Vocational Employer-Sponsored Education of Employees of the Water Supply and Sewage

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ABSTRACT

The provision of a complex development of an enterprise, the implementation of innovative projects, the introduction of the efficient management systems requires the assistance of the corresponding staff. The rates of engineering and technological development stipulate the demand for constant increase of the level of professional skills of the staff. The requirements to the systems of training and improvement in specialists’ skill are changing as well. Nowadays traditional requirements to the level of pedagogical staff and technical equipment are supplemented with the requirements of versatility, the ability to respond to technical innovations and socio-economic changes promptly, to foresee a possibility of individualization of the training trajectory according to the professional requirements of an employer. The experience of O.M. Beketov National University of Urban Economy in Kharkiv in cooperation with the public utility company “Kharkivvodokanal” on implementation of the project of industry-specific employer-sponsored training of an enterprise staff aimed at increasing the level of their theoretic and practical training has been described in the article.

Keywords: staff development, specific training of engineers, employer-sponsored training, water and sewage enterprise.

INTRODUCTION

The European Union Water Initiative (EUWI) supports the achievement of the water-related Sustainable Development Goals (SDGs) and takes a partnership approach with national governments, donors, the water industry, NGOs and other stakeholders. Countries of Eastern Europe, the Caucasus and Central Asia (EECCA) are currently adopting a range of policy reforms regarding water management in cooperation with the EUWI. The EUWI EECCA component is financially supported by the European Union and other donors. One of the key objectives in water supply and sanitation is encouraging investment and ensuring the financial viability of utilities (EUWI Report, 2016). Each state is to provide the necessary level of the quality of water supply and sewage services for all the subjects of business activities at a reasonable price. The solution of such
global problems requires an introduction of modern technologies into water and sewage utilities, encouraging investments and corresponding staff assistance.

The complexity of the projects on the introduction of modern technologies into the water industry stipulates the necessity of all-round training of specialists for water industry – technical, legal, economic, managerial, ecological and social. However, staff assistance in municipal economy of Ukraine is characterized by a number of problems, in particular, more than 40% of employees in public utility companies do not have industry-specific education. Imbalance in salary level and occupational prestige, population migration (labour, displaced people from conflict zones), outdated material and technical facilities of educational establishments are considered to be the negative factors in the context of the staff assistance. The demand for modernization and technical re-equipment stipulates the urgency of the problems of retraining and improvement in the staff’s skill at the public utility companies of Ukraine.

INTERNATIONAL EXPERIENCE

Nowadays Higher educational establishments, scientific and production organizations of different countries with different level of development and technical state of water supply and sewage systems deal with the problems of staff assistance. Germany is the country that does not face the problem of water scarcity. However, there are three main problems: water quality improvement, the provision of public water supply and sewage as well as the protection of the population and the infrastructure against floods (Sewilam, et al., 2017). Engineers, technicians and mechanics should upgrade their knowledge to cope with the complex management and modern technological equipment. The approach based on the comparison of the level of employees’ competence with the standard competence level for each kind of work has been worked out for this purpose. RWTH Aachen University in cooperation with its partners worked out a game approach (SeCom2.0) based on the game technology to give specialists, dealing with flood risks control, a chance to study different flood risk situations in virtual environment.

Water supply is one of the key problems in Malaysia. Management is considered to be the major problem of all the aspects connected with the use of water resources. Therefore, the work on the improvement of water supply departments functioning is controlled by the government by means of training and improvement of the employees’ skills is carried out (Chan, 2009). Constant upgrading and modernization of knowledge is one of the most important factors of socio-economic development in Azerbaijan. The next stage is the postgraduate industry-specific training allowing enterprise employees to increase their educational, scientific and professional level on the basis of higher industry-specific education (Mammadov, 2019). Such ideology puts into practice the criteria of lifelong learning, which embraces the whole life of a person, the diversity of the content, means and methods, time and place of getting education, equal assessment and recognition of the education not by the form of education, but by the real results as well as by the publicity and flexibility of the education (London, 2012). Open global market of postgraduate education requires new educational programs offering flexible and innovative technologies. It is true in vocational and applied fields, in particular such as engineering (Gruenwald et al., 2010; Anderson and Staubb, 2015). The systems of distance learning got wide implication due to essential advantages: organization of lifelong learning and constant monitoring of the knowledge and skills obtained; increasing the education quality using modern means of audiovisual reproduction of learning materials; simultaneous teaching of a great amount of students; reduction of expenses on education. For example, a national poll of the students and graduates who had a distance form of education in Romania found out that they did not consider the level of their education worse than at other forms of education (Andronic, et al., 2012).
EMPLOYER-SPONSORED EDUCATION OBJECTIVES

