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About the Problem of Professional Personnel Shortage in Mechanical Engineering Industry and Ways of Solving

Marina Suzdalova, Ekaterina Politsinskaya*, Anastasia Sushko

Yurga Institute of Technology, 26 Leningradskaya, Yurga, 652055, Russia

Abstract

The article considers the problem of qualified engineering personnel training in the mechanical engineering industry. The recommendations for a qualified specialist training with a high level of professional competencies are offered for the purpose of strengthening of Russia's unity and progressive development.

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1. Introduction

Industry of mechanical engineering, which acts as the basis for production system in any country that reached the industrialization stage, undergoes the drastic changes, caused by internationalization of production and capital, world market globalization and multiple aggravation of competition. Re-orientation of mechanical engineering sector to intensive and advance way of development is required, what assumes necessity to solve a complex of accumulated interrelated and interdependent problems in legislative, legal and regulatory, financial and economic, educational and personnel areas (Lizunkov & Sushko, 2015).

Today one of the main objectives for mechanical engineering sector is its reconstruction, allowing the mechanical engineering, and Russia in general as an active member of world community, to approach the world level of economy. Territorially, mechanical engineering in Russia is one of the most widespread industries.

* Corresponding author.

E-mail address: katy031983@mail.ru (E. Politsinskaya).

2. Subject and methods of research

One of the most important problems in mechanical engineering is professional personnel shortage, namely, high-qualified engineering technical and regular labor force, what is reflected in the concept of the State complex program for mechanical engineering development in Russia, related to inefficient domestic system of professional education (Efremkov, et al., 2012).

At present, the social institution of basic enterprises, which funded construction, provision of equipment, tools and materials, production and practical training for initial and secondary vocational education institutions, is practically eliminated. It complicated the training of qualified personnel considerably. Number of initial vocational institutions or their merging with the secondary vocational institutions had a negative effect on personnel of mechanical engineering enterprises.

It is now obvious that future of the Russian society is connected with innovative economy development, which is impossible without modernisation of professional education system. Innovative economy acts as the object of management, causing search of new approaches, implementing the strategy of innovative development of modern professional education system. Peculiarity of current situation of professional education development is its restructuring. The developing process of educational institutions diversification results in formation of a new hierarchy of professional education system.

Transition of mechanical engineering production to innovative phase of development also directly depends on qualitative and quantitative characteristics of specialists, working in the industry. More than two thirds of employers state about increased demand for personnel of new kind and profile; requirements to professional qualification grow. The increased demand in specialists of a new kind is related to modernisation of equipment and technologies, expansion of production volumes, range of manufactured products and new markets conquering. The situation in the industry determines the innovative approaches to organization of personnel training for mechanical engineering enterprises objectively.

As economy development has an advance nature, technological changes hinder the prediction development of demand for personnel and competencies, the demographic problems cannot be left unmentioned. It is also important to note an intensified skewness towards higher education and lack of qualified workforce, the gap between the structure of specialists training and labor market structure is increasing, and the prestige of blue-collar professions in the mechanical engineering sector is falling. Employers make steep demands to graduates, and the turnover of personnel increases.

Innovative development is the basis for education modernization, the necessity to form a multilevel system of professional education that will give new opportunities for optimization of higher professional educational institutions activity, implemented as strategies, programs, models and projects based on prediction, for development and provision of personnel demand for innovative economy and mechanical engineering sector.

At present we speak about transition from mass education to “single-piece” training of specialists in high demand, “rare” specialists, and specialists of certain qualification level and profile.

The latest research implementations in industrial production only then give feedback in the form of economic growth and nation well-being when there are trained and highly qualified personnel with the required skills, knowledge and ability to risk and make independent decisions. Constant exchange of information, knowledge and skills happens in the information space; the content of these data constantly changes, develops, and enhances the personnel activity that uses this information. Only highly qualified personnel in any sector of the country’s economy is the most important requirement for determining the country’s economic development in the world economy.

Market uncertainty, dynamism of social and cultural formation of the time, increased requirements to knowledge level in society now results in “ageing” of engineering and technical personnel of the national industrial complex. Qualification and knowledge level of the working people lags behind the contemporary requirements of knowledge-intensive technologies (Suzdalova, 2013).

Reorganization of relations is required not only between enterprises and professional education institutions, but among professional education institutions of different level. Today it is impossible to solve the problem without social partnership in the area of professional education, the key role in its development we give to employers who, in our opinion, should fulfill the following functions:

- Participation in development of qualification requirements and professional standards, as well as of professional education standards
- Formation of priorities for on-the-job training
- Participation in state policy development and decision making in the area of professional education
- Participation in development of professional education programs
- Defining of the requirements to content of professional education and final assessment of this activity
- Raising the funds and control their spending
- Participation in professional education institutions management (Suzdalova, et al., 2014; Suzdalova & Sushko, 2014).

