



TOVAROVSKIY IOSIF GRIGOREVICH

Introduction to the author

Date of Birth 15.07.1936. Doctor of Technical Sciences, professor, academician of the Academy of Mining Sciences of Ukraine, winner of the Prize of NASU.

Author 430 scientific papers, including 16 monographs, 10 brochures and 70 inventions. 20 English-language publications in the collections of scientific papers Conference in the Czech Republic, Poland, Bulgaria, Latvia, India, Israel, USA, Sweden, Japan, Germany. 20 English-language Journal Articles.

EXPERIENCE

1967 – present :

Working in the Iron and Steel Institute (Senior Researcher, Laboratory Head, Senior Research Officer).

Protecting doctoral dissertation on the specialty 05.16.02 - Ferrous metals on the theme “Theoretical basis and practical techniques of system analysis to determine the direction of its development” (1989, Moscow, MISA) to obtain the academic title of professor (2002); work the Expert Council of Higher Commission for attestation of Ukraine (2001 - 2008 years); Prize National Academy of Sciences of Ukraine (2003).

1960 – 1967:

Working at a metallurgical plant Kryvorozhstal of posts in the gasman, the master of the blast furnace, the head of research group.

Participation in the development of powerful blast furnaces 2000 - 2700 m³, blast furnace smelting technology on the combined high impact parameters. The first publication in the journal “Steel”; (1963) and the output of the first book (1968). Ph.D. Sciences (1967, Moscow, TsNIIChM).

1955 – 1960:

Study at the Dnepropetrovsk Metallurgical Institute and the first work on the Dnieper Metallurgical Plant. Dzerzhinsky (Assistant gasman, furnaceman, etc.).

ACTIVITIES

Scientific Activities

1. Analytical and experimental studies of blast-furnace smelting with the use of mathematical modeling. Systematic analysis of melting.

2. Coke-saving in the blast furnace. Unconventional metallurgical technology by the use of the products of gasification of low-grade coal. Low-consumption coke and coke-less blast furnace smelting.

Pedagogical Activities

Working in the position of professor of metallurgy Krevoy Roge Faculty of the National iron and steel Academy of Ukraine.

SCIENTIFIC - TECHNICAL DEVELOPMENTS

1. Methods of calculating the blast-furnace smelting in the actual and promising conditions.
2. Analytical studies of the processes and optimization of the blast-furnace smelting modes.
3. Theoretical and technical solutions of the low-consumption coke and coke-less blast furnace smelting with injection of products of coal gasification.
4. Using the blast-furnaces to make coal gasification products with waste disposal.

PRACTICAL IMPLEMENTATION FUNCTION

1. Complex technical of solutions for the parameters of blast-furnace smelting the blast parameters of blast-furnace smelting (Zaporozhstal, Krivorozhstal, Makeevsky MK et al. - 1980-1995 years).
2. Technology of blast-furnace smelting with coke oven gas injection for the replacement of natural gas and economy of coke (Makeevsky MC - 1980-1992 years).
3. Annual (1967-1995) Analytical studies of the blast furnace industry to improve the modes of blast-furnace smelting.
4. Blast-furnace smelting technology with the replacement of 10 - 15% of coke by atratsit in the blast furnace plant Kryvorozhstal - 2000-2011 years.
5. Formation on the basis of system analysis of the processes of the blast-furnace smelting recommendations for blast furnace production of coke-saving and nontraditional low-consumption coke and coke-less Technology (2000-2011 years).

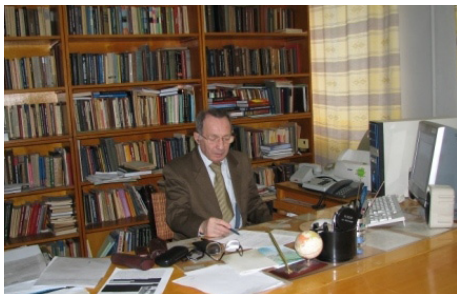
AWARDS

1. Diploma of the Presidium of NAS of Ukraine (1999, 2004, 2006 years) for fruitful scientific work and considerable personal creative contribution to the theory and technology of metallurgical production.
2. National Academy of Sciences of Ukraine Prize by the name of Z.I. Nekrasov for the work "The technological foundations of non-traditional low-coke and coke-less blast furnace melting" (2003).
3. NAS Award "For training of scientists" (Medal, 2011).