Nowadays the main target of the system of an employer-sponsored education is training of a new generation of specialists, understanding technical, social and economic significance of water supply and sewage systems, able to create systems, to foresee the trends of their reconstruction and modernization, to make appropriate decisions in a short span of time, to possess a high level of professional competence in a wide range of specific problems. Consequently, alongside with the professional trends connected with water supply and sewage systems, there is a demand for do-all specialists with a high level of not only technical education but also with the competence in legal, economic and managerial spheres. A separate line of training in an employer-sponsored education is the specific training of engineers who are retrained for a new occupation. They often have gaps in their knowledge concerning modern technologies and work practice, automation systems and application of information technologies.

AIM OF THE PAPER

The aim of the paper is to present the experience of the development and implementation of the project of the employer-sponsored industry-specific education of the employees of the water and sewage enterprise “Public utility company “Kharkivvodokanal” at O.M. Beketov National University of Urban Economy in Kharkiv.

Project participants

Public utility company (PUC) “Kharkivvodokanal” is the main organization in Ukraine on scientific and research works in the sphere of power saving and developing the alternative sources of power, sanitation technologies of water supply and sewage nets, upgrading the quality of drinking water and mastering new information technologies in water supply and sewage systems.

Implementation of the investment policy at the PUC “Kharkivvodokanal” is the basis of attracting financial resources for technical modernization of the enterprise with the purpose of achieving the standards of the European Union in the sphere of water supply and sewage systems. The investment projects developed at the enterprise presuppose modernization of the main production processes using new technologies, modern energy efficient equipment, the systems of automated control. At the same time, the use of more complex technological solutions, introduction of energy efficient technologies and equipment supplied by the companies of the European Union raises a question if the enterprise specialists are ready for such innovations. The experience of the implementation of investment projects at the enterprise from 2002 to the present time has shown that with the specialists having professional training and the certificates for the work with new equipment and technologies, the terms of becoming familiar with new technologies is reduced and which allows to decrease the return on investment period of the projects.

O.M. Beketov National University of Urban Economy in Kharkiv (NUUEKh) was founded in 1922 and is the oldest industry oriented Higher educational establishment in Ukraine. The NUUEKh trains specialists of all educational levels in a wide complex of specialties and educational programs for providing vital activities of modern cities and their stable development. The NUUEKh has partner relations and cooperates with the enterprises and organizations providing vital activities of Kharkiv and other cities of Ukraine. It has close connections with municipal and local authorities. Graduates from the NUUEKh are in demand at the leading enterprises of municipal economy, in the services sector, hold key positions in the system of management of housing and communal services and in the bodies of the state and local government.
IMPLEMENTATION OF THE PROJECT

The idea of the employer-sponsored education of engineering and technical employees for implementation of the investment policy was suggested by the department of investment policy, science and innovations of the PUC “Kharkivvodokanal” in April 2016. The aim of the project:

- To increase the level of theoretical and practical training of the employees of the PUC “Kharkivvodokanal” in the field of introduction of innovative technologies of water supply and sewage systems and water purification.
- To improve employees’ skill in economic, legal and managerial aspects of the enterprise activity. To master modern information and computer technologies.
- To meet the requirements of foreign creditors concerning the increase of employees’ professional level as a condition of crediting the investment projects.
- To create a personnel resource of the enterprise.

Preparation Stage

The project of the employer-sponsored training of specialists was developed by NUUEKhn for the PUC “Kharkivvodokanal” at the educational program “Water supply and sewage systems”. The specialty “Construction and civil engineering”, specialization “Water supply and sewage systems” at the educational qualification level “Specialist” was taken as the basis to implement the program of the employer-sponsored education. Besides, the employer-sponsored character of the project, it is characterized by the increase of the volume of the training content (150 credits ECTS) and the terms of its implementation: from 01.09.2016 to 31.01.2019. The content of the program, the level of competence in technical, managerial, legal and economic aspects were discussed in detail and agreed by the NUUEKhn with the PUC “Kharkivvodokanal”.

