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The Problem of Shortage of Foreign Language Training for Students during Professional Skills Development in the Field of Mechatronics

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Abstract

The article notes the shortage of foreign language training for Russian students studying in the Electric Drive and Automation program that hinders a successful mastering of professional engineering skills in the field of mechatronics. The absence of a holistic approach to language training is described on the example of the federal educational standards for Power and Electrical Engineering and similar educational programs. The article gives examples of an approach to solving this problem, which is used in some universities of the Siberian Federal District and it proposes the concept of using a foreign language in the professional training, aimed at overcoming the problem.

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Keywords: Mechatronics; electric drive and automation; educational program; shortage of foreign language training.

1. Introduction

Today mechatronics is one of integral elements of the Russian industrial growth because the domestic industrial development and spread of robotics technology are impossible without it. The level of mechatronic systems implementation influences directly on penetration of intelligent systems in the production processes of domestic

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industries, their energy and resource efficiency. It is very important for such industries as textile industry, mechanical engineering, mining and other, which traditionally lag behind in mechanization and automation.

The technical level of the widespread American, European and Asian samples of mechatronic systems often surpasses the domestic. For import substitution, development of existing and creation of new domestic systems, it is necessary to solve a wide range of issues related to controlling the intellectual mechatronic systems in real time, providing the competitive technical characteristics and development of effective software systems for their implementation. However, none of these issues can be solved without sufficient number of professionals, skilled in the field of mechatronics.

The mechatronics originated due to electric drive, power electronics and microprocessor technologies. Studying of all these systems is the basis for graduation in the Electric Drive and Automatic Equipment major, which is available in many Russian higher educational institutions, including almost all technical universities of the Siberian Federal District. However, as the science is currently developing fast and the peak of development is observed in foreign researches, the educational and methodological documentation used for training is obviously not sufficient enough for students to get a complete idea of the actual state in the field of mechatronics. The reason is that many scientific developments in the field of electric drive, power electronics, microprocessor equipment and information technologies belong to foreign experts, and technical documentation for modern equipment is usually given in English.

Thus, to obtain the required skills and competences, a student must have the skills of studying and analyzing the foreign scientific and technical literature, especially in English, in addition to training in technical disciplines. However, there is a shortage of foreign language learning in the training program for students, which hinders their professional development and intensive penetration of mechatronic systems in the domestic industry.

2. The causes and consequences of shortage of foreign language training in the field of mechatronics

Now, when the information field doesn't depend on the borders of the certain states, and globalization process is, first of all, connected with opportunity of getting knowledge worldwide, a unique opportunity to get the real time knowledge and learn about achievements of other peoples opens up.

Foreign language skills for bachelor graduates are an important element for their professional growth. Thus some researchers (Martynova, 2014; Yuryeva, 2009; Galimzyanova, 2008), regard speech skills and communicative competences as having the paramount importance and opportunity to participate in international conferences and training, and listen to lectures of foreign experts, etc. What is much more important, it is that foreign language skills of an engineer increase their competitiveness factor in the industrial sectors where they work. Professional technical language abounds with technical terms and subtleties which only the expert can understand correctly. Therefore, it is very difficult and sometimes impossible to involve a translator for technical documentation translation. To the contrary, when reading a foreign text, a specialist can easily understand and anticipate the professional information, even with a basic level of a foreign language.

However, the programs of technical universities, including the Electric Drive and Automation profile, do not pay sufficient attention to the Foreign Language course. This is primarily due to the humanities nature of this discipline, which is radically different from the professional technical disciplines, much more familiar and interesting for the developers of educational programs, because in most cases they are specialists in technical sciences.

Confirmation to this is an exemplary educational program for Power and Electrical Engineering (Exemplary Program, 2010), developed by the specialists of Moscow Power Engineering Institute in accordance with the Federal State Educational Standard (Order, 2009). This program was recommended by the Educational and Methodological Association of Universities for Education in Power Engineering and Electrical Engineering to be used in all universities that train students in this field, including Electric Drive and Automation. Table 1 gives the excerpts from the curriculum (Exemplary Program, 2010), which clearly evidence that the educational program includes the foreign language training only as the implementation of common cultural competences and not included in the group of professional disciplines.

Even if foreign language training corresponds to the exemplary program for Foreign Language discipline (Exemplary Program, 2009), which is recommended by the Scientific and Methodological Council for Foreign Languages of the Russian Ministry of Education for technical (non-linguistic) universities, the specified topics

restrict the linguistic competence in the professional field. The proposed topics are limited to the main areas of activity in the professional field, functional responsibilities of specialists, personal development and career prospects, the outstanding personalities in the science, prerequisites and consequences of scientific discoveries and inventions, as well as the social responsibility of scientists for their labor results. At the same time, professional skills in mechatronics require strong foreign language knowledge on the subject of power converter equipment, electromechanical systems and electronic components, microprocessor technology, the low-level programming techniques and programming of controllers, the nonlinear and adaptive control systems.

