

International Projects

COST MP0602 (COST) (05.08.2008-15.05.2011)

Jozef Janovec, Professor, DrSc.

Preparation and characterisation of lead-free solders

The project is focused on processing and investigation of properties of novel lead-free solders for high-temperature applications. New solders developed in the frame of the project will consist of various combinations of tin, zinc, cobalt, silver, copper and rare earth elements. Thermodynamic and kinetic aspects of soldering will be studied. Phase equilibria and formation of intermetallic phases at the solder/substrate interface will also be investigated.

IFW MTF STU (04.07.2008-31.12.2010)

Jozef Janovec, Professor, DrSc.

Investigation of fine structures in metallic materials using TEM

With the intention to improve the investigation of fine metallic structures at the Faculty of Materials Science and Technology of STU, the IFW provided financial resources for purchase of ancillary units for TEM (Delta Abrasiment).

DAAD 1 (01.01.2009 - 31.12.2010)

Jozef Janovec, Professor, DrSc.

Metal matrix composites reinforced with complex metallic alloys

Complex metallic alloys display several interesting properties, such as good corrosion resistance and high-temperature strength, however, they are brittle at room temperature in the single-phase form, which limits their use in engineering applications. A way to improve the room temperature ductility is the development of a heterogeneous microstructure combining a soft metallic matrix with second-phase CMA particles. The CMA particles act as a strength-bearing component, while the metallic matrix supplies ductility. The project is focused on the production, the structure character and the mechanical testing of high-strength metal matrix composites reinforced with complex metallic alloys.

EFDA- European Fusion Development Agreement - Research programme in the field of thermonuclear fusion (01.01.2010 - 31.12.2010)

Miroslav Urban, Professor, DrSc.

Chemical sputtering: Computational modelling of interactions in the carbon-containing films exposed to molecular ions and hydrogen. EUROATOM CU

The project aim is to know processes via methods of computer modelling which can be by interaction of products of low-temperature plasma with walls of a reactor by nuclear fusion (plasma – wall interactions). There is the most frequent expectation in construction of fusion reactor walls (particularly in a divertor) that a construction material will be wolfram covered with layer of amorphous hydrocarbon films (a-C:H). One of the project aims is to study the stability and the reactivity of various ions which can occur during interaction of plasma particles with divertor walls, also their capture and release into an area of the reactor. Layers of poisonous BeO are alternative materials which are considered in processes of plasma products interaction. We take into account in our project also other alternatives, e.g. based on compositions of $B_xC_yN_z$, - the content determines if they can create firm layers with properties which are necessary in the material to provide an interaction of the plasma components with reactor walls.

Bekaert, Zwevegem, Belgium (26.05.2008-25.05.2010)

Martin Kusý, Assoc. Prof. PhD.

Progressive materials, processing and automation

The subject of the project will be research on advanced materials, processing and automation technologies for direct manufacturing and application. The aim of the project is to bridge basic and applied research in the field of advanced materials with application and manufacturing leading to competitiveness and sustainable growth of both partners. A valuable and unique aspect of the research project is broad involvement of students of master and doctoral degree in up-to-date research activities.

National Projects

APVV-0009-07 (01.01.2008- 31.12.2010)

Svetozár Demian, MSc. Eng.

Metallurgical preparation and research of new intermetallic materials for extreme stress conditions

The project is focused on the development of an optimal metallurgical preparation of high-reactive and heavy melting intermetallic based alloys (TiAl, TiB₂ and others) and the research of new systems appropriate for extreme conditions characterised especially by a high temperature, an aggressive environment, a high mechanical and thermal load. The required chemical composition and lower price of new generation of polyphase intermetallic alloys on the base of TiAl can be reached with precursors prepared by an original way from output material isostatic compacting reaction that will follow in remelting or plasma arc furnace. This approach will provide significant improvements in their chemical homogeneity, high flexibility in the alloy necessary ingredients to minimize impurities, thereby obtaining the desired properties for use in extreme conditions.

VEGA 1/1000/09 (01.01.2009- 31.12.2012)

Milan Ožvold, Professor, PhD.

