

THE INNOVATIONS IN KAZAKHSTAN'S ECONOMY: ANALYTICAL INSTRUMENT MAKING DEVELOPMENT PROSPECTS

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The perspective directions of the analytical instrument making development of the mining and smelting branch of Kazakhstan have been presented in the paper. The data on the operation of the domestic x-ray fluorescence (XRF) appliances of the analytical express control in the enterprises of the mining and metallurgical branch have also been given. The negative factors, having constrained the active introduction of the domestic developments in the production industry have also been shown in the paper.

Keywords: X-ray fluorescence (XRF) appliance, express analysis, portable devices, control, elemental composition

At the present stage of the development, the Mining and Smelting Complex (MSC), as one of the basic branches and the domestic economy engine, essentially, is acted the legislator in the conducting of the innovation and the external economic policy of the Republic. That is why, it must be formulated the quite clear understanding, that the level of the industrial development of the State is determined not so much by their resource possibilities potential and the sizes of the manufacturing products with the low level of the technological conversion, as the degree of the development of the science intensive, high – tech, advanced, in terms of the technology, industries.

Especially, the analytical instrument making has been become the principal key aspect of the new type of the innovation development in the field of the high – tech, which is based on the development of the high-precision X-ray fluorescence (XRF) analytical appliances for the basic sectors of the economy of Kazakhstan.

Today, no one doubts, that the development of the express, X-ray fluorescent (XRF) methods for the elemental composition control of the various materials is one of the basic directions and its trends of the modern analytical chemistry. The extensive development and the analytical control appliances application have been provided the operational information to be obtained, at the ores quality assessing, at the prospecting and the exploring of the ore fields for the calculation of the deposit reserves, the exercising control, and the technological processes control of the ore raw material processing and the environmental monitoring [1–3]. Certainly, that the mining enterprises and companies equipping of MSC of Kazakhstan by the given appliances and corresponding devices could be provided the multiplicative effect for the solution of their many key challenges.

So, the large achievements and the major advances in the field of the nuclear electronics, solid state physics, computer technology, having observed in the recent times, have also been

allowed to be achieved the considerable and significant progress in the instrumental part of the method [1, 2]. The following distribution is received by the various modifications of the X-ray fluorescence (XRF) appliances, having solved the large – range of the analytical challenges, that are faced the key domestic industries, including the mining and metallurgical industries.

So, the active practical introduction and its further implementation of the energy-dispersive (EDXRF) appliances and its devices of the various modifications (e.g. the stationary and portable handheld ones) have been begun since the mid 90-es of the last century. The devices, having produced in the most developed and advanced countries throughout the world, and having entered into the top ten most competitive countries, have been the most common and promising devices, are widely used in the various fields of industry.

These are the devices of such famous and well – known foreign firms and companies, as «Bruker», «Philips and «Spectro Analytical» (Germany), «Oxford Instruments» (Great Britain), «PANalytical» (the Netherland), «Niton», «Innov-X Systems» (the USA) and the others.

To the analogous devices, having been produced by the former Soviet Union (CIS), it is quite possible to be referred the well – known Russian – made production devices – JSC «The Institute of the Physical and Technical Problems» (Dubna city), SPA «Burevestnik» (Saint – Petersburg), «the Institute for Roentgen Optics» (Moscow city) and several others.

In enumerate number of the well – known development, it cannot be ignored by attention the energy – dispersive X-ray fluorescence (XRF) appliances of the domestic production – X-ray fluorescence (XRF) laboratory appliance – XLA-21 (e.g. PJIII-21 – stationary) and the X-ray fluorescence (XRF) portable appliance – XPA-12 (e.g. PIII-12), having developed by SPL «AspapGEO», which are successfully competed in the global market with the above – stated foreign firms and their companies.

