

Diversification of the Higher Mining Education Financing in Globalization Era

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Abstract. In the current conditions of global competition, the development of new mining technologies, the requirements to labor resources, their skills and creative potential are increasing. The tasks facing the mining industry cannot be solved without highly qualified personnel, especially managers, engineers and technicians, specialists who possess the knowledge and competences necessary for the development of science and technology of mining, and ensuring mining industrial safety. The authors analyze personnel problems and financing of mining higher education, conclude that there is a need to develop social partnership and diversify the sources of funding for training, advanced training and retraining of personnel for mining and processing of solid mineral deposits.

1 Introduction

The lack of specialists of the appropriate qualification restrains the development of mining industry in Russia. The solution of tactical and strategic tasks of the industry development cannot be carried out without an effective innovative system of training and development of highly skilled personnel.

Modern personnel problems at the enterprises involved in the extraction and processing of solid minerals are due to the following factors:

- the lack of a close relationship between production, education and science;
- insufficient financing of research and development (R&D);
- shortage of highly skilled personnel to ensure innovative development of industry enterprises.

The specific features of the mining industry are also stipulated by the additional specific training problems, such as:

- the mining profession is not currently prestigious for the younger generation;
- the graduates of universities do not want to work in dangerous and harmful working conditions and move to the remote sparsely populated villages.

It is not possible to solve the personnel problems in the industry only by the increase in wages: large businesses traditionally spend most of the profits for dividends to the owners of the company, and small businesses simply cannot afford to increase their production cost by the wage increase for employees in conditions of severe internal and external competition.

2 Materials and Methods

Extracting and processing fuel, energy and mineral raw materials enterprises are the budget-forming in the Russian Federation. They provide more than 50% of Russian exports, in the labor market it is several million jobs [1-2]. At the same time, science costs are less than 1-2% of profits (for comparison, in developed countries, about 30-40% of profit is spent on research and development in similar spheres of activity) [3-4]. Recently in the large mineral resource companies there has been an active reduction in spending on scientific research: approximately 80% of scientific personnel have been cut by "Rusal", "Norilsk Nickel" and other mineral resource companies are reducing the funding of their scientific departments. To change this situation in the context of globalization, to ensure future competitiveness of Russian mining enterprises, it is necessary to increase investments in the human factor, the costs of science and education, retraining of personnel [5].

Financing is one of the most serious problems of improving mining industry in Russia.

Currently, the training of personnel for mining industry within the framework of per capita financing does not allow training a qualified specialist taking into account the specifics of the industry and the need for additional transport and field costs during on-the-job training in remote regions of Russia. Education in educational institutions of various organizational and legal forms and in-house training also require significant investments in the training, retraining of teachers, advanced training, new information technologies, the acquisition of special literature, etc. In future insufficient financing can negatively affect the professionalism of engineering personnel. Additional costs in mining education are also associated with the acquisition of new imported equipment, instruments and mechanisms for the extractive industry that do not have Russian counterparts.

Budget financing of mining education in conditions of limited budget is not able to ensure an effective modernization of the industry. Due to this fact, it is necessary to search for and use additional sources of financing for the mining education. The professional mining community is interested in finding a means for non-state financing of educational institutions. To prepare high skilled specialists the part of the costs for education should be invested by enterprises, private investors, and entrepreneurs.

In the conditions of external competition mining enterprises need investments for their development - they are forced to invest in the introduction of innovative technological programs and installation of equipment in order to increase production efficiency, while the costs of labor remuneration for employees and their retraining are reduced. Now it is not possible to attract investments into the extraction and processing of solid minerals from foreign sources. As the analysis showed, according to the results of 2016, the investment flow to Russia totaled \$ 1.14 billion (in 2015 this figure was \$ 208 million). Taking into account the problems mentioned above, the expenses for the government program "The development of industry and increase of its competitiveness" in the amount of 154.4 billion rubles were included into the budget of 2016. The financing of industrial enterprises due to this program caused a slight improvement in their activities, as these funds are insufficient for the development.

3 Results and Discussion

We consider the fuel and energy sector as the key industries which are promising today for attracting foreign investments. At the same time the outflow of investments is taking place from other extractive industries, including those engaged in the extraction and processing of solid minerals. In Russia, unfortunately, the financing of business ideas from "business angels" is not developed, as it is the case in foreign practice.

