Association of Metallurgical Engineers of Serbia *Profesional paper*
AME *UDC:669:930.85=861*

EXPERIENCE IN TEACHING OF HISTORY OF METALLURGY IN MISIS

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In the Moscow Institute of Steel and Alloys (MISA, MISIS) until 1994 there was the only training course in the program of training of engineers-metallurgists of all specialities –«Introduction to a speciality», which in the most general form briefly informs students about the basic constructions of metallurgical units and some techniques and devices used in production of ferrous and nonferrous metals existing until the 20^{th} century. This course consists only of a course of lectures, and its volume made 1 teaching period a week during one semester.

The increase of the Institute' status gave new opportunities which allowed to change essentially both – structure and principles incorporated in the concept of students training. As a result in 1994 in MISA – Technological University – for the first time a training course «History of Metallurgy of Iron» was given at the faculty of Metallurgical technologies, resource economy and ecologies. Its volume made 3 hours of lectures and 2 hours of practical training per week. While elaborating methodical technique base for a said course we thoroughly studied scientific achievements of the last decades in archeological metallurgy, history of science and engineering, practical archeology and in other spheres of modern historical science and in a museum science.

The authors initially put the overall objective to form of a complete picture of iron metallurgy development in interrelation with a history of a civilization. Achievement of this objective is provided on the base of salvation of four basic methodical problems as follows:

1. Exposition of a global mechanism of appearance, development and diffusion of metallurgical technologies and technics. As a typical example it is possible to give the original diagrams connecting time scale, type and geometrical sizes of the basic metallurgical units for processing iron ore with intensity of blast supply, a temperature level of the process and the content of iron monoxide in a slag.
2. An analysis and substantiation of conditionality of appearance of new metallurgical technologies and technics in concrete historical conditions

(time and geographical coordinates). The most brightly this thesis illustrates generally recognized facts of appearance of high puddling hearth in the Early Middle Ages in the Alpine region and Scandinavia, Catalan hearth at the beginning of an the Renaissance epoch in Spain and in the south of France, large blast-furnace production of manufactory type – at first, in the middle of 16th century in England, and then in the first half of the 17th century in Sweden.

3. Exposition of a mechanism of appearance and development of scientific metallurgy. While training students have an opportunity to study in detail not only works, but also facts of life of V. Biringuchcho, G. Agrikola, A. de Reaumur. A special place in a course takes an analysis of achievements of a unique school of Swedish scientist-metallurgists and chemists-analysts who have made practically all discoveries of new chemical metal-elements in the second half the 18th century.
4. Transfer to students an engineering culture of analysis of metallurgical processes. Calculations of parameters of ancient metallurgy at practical and individual studies are conducted with obligatory making up a balance of metal, definition of recycling parameters, attributes of resource economy and emissions in the environment.

On the one hand, «popularity» of a sated (posed) material of the lecture part of the course in which issues of history of the iron metallurgy are considered in connection with a history of a civilization, and on the other hand, concrete character of practical studies and tasks for individual work promote comfort and high qualitative level of mastering by students of the subject matter.

Thus, practical calculation trainings got a special place in structure of the course. Benchmark data for them are taken from a real archeological and historical and archival materials, calculation is accompanied by making up of full balance of iron, slag-forming material, and some impurity elements (for example, manganese, phosphorus, sulfur, vanadium). Practical training includes making out of the recycling schemes of metallurgical materials, typical for a historical epoch under consideration. Calculation comes to the end with obligatory check of results.

Large volume of issues in point of the training course under discussion predetermines some objective difficulties in work and shortcomings connected with it. In particular it concerns the necessity of a correct simplification and generalization of issues in point which may generate inaccuracy in explanation both as historical, so special metallurgical issues.

Nevertheless by now in MISIS (MISA, TU) an approved system of teaching students history of metallurgy is developed. It includes the original lecture and practical training, available intrainstitute editions (including an electronic type), home tasks with a historical part, abstracts which are carried out during students' research work. The first student's scientific conference on problems History of

metallurgy was held in 2005. It was devoted to the 525th anniversary of V. Biringuchcho. During the current year a conference was dated for the 450 anniversary of publishing of a well-known book of G. Agrikola " De re metallica ". Winners of conference became the research works executed on themes:

1. Experience of preservation of an industrial heritage of a civilization.
2. Iron is a building material.
3. " Minor industrial revolution " in England and development.
4. An iron costume opens new directions of a fashion in clothes.

In 2004 and 2005 the first diploma works in the field of History of metallurgy of iron on themes: «Analysis of a role of iron metallurgy in energy crisis in the Western Europe at the beginning of the 17th century» and «Analysis of a role of iron metallurgy in the civilization development of technologies of global recycling» were prepared and successfully defended.

The experience which was gained during ten years' period in point, is substantially generalized in the textbook «*Metallurgy of iron in a history of a civilization*», published in MISIS (MISA) in the current year. The textbook consider development of the iron metallurgy during a period since ancient times up to the beginning of the 17th century. The textbook includes practical and individual tasks on definition of characteristics of metallurgical processes used in the Ancient world and Middle Ages.

Furthermore the intense interest shown by students in studying of a history of metallurgy contribute to initiation of specialization «Archeological metallurgy and technosociology» within a framework of new educational speciality «Metallurgy of man-caused and secondary resources», training on which was started in MISIS in 2004.

At present within a framework of the above mentioned specialization a development of the following subjects is carried out:

1. «Metals in culture, art and philosophy of nations of the world»
2. «Technosociology» (aspects of the interconnected technical and social development of civilization)
3. «Logic of engineering decisions (in metallurgy)»
4. «The role of metallurgy in formation of global recycling infrastructure»
5. «Man-caused landscape and industrial architecture in metallurgical regions»
6. «Museums of metallurgical technics and technology» (and their role in formation of a modern engineer)

In opinion of leading MISIS methodologists, a development of a system of teaching of subject on a history of metallurgy allows to raise essentially as general-cultural, so a professional level of training of the future professional metallurgists.