Properties of soft lead-free solders and their reactions to interface with the substrate in liquid and solid form.

Noble earths are added to improve properties of lead-free solders on base of Sn/Cu/Ag. We added cerium in small amounts (0.1, 0.2 and 0.5 wt%) into eutectic compounds of solders and we compared their properties. Observations showed differences in solders microstructure in dependence on content of Ce. We have studied morphology intermetallics which are formed on the range of fluid solid and copper plate in dependence on time of soldering. The most significant changes were observed for solders SnAg_{3,5} and SnAg_{3,5} + 0,5% Ce, by time of soldering 256 seconds. Layer of intermetallics was destroyed in solder with Ce and particular units of the phase Cu₆Sn₅ did not grow to big shapes and dimensions. Mechanical properties of solders were also measured. Shear strength of solder with eutectic solder SAC357 is significantly higher than one with hypoeutectic solder with low content of silver SACX0307. However relative decline of shear strength of SACX0307 is minimal after ageing 200 hours at temperature of 150°C, while it is significant by eutectic solders.

VEGA 1/0011/10 (01.01.2010 - 31.12.2010)

Jozef Janovec, Professor, DrSc.

Characterization of structurally complex materials to improve their application possibilities.

The project is focused on research of complex metal alloys and nanostructure of materials. Alloys of type Al-Mn-TM and Al-Pd-TM in annealed state (TM = transition metal) and Al-CMA composites (CMA = complex metal alloy) are characterised with x-ray diffraction, TEM (HRTEM), DTA, HR SEM, EDX, WDX and EBSD, as well as thermodynamic modelling. Experiments results and theoretical knowledge will help to calculate basic thermodynamic

parameters of studied systems and identified phases. Application of progressive experimental methods creates prepositions for innovations in methodology area. Solving of the project will enlarge basic research knowledge with possible transfer into praxis.

VEGA 1/0126/08 (01.01.2008- 31.12.2010)

Mária Dománková, Assoc. Prof. PhD.

Improvement of microstructural stability and corrosion resistance of stainless steels controlled by precipitation of secondary phases.

The process of the secondary phase precipitation controls the mechanical and physical properties of stainless steels. The main goal of this project is characterisation of the influence of selected factors (chemical composition, annealing conditions, deformation) on kinetics and thermodynamics of the secondary phase precipitation in stainless steels.

VEGA 1/0173/08 (01.01.2008- 31.12.2010)

Viera Trnovcová, PhD.

Physical properties of optical crystals and glasses of heavy metal halides, chalcogenides and oxides

To study optical, mechanical, thermophysical and electrical properties and phase transition in crystalline, glassy and composite heavy metal halides, oxides, oxides and chalcogenides doped with rare earth, for applications in optonics, fiber optics, superonics and dosimetry. To determine relations between properties, composition, defect structure and preparation technique.

VEGA 1/0148/08 (01.01.2008- 31.12.2010)

Roman Moravčík, Assoc. Prof. PhD.

Analysis of tool materials prepared by progressive powder metallurgy processes

The project will be primarily oriented to the analysis of distinguished parameters of the atomisation process and to distinguished characteristics of the microstructure of rapidly solidified powder particles, which were prepared from highalloyed materials of tool steels and properties with respect to application possibilities. The obtained knowledge will be the base for a correlation model design which simulates relations between rapid solidification of materials produced by powder metallurgy processes.

VEGA 1/0840/08 (01.02.2008- 31.12.2010)

Andrej Antušek, PhD.

Ab initio calculations of NMR properties with electron correlation and relativistic effects and vibrational corrections

This project is focused on precise ab initio calculations of NMR properties of molecules. We will explore trends of all important contributions such as electron correlation effects, relativistic effects and vibrational corrections for NMR properties of selected systems. The accuracy which can be reached using "state of the art" quantum chemical methods will be evaluated by comparison of theoretical results and gas-phase NMR experimental values.

VEGA 1/0648/10 (01.01.2010 - 31.12.2011)

Filip Holka, PhD.

