

MAGNITOGORSK ROLLING PRACTICE 2019: THE BENCHMARK FOR YOUNG SCIENTISTS FROM AROUND THE WORLD

A. G. Korchunov¹

¹ *Nosov Magnitogorsk State Technical University (Magnitogorsk, Russia)*

E-mail: international@magtu.ru

AUTHOR'S INFO ABSTRACT

A. G. Korchunov,
Dr. Eng., Prof., Chair-
person of the Organizing
Committee, Vice Rector
for International Affairs

Key words:

metal forming, interna-
tional youth conference,
rolling practice, research,
industrial tour

Leading scientists from Europe and Asia and young scientists specializing in metal forming took part in the 4th international youth scientific and practical conference *Magnitogorsk Rolling Practice 2019* which took place at Nosov Magnitogorsk State Technical University (NMSTU) from 4th to 7th June. This year the conference was dedicated to the 85th anniversary of NMSTU and the 90th anniversary of Magnitogorsk city. For four days the participants followed a busy agenda. On the first day, a plenary session was delivered by well-known scientists from India, China, Italy, Poland and Russia. On the second day, specialized workshops for young scientists were held. More than forty young participants from various cities of Russia, as well as Poland, Iraq, Kazakhstan, Belorussia and Myanmar, presented the results of their research in three workshops: “Cross-disciplinary solutions in advanced materials engineering”, “Innovative technologies and materials in metal forming” and “Fundamental problems of metal forming in view of current needs of the global industry”. In addition to lectures and discussions, conference participants took an industrial tour around Magnitogorsk Iron and Steel Works PJSC (Russia’s largest iron and steel company), looked at the university infrastructure and enjoyed an entertainment program outside the city, in particular, a visit to a well-known alpine-skiing center near Bannoye Lake.

Magnitogorsk Rolling Practice 2019 welcomed over 120 participants from India, China, Italy, Poland, Russia, Poland, Iraq, Kazakhstan, Belorussia and Myanmar. The participants also included industry experts and students of metal forming.

Traditionally, the conference is meant to gather young researchers and world-known scientists from Russia and abroad to discuss the latest achievements in metal forming processes [1]. The conference is a unique event, distinguished by its non-conventional format providing for workshops by leading scientists and reports presented by young researchers during specialized sessions. The participants note that such non-conventional format is a big advantage, as they can listen to reports of leading scientists and then present their own research and get valuable feedback and evaluations from renowned scientists.

Vice rector for research and development Oleg Tulupov gave a welcoming speech at the plenary session noting that the conference format provided a stimulus to a wider cooperation between young researchers dealing with metal forming and would help build new international research teams. He mentioned that it also stimulated postgraduates to go further in their research pursuits and become active participants in top-level international forums (Fig. 1) [2].

The first plenary report was presented by professor Puneet Tandon from the Indian Institute of Information Technology, Design and Manufacturing Jabalpur, India. The report was entitled as “Elevated temperature — incremental forming”. From his report the listeners learned about the innovative processes of incremental forming of flat rolled stock, which can find application in various industries — from car making to medicine (Fig. 2) [3].



Fig. 1. Dr. A. Korchunov, Dr. O. Tulupov and Dr. I. Calliari in the conference presidium



Fig. 2. Dr. P. Tandon's report

The next speaker — professor Irene Calliari from the University of Padua, Italy — presented her report on “Electrically enhanced plastic deformation of steels”. The report focused on the results of research study that looked at various aspects of the electroplastic effect in

metals during tensile tests, deriving both from continuous electric current and pulsed regime, in order to achieve reliable data for the application of the electroplastic effect to an industrial scale [4].

The closing speech of the plenary session featured a welcoming presentation of the 5th ECCOMAS Young Investigators Conference (YIC2019) and the 18th International Conference Metal Forming 2020, presented by Anna Smyk from AGH University of Science and Technology, Poland.

The second part of the plenary session began with a report presented by professor Elena Korznikova from the Institute for Metals Superplasticity Problems of RAS in Ufa, Russia, on the following subject: “Atomistic simulations of deformation mechanisms during metal forming”. The report provided a comprehensive overview of recent advances in molecular dynamics simulation studies of deformation mechanisms in metals and alloys taking place during metal forming together with the critical analysis of the possibilities of this approach application in different fields [5].