The wide-scale functional possibilities and their comprehensive features of the already developed devices are allowed to be solved the specific analytical challenges, which are the priority for the mining enterprises of the MSC. The successful use of the XPA-12 (e.g. PIII-12) device for the core samples testing, stone samples and pieces of ores in the natural bedding, in situ, we consider rather principal and fundamental from the point of view the primary raw materials resource-saving and the efficiency rise of the production, as a whole. For example, using only 15 devices of the XPA-12 (e.g. PIII-12) type, only in pits of the underground mines of the Production Association «Zhezkazgantzvetmet» SPL «Kazakhmys Corporation» the rapid testing are made more than 200,000 linear meters, per annual, underground mine workings.

In its turn, the clear understanding of the analytical challenges, having faced the mining enterprises and companies of the MSC Republic, the Kazakh developers have been allowed to be created their modern domestic appliances, which by the technical specifications are on par, and for some, even are superior to their foreign counterparts [2–4]. These already developed devices are provided their high level sensitivity, selectivity, precision and accuracy of the testing. The low cost (e.g. for 30% lower, than their foreign counterparts), easy of maintenance, the complete range of services provision for the operating personnel training, and the qualitative customer service have considerably increased and also improved the developed devices' competitiveness to the foreign counterparts. Their significant advantage over the imported devices is that they are adapted to address the specific challengers' solutions, having faced by the mining companies of the MSC. So, since 90-es, at the mining enterprises of the MSC of the Republic, more than one hundred of the various modifications and their different versions of the stationary XLA-21 (e.g. PIII-21), together with the portable XPA-12 (e.g. PIII-12) devices of SPL «AspapGEO» have been introduced. All these appliances are run smoothly, and they are successfully used at the advanced enterprises of the Republic – SPL «Kazakhmys Corporation», SPL «Kaztink», AO «Zhayremsky FOK», AO «THK «Kazchrom», SPL «Shalkiya-Tzink» and SPL «Kazakhmys Corporation».

Along with this, the XLA-21 (e.g. PIII-21) appliance and its various modifications more, than 10 years (e.g. 120 months) are successfully used to be analyzed and to be sorted the jewelry products in a number of the State bodies and agencies – the Customs Committee of Republic of Kazakhstan, the State vault of the National Bank of the Republic and the others, which is the statement of the high reliability of the developed appliances.

So, the Kazakh scientists and the scholars have already made the great contribution to

the theoretical justification of the method, the development of analyses method, the rationale for the new sources of the primary radiation, which are made up the fundamental method for the new modifications of the X-ray fluorescence (XRF) appliances of the analytical control. One should not forget that the first fully automated technique of the X-ray fluorescence energy-dispersive multi-element analysis, having approved by the Scientific Council of the analytical methods of the All-Union Institute of the Mineral Resources (SCAM AUIMR), has been designed and developed precisely by the Kazakh scientists and scholars.

At the modern stage of the Kazakh scientists' and scholars' achievement on the development and the implementation into the production the X-ray fluorescence (XRF) energy – dispersive appliances of the domestic production are deservedly recognized by the wide range of the scientists, the scholars, and they are considered the significant success, having achieved in the field of high technologies under the harsh conditions, the competitive market economy relations.

The achievements are not simply just the statement of the facts, but the confirmation of the depth, the continuity of the systematic ongoing scientific research in the field of the high technologies for the development and the further modernization of the domestic X-ray fluorescence (XRF) appliances [4].

Today, the research and development works to be created the new modifications of the appliances, which have the high-tech solutions (e.g. the «know-how») and, moreover, have principally, the new, powerful, methodological-programmatically software, are being continued by the scientists and the scholars. The new modifications of the appliances, which successfully can be used not only in the mining-metallurgical branch of industry, but and in the chemical, uranium and other industries, are developed and prepared for the testing by the authors. All these achievements are implied to be spoken on the considerable leading and the substantial forestall competition with the Western firms and their companies of the advanced and developed countries of the world in the field of the high technologies.

However, the further development of the initiated directions is required the support, from the state's side in addressing a number of challenges, on which we would like to be emphasized.

