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From the days of professor Nikolaev [1] a new generation and enthusiasts fortified by initial successes are emerging. It is encouraging that practically all school technical drawing teachers in Yakutsk (SR) have been professor Nikolaev followers.

We, teachers of technical drawing, descriptive geometry, engineering graphics of Yakutsk education institutions are proud of the fact that N.S. Nikolaev has been entitled one of 2900 Russian leading scientists and specialists in 2007- this can be found on Internet- encyclopaedia of Russia (www.famous-scientists.ru/1158). This is really true recognition- professor's achievements in Russian science. He

received the badge “Eminent Scientists of Russia” and certificate INTERNET-Encyclopaedia “Eminent Scientists of Russia” (Sochi, 2007).

Professor N.S. Nikolaev was elected Russian Academy of Engineering delegate of the 1st Russian Congress of Engineers, which was held in the Kremlin Palace (Moscow, 2003). In May, 2004 he was invited to participate the 5th Forum Of World Engineers (Earth), in Paris (France).

Now there is a saying that “If you are a Yakut, you are a good drafter.” This is the result of the gigantic work of all professor Nikolaev's followers. This is recognition of his service and works!!!! Professor Nikolaev in Yakutsk established his School (Nikolaev School). We have only briefly described the first achievements of this School.

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Engineering Staff Training – Issue of National Concern

North-Eastern Federal University
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The article examines the quality of engineering education. It underlines the urgency of:

- implementing system policies regarding engineering education;
- introducing preferential treatment and incentives to the enterprises which are planning to contribute to engineering staff training through the cooperation with universities.

Key words: quality and professionalism, engineering education, industrial enterprise, national policy.

Mining industry creates a foundation for development of the manufacturing sector and strengthens the defense potential of the country. Through colossal common effort, Yakutia produced 116 tonnes of gold and more than 8000 tonnes of tin metal during World War II. Back during those years, gold of Yakutia, having become a strategic reserve of the country, was used to lease 80 thousands of fighting vehicles.

As reported in archival materials, the first gold mines of the well-known Lensky gold district were discovered in 1846. In 1898, 976 miners worked in the gold mines of Yakutia. In April 1923, by the decree of the Yakut Autonomous Soviet Socialist Republic, gold mining entered a new age when the first Yakut gold mining company led by Voldemar P. Bertin was established. On May 1, 1923, 18 staff members began their work in a remote taiga area and off-road conditions. In 1931, the state trust company “Yakutzoloto” was founded. Within two years the company's staff was equal to 14 523 people, with 6943 employees working in mining sector. In 1957, the “Yakutalmaz” trust company was established.

The backbone of modern mineral resource base of Yakutia was formed in 1950-70. However, a major breakthrough

was achieved in 1974 as a result of the official visit by the Chairman of the Council of Ministers of the USSR A.N. Kosygin. Thus, in the Republic of Sakha (Yakutia), annual volume of mining in 1973-74 made up 4.5 tonnes of gold [1].

In the global context, there are only 10 countries, each of which mines more than 30 types of mineral resources. It is a well-known fact that development of mining industry is directly dependent on the amount of mineral resource extraction (Fig.1), precisely, the number of mineral resources types. The estimates of mineral resource production across the countries demonstrate that USA (15.8%), China (15.4%), and Russia (9.7%) take the leading position. In 2005, together they accounted for 41% of total world mineral reserves. It is worth noting that mining in the Asian part of Russia produces 33 types of mineral resources, and it would play an increasingly important role through the rest of the century. It is due to the fact that the most precious and valuable mineral deposits are found on the Asian part of Russia. However, there is lack of total staff resources [2].