The report presented by professor Hailiang Yu from the Central South University, China, on the subject of “Enhanced mechanical properties of metal sheets by special rolling techniques” provided a summary of the results obtained in the course of a long-term research study into the application of special rolling techniques for improvement of the mechanical properties of metal sheets [6]. These techniques include asymmetric rolling, cryorolling, asymmetric cryorolling, cross-accumulative roll bonding and skin-pass rolling, combined accumulative roll bonding and subsequent asymmetric rolling.

The following report was presented by Sergey Stebunov from QuantorForm LLC in Moscow, Russia. The report had the following title: “Recent Advances in Metal Forming Simulation: Microstructure, Phase Transformation and Ductile Fracture”, and it covered the recent developments in metal forming simulation on the basis of QForm [7].

Professor Alexander Pesin from Nosov Magnitogorsk State Technical University, Russia, in his report entitled as “Numerical modeling and development of new hybrid metal forming methods” described the results of the development of theory, mathematical models and novel processes, which were helpful in the forming of the ultra-high strength materials by combining the conventional methods of forming such as drawing, stamping, plate rolling, plastic bending and asymmetrical rolling with the process of incremental sheet forming [8].

The conference continued the following day in the form of three specialized workshops: “Cross-disciplinary solutions in advanced materials engineering”, “Innovative technologies and materials in metal forming” and “Fundamental problems of metal forming in view of current needs of the global industry”, giving the floor to young researchers who presented the results of their research work.



Fig. 3. The visit to Magnitogorsk Iron and Steel Works

All the reports were of high academic value, and the speakers strived to make memorable presentations of their scientific achievements. In spite of their young age the speakers acted like mature researchers demonstrating their capability to tackle complex problems in the field of metal forming.

The subjects covered by young participants point at the research fields that are of special relevance at the moment. They include:

- Multiscale modelling of metal forming processes that also considers the evolution of structure and properties in the processed metals and alloys;
- Computer modelling of metal and alloy forming processes on the basis of Abaqus, Deform 3D, ANSYS software packages;
- Innovative metal forming processes including rolling, pipe making and drawing;
- Study of rheological properties of metals and alloys;
- Modernization of metallurgical sites through automation and implementation of advanced processing on the basis of digital IT technologies.

A particular feature of *Magnitogorsk Rolling Practice* is an eventful entertainment program which includes an industrial tour. A visit to the Magnitogorsk Iron and Steel Works, one of the largest metallurgical enterprises in Russia, fascinated the guests. Many of the visitors had previously visited metallurgical sites, but the Magnitogorsk Works really impressed them with its size and scope (Fig. 3). Besides, NMSTU organized a city tour and a visit to beautiful countryside zones around the city.

At a closing meeting, the best reports of young scientists were announced. Thus, the 1st degree diploma was awarded to Grzegorz Smyk, AGH University of Science and Technology (Krakow, Poland) for his report: “Implementation of the Universal Interface that Allows the Communication Between Many Models to Perform Hot Strip Rolling Schedules” (Fig. 4) [9].



Fig. 4. Dr. A. Korchunov awards G. Smyk with the 1st degree diploma

The second place was shared between Russian young scientists: Denis Voroshilov, Siberian Federal University (Krasnoyarsk) for his report: “Development of Technology for Obtaining Wires of Electrotechnical Purpose from Alloys of the Al-REM System Received by Using Methods of Combined Processing” and Daria Komkova, Institute of Metal Physics, the Ural Branch of the Russian Academy of Sciences (Yekaterinburg) for her report: “Severe Plastic Deformation of Magnesium by Methods of Lateral and Back Extrusion at Low Temperatures” [10]. The 3rd degree diplomas were awarded to two participants as well: Akhmed Salim Oleivi Al-Khuzai, a post-graduate student from the South Ural State University (Chelyabinsk) for his report: “Study of Steel Resistance to Plastic Deformations within a Broad Temperature Range for Pipe Steels” and Alexander Gulin from NMSTU for his report: “The Way to Improve the Complex of Mechanical Characteristics of Drawn Steel Wire” [11].

The best speakers received prizes and invitations to publish their papers in the journals, which acted as the information partners of the conference: “Chernye metally” (“Ferrous metals”), “CIS Iron and Steel Review”, “Vestnik Magnitogorskogo gosudarstvennogo tekhnicheskogo universiteta im. G. I. Nosova” (“Vestnik of NMSTU”) and “Mekhanicheskoe oborudovanie metallurgicheskikh zavodov” (“Mechanical Equipment of Metallurgical Plants”). There were also individual nominations for the best reports.