The result of the work is the standard of the program developed by the department of water supply and sewage systems and water purification of NUUEKhn and coordinated with the Scientific and technical council of the PUC “Kharkivvodokanal” and confirmed by the Scientific Council of the University. A great amount of organizational work has been carried out at the NUUEKhn and at the PUC “Kharkivvodokanal” for implementing the program. An expert committee for an unbiassed knowledge evaluation of the candidates for training and a committee on the competitive selection of employees for the employer-sponsored education on the program “Educational and professional program of training a specialist” have been formed at the enterprise. The department of the investment policy, science and innovations was appointed to be in charge of the educational process and the fulfilment of the program. Direct fulfilment of the program requirements and educational contracts between the NUUEKhn, the enterprise and students was carried out by the department of science and innovations of the PUC “Kharkivvodokanal” according to Ukrainian legislation.

The following documents have been developed: an agreement between the PUC “Kharkivvodokanal”, the Higher educational establishment and a student on providing educational services; an agreement between the PUC “Kharkivvodokanal” and the enterprise employee on paying the fee for education by the enterprise. Regulations on the conditions of education and its payment covered by the enterprise. These regulations reflect the conditions and the responsibility of students to the enterprise (maintaining labour relations with the enterprise for not less than 5 years or return of money paid by the enterprise for their education). These documents have been agreed by the Legal department, Finance and economics department and Management department of the enterprise. The agreements on providing educational services between the PUC “Kharkivvodokanal”, NUUEKhn and the enterprise employees were signed in August 2016.

The employees for training on the employer-sponsored “Educational and professional program of training a specialist” were selected on the basis of suggestions of structural divisions of the enterprise and the results of the test-control of the retained knowledge of employees recommended for training. The group for participating in the project included reputable engineering and technical
employees, directors and deputy directors of structural divisions. The expert committee selecting the employees for training confirmed 34 students.

In the development of the curriculum, the main directions of water supply and sewage enterprises functioning and upgrading were taken into account. Academic disciplines covered the main areas of enterprise specialists’ activities: theoretical foundations, implementation features and development directions for treatment of natural and wastewater; equipment, materials, operation and reconstruction of water supply and sanitation systems; organization, economics and planning of water supply and sewage enterprises; features of legal issues regulation at the enterprise.

The teaching staff responsible for developing the curriculum content of the NUUEKh disciplines for the employer-sponsored educational program was appointed by the order of the rector of NUUEKh. The programs of the disciplines in accordance with the content of the educational and professional program were developed by the teachers and presented to the vocational departments of the PUC “Kharkivvodokanal” for reviewing. The comments received were inserted into the programs of the disciplines and taken into account when preparing the curriculum content of theoretical and practical classes, developing the forms of the current and final assessment of students’ knowledge and distance courses of the disciplines. To increase the quality of implementing the employer-sponsored educational program the teaching staff was strengthened with the leading specialists of Kharkiv in such fields as reconstruction of waste treatment facilities, pipeline protection, automation of technological processes.

Organization of the Educational Process and the Quality Assurance System

The approach to the implementation of the educational program is unique. The educational process is organized on the basis of correspondence and distance forms of education. The distance courses have been developed for all the disciplines and it allowed to organize lifelong education and constant monitoring of the knowledge and skills gained by the students. Besides, classes on Saturdays are provided according to the academic calendar (Figure 1).

Special attention has been paid to practical training, which presupposed getting acquainted with the facilities of the PUC “Kharkivvodokanal” and with the experience of reconstruction and implementation of the investment projects of water and sewage industries of Ukraine, organizing workshops conducted by the specialists of the leading design and scientific and production companies. Students of the program got acquainted with features of projects implementation: reconstruction of reagent facilities of a water treatment plant; introduction of denitrification technology at a sewage treatment plant; use of equipment for sludge treatment; organization of water utility activities under a commercial concession agreement; achievement of modern requirements for water quality control.

There were some problems in financing the education and organizing practical training. The introductory practical training at the facilities of water and sewage enterprises of Poland did not take
place because of the lack of finance. On the basis of the program, developed by the specialists of the NUUEKh in August 2017, the students got acquainted with experience of implementing innovation projects, application of modern technologies in water supply and sewage systems at Zaporozhian and Dnipropetrovsk water canals. In July 2018 the students had technological training at workplaces. Pre-graduation practice took place at the private joint stock company “Kyivvodokanal” and Co., Ltd “Bilotserkovvod” in September 2018. The results of the practice were discussed at the meeting of the section “Water supply” of the scientific and technical council of the PUC “Kharkivvodokanal”.