Trying to meet the accreditation requirements, Russian universities have put special emphasis on the quality of training

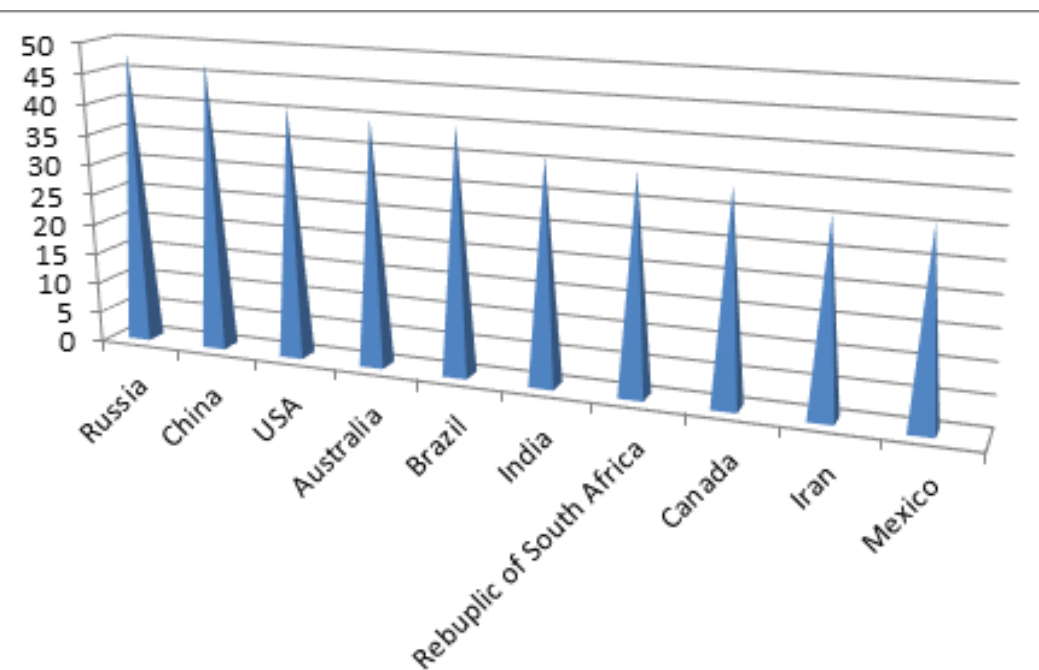


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Fig.1. Global distribution of resource extraction



programs and job placement issues over the past decade. The analysis of various materials including research papers and presentations has shown that the questions related to the job placement of graduates should not be discussed at university level only. A steady supply of mining staff is priority concern of the country. To cope with staff scarcity within the mining sector, it is required to develop an integrated approach toward engineering training and graduate job placement.

To prove the above statement, let us consider the academic activity of a number of departments of Mining Institute, North-Eastern Federal University (NEFU) in Yakutsk.

Today, NEFU's total undergraduate student number is over 20,000, with 30% being enrolled for engineering degree programs. The university is constantly revising the engineering programs and qualifications in order to match them with the priority goals of northeastern Russia development. Mining Institute of NEFU

offers two basic degree programs: "Mining Engineering" and "Technosphere Safety", i.e. 7 qualifications (Tab. 1).

In 2012, first students graduated from Fire Protection Program. The students enrolled for the first time for Mine and Underground Construction Program graduated in 2013. "Technosphere Safety" program has been recently developed in accordance with the regional labor market needs. Precisely, the program was developed with regard to stiffening of safety and labor protection requirements stated in Article 217 of the Labor Code of the Russian Federation "On Work Safety Division" [3, 4].

Recruitment data of *Open-Pit Mining Program* graduates in 2014 are given in Tab. 2.

The analysis of the data presented in Tab. 2 and Fig. 2 shows that 100 % of graduates find a job. Each year, 3 graduates take post-graduate course or enroll for master's degree programs. 30 % of graduates are called upon to serve in the armed forces of the Russian Federation.

Table 1.

Qualification	Graduate number per year					Total
	2010	2011	2012	2013	2014	
Open-pit mining (OPM)	15	17	5	13	13	63
Underground Mining (UM)	10	19	13	12	10	64
Mine and underground construction (MUC)	0	0	0	7	8	15
Mining Machinery and Equipment (MME)	17	14	16	13	11	71
Process Safety Management (PSM)	18	14	17	10	12	71
Protection in Emergency Situations (PES)	16	21	22	18	14	91
Fire Protection (FP)	0	0	12	10	13	35
Total over 5 years						410

Depending on the specific characteristics of the graduates, each year about 6 graduates are free in their job search.

