Practice and Thinkings About the Engineering Technology Research and Development Service Center Co-established by Government, Industries, College and Enterprises

SHEN LIU and LI ZHAO

ABSTRACT

Facing the requirements of developing the regional economy, under the leadership of the government, industries and enterprises set up research and development service centers of engineering technology which are relying on higher vocational colleges, and such college-enterprise cooperation serves teaching and research. This research and development is consigned by industries and enterprises, technological services and achievements from the research and development could be transformed directly into production, which serve industries and enterprises. The form of its organization is the integration of scientific research, teaching and learning, guided by scientific research and oriented by process, thus, students’ abilities of engineering can be improved.

Keywords: research and development service center of engineering technology; college-enterprise cooperation; engineering education

INTRODUCTION

"Decision on the Accelerating the Development of Modern Vocational Education" by the State Council of the People's Republic of China and the Modern Vocational Education System Construction Plan (2014-2020) further point out that with the integration of enterprise and education as our main line, we should establish a systematic innovation platform of cooperation among governments at all level, industries, enterprises, colleges and all sectors of society, providing a system safeguard for establishing the modern vocational education system.

FUNCTION OF ENGINEERING TECHNOLOGY RESEARCH AND DEVELOPMENT SERVICE CENTER

The engineering technology research and development service center co-established by governments, industries, colleges and enterprises is mainly led by

First author, Liu Shen, Shandong Water Conservancy Vocational College, Rizhao City, 276826 China
Second author, Zhao Li, Shandong Water Conservancy Vocational College, Rizhao City, 276826, China
governments and integrating the vocational feature of college education and the relative industries and enterprises. The engineering technology research and development service center is not engineering (technology) center, nor similar to experiment and practice training center. It is approved and established by authority in Rizhao city, relying on higher vocational and technical colleges, and focused on one special sector. Through researching and developing new technologies, new products, transforming achievements, engineering technical service and other process, it can develop students’ engineering practice abilities, improve the scientific research level and strengthen social service ability. Colleges could take advantage of the platform role played by industries and enterprises, providing more market information, suggestions of optimizing the industrial structure and product mix, offering a platform for scientific research transformation which will be applied to the market and becomes productivity. Enterprises can make use of human resources and research and development capabilities of colleges, reducing the risks and costs of research and development. Engineering research and development Service Center is a comprehensive engineering practice base, serving as a real environment of engineering knowledge learning, practical training and work experience for students. It also provides opportunities for teachers and students to practice, which is conducive to improving the quality of personnel.[1]

CASE ANALYSIS OF THE ESTABLISHMENT OF ENGINEERING TECHNOLOGY RESEARCH AND DEVELOPMENT SERVICE CENTER

A. Establishing Rizhao Hydraulic Mechanical Engineering Technology Research Center in the Principle of Co-establishment by Sides

According to requirements for water conservancy development in the new era, we must strengthen the intensity of water ecology and water environment protection. In 2014, based on the subjects’ features of water conservancy engineering and water conservancy machinery, Shandong water conservancy vocational college applied for establishing “Rizhao hydraulic machinery engineering and technologies research center” (short for the Center) which has been approved by Rizhao government. The Rizhao water resources bureau, Rizhao water group co., Ltd, Qufu Hengwei hydraulic machinery co., Ltd, Jining water resources bureau and others have financed the project in the form of innovation center. Since 2 years, many companies in Rizhao engaged in the establishment of the Center, with a total of over 1 million RMB supported on the projects at various levels in the Center building, and the overall expenses of over 5 million RMB on the equipment. Recently, the Center provides 1000 square meters for research and development and 1500 for student training, with 4 vocational research and development and technological service organizations and 2 major laboratories at municipal level and 2 researchers included. Through 2 years, the Center has established the water resources information system platform based on GIS with the first-class technology in Shandong Province and Water conservancy machinery simulation laboratory. The Center has become the local research and development center of regional water conservancy engineering technology.[2]

B. Integrating the Resources of Colleges and Building up a Professional Team of research and development

The work of building a professional team of research and development has been emphasized in the Center building, leaving impact on the level of research and
development. Colleges should integrate the quality professional and technological resources to build up a research and development team, clarify the responsibilities of the leaders and other staff. The Colleges also need to issue regulations of transformation between technological innovation and teaching, encouraging the professional teachers to engage in the technological innovation and social service. The Center adopts the project responsibility system: the Center principals decide different project leaders according to different projects, and project leaders hire research staff needed in the projects. The Center principals and project leaders are the formal staff in the colleges. The project leaders are selected multi-disciplinarily according to the project and integrated within the college resources. The college staff have dual roles, mainly working on the research and development, which examined by the Center and its teaching job is assessed by department. Other research staffs are composed of teachers, students from relative majors and leading men from enterprises. The number of research staff shall be decided by the project conditions, and students get their payment according to their work, which is like work-study programmers. The Center enacts the regulations of training, introduction, use, and management of team workers of technological innovation, and establishes the systems of cooperation of technological innovation staff between colleges and enterprises, gradually to set up a technology research and development team with a optimized mix and resourceful engineering experience.

