BULETINUL Universităţii Petrol – Gaze din Ploieşti	Vol. LXV No. 2/2013	77 - 82	Seria Tehnică

	Marie Curie Actions International Research Staff Exchange Scheme	**INNO**VATIVE NONDESTRUCTIVE TESTING AND ADVANCED COMPOSITE REPAIR OF **PIPE**LINES WITH VOLUMETRIC **S**URFACE DEFECTS **Project acronym:** INNOPIPES **Project number:** 318874 **Project duration:** 1 September 2012 – 31 August 2016

INNOPIPES European Project
First Training Event at the Military University of Technology Warsaw, Poland, 21-29 May 2013

Between 21 and 29 May 2013, at the ***Military University of Technology*** (***WAT*** - ***W****ojskowa* ***A****kademia* ***T****echniczna im. Jarosława Dabrowskiego*), located in Warsaw (Poland), an important scientific event, involving also our university, has taken place: the *First training event* of an European FP7 project, Project No. 318874, *INNOPIPES – "**Inno**vative Nondestructive Testing and Advanced Composite Repair of **Pipe**lines with Volumetric **S**urface Defects"*, financed by the *European Commission*, within the *7th Framework Programme*, FP7-PEOPLE-2012-IRSES, *International Research Staff Exchange Scheme*, *Marie Curie Actions*. Our university has a research team from the Department of Mechanical Engineering that is involved in this project (a general presentation of which has been included in a previous issue of our *Bulletin*: Vol. LXIV, No. 4/2012, pp. 97-99, within the column *International Projects and Conferences*).

The *training event* has been attended by researchers from all eight partners of the *INNOPIPES Project*, Universities and academic research institutes from EU and third countries: the Institute of Materials and Structures from the Riga Technical University, Latvia (represented by the project coordinator, Prof. Evgeny

Barkanov); the Department of Mechanics and Applied Computer Science from the Military University of Technology, Warsaw, Poland (host organisation); the Institute of Mechanics from the Bulgarian Academy of Sciences, Sofia; the Department of Mechanical Engineering of the Petroleum-Gas University of Ploieşti (represented by Assoc. Prof. Andrei Dumitrescu, coordinator of the research team from our university involved in the project); the E. O. Paton Electric Welding Institute of the National Academy of Science of Ukraine, Kiev; the State Scientific Institution V.A. Belyi Metal-Polymer Research Institute of the National Academy of Sciences of Belarus, Gomel; the Research Institute for Mechanics and Applied Mathematics from the Southern Federal University, Rostov-on-Don, Russia; the Department of Dynamics and Strength of Machines from National Technical University "Kharkov Polytechnic Institute", Ukraine.

The host of the event, the *Military University of Technology "Jaroslaw Dabrowskiego"*, is a public academic institution founded in 1951. The educational offer of WAT includes first (B.Sc.), second (M.Sc.) and third (Ph.D.) degree studies, as well as post-graduate studies and training courses. The educational processes in WAT are organised within seven faculties: Cybernetics, Electronics, Civil Engineering and Geodesy, Mechanical Engineering, Mechatronics and Aeronautical Engineering, Advanced Technologies and Chemistry, Optoelectronics. WAT is located in a green, environmental friendly area within the Bemowo district of Warsaw, the capital and largest city of Poland.

The training event has been opened by the following WAT officials, who had warmly welcomed the participants and wished them success and fruitful discussions on the issues of the project: Prof. ***Zdzislaw Bogdanowicz***, Dean of the Faculty of Mechanical Engineering (speaking in the nearby picture), Prof. ***Tadeusz Niezgoda***, Head of the Department of Mechanics and Applied Computer Science (left), and Prof. ***Jerzy Malachowski***, Deputy Dean for Scientific Affairs and head of the WAT research team involved in the INNOPIPES Project (right).

The first day of the event (21 May) was dedicated to a *Project meeting*, conducted by the project coordinator, Prof. ***Evgeny Barkanov***, Riga Technical University (in the picture below). Each Work Package (WP) leader has presented the work performed within each WP and the future activities planned, including dissemination. The project is divided in five WP (described in our general presentation previously mentioned), coordinated by the Bulgarian Academy of Sciences, V.A. Belyi Metal-Polymer Research Institute, the Petroleum-Gas University of Ploieşti, E. O. Paton Electric Welding Institute and Riga Technical University (coordinating WP5 – Management and dissemination). Each presentation has been followed by discussions which

defined the future lines of action required by an optimal development of the research activities within INNOPIPES Project. Dissemination, financial management and budget distribution aspects have also been discussed and decided, as well as the organization of the next project meeting and the second training event, both planned next year.