Since 2012 NEFU has collected an array of job placement information (Fig. 3). It is worth noting that regional enterprises do not always provide university career service with the data on further career changes of its graduates. Therefore, there is no clear vision of graduates' career paths. It has become obvious that it is a common place almost at all universities of the Russian Federation as there is no clear mechanism of information exchange between universities, employers, and corresponding Ministries. All these issues should be addressed at the federal level within various industries. Despite the fact that the accreditation requirements are approved at the federal level, they are still developed by one agency, i.e. The Ministry of Education and Science of the RF, which has no legal power with respect to other social spheres and industries.

The monitoring results have revealed that mining program graduates are basically

recruited by the corresponding mining companies. 63% of graduates found job in mining companies and proved to be well-qualified specialists. For example, a graduate of 2013 was first recruited as a repair man by OJSC "Almazy Anabara". Over the first year, he upgraded his skills and was promoted to the position of mining engineer. Traditionally, all mining program graduates start their career as workers in mining companies. It is due to the fact that the specific characteristics of the mining industry require that engineering staff should know all stages of the hazardous production cycle.

However, job placement at mining companies today is still a challenge for graduates, which is caused by their lack of experience.

On November 10–15, 2014, there was an accreditation of NEFU by the expert committee. The students were asked about the places of internship and who is in charge of the choice. According to the answers of students pursuing the degree within Mining Machinery and Equipment program, in

Table 2.

2014			
1	Arkhipov Boris Petrovich	OJSC Almazy Anabara	overman
2	D'yachkovskiy Lookut Alekseevich	OJSC Almazy Anabara	overman
3	Sleptsov Gavril Fedotovich	OJSC Almazy Anabara	overman
4	Surovov Sergey Vladimirovich	OJSC Almazy Anabara	overman
5	Maloshenko Andrey Andreevich	«Aldanzoloto»	overman
6	Svinoboev Evgeniy Anatol'yevich	Continue education in NEFU	post-graduate
7	Ayarov Dmitriy Dmitrievich	Military service	
8	Slobodchikov Dmitriy Dmitrievich	Military service	
9	Smetanin Nikolay Nikolaevich	Military service	
10	Fedorov Viktor Egorovich	Military service	
11	Filippov Artem Valer'yevich	Military service	
12	Sofronov Andrey Viktorovich	Administration of municipal unit "Momskiy natsional'nyy nasleg "	specialist
13	Kondakova-Zakharova Olesya Sergeevna	Administration "Deti Azii"	specialist