Firstly, despite of the high price, the complexity of the maintenance, the lack of the skilled maintenance personnel, and also as well as the consequent circumstances, the questions of the staff's training and service, the domestic enterprises are continued to be equipped by the Western instruments and their appliances, having provided the enormous sums of money. The surprising results are presented and

conducted the public and State procurements and purchases (e.g. the tenders). The repeated experience of the participation in them is showed, that, at the equal specifications, despite of the number of the advantages of the domestic appliances (e.g. the price, service maintenance, specific challenges' solution of the enterprise) the customers, for some reason, are preferred the Western appliances and their devices.

Secondly, the enterprises equipment by the modern analytical appliances and the corresponding devices, this is undoubtedly the positive thing, because of the links in the quality control of the raw materials and the resulting products are derived the old and high-cost methods of the chemical analysis. But, for all this, it is necessary to be focused the attention on the fact, that the acquired at the high price, the Western appliances and the devices are not used to the full rate. This is due to the fact, that despite of their potential multi-functionality and versatility, they are not fully adapted to the analytical challenges' solution, having faced our enterprises: there is not clear understanding in the formulation and decision of the analytical challenges, having faced the domestic enterprises at the Western manufactures. The well-known foreign and overseas developments-oriented the portable appliances and the corresponding devices, mainly, for sorting metal alloys are not fully designed to be met the challenges solution, having faced the MSC. In addition, the foreign and overseas appliances and the devices are not designed and the tough operating conditions, with the respect to the conditions of our enterprises. Overwhelming majority of the acquired Western appliances and the devices, in case of their failure, are much costly to be recovered. That is why, in the considered aspect, it is seemed to us quite reasonable and optimal solution, when the equipment of the industrial enterprises of the MSC by the analytical appliances and the corresponding devices, will be carried out by their own, the domestic developments with all the outbound positive effects for them (e.g. the low price, the appliances adaptation to be addressed for the specific analytical challenges' solution, the service maintenance, the personnel's training, etc.). Such approach would be created the substantial, efficient prerequisites and conditions for the further development of the innovation directions in the field of the high technologies.

Thirdly, at the advanced technologies' introduction, we must be prepared to be addressed for a number of the related challenges' solution, which may be given the negative effect. So, the Western technologies, as a rule, are tended to be based and built at the highest technical level with the sufficient automatization and with the minimal involvement of the working staff. The significant decrease in the number of the working people will be created the certain social

tensions, under our conditions. Therefore, we should consider the measures for the preparation of the non-working specialties, but the engineers and the highly-qualified and skilled experts, specialists and the professionals.

At the same time, we believe, that the development of innovation direction new type – is the domestic analytical instrument making creation, it will be the powerful impetus for the organization of the large-scale high-end training specialists, by bringing and involving them to the scientific and research work, having performed at the junction of the quite different and various sciences. It is clear and evidently, that the greatest synergistic effect, for all this, can be reached, in the case of the close cooperation between the scientists and the developers, having worked in the field of the high – tech, with the Higher Education Institutions, for example, by the creative scientific groups or the scientific and research centers creation at the Universities.

As the gained positive experience, it can be given the example of Scientific and Research Center creation of the «Innovation Technologies in the Mining and Metallurgical Industry» (SRC «INTEMMI»), through the joint cooperation of the Kazakhsky National Technical University after K.E. Saptayev (KazNTU) with the SPL «The Scientific Center after E.A. Onayev» and SPL «AspapgEO».

So, the main objective of the SRC «INTEMMI» – is the innovation projects development and their further implementation into the mining and metallurgical industry. The Scientific and Research Center is designed to be involved and engaged the most talented and the advanced part of the students in the scientific activities, having connected with the scientific and research work in the field of the high technologies.

Thus, along with the main task, the SRC «INTEMMI» is striving to be taken their active participation in the preparation of the wide – profile specialists and the generalists, who will, certainly, will contribute the new class formation of the scientists and the scholars of the new formation, able to think creatively, to generate the new ideas and to respond flexibly to address the challenges' solution of the intensive and high technologies.

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