In such difficult financial conditions, we consider it expedient to develop and strengthen the system of social partnership taking into account the interests of all interested parties. Social partnership can be implemented in the form of interaction between universities, employers, academic and industrial institutes, through the establishing of educational and scientific-educational centers, departments of training and retraining of enterprise personnel, training and workshop complexes, as well as directly at the places of work with the involvement of specialists in the form of group and individual training. At the same time, it should be kept in mind that, in global competition, the training of personnel must be business and practice-oriented, the quality of personnel must meet the requirements of the most progressive technologies and innovations. Educational programs must be developed with the participation of representatives of production. Special grants of interested ministries and departments could contribute to improving the quality of education through the organization and conduct of regular training workshops, contests for employees, students and teachers. To ensure the staff meeting the global requirements, special attention should be paid to training technical specialists in English.

Mining companies should carry out training and retraining of indigenous workers and provide opportunities for the development of labor force in the region and in the country as a whole in order to meet the production tasks and reduce the shortage of high skilled personnel. This approach corresponds with the needs of local society and helps to increase the indicator of labor mobility.

Many organizations solve the problem of staff shortage by improving the skills of their own personnel, which makes it possible to prepare the employees for the solution of new tasks and perform new labor functions.

Advanced training and retraining of enterprise specialists on the basis of professional training and retraining of personnel is a system of measures aimed at improving the quality of labor resources and, accordingly, the labor potential of the whole enterprise.

The retraining personnel system allows obtaining not only an overall knowledge, but a complete training of skills in a given professional sphere. At the advanced training courses, the specialist will have an opportunity to learn about new technologies and techniques that are being introduced at the leading enterprises in Russia and all around the world.

The special programs for skills improvement and retraining of specialists in mining include studying new technologies and developments in the extraction and processing of solid minerals, underground and open pit mining, labor safety, and also consider the economic aspect of mining.

Mining specialist requires a special attention. This is the sphere of labor in which the theoretical knowledge obtained in training at higher education institutions, as a rule, is not enough. We need personal experience and continuous improvement of skills and knowledge.

In the period of scientific discoveries and the digital revolution, it is necessary not only to be well-educated in the latest technologies of coal mining and processing, but also to be able to apply them in practice. Only through the introduction of innovations and new technologies the efficiency of the enterprise can be improved. Competent specialists are the key factor that influences the effectiveness of the entire industry. The qualifications of both workers and management personnel must be constantly updated [5]. This can be seen from the production index based on the type of economic activity "Extraction of minerals", which for the last 10 years has not changed much.

The data shows a decline in the production index in 2009 compared with 2008 to 97.2%, which was due to the economic crisis. The highest value of the production index was observed in 2007 and in 2010. In 2016, the production index was 102.5%, which indicates a slight increase in production and processing of solid minerals in comparison with 2015. In the long term, to improve the efficiency of the industry, it is necessary to introduce

high-precision and high-tech equipment, which must be produced, and highly skilled personnel are also needed for this.

As the experience of Moscow Higher Engineering School, which prepares managers and engineers for solving urgent problems of developing industrial enterprises and increasing labor productivity, show the best form of staff retraining has been the creation of a comprehensive program composed of separate modules. In addition, short courses and expert seminars are offered. If desired, one can choose either the entire complex program, or one of its parts or individual modules or courses.

The peculiarity of modular programs is that they provide interdisciplinary competences, first of all, managerial, economic and engineering.

Work experience of some large enterprises showed that at first a small group of senior staff headed by the Deputy Director for Development had been trained by individual modules. After that, the management of the enterprise made a decision to train the group of heads of shops and project managers by the special program directly at the plants of the corporation. Being trained directly at the enterprise allowed them, and, if necessary, to make managerial decisions.

The practice of staff development and retraining when teams of 2-4 people (for example, a technologist, production director, chief engineer, and economist) from one enterprise have been trained is of much interest. Within the framework of the program, under the guidance of the curator, they work out various concepts and make a feasibility study, which is of practical value and will increase the efficiency of the enterprise's activity.

We believe that in order to develop advanced methods for improving the process of coal mining, it is necessary to improve the skills of management personnel and workers. For this purpose, it is advisable to use comprehensive programs for professional development and retraining, since they have shown their effectiveness.

The algorithm of the comprehensive program for advanced training and retraining is following:

1. Analysis stage
2. Conceptual stage
3. Design stage
4. Implementation phase
5. The stage of analysis and formation of technical task
6. Conceptual planning stage
7. The stage of detailed study and implementation
8. Launching and operation of new technology, models, equipment, etc. stage.