Fig. 2. Job placement rate over the past 5 years

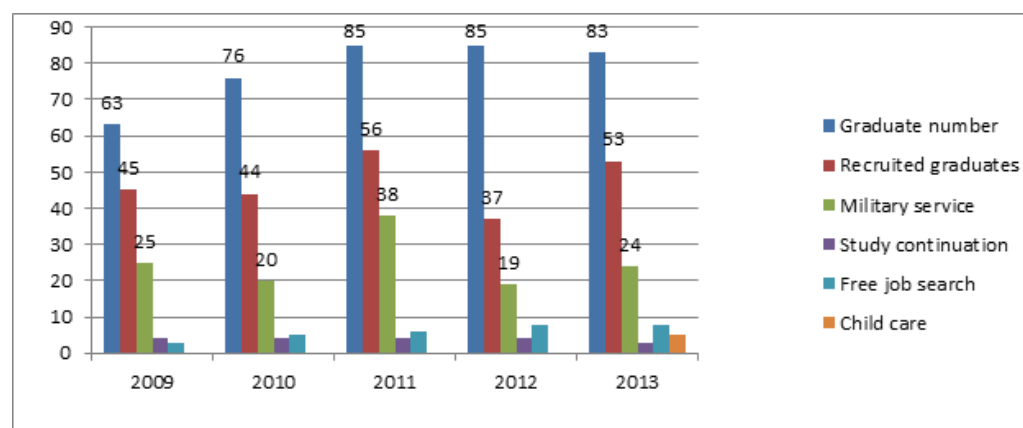
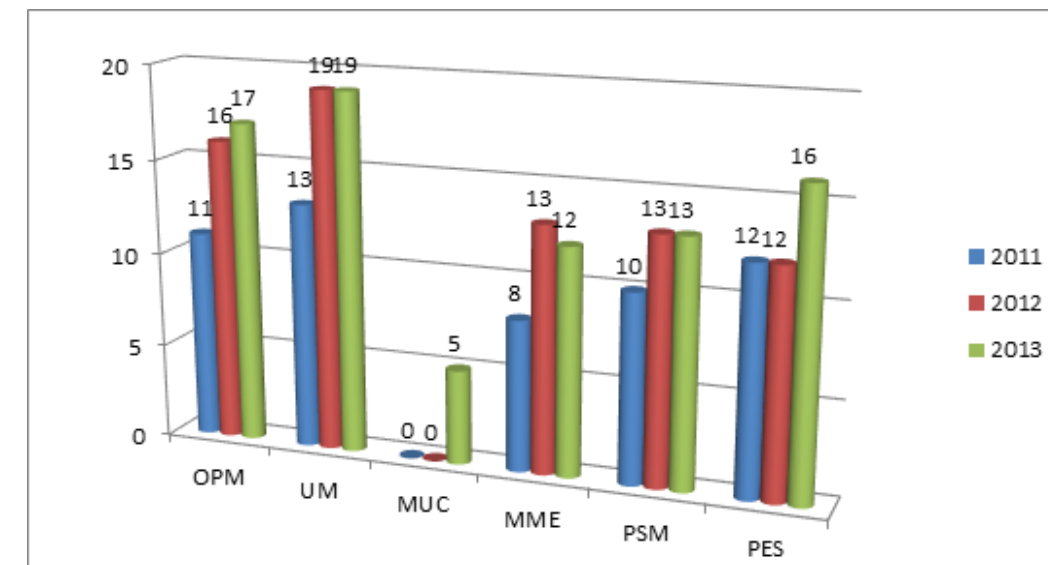


Fig. 3. Job placement data in 2011 - 2013



67% of cases the place of internship is chosen by the department staff while in the rest 33% it is for the students to choose. It seems that the percentage is approximately the same for the majority of engineering universities, and it is not bad at all under current economic conditions. Since internship placement is not regulated by the national law, it is determined by the heads of the departments and the Department of Student Affairs in close cooperation with mining companies. In this case, the internship quality totally depends on the company's interest in interns. For example, in summer 2014 three students pursuing the degree within Mining Machinery and Equipment program were on internship on the mine site "Denisovskaya" and worked as backmen.

All students had a qualification of repairman and profound theoretical knowledge in repair management, including the ability to understand kinematic and hydraulic schemes. However, the employer was not interested in students' professional development, and as a result, the internship outcomes were poor and the students failed to apply the acquired theoretical knowledge.

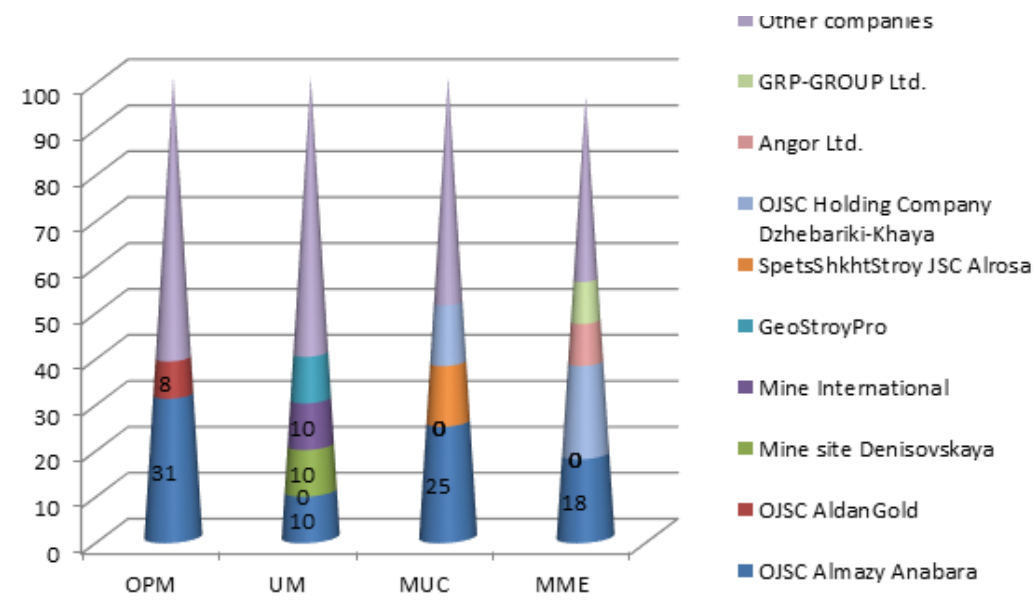
However, this situation is not the rule. For instance, the students of group MUC-10 were on internship on the site GKD 8 of the mine construction department, Mine "Mir". These students described their supervisor, Vladimir Alexandrovich Ivanov, being strict and demanding but interested in interns as he showed and told about all particularities of production process.