At the NUUEKh the system of internal quality assurance was based on the principles of Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG, 2015): Institutions should have a policy for quality assurance that is made public and forms part of their strategic management. Internal stakeholders should develop and implement this policy through appropriate structures and processes, while involving external stakeholders.

The Office of Science and Innovations of the Department on the investment policy, science and innovations of the PUC “Kharkivvodokanal” has been monitoring the educational process, absence rate, the quality of knowledge and the academic ranking for 2 years and six months. The Heads of the departments attended lectures and classes, communicated with the students. The results of training were discussed at the meetings by the representatives of PUC “Kharkivvodokanal” and NUUEKh. Monitoring the educational process allowed to estimate the attitude of students to the educational program. However, not all the students managed to combine industrial activity, daily routine and education. 8 students were sent down from the NUUEKh for various reasons: three of them – for the academic failure, and five – at their will.

Project results

The defence of graduation papers took place from 28.01.2019 to 30.01.2019. 40% of students got excellent marks for their graduation papers. According to the level of students’ grades (Figure 2) and the results of the defence of graduation papers 13 students (50%) got the diplomas with honors.

In the estimation of the teaching staff of the department of water supply and sewage systems and water purification of NUUEKh and the members of the State Examination Board the students were scrupulous about their graduation works, the subjects of their papers corresponded to the tasks of modernization, introduction of innovative technologies (the improvement of the effectiveness and safety of the processes of drinking water neutralization, the improvement of the processes of sewage water treatment, biogas production, trenchless pipe-laying and their sanation) solved by the enterprise.

In spite of the technical focus of the educational program the availability of the disciplines, forming fundamental managerial and economic and legal competence (Figure 3), allows the students to participate in developing investment projects and their implementation.

![Figure 2: Rating of students by the average grade for the course, the number of students.](image)

![Figure 3: Distribution of study time, ECTS credits.](image)
PROJECT PUBLICITY

The plans and results of implementation of each stage of the project were discussed at the PUC “Kharkivvodokanal” and at NUUEKh, obtained media coverage and were presented on official sites of the project participants as well as presented at the following meetings:

- On June 12-16, 2017 at the International Congress “ETEVK-2019” as one of the trends of implementation of the “Concept of developing water and sewage industries of Ukraine” in the context of staff assistance of the development of the investment activities of water enterprises;
- On May 15, 2018 at the roundtable conference “The problems of improving employees’ skill and the ways of solving them” within the framework of the meetings of Ukrainian Association of water and sewage enterprises “Ukrvodkanalekolohiia”;
- On September 14, 2018 at the meeting of the Council of the Association “Ukrvodkanalekolohiia” with the representatives of associations and research institutions when discussing the master-plan “Education and improvement in employees’ skill in the water industry of Ukraine with the participation of “Ukrvodkanalekolohiia”;
- In August 2018 the initiative of the PUC “Kharkivvodokanal” on training the enterprise specialists for the introduction of innovative technologies within the framework of the project “The improvement of silt management at waste water treatment plants of Kharkiv” was approved by the representatives of the International bank of reconstruction and development.

CONCLUDING REMARKS

Implementation of the employer-sponsored project of improving the employees’ skill of the PUC “Kharkivvodokanal” provided them with the competence for solving theoretical, applied, managerial tasks in accordance with the strategic plans of the Company as well as the tasks of the innovative development of the water and sewage industry as a whole. The experience of implementing the employer-sponsored educational program was taken as a principle for developing the Master educational program. Nowadays 22 students study at NUUEKh according to this program. The content of the program meets the vocational requirements of the employers.

The analysis of the project results allowed to point out the most complicated problems, the solution of which requires special attention including the development of the perspective programs:

- The appropriateness of the staff and material and technical support of the educational components connected with the use of innovative technologies;
- The development of the educational program meeting the requirements of the industry in conditions of uncertainty as for the perspectives of technical modernization of the enterprise;
- Individualization of the educational programs taking into account the students’ demands from different departments and enterprises;
- Financial problems of the implementation of the employer-sponsored educational programs, in particular practical training of the students.

Strategic partnership of Higher educational establishments and industrial enterprises is the demand of time. The main incentive of the formation of long-term partner relations is the mutual interest in increasing the quality of specialists’ training.

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