scientific research team has gradually formed in the process of foreign technical services. The core full-time scientific research team consists of "double-qualified" teachers of my university, and the university selected academic leaders, and part-time team members are high-level industry masters and technical experts from universities, research institutions and enterprises. Xu Honghai studio has been set up in the pilot base, who is the chief technician of Mercedes in Beijing. The academic leaders led the team members to carry out exchanges and project discussions, cooperated in the research and development of industrial innovation technology projects, promoted the improvement of teachers' research and service capabilities, and formed the research direction of non-standard product design and the application of compound manufacturing technology of increasing and reducing materials. The implementation of the project has been in strict accordance with the university's horizontal technical service rules and regulations, according to the ISO9000 quality management system, standardized the business process of the pilot base, improving the quality of trial-produced products, effectively prevented and controlled risks, thus forming a standardized operation and management mode, as well as a construction mechanisms of incentive and performance evaluation towards scientific research teams.

3) Integrate into the SCI talent training system, and innovate approaches of promoting teaching through research

The pilot base has been closely integrated into the SCI talent training system of the professional automotive manufacturing and assembly technology group, constructed a structured curriculum system and a practical teaching system of progressive ability, and promoted the joint development

of high-level teaching resources by the university and the enterprise. On the one hand, the transformation teaching projects of new products, new processes and new norms in the science and technology service projects has been applied to the compound and innovative modular courses and SCI talent training system to realize 2 transformations of teaching projects. On the other hand, students participated in horizontal technical service projects, and assisted teachers in the scientific research team to produce drawings, compile processes and draft technical documents, which improved their innovation ability and ability to solve practical problems.

3. Typical Experience

The collaborative innovation of government, industry, university and research institutions has studied the operation mechanism of innovation platform and identified platform construction path; has highlighted the "dual subject" status of school and enterprise innovation, giving full play to the function of the base, combing the mode of production, education and research, taking scientific research projects as the focus, science and technology services, personnel training as the main content to promote the integrated development of teachers and enterprises, and enhance the overall ability of professional groups to serve the development area.

4. Features and Highlights

"Three drives" and "two integration" have been achieved, and "five in one" has been realized. That is, the planning of the base, the planning of the base in development area and the needs of enterprises has been tied together, which drives the common development of schools, governments and enterprises. Integrating the base into the development of industries and enterprises, and into the training of SCI talents in schools has realized the integrated development of industry and education; expanding the functions of the integrated base has realized the "five-in-one" of teaching, training, service, competition and research and development.

Technology service has made achievements and the service project fully reflects the technical level and service quality of the scientific research team of the pilot base. The team participated in the design and trial production of the arrow body test device (as shown in Figure 2) in an aerospace research institute, reflecting the technical level of precision manufacturing, installation and debugging; cooperated with Peking University People's Hospital to pilot produce the medical transfer compartment (Figure 3), demonstrating the lightweight and mechatronics design and manufacturing capability; together with enterprises in the development zone, the team developed trial-production medical robots (Figure 4) and automatic wine shaker design and the project of 3D printing of key parts (Figure 5), which reflected the development and trial-production level of non-standard products in the test base.

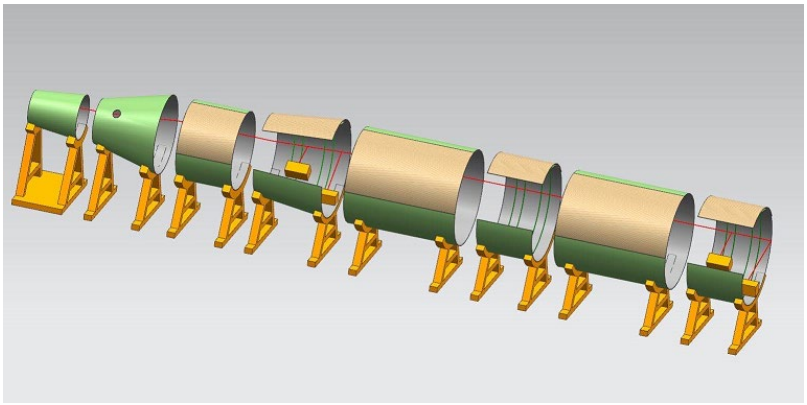

Figure 2: Simulation diagram of rocket body test device

Figure 3: Medical transfer compartment

Figure 4: Medical robots

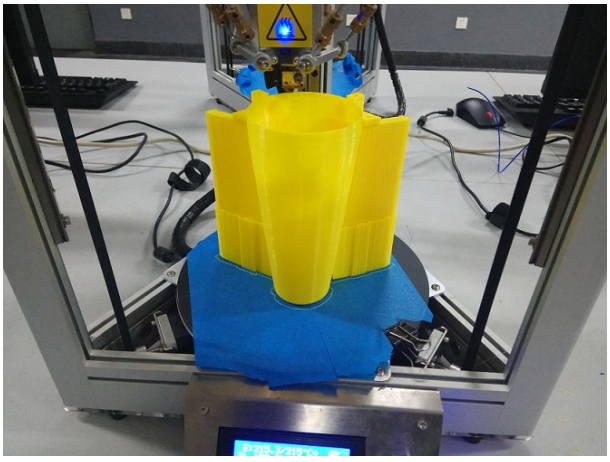

Figure 5: 3D printing the key parts of automatic wine shaker

5. Achievements

In the past two years, the pilot base has served 12 enterprises, completed 14 horizontal technical service projects, 20 high-quality papers, 34 patents, including two invention patents, two achievements transformation, and generated more than 10 million yuan for enterprises; the research team has presided over three provincial and ministerial projects, and two university level major projects, etc; compiled 1 national occupational standard for Additive Manufacturing Equipment Operator and 1 national planning textbook; provided instruction for students to participate in the Belt and Road and BRICS Skills Development and Technology Innovation Competition and won the first prize in the 3D printing competition for two consecutive years, and won the first prize in the 7th Beijing College Students Engineering Design Expression Competition; carried out series

training of intermediate workers, senior workers, technicians and senior technicians for BAIC Group (Beijing Automotive Group) employees; Relying on the Yicheng Craftsman College and yicheng Engineer College established by our school, the Economic Development Zone is for the children of employees of enterprises in the Economic Development Zone., and the research team carried out the vocational enlightenment education training program "Design the Future -- Little Engineer", which was reported by Beijing Satellite TV.

The pilot base is not a general production enterprise. Its operation purpose is to further enlarge and mature the laboratory technology, and continuously promote the matured scientific and technological achievements after the pilot to the society [2]. In the process of the construction and operation of the pilot base, "it is necessary to deepen the reform, update the concept, emancipate the mind, and continue to explore", so that the base can go further in a more stable way.

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