Accurate ab-initio calculation of the potential energy hypersurface of ozone for the theoretical molecular

The project is focused on ab-initio calculation of global potential energetic hyperarea of basic electronic state of ozone with a sufficient accuracy for next application in theoretical rotation-vibration spectroscopy. To gain this aim we will study into details a convergency of hyperarea to a limit of complete base, relativistic effects and contribution of internal electrons correlation. One important part of project is the calculation of adiabatic correction and analysis of its influence on a shape of hyperarea. According to this analysis we will design an optimal methodological access which is appropriate for a construction of global energetic hyperarea and we will make a calculation.

VEGA 1/0645/10 (01.01.2010 - 31.12.2011)

Stanislav Minárik, Assoc. Prof. PhD.

Analysis of irreversible changes in condensed non-crystalline structures

The project is focused on a study of causes of permanent (irreversible) changes in selected condensed non-crystalline structures. The main attention will be on processes of polymerisation and photodegradation of plastics, vulcanization of rubber compound as well as irreversible changes in glass structure. Structure modifications are usually typical by creation of free spaces, new parts and phases which can be observed by different way. In case of the mentioned non-crystalline substances the structure modifications can not be reflected in a visible destroying of structure symmetry. Methods of their identification and evaluation are therefore more complicated than crystalline substances. We will study the examination possibilities of process character via different experimental methods based on IR and UV-VIS spectroscopy, dielectric spectroscopy and thermal analysis. The project aim is a search of correlation possibilities between results of mentioned methods and design of models for description of irreversible processes in non-crystalline structures.

KEGA 327-010STU-4/2010 (01.01.2010 - 31.12.2011)

Marián Kubliha, Assoc. Prof. PhD.

Promotion of new responsibilities for IT application in materials research and education

The project is focused on an improvement of intellectual skills of graduates of the II. and III grade of university study in area of preparation and management of technical experiment supported with IT technology, especially correct selection, application of communication systems of measurement appliances, technological equipment, sensors, etc. The aim of project is to prepare and implement a subject processed in a specialised laboratory into syllabus. Students can gain new competencies which will increase their ability to be successful at labour market and workplaces which are using a top technology. We expect an increase of research potential and the growth of flexibility of graduates.

APVV SK-CZ-0143-09 (23.03.2010 - 31.12.2011)

Co-researcher Vladimír Labaš, Assoc. Prof. PhD.

Addressing the technology of special glasses using physical methods

The project is focused on a support of cooperation between Slovak and Czech partner in area of preparation and testing of physical properties of special glass. It is the study of causes of permanent (irreversible) changes in structure of glass. Structure modifications are usually typical by creation of free spaces, new parts and phases which can be observed by different way. In case of the mentioned non-crystalline substances the structure modifications can not be reflected in a visible destroying of structure symmetry. Methods of their identification and evaluation are therefore more complicated than crystalline substances. We will study the examination possibilities of process character via different experimental methods based on IR and UV-VIS spectroscopy, dielectric spectroscopy and thermal analysis. The aim of project is a search of possible correlations between mentioned methods and proposing of models for description of irreversible processes in non-crystalline structures. The project will support also a cooperation with French partner who cooperates with both workplaces.

Projects 2010 - INSTITUTE OF PRODUCTION TECHNOLOGIES**Centre of Excellence for Five-Axis Machining (CE)**

Five-axis machining is one of the main trends in cutting technology used for mould production. The term five-axis machining means cutting machine tools through which

the movement carried out moves in five different axes simultaneously. The benefit of five-axis machining is the machine's ability to machine complex shapes in a single set-up and achieve a uniform surface with roughness being cultivated.

The Centre will have the opportunity to realize the basic research on 5-axis machining of complex shape parts, including control and measurement and will also be able to monitor the quality of cutting fluids and cutting processes. It will be able to provide for all levels of learning in education together with establishing an experimental base for doctoral researchers from Slovak and foreign universities, and also practitioners.

The ambition of the project is to help mould and die manufacturers (developers, designers, technologists, quality control persons, supervisors, young starting engineers and also skilled senior engineers) to mostly find theoretical and practical orientation (guidance) in this difficult cutting process of five-axis machining.