It is essential for professionals training, and engineers training in particular, to support theoretical knowledge with practical experience, which equips engineers with necessary skills and methods of work, familiarize them with production challenges.

As for the quality of training, the mining institute staff currently includes highly qualified professionals who can ensure profound education, however, the mining companies are not interested in the development of human resources potential, which is caused by the current economic conditions, when the costs for professionals training are reduced. This undoubtedly has a negative impact on engineers training and educational outcomes.

Let us turn to the chart illustrating work placement of graduates in mining

Fig. 4. Work placement of graduates in mining engineering in 2014



engineering in 2014 (Fig. 4). It is clear that the graduates got jobs in different regions, and the majority of them were employed by OJSC Almaz Anabara. Looking ahead, we can say that next year the geographical area of work placement will expand. After the internship in 2014, upon the recommendation of the company overman, Igor Yuryevich Zhukov, the interns' supervisor, two students of group MUC-10 and one student of group UM-10 were employed in OJSC Apatite. Unfortunately, the issue of graduates work placement is still critical and it is for the department staff only to solve this problem.

Currently, one of the RF Government requirements is to improve engineering education focusing on practical experience, however, there are still no laws or regulations to prescribe the improvement procedure. We suppose that the Government should introduce preferential treatment, in particular, tax incentives, to the enterprises which are planning to contribute to engineering staff training, including student internship. Under the unstable market conditions, the

declarative approach to higher engineering education improvement has negative impact on student internship quality, and as a result, inevitably fails in graduates work placement.

There are many risks potentially associated with the mining industry. According to the Government Statistics of the Republic of Sakha (Yakutia), every third accident involving injuries in 2011–2013 took place in the mining companies, including those with the fatal outcome [5]. Having analyzed these accidents, it is possible to conclude that the causes were both equipment disfunctions and poor work management, when the safety management system fails. It is worth noting that the real reasons for employees' unsafe practices are the lack of knowledge and skills, overlooking the instructions, missing trainings, studies and exams. This is also proved by the quality of works which students submit within the course "Mining equipment operation safety" [6]. In this regard, the qualification "Industrial safety" is up-to-date and in demand, however, due to poor organization of human reserve

development, these graduates have challenges in work placement.

"Forum FEC" is an outstanding event which was held in Yakutia on November 12-14, 2014. In the territory of the Republic, there are more than 30 companies involved in fuel and energy complex sector. It is clear that FEC comprises all organizations and enterprises dealing with production, refinery, and utilization of coal, oil and gas, which is declared in the Agreement on Cooperation in Fuel and Energy Complex between the Government of the RF and the Republic of Sakha (Yakutia). However, there are no FEC companies in the chart of graduate work placement (Fig. 4).

Currently, none of the FEC project documents considers the issue of NEFU mining graduates work placement, though there are open positions and vacancies on

FEC official website [7] (Tab. 3).

Tab. 3 shows that professionals with the qualification "Production and technology safety" are in demand in FEC companies, though there is no strategy of professionals training. If we turn to the website, it becomes obvious that work experience is an essential requirement, but professional abilities and skills are developed only through experience and practice. Currently, there is no contract or agreement on student internship in FEC companies.