CONTACT

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PERSONAL WEB-SITES OF TOVAROVSKIY I. G.



Professor I. G. Tovarovkiy in the Office



Handing the Prize of National Academy of Sciences of Ukraine (2003) by Academician Paton B. E.



Expert Council of Higher Commission for Attestation of Ukraine (2007)

<http://www.tovarovskiy.openua.net/bio.php>
<http://www.nas.gov.ua/rsc/psc/Scientists/T/Pages/TovarovskiyIG.aspx>
<http://www.famous-scientists.ru/11587/>
<http://web.alkar.net/tig/> (старый, old)
<http://www.marquiswhoswho.com/listees/publications/whos-who-in-the-world>

INTRODUCTION TO TECHNOLOGY

Present here a complex of articles of Professor I.G. Tovarovskiy is a generalization of fulfilled by the author with the staff of the research aimed at cognition and development of the blast smelting technology as the basis of mass of the metal production in the world. The complex includes 7 articles with a common thematic focus “Saving coke and energy in blast furnaces”.

Blast melting is one of the few industrial technologies, which preserve the essence and significance by all technical revolutions. This phenomenon exists due to certain properties of the system that ensures exponentially increasing the productivity and linearly lowering the coke rate that seeks to 200-250 kg /thm. The solution of problems of blast-furnace (BF) smelting involves the study of the relationship of real parameters and forecast of expected parameters and processes on preset parameters of work of the blast melting. The solution is based on the method of numerical modeling of processes in radial annular cross-sections along the height of the furnace: multi-zone model of heat-and mass transfer; physico-chemical transformations and mechanics of material and gases.

A new approach has opened additional opportunities for the analysis of processes and the emergence of measures to improve efficiency of the smelting, including: identification of the limiting zone and height of the cross section of a furnace; the quantification of the higher heat load of the gas flow in the peripheral zone (for the account of heat losses); the account of gas flows at different horizons of some radial ring zones (RRZ) in the other; assessment of the development of restorative process, in particular the rates of direct recovery of circular cross-sections furnace radius; establish the influence of the distribution of materials for furnace radius on heat loss, as well as the influence of all the technological factors on the consumption of coke into account the changes of heat losses; assessment of the role zone softening and melting (considering the influence of the degree of restitution of iron and ward alkali oxides in the formation of melting modes and the corresponding temperature and concentration fields furnace.

It was studied the influence of individual parameters and complex of factors on consumption of coke and found that use of the offered modes will allow to cut expenses coke to 190-200 kg/t of pig-iron. Use of effective technology of pulverized coal injection should be accompanied by the development of additional and alternative technologies. In particular, attention should be drawn on injecting of coke-oven gas and the products of gasification of low-grade coal, as well as the charging in blast furnaces of specially prepared lump anthracite.

Lack of resources, low-ash coal for pulverized coal injection – PCI (pulverized coal fuel - PCF) requires solutions to technical problems of the use of high-ash coals, in particular, partial and full gasification of fuel before entering the tuyere area of BF.

Injection of the products of coal gasification (PCG) instead of PCI into the blast furnace tuyeres eliminates these limitations. The evolution of the blast furnace smelting is going on the path of reducing the coke consumption to 180-200 kg/tm with the General improvement of the technological mode with pulverized coal injection and coal gasification products. The further regularity way related to the restructuring of the technology and design for the purpose of transition to obtaining metal without coke. The results of developments showed that the major advantage of the technology without coke (TWC) in Shaft-Heart Unit is less cost of fuel and is missing emissions from coke production.

It is shown that the blast melting, as a multifunctional technology, can be focused on modes, which are dominated by one of the functions: metallurgical, energy and sanitary-ecological. As the development of basic metals and the emergence of excess individual capacities occurs possibility and expediency of the autonomy of the individual functions, for example, translation of individual blast furnaces to mode of coal gasification and waste utilization.