

Creation of New Technologies and Equipment as a Basis for Mining and Smelting Industry Development

V. I. Bolshakov

*Z. I. Nekrasov Iron & Steel Institute of National Academy of Sciences of Ukraine
1 Academician Starodubov Square, Dnipropetrovsk, 49050, Ukraine*

It is shown that Ukrainian scientists made a considerable contribution to development and implementation of new advanced technologies, equipment, monitoring systems that provide effective and safe operation of metallurgical units.

Keywords: TECHNOLOGY, EQUIPMENT, SYSTEMS OF METALLURGICAL UNITS CONTROL

Introduction

Generally, development and implementation of new engineering and technological solutions in metallurgical and ore mining industry need participation of scientists, engineers of various qualifications - process men, machine scientists, heating engineers, automation and control instrumentation specialists, etc. [1]. This feature is covered in complex scientific research carried out by Z. I. Nekrasov Iron & Steel Institute of National Academy of Sciences of Ukraine

Results and Discussion

Investigations of various metallurgical machines with spring linkage, electric and hydro-mechanical drives carried out by scientists of S. N. Kozhevnikov's school allowed working out a basic research methodology for metallurgical units [2-5]. Application of this methodology enables to define loadings in drives and machine components, to select rational conditions of their operation, relationship of mass and ruggedness, to retune electric and hydraulic drives, as well as control systems [5]. The features of using this technology are described in paper [4]. The major scientific research results obtained by Z. I. Nekrasov Iron & Steel Institute of National Academy of Sciences of Ukraine and related scientific research institutes and high schools are stated in work [6].

Review of the greatest scientific and technical investigations accomplished under the

guidance of outstanding scientists-metallurgists and mechanics - members of Academy of Sciences of Ukraine - confirms the high scientific and technical level. It is important that deep knowledge of metallurgical processes, their implementation with the use of new engineering solutions, new machines and automated control systems are combined.

Investigation, implementation and development of new production processes and equipment were carried out at close cooperation of scientists, process men, mechanics and automated control specialists. A comprehensive approach to solving problems related to creation of new techniques and equipment always provided prompt and quality results [7].

For last 10-15 years, scientists of Z. I. Nekrasov Iron & Steel Institute of National Academy of Sciences of Ukraine have accomplished a number of new investigations related to various processes in iron & steel industry. During economic and financial crisis, when output of metal products dropped, it is reasonable to reconstruct metallurgical aggregates and manufactures without essential financial losses. A range of new engineering solutions tested in practice and prepared for implementation were worked out. We will consider some of them.

In the field of blast-furnace process, methodical fundamentals of reconstruction projects of blast furnace equipped with cone-free loading units of various constructions; the fundamentals and order of prestart investigation of blast furnace

were developed. Calculation procedure of charging and burden distribution along mouth radius that allows selecting a rational blast furnace loading program according to available charge materials and pig-iron demand was developed. Advanced blast furnace blowing and blowing-down processes were suggested on the basis of general home and world experience [9].

Technology and equipment of pig-iron desulfurization by magnesium without components providing content of sulfur in pig-iron less than 0.001 % in ladles with mass of pig-iron 140-300 t were developed and implemented under the guidance of Dr. A. F. Shevchenko. This technically perfect and economically effective technology and equipment are widely used at iron & steel plants of China [10].

S. V. Belodedenko (National Metallurgical Academy of Ukraine) has worked out methodical fundamentals of estimation and reliability control of metallurgical equipment. Employees of Donetsk Polytechnic University published a series of works accomplished under direction of Dr. S. P. Eronko related to creation of original devices for slag cut-off in the process of steel tapping from converters. Employees of Kryvyi Rih Department of National Metallurgical Academy of Ukraine, Prof. A. D. Uchitel and V. I. Zaselskiy published a number of papers related to development and creation of vibration screens of new generation for grading charge materials grounded on excitation of heterogeneous (beatings) of executive device ensuring screening intensity and self-cleaning of screen plates during operation [11].

Technology and equipment for briquetting fine waste and their recycling with minimum energy consumption were developed and implemented under direction of Dr. V. A. Noskov [12].

Conclusions

The publication and discussion of new scientific and technical results related to advanced methods of calculation of technical characteristics of equipment, machine designs, their strength and durability, implementation of advanced technologies of metallurgical manufacture, reliability control and safe maintenance on pages of the journal "Metallurgical and Mining Industry" promote technical advance in metallurgy, upgrade of qualified level of scientists and specialists.

References

1. V. I. Bolshakov *Metalurgicheskaya i Gornorudnaya Proyshlennost*, 2008, No. 1, pp. 125-128.*
2. V. I. Bolshakov *Metalurgicheskaya i Gornorudnaya Proyshlennost*, 2000, No. 2, pp. 86-88.*
3. S. N. Kozhevnikov *Dynamics of Machines with Spring Linkage, Edition of Academy of Sciences of USSR*, Kyiv, 1961, 160 p. *
4. V. I. Bolshakov *Metalurgicheskaya i Gornorudnaya Proyshlennost*, 2000, No. 3, pp. 72-78.*
5. A. V. Prazdnikov *Hydraulic Drive in Metallurgy*, Metallurgiya, Moscow, 1973, 336 p.*
6. V. I. Bolshakov *Metalurgicheskaya i Gornorudnaya Proyshlennost*, 2000, No. 4, pp. 10-13.*
7. V. I. Bolshakov *Z. I. Nekrasov Iron & Steel Institute*, Art-PRESS, Dnipropetrovsk, 2007, 448 p.*
8. V. I. Bolshakov, I. G. Muraveva, Yu. S. Semenov *Collection of Scientific Papers by Z. I. Nekrasov Iron & Steel Institute of NASU "Fundamental and Application Problems of Iron & Steel Industry"*, 2008, Issue 16, pp. 372-379.*
9. V. I. Bolshakov, N. M. Mozhareno et al. *Collection of Scientific Papers "Problems of Safety Operation of Hardware, Constructions and Machines"*, E. O. Paton Electric Welding Institute of NASU, Kyiv, 2009, pp. 424-428.*
10. V. I. Bolshakov, A. F. Shevchenko, V. A. Aleksandrov et al. *Metalurgicheskaya i Gornorudnaya Proyshlennost*, 2004, No. 4, pp. 6-11.*
11. V. I. Zaselskiy *Metalurgicheskaya i Gornorudnaya Proyshlennost*, 2007, No. 6, pp. 79-81.*
12. V. A. Noskov, V. I. Bolshakov, V. S. Kutsin et al. *Metalurgicheskaya i Gornorudnaya Proyshlennost*, 2004, No. 3, pp. 124-126.*

*Published in Russian

Received February 04, 2010

Создание новых технологий и оборудования – основа развития горно-металлургического комплекса

Большаков В.И.

Показано, что украинские ученые внесли существенный вклад в разработку и реализацию новых прогрессивных технологий, оборудования, систем контроля и обеспечение эффективной и безопасной работы металлургических агрегатов.