In modern conditions, in order to increase the efficiency of a mining enterprise, it is also necessary to manage properly the capital structure, financial stability, and financial solvency of the enterprise. All these matters are in the competence of the financial manager. Along with the training of management personnel and workers, one should not forget about the improvement of skills of the company's specialists. With their help the company can not only rationally use the available funds, but also optimize the company's expenses, which is important in the period of recovery from the crisis.

The authors conducted a study of motivation and assessment of staff development effectiveness (See Table 1).

Table 1. Motives for professional development.

Motivation for professional development	Interview results, %	Effectiveness of professional development
Employer's requirement	28	There is a formal approach to the advanced training, and sometimes denial of offered knowledge on the basics of personal experience

Professional growth	21	As a rule, there is an interest in learning process
Mastering modern professional methods in work	18	There is active work, interest, complete fulfillment of all tasks
Waiting for salary growth	18	As a rule, an employee's professional development is not grounds for the employer to increase the salary of an employee, if this does not mean a change in activity
Desire to improve the position of the company	15	The top manager wants to raise his level of knowledge and professional skills in order to bring the company to a new level, to develop new areas of financial and investment activity, and to increase their effectiveness

As shown by the survey, the leaders most often motivate the employee's professional development, and senior managers tend to increase knowledge and professional skills with greater desire. At the same time, it should be noted that the greatest result of staff development and retraining can be achieved by the synergistic effect of several motives. For example, if the financial manager is the owner of a mining enterprise and he has much interest in the growth of its activities' results, and consequently the profit growth.

From the point of view of the employer, some problems concerning the possibility for an employee to attend training classes depending on their forms arise (see Table 2).

Table 2. Forms of training.

Form	Advantages	Disadvantages
On-site training on the job	The possibility of combining professional and educational activities	Not enough time to study and consolidate the knowledge
On-site training off the job	Complete involvement in the educational process	The possibility of losing a part of wage/salary
Remote	The choice of the time of classes	The impossibility of conducting interactive classes

In case of the on-the-job training, the level of material development is lower than in off-the-job training, but it is often necessary for the financial manager to perform his duties even when studying off-the-job, which also has a negative impact on the level of mastering the training program. An important problem is the issue of payment for training. The employer is not always ready to bear the costs, and all expenses are assigned to the employee improving the qualification. It should be noted that the cost of remote training is less, as a rule.

From the point of view of organizing the learning process, an important issue is the organization of current, intermediate and final forms of control (see Table 3).

Table 3. Forms of control.

Form	Advantages	Disadvantages
Testing	The possibility of using computer processing, the absence of a subjective attitude of the examiner	A variant of a random correct answer is possible. Subjectivity of opinion of the author - the compiler of test tasks
Oral exam	The possibility to identify the true knowledge more accurately	Human factor
Creative work	The development of an individual approach to solving the task	Does not reflect the whole set of knowledge, skills and abilities

Thesis defense	Study and consolidation of theoretical knowledge and their practical implementation in the paper	Preparing a thesis on a specific issue does not allow evaluating the result on all subjects
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Obviously, in conducting training classes for all categories of employees, including management, it is necessary to apply various forms of motivation, training and control to achieve the best result.

At the same time, the spread of digital production, the emergence of completely new technologies make both employers and employees constantly improve not only their skills, but also be able to learn and retrain quickly, including directly during the production process.

However, it should be borne in mind that practical training directly in production process is very dangerous. Young professionals or newly recruited staff which do not have the skills and work experience cannot be admitted to the work on hazardous equipment. But they need to learn how to work on complex equipment in the process of specific production. To solve this problem, we can recommend the creation of training grounds equipped with special equipment that is safe for trainees.

We consider it expedient in the process of strategic and tactical planning of the development of the extraction and processing of solid minerals enterprise to provide the costs for training and upgrading the skills of personnel, as well as to calculate the effectiveness of personnel development activities (EF) according to the following formula:

$$EF = PR - CE \times EXP \quad (1)$$

where: PR – balance profit of the organization for the reporting period;

CE – the efficiency coefficient;

EXP – actual expenses for personnel development in the reporting period.

The magnitude of the efficiency factor determines the management of the enterprise, based on the tasks assigned to the personnel development programs.

4 Conclusion

Thus, in the new model of economy, there will be a need for people who are able to modernize production, solve problems and make decisions in non-standard situations, create new models and business processes, process and analyze data. All this is possible on condition of retraining and constant improvement of the professional skills. Consolidation of efforts of educational institutions, scientific organizations and industrial enterprises will ensure a high level and quality of education in conditions of limited funding.

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