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Advances in Modern Mechanical Engineering

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Proceedings of the 4th International Conference on Fluid Mechanics and Heat & Mass Transfer (FLUIDSHEAT '13)

Dubrovnik, Croatia, June 25-27, 2013

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Plenary Lecture 1

Intense Hardening of Optimal Hardenability Steels Saves Alloy Elements, Energy, Improves Service Life of Machine Components and Makes Environment Cleaner

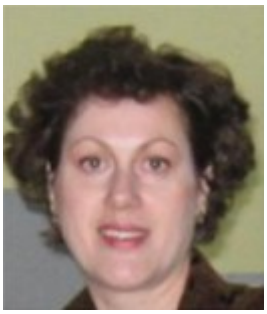
Dr. Nikolai Kobasko
Fellow of ASM International (FASM)
IQ Technologies Inc.
Akron, USA
&
Intensive Technologies Ltd
Kyiv, Ukraine
E-mail: NKobasko@aol.com

Abstract: Manufacturing steels of optimal chemical composition, combined with intensive quenching, is an important step to save essential alloy elements and make the environment cleaner. As a rule, alloy steels are hardened in oils or high concentration polymers to prevent crack formation during quenching. However, slow cooling in oils requires more alloy elements to provide the needed surface hardness and hardenability. To provide an optimal hardened layer and optimal residual stress distribution in machine components after intensive cooling, chemical composition of steel must be properly optimized to create high compressive residual stresses at the surface of steel parts after intensive quenching. Compressive residual stresses and high cooling rate within the martensite range result in additional strengthening of material. Both high compressive residual stresses at the surface of steel parts and additional strengthening (superstrengthening of the material) increase significantly their service life and save expensive alloy elements. After intensive quenching machine components, made of optimal hardenability steels, provide the following benefits: (1) high compressive residual stresses at the surface of steel parts are formed; (2) the super strengthening phenomenon in the surface layers take place; (3) mechanical properties of material at the core of steel parts are significantly improved due to high cooling rate during intensive cooling; (4) crack formation decreases due to compressive residual stresses at the surface and low tensile residual stresses at the core where material is softer. (5) distortion of steel parts decreases because the core does not swell. All of these factors increase service life of machine components, save energy and improve environment condition in heat treating industry.
These important problems are widely discussed in the plenary lecture and appropriate results of computer simulations of technological processes are provided.

Brief Biography of the Speaker: Dr. Kobasko received his Ph.D. from the National Academy of Sciences of Ukraine. He is a leading expert on quenching and heat transfer during the hardening of steels. He was the Head of the laboratory of the Thermal Science Institute of the National Academy of Sciences of Ukraine. He is Director of Technology and Research and Development for IQ Technologies, Inc., Akron, Ohio and supervisor of Intensive Technologies, Ltd, Kyiv, Ukraine. The aim of both companies is material savings, ecological problem-solving, and increasing service life of steel parts. He is an ASM International Fellow (FASM). Dr. Kobasko is the author and coauthor of more than 270 scientific and technical papers, several books and more than 30 patents and certificates. He received the Da Vinci Diamond Award and Certificate in recognition of an outstanding contribution to thermal science. Dr. Nikolai Kobasko was Editor-in-Chief and Co-Editor of the WSEAS Transactions on Heat and Mass Transfer; and is currently a member of the Editorial Board for the International ASTM Journal "Materials Performance and Characterization (MPC).

Plenary Lecture 2

Mathematical Modeling Based on Experimental Data for the Internal Combustion Engines



Associate Professor Krisztina Uzuneanu
Thermal Systems and Environmental Engineering Department
"Dunarea de Jos" University of Galati
Romania
E-mail: kuzuneanu@ugal.ro

Abstract: The mathematical model is, in an unpretentious sense, an attempt to describe as really as possible a time-developing process or phenomenon regardless of the type of phenomenon envisaged; modeling aims to analytically highlight some difficult – to-see or even imperceptible issues. At the same time, mathematics makes availbale to researchers analysis methods and methodologies able to provide a meaningful explanation of both causes and effects of such less known phenomenological aspects.
The functional components of the engine result by adapting some adjustable parameters such as: cooling agent temperature, overcharge pressure,etc. In this paper , the internal combustion engine will be analyzed as an object adjustable according to the adopted parameter.

Brief Biography of the Speaker: Dr. Krisztina Uzuneanu graduated Faculty of Mechanical Engineering of University "Dunarea de Jos" of Galati in 1984 and she obtained the title of Doctor Engineer in 1998.
Since 1987 she followed the academic carrier at "Dunarea de Jos" University of Galati as assistant, lecturer and associate professor. Dr. Uzuneanu is a visiting professor at different universities: Universidade do Minho, Portugal, Universita degli Studi di Genova, Italy, Universita degli Studi di Salerno, Italy, Pannon University Veszprem, Hungary, Erciyes University Kayseri, Turkey and visitor scientist of of Universidade do Minho Guimaraes, Portugal where she was awarded with a post-doc NATO grant in 2002 - 2003.
Research fields are connected with applied thermodynamics, alternative fuels for internal combustion engines, modeling the thermal stresses of different parts of internal combustion engines, renewable energy and pollution.
Dr. Uzuneanu published over 100 articles in national and internationals conferences proceedings and she is author of 3 books.
The research work was done as member of 20 research contracts financed by European Commission and Romanian Ministry of Education and Research and director of 5 research contracts financed by industry.
Dr K. Uzuneanu is member of Romanian Society of Thermodynamics since 1990 and member of Balkan Environmental Association since 2011.