In our view, a full interaction of theoretical training of students in higher institutions with employer requirements is possible during the process of engineering and industrial internship. Supposedly, students graduate from university to become highly qualified specialists. However, according to views of majority of employers, young specialists need to get additional training in the workplace. One of major requirements of employers to graduates nowadays is work experience. This problem solving is in many cases determined by results of engineering and industrial internship, which is an integral part of the entire process of specialist training.

3. Survey results analysis

Engineering and industrial internship, especially during the period of theoretical training reduction and increase of independent and practical studies in higher educational institutions, in our opinion, cannot be considered separately from theoretical training of students. Moreover, practical training is the logical continuation of theoretical training and it should be the foundation and basis for practical problems solving. To implement the requirements, stipulated in standards, both theoretical and practical training of the specialist is required.

As it follows from the analysis of currently effective standards, they only define types of internship, but do not specify its content, forms, requirements to internship base and other. In our opinion, engineering and industrial internship should become one of priorities in educational and pedagogic process. Professional growth of students as future competitive specialists directly depends on effectiveness of organization, content, forms and methods of student professional training during curricular practical training and sequence of all levels. Each stage of engineering and industrial internship should be the final stage of the respective year of training and act as the basis for student transfer to the following level of training.

Focus on solving practical problems of professional competence development compels to review, in the context of education modernisation concept, the change of main components of engineering and industrial internship: its purpose, content, criteria of training forms and methods effectiveness, student functions during the period of industrial and economic training:

- Purpose of internship applied to the problem of professional competence development means that goal of practical training is not simply learning of information for separate types of activity, but rather expansion and complication of individual intellectual resources by means of this activity
- Content of internship. The content of engineering and industrial internship should be formed in such way so that students could try all activities of a future specialist to form certain competencies (information, communicative, organizational, constructive and other), which are the basis for professional competence
- Criteria of training forms and methods effectiveness. All methods and forms of organization of engineering and industrial internship should comply with the purpose of professional competence development of students. As a criterion of evaluation of training forms and methods effectiveness during engineering and industrial internship should not be only the performance criteria of knowledge, skills, but also experience in solving specific practical problems in the area of future professional activity
- Student functions during engineering and industrial internship. These functions are compared to functions of the specialist. During internships the students should be able to implement the function of designing of individual intellectual development progress for themselves as specialists. Consequently, such forms of student activities

which facilitate the development of certain competencies, constituting the professional competence, come to the forefront

4. Conclusion

In the course of researches, we found the following conditions, facilitating the students' competence in the period of engineering and industrial internship:

- Acquisition of various experience, which students get during internship due to work in real environment of various industrial companies, provided that they analyze and integrate the acquired experience under guidance of university supervisor
- Solving of new, unknown, various and complex problems, directly connected with students activity during internship
- Provision of wide opportunities for students participation in the activity which is new for them (leadership, innovative, research and other) and provision of support during engineering and industrial internship when they try to perform work, important for achieving the objectives meaningful for them
- Achievement of high results during independent work
- Participation in scientific and design researches
- Stimulation of student project activity during engineering and industrial internship

As internship takes place in real environment, then it can be presented as an integrated pedagogical process. The integrated pedagogical process of engineering and industrial internship is caused by the internship objectives and interaction of its main components. This process is aimed at conscious and firm learning of the system of knowledge, skills and abilities by the students, in other words, at development of a range of competencies, constituting the professional competence basis. For implementation of integrated pedagogical process, it is required to realize the following in the learning process.

First, learning during lectures, practical lessons and seminars should be activity-based. Namely, it is necessary to reject the instruction practice that is based on communication of ready knowledge to students in teaching. Teacher activities should include designing, organization and guidance of learning activity, but not transfer of knowledge. Thus, student personality comes to the forefront, their ability for self-fulfillment, for independent decision-making and their implementation, for reflexive analysis of their activity. It can be facilitated by active application of discussion, problem setting and solving, use of the Debates technology (Politsinskaya, 2013) at the lessons, of task-oriented approach, including not only simple reproduction exercises, but solving and construction of nonstandard, creative tasks related to actual future practical activity of students, (Politsinsky & Demenkova, 2015).

Second, engineering and industrial internship should be viewed as logical continuation of previous theoretical training, and should include, along with standard report on internship, performance of a project (system of interrelated mini-projects), creative assignments on solving specific practical tasks, connected with the area of future professional activity, etc., assigned earlier during student work with the supervisor responsible for practical training.

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