Closing of the conference is meant to be an opening of new research. The participants exchanged their contact details in order to keep in touch and work on joined projects.

“I have been visiting many conferences every year and I can say that this is one of the most finely organized conference in terms of warm feelings people are provided, love and affection which is given by all people over here. And a very important thing is that this is a platform which is provided for future researchers, the people who will continue to develop technologies for further generations. This platform is important because it gives an idea of how to write a manuscript, to make a report, how to present and share the ideas, how to listen to ideas of other people, how to ask questions.

This is a perfect platform for young researchers to share their knowledge among other people. Having received comments from other scientists, you may know what direction to move and what others think about your work. This is important. That is why this conference is a wonderful platform for such practice. Thank you, NMSTU, for such opportunity!” commented Puneet Tandon, professor at the Indian Institute of Information Technology, Design and Manufacturing.

“My research is devoted to severe plastic deformation of magnesium and its alloys. In particular, at this conference I gave a speech on new methods developed by our Institute of Metal Physics in the Strength Research Laboratory. I liked the conference very much, especially foreign speakers. Listening to lectures from leading scientists is very interesting!” said Daria Komkova from Yekaterinburg, while holding in her hands her 2nd degree diploma of **Magnitogorsk Rolling Practice 2019**.

The conference proceedings were compiled into a 150-page volume. More information about the Conference can be found at the following website: <http://mrp.magtu.ru>.

Magnitogorsk Rolling Practice 2020, which will be conference No. 5, is to take place from 2nd till 5th June 2020 at Nosov Magnitogorsk State Technical University.

REFERENCES

- Korchunov A. G. Magnitogorsk rolling practice 2018 — International youth scientific-practical conference in the Nosov Magnitogorsk State Technical University. *Chernye Metally*. 2018. No. 9. pp. 6–8.
- Rumyantsev M. I., Tulupov O. N. Further developments in simulation of metal forming processes. *CIS Iron and Steel Review*. 2018. Vol. 16, pp. 21–24.
- Tandon P., Sharma O. N. Experimental investigation into a new hybrid-forming process: Incremental stretch drawing. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*. 2018. Vol. 232(3), pp. 475–486.
- Ghiotti, A., Bruschi, S., Calliari, I., Bariani, P. Electroplastic effect on AA1050 aluminium alloy formability. *CIRP Annals*. 2018. Vol. 67(1), pp. 289–292.
- Nikitiuk A. S., Korznikova E. A., Dmitriev S. V., Naimark O. B. Nonlinear dynamics of DNA with topological constraints. 2018. *Letters on Materials*. Vol. 8 (4), pp. 489–493.
- Yu H., Du Q., Godbole A., Lu C., Kong C. Improvement in Strength and Ductility of Asymmetric-Cryorolled Copper Sheets Under Low-Temperature Annealing. *Metallurgical and Materials Transactions A: Physical Metallurgy and Materials Science*. 2018. Vol. 49(10), pp. 4398–4403.
- Stebunov S., Vlasov A., Biba N. Prediction of fracture in cold forging with modified Cockcroft-Latham criterion. *Procedia Manufacturing*. 2018. Vol. 15, pp. 519–526.
- Pesin A., Pustovoytov D. Novel technique for physical simulation of asymmetric rolling. *Procedia Manufacturing*. 2018. Vol. 15, pp. 137–143.
- Smyk G., Pernach M., Ambroziński M. Thermal-mechanical-microstructural model of rolling and cooling of rails. *Computer Methods in Materials Science*. 2015. Vol. 15(3), pp. 416–426.
- Komkova D. A., Antonova O. V., Volkov A. Y. On the Issue of the Improvement of Magnesium Plasticity by Cold Severe Plastic Deformation. *Physics of Metals and Metallography*. 2018. Vol. 119(11), pp. 1120–1126.
- Polyakova M. A., Calliari I., Pivovarova K. G., Gulina A. E. Approach to obtaining medium carbon steel wire with a specified set of mechanical properties after combined deformational processing. *Materials Physics and Mechanics*. 2018. Vol. 36(1), pp. 53–59.