C. Orienting the research and development, and Targeting the Hydraulic Machinery Field

The hydraulic machinery research and development center regards “3 points” as its direction of research and service. The first is technological services, mainly provided to offer water conservancy machinery production and design services and equipment installation and debugging services. Since 2 years the center has undertaken 2 large-size completed projects consigned by enterprises, among which there is 1 set of water contamination processor design and 17 sets of automatic control system of rotary raking equipment. The second point is technological development, through research and development technology, products designing, achievement transforming and other technologies; the center can serve the hydraulic industry directly. Since 2 years, the center has undertaken 3 science and technology projects at municipal level or above, among which 1 achievement has been appraised by Ministry of Water Resources, filling a domestic gap in this field. The center applied for 6 patents and 5 of them have been authorized with 1 patent for invention. The third point is technological counseling and personnel training. The center has undertaken the work of training the emigrants of reservoir region for our college, and technological training of machining and electrical control technology for 150 students. The trainees passed the tests and got professional qualification certificates. Job recommendations are given to all trainees, who can work with their qualification certificates. The center has trained 120 technical backbones from Linqing water authority in Shandong to learn new technology of pumping and trained 160 staff from Hebei water authority. Consigned by Rizhao Lanshan branch of Qingdao Municipal Ocean and Fisheries Administration, the Center held new technology training of marine engine for 465 seamen.

D. Training the Students’ Engineering Practice Ability through Project-guided

Engineering practice ability is the core quality of students from engineering major. We are concerned about how to train the students’ engineering practice ability through researching. The Center divided the engineering projects into 2 categories, which is guided by projects and oriented by work. One kind of projects aims at improving the
students’ engineering practice ability, which is production design, processing preparation, numerical control programming, machining simulation, and installation and debugging of equipment of hydraulic machinery. This kind of projects could make students put what they have learned from classes to engineering process, and make use of the advanced technology to address the engineering problems. The other kind of projects is to improve students’ engineering creativity, which are hydraulic machinery development and water conservancy projects design and other research projects. Its aim is to make part of students have more time to engage in real research and development project and design a new product according to the need, and develop a comprehensive system, and finally develop their engineering creativity and comprehensive design ability. Since 2 years, about over 60 students have worked in the Center in turns, and each student has worked for nearly a half year in the Center, at least engaging in 1 engineering project or above. When they graduated, they attended job fairs with their design map and technological service achievements. Due to their own comprehensive quality and strong engineering practice ability, they not only could find an employment with a decent salary but also they are in demand.[5]

ESTABLISHING ENGINEERING TECHNOLOGICAL RESEARCH AND DEVELOPMENT SERVICE CENTER

A. Nature and Orientation

The center is fully guided by the Rizhao municipal government and mainly led by Rizhao Science and Technology Bureau, with the guide of industries and participation of enterprises. It can serve the society directly by consigned development, technological service, and achievement transformation, in the meantime, the Center plays the leading role in talents training, major setup, teaching reforming and other respects, and gains economic benefits. However, the Center is not a pure economic organization, nor an industry, its fundamental goal is not to seek the maximized economic benefits. The Center belongs to the basic academic organization of the college and serves as a multi-disciplinary platform for sharing resources, with double structures of teaching function and research function connected together but relatively differentiated. The Center is managed directly by the college. The Center enables students to join in the engineering practice projects with the scientific and research programs as its carrier, thus student’s engineering practice ability and creativity can be improved. In the meantime, students could learn more knowledge which couldn’t be learned in classes, such as work standard and criteria, team collaboration and social communication, social responsibility and so on. Therefore, the teaching style in the Center is the highest level, where students can learn theory and practice.

The orientation of scientific research in the Center: special industry is targeted in the Center, so the center lays emphasis on engineering technology not engineering science.

The orientation of service in the Center: SMEs; not large-size backbone enterprises.

B. Management System and Processing Mechanism

The Center is not a pure economic organization, but it has the feature of market economy. Therefore, the sustainable development of the Center should be ensured, the funds of building the Center and operating costs can’t totally come from the college, there must be an effective management system and processing mechanism. The college chooses to manage the Center by 2 steps: within the period of establishment, the Center adopts the director’s responsibility system. The board of directors consists of education
departments and leaders from appointed department of the college. It is responsible for deliberating and approving the development planning and annual plan of the Center, and examining and approving budget and final account of expenditure. It also has the right to appoint or dismiss directors. In the meantime experts in the industry hired by the Center organize the technology committee, checking on the research and development directions in the Center and reviewing the applications of project development and assessing the feasibility of large-scale technology development and service projects. After the establishment, the fund will be provided solely by one enterprise or enterprises, and the modern enterprises system will be established, and the special mix of “Enterprise-Center” as well. According to articles of enterprises and the requirements of the market operation, the Center will independently account and self-finance. The form of organization of the Center is entity; its operating mechanism is safeguarded by 2 systems. One system is management system of personnel. Researchers in the Center come from different departments, having 2 roles. They are managed by the Center when they work on projects while managed by department when they teach. The other system is distribution system. In order to activate researchers, their salaries are closely related to their performance, and their contributions. [6]

CONCLUSION

Through political line of the building engineering technology research and development services center construction and vigorously promote higher vocational colleges and industry enterprise, the local deep close cooperation, promoting vocational colleges in view of the enterprise innovation needs to carry out research and development activities of technical services. To help enterprises solve the key technical problems, train the engineering ability of students, higher vocational colleges, scientific research, encourage enterprise product upgrade and build all kinds of research and development and service platform, for the enterprise technology innovation and industrial technology development to provide technological support has obtained the good effect. At the same time for the cooperation between higher vocational colleges and vocational colleges to develop a new model.

REFERENCES

1. Lujin, Li Hongyu, Wang Xiaohao, Exploration and Practice of practical training center of software co-established by colleges and enterprises. Experimental techniques and management, 2008(12).