On the other hand, a great number of FEC enterprises are included in the list of high-risk sites, the list being presented on the Site of Yakutia government (www.sakha.gov.ru) [8]. According to safety requirements, there must be Health and Safety Departments, services of civil defense and emergency situations or there

Table 3.

Vacancy	Advertisement	Date	Company
Lead engineer for process safety	A big international company needs a production engineer. Requirements: higher education in technology or chemical technology safety system modeling (or the diploma of secondary technical training and solid work experience). Work experience in design, technology safety	30.09.2014	FEC vacancy
Head of occupational and fire safety department	Responsibilities: to provide occupational safety management; assist in instructions development at the companies departments; be in charge of occupational and fire safety department; be aware of laws and regulations on occupational safety, and be familiar with the relevant methodological support; manage the department work. Requirements: be aware of report preparation terms and procedure; be able to work with Word, Excel, 1S; work experience in big machine manufacturing companies	26.09.2014	FEC vacancy
Head of operational control and occupational safety department	Responsibilities: personnel work management in compliance with national laws and regulations; determine and present in written declaration the personnel responsibilities; make personnel know their responsibilities and duties within the integrated management system used to improve quality and environmental managements	23.09.2014	FEC vacancy

should be a specialist in fires safety (FS) or emergency situations (ES) [9]. However, no official companies' sources prove the demand for such kind of specialists.

The facts mentioned above show that graduates with degrees in "Industrial Safety" (IS), "Safety in Emergency Situations" (SES) and "Fire Safety" (FS) can and must be employed by FEC enterprises.

It should be noted that according to professional requirements, Industrial safety specialist is to have higher education degree in corresponding specialty [10]. Thus, the State declares the need in highly qualified specialists in this sphere. However, companies while advertising vacancies, deliberately or not, require work experience as the main factor. It is obvious that the enterprises are interested in existing staff retention, but government bodies do not check the compliance of staff's qualification with the requirements. For example, State Labour Inspection Service in the Republic of Sakha (Yakutia) has not yet taken any measures to dismiss the safety specialists who fail to meet the qualification (professional) requirements mentioned above. The existing labour policies in FEC companies is focused on unstable market and fail to ensure strategic monitoring of human resources.

In relation to mining industry, it should be taken into account that many enterprises employ their staff with the help of recruiting companies at a free market. They require particular qualification standards but offer worse labour conditions and social guarantees, which is explained by maximal reduction of manufacturing infrastructure costs. The mining infrastructure in remote regions of Russia is known to have been constructed in the Soviet time. Most of these companies became private over the past 15-20 years, companies in the Far East and North use fly-in fly-out (FIFO) work schedule, both factors having negative impact on staff quality.

The given examples prove that there is no strategic human resource(HR) planning with regard to development prospect in a

big number of companies in the country including big enterprises. Either there is no efficient human resource management in remote mining companies or it is in embryonic state, which is conditioned by modern market state.

The RF Government Executive Order № 2037-p 15.10.2014 concerning Priority Development Areas (PDA) implies a special legal regime which can simplify employment of highly qualified foreign HR [11].

Besides, there is the President's instruction to Far East and North East Federal Universities jointly with state corporations and JSCs with federal shares exceeding 50 % to consider the following [12]:

- to facilitate development of specialized funds of these Universities;
- to ensure constant interaction in terms of staff training and use of prospective research results.

Nevertheless, the analysis shows that the suggestions in the frame of PDA consider only taking agreements. The prospect of attracting foreign HR can also have negative impact on the graduates' employment rate.

The absence of HR legal framework can further impede graduates' employment and students' internships especially in remote underpopulated regions. The administrative requirements to increase graduates' employment efficiency cannot be met without basic legislative acts and regulations and should not be the responsibility of the university only.

Robust HR management, including PDAs, is a State's strategic task. We consider the solution of the task to be closely connected with development of legislative environment to support companies having strategic plans of HR development. Such plans can include effective internships, professional competence development, graduates employment, i.e. the activities involving company-university interaction. It is necessary to develop a state complex and systems strategy in engineering

education which would involve interests and opportunities of higher education and research institutions, industry and the economy in the whole. Efficient

engineering training depends not only on developed industry and economy but also on intensive progress in science and technology.

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