Getting the stated knowledge is usually an individual problem of researchers during postgraduate study. As a result, domestic researchers in mechatronics find the topical solution to the researched problems rather intuitively than relying on the advanced world experience. A typical example is the thesis research (Lipin, 2015), which is a pioneering work in the Russian segment, but only one of a wide range of researches in mechatronic systems with the multiple degrees of freedom (Kahlen, et al., 2004; Wang, et al., 2003; Zhu & Howe, 2001; Kaminski & Smak, 2004; Tadakuma & Tadakuma, 2007) in the English-speaking segment.

Table 1. Excerpts from the curriculum for higher education profile Electric Drive and Automation.

Name of courses and disciplines	Hours (credits)	Distribution by semesters								Type of assessment
		1	2	3	4	5	6	7	8	
Humanities, social and economic cycle of disciplines	30-40									
The basic part	15-20									
Philosophy				x						Pass-fail exam
Russian History			x							Pass-fail exam
Foreign language		x	x							Examination
Economics								x	x	Examination
Mathematical and natural science cycle of disciplines	55-65									
Professional cycle of disciplines	125-135									
Basic (general professional) part	55-65									
Variable (profile) part Education profile “Electric drive and automation”	35-45									
Electrical and computer measurement						x				Pass-fail exam
Simulation in engineering							x			Pass-fail exam
Computer and microprocessor technology in study and control of electric drive							x			Examination
Elements of automation systems								x		Examination
Design of electrical devices								x		Examination
Electric drive in modern technologies									x	Examination
Module of specialized disciplines, including optional						x	x	x	x	Examination
Term Project								x	x	Pass-fail exam

It is important that foreign language training at universities takes place during the first year of study or the first and partially the second years, as the first year is like a track with obstacles for any student. Beginning their studies, freshmen fall into another educational environment, totally different from school, where they are carefully looked after by the parents and the class tutor, the teachers and the school administration. This attention is caused by the main task of school: to assist pupils in obtaining the certificate as the state guarantees the availability and free of charge basic education. Therefore, class attendance is mandatory at school and nonattendance without any unreasonable excuse is an emergency. It is different at the university because the higher professional education is

provided on a voluntary basis and student has the full freedom to make independent decisions. No one forces them to study the way they did at school.

Therefore, the first-year students, who made their choice in favor of studying, apply the maximum efforts to follow the rhythm and keep up with the basic and major disciplines in the first place, giving the time left for studying the humanities. Along with this, the quality of foreign language training decreases due to reduction of hours after Russia's joining the Bologna Process, as well as due to increase of the student's workload and increase of material volume for self-study.

In addition to the above-mentioned factors, affecting the quality of foreign language knowledge negatively, there is no integrated approach to foreign language training. The fact that students learn a foreign language during the first year simultaneously with the fundamental training in natural sciences, and there are no specialized disciplines in the educational program which form the basis of professional knowledge; thus students are not aware of the terminology, or the fundamentals, much less they know about the features of technological process automation, or the methods of modeling and the full control functions, which are the area of their professional interest.

The following period of study is devoted to an enhanced study of professional disciplines. This training goes with the full application of basic knowledge of mathematics, mechanics and electrical engineering etc., but in isolation from using and improving the foreign language as a tool for learning. It adversely affects the perspective of the foreign language learning, and especially the quality of this tool application. Thus, the course learning is running idle. The foreign language cannot reveal the further potential for symbiosis of professional and linguistic knowledge. As a result, a highly qualified specialist is limited by their language skills.

3. The concept of foreign language application in the professional training

To solve the described problem of foreign language training shortage for students in mastering professional skills in the field of mechatronics, it is necessary to make a synthesis of linguistic and professional training. Namely, it is very important to introduce the foreign language at the final stage of training program in one form or another to give the senior students the tool for getting professional knowledge. It will provide the integrated approach to foreign language training through its practical application in the process of mastering the specialization.

For example, in some universities, particularly, in Kuzbass State Technical University between 2004 and 2010 in the educational program Electric Drive and Automation, the optional foreign language classes were introduced starting the second and subsequent years of training that thematically supported the professional disciplines. The disadvantage of this approach is that it is optional, so students who initially were not motivated to learn a foreign language avoid the possibility of developing this skill.

The authors believe that the most successful example of teaching practice is the National Research Tomsk Polytechnic University, where each educational program, as well as Electric Drive and Automation, includes a compulsory course of Professional English Language during the last two years of training. The disadvantage of this approach is the unified course content for several educational profiles. This means that the considered professional issues inevitably have a general nature, although they are related to electrical engineering, thus forming an obstacle to professional vocabulary expansion in the field of mechatronics. Another disadvantage is the fact that the course is taught by a profile department, where teachers are usually technical specialists and have insufficient qualification in methodology and techniques of foreign language teaching and teaching in the foreign language, compared with the teaching staff of foreign languages department.

4. Conclusion

From our point of view, the drawbacks mentioned can be easily eliminated by development of individual programs for Professional English Language course directly for the educational profile Electric Drive and Automation, as well as any other, and by involvement of teachers from the foreign languages department in development of the teaching methods or as co-teachers. The options may be different, but in any case it will be logically complete in terms of mastering the foreign language skills and will help overcome the problem of foreign language learning without additional incentives for students motivation increase. In the authors' opinion, such

approach would contribute to mastering the high-quality skills in the field of mechatronics, as well as in other fields of technology.

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