In the following two days of the event (22-23 May), experienced researchers from the organizations involved in the project held several lectures for the young researchers included in the research teams, followed by constructive discussions. The topics of these lectures, describing the partners experience in the various fields connected to the project, have been the following:

- *Non-destructive testing methods used in the diagnosis of pipelines*, presented by Prof. ***Mitko Mihovski***, Institute of Mechanics, Bulgarian Academy of Sciences, Sofia;
- *Introduction on guided wave ultrasonic testing of pipelines*, held by Dr. ***Andrej Shekero***, E. O. Paton Electric Welding Institute, National Academy of Science of Ukraine, Kiev;
- *Methods for the evaluation of the severity of the Volumetric Surface Defects detected on steel transmission lines and for the definition of the pipeline areas requiring maintenance works* and *Repair methods for transmission pipelines with Volumetric Surface Defects*, both presented by Assoc. Prof. ***Andrei Dumitrescu***, Petroleum-Gas University of Ploieşti (in the picture below);

- *Composites based on epoxy resins used to repair mechanic-chemical flaws of trunk gas and oil pipelines*, held by Dr. ***Vladimir Sergienko***, V.A. Belyi Metal-Polymer Research Institute, National Academy of Sciences of Belarus, Gomel;
- *Organosilicate nanostructured modifiers of composites based on epoxy resins used to repair corrosion and mechanical damage of trunk gas and oil pipelines*, presented by Dr. ***Elena Kudina***, V.A. Belyi Metal-Polymer Research Institute, National Academy of Sciences of Belarus, Gomel;
- *Non-destructive techniques for reliable characterization of the mechanical properties of materials used in composite repair* and *Influence of measurement and modeling errors on identified material properties*, both held by Prof. ***Evgeny Barkanov***, Institute of Materials and Structures, Riga Technical University, Latvia;

- *Analysis of cylindrical shells with reinforcement bandages*, presented by Prof. ***Gennadiy Lvov***, NTU Kharkov Polytechnic Institute, Ukraine;
- *Investigations in low cycle*

strength of corrosion damaged pipelines, held by Dr. ***Peter Yukhymets***, E. O. Paton Electric Welding Institute, National Academy of Science of Ukraine, Kiev;
- *Numerical and experimental testing of pipeline components*, presented by Prof. ***Jerzy Malachowski***, Military University of Technology, Warsaw, Poland;
- *Contact problems for multilayer cylindrical pipe*, held by Prof. ***Michael Chebakov***, Southern Federal University, Rostov-on-Don, Russia.

In the following day (24 May), our kind and friendly hosts have organized an interesting visit to some of the research facilities of the Military University of Technology, belonging to the Departments: Advanced Materials and Technologies, Mechanics and Applied Computer Science, Machine Building. We have noticed the ample logistical base for research on new materials, the modern equipment for the determination of physical and chemical properties (hardness, wear resistance, toughness etc.). The academic staff and the students of WAT are able to conduct research activities in the field of design and development of alternative technologies for production and machining metal products, plastics, composites, etc., including those intended for elevated temperatures or corrosive environments, thus replacing the traditional, expensive and time-consuming technologies.

The training event has been closed at the beginning of the following week (27-29 May) with a *Round table* for the early stage researchers involved in the project, where young professionals of the partner organizations from third countries and WAT reported their research results and their possible use within the project. Their presentations where followed by discussions moderated by Prof. G. Lvov, Dr. E. Kudina, Prof. M. Chebakov and Dr. P. Yukhymets. The subjects of these interesting presentations were the following:
- *Contact interaction of a cylindrical shell with a composite bandage with consideration of the shear stiffness*, ***Dmitry Beschetnikov***, NTU Kharkov Polytechnic Institute;
- *FEM analysis of 3-D stress state around volumetric defects on pipeline surface*, ***Volodymyr Okorokov***, NTU Kharkov Polytechnic Institute;
- *Application of heterogeneous media models to the analysis of structures*, ***Alexander Liapin***, Southern Federal University;
- *Numerical and experimental testing of composite coupons*, ***Lukasz Mazurkiewicz***, Military University of Technology;
- *Material tests under high strain rates*, ***Pawel Baranowski***, Military University of Technology;
- *Wear process – the concept of numerical approach*, ***Krzysztof Damaziak***, Military University of Technology;
- *Mathematical description ductility-dip cracking of weld metals with FCC lattice*, ***Grigory Beliajev***, E. O. Paton Electric Welding Institute;
- *Combination of traditional and long-range ultrasonic testing in the pipelines diagnostics*, ***Sergey Shvydkiy***, E. O. Paton Electric Welding Institute;
- *Evaluation of stress concentration in the weld area, depending on its geometrical parameters*, ***Sergei Prokopchuk***, E. O. Paton Electric Welding Institute.

In the end of our report regarding the *INNOPIPES training event*, a few words about the city where it was held and which left a very positive impression to all visiting participants that had a chance to get acquainted with it – one of the most beautiful cities in Central and Eastern Europe,

an important cultural and industrial centre, the impressive, welcoming and dynamic ***Warsaw***. The visitors' impression is even stronger when taking into account the recent history of the town. In fact, Warsaw has been rebuilt after the last war virtually "from zero" (85% of its original architecture has been completely destroyed as a result of the Second World War, but it has been meticulously and tenaciously reconstructed based on old drawings and photographs). The visit of the city is facilitated by a well served public transport system functioning on schedule.

The most interesting places in Warsaw to be visited are, in our opinion: the *Old Town*, the historic centre of the city, granted in 1980 with the status of a UNESCO World Heritage site of culture (the picture nearby shows the Old Town Square with the legendary Mermaid Statue – a symbol of Warsaw); the *Royal Route*, a most remarkable succession of streets bordered by many elegant palaces, churches, galleries and museums, connecting three former royal residences – the Royal Castle in the Old Town, the Royal Laziensky (summer residence, placed in a wonderful park, where one can find the statue below of one of the most famous sons of Poland – Fryderyk Chopin) and the beautiful Wilanow Palace; the modern city centre (its impressive skyline can be seen in a picture below).