International Projects

TOWARDS A COMMON RESEARCH PROJECT (01.10.2008-31.12.2011)

Jozef Peterka, Professor, PhD.

The main purpose of the project is to expand the theoretical concept of CAD-CAM-CNC on concept CAD-CAM-CNC-CAQ-CAD and experimentally verify this new concept in the field of manufacturing of free form surfaces and in the field of assembly parts with free form surfaces in the conditions of university.

6. FP EU (01.09.2009 - 31.12.2011)

Peter Šugár, Assoc. Prof. PhD.

Multivariate optimization of the metal spinning processes—research and development

Specific innovation objectives, state-of-the art, needs addressed, market impact and potential benefits.

The project of international applied research in cooperation with the research organisation Inpromat, S. Coop., Sondika (Spain) and production company Sandrik 1895, Limited Hodruša-Hámre, is focused on the research of influence of so-called induced plasticity of material which is formed in specific conditions of press plastic deformation, and its positive influence on forming of exploitative properties. These properties are observed on non-developed parts from thin sheets which are produced by the technology for bending rotation (technology of metal pressing).

National Projects

VMSP-P-0009-09

Koloman Ulrich, Professor, PhD.

An electron technological complex for welding, surfacing and surface treatment of materials

The project subject is research of a technical solution for particular modules and function nodes of a laboratory model of university electron beam technological complex for industrial use. The subject technological complex is suitable for sophisticated industrial applications of high-tech electron technologies in areas of welding, creation of special layers and surface thermal treatment with use of a high-performance source of electrons with specific properties which will enable complex implementation for all mentioned applications. Its technical

parameters will provide processing of solders according to the programmed trajectory of solder in a three-dimensional area.

APVV-0057-07 (02.06.2008-31.12.2010)

Milan Marônek, Assoc. Prof., PhD.

Research of Welding and Forming of Nitrooxidatively Treated Steel Sheets

Nitrooxidative layers enhance significantly mechanical and anticorrosive properties of metal sheets. The project deals with the research of nitrooxidative layer making on metal sheets, the research of appropriate welding methods of such treated plates and with the study of forming and corrosive resistance of made weld joints. In the field of welding the basic characteristics of made weld joints will be studied (shape, structure, mechanical properties, weldability) by using the advanced technologies of welding of nitrooxidatively treated sheets.

VMSP-P-0009-09 (03.09.2009-31.07.2011)

František Kolenič, PhD. – project participant for MTF –Koloman Ulrich, Professor, PhD.

A complex of technological electrays of welding, welding on and surface material treatment.

The project deals with a module and nets research of universal electronray technological complex and their integration into an independent functional unit. A subject complex enables the forming of welds in 3D according to the setted parameters. The size of weld to one transfer will be 80mm. There is a device of programming of technological ray movement. It forms unique surface layers with electronrays remelting. The fire-powder sprays are remelted. The added sprays or material in a wire form can be also remelted. It enables the surface treatment of metal materials without added material in the first phase (without surface setting) as well as in the liquid phase (with a surface setting). The complex is determined for specific industrial applications in welding, a forming of specific layers and a surface thermal material treatment.

VEGA 1/0099/10 (01.01.2010 - 31.12.2011)

Alexander Čaus, Professor, DrSc.

The structure and property enhancement upon production of near-net-shape semi-products using technology of a direct hydrodynamic extrusion of castings

VEGA 1/0354/08 (01.01.2008- 31.12.2010)

Štefan Podhorský, PhD.

The technological and the enviromental aspects of the plasma-electrolytic process used for stainless steel polishing

The subject of the project is a new, unconventional method for polishing and surface finishing of stainless steel products - the technology of plasma polishing. The technology utilizes the physical effect of the electric discharges onto the metal surface sunken in an electrolyte.

VEGA 1/0130/08 (01.01.2008- 31.12.2010)

Peter Pokorný, Assoc. Prof. PhD.

Research of influence of CAM strategies on achieved dimension accuracy and roughness of machined surface in conditions of university Hi-tech laboratory

The project is focused on research of the influence of CAM strategies on 3D milling (for example raster, spiral, offset, box etc.) and 4D milling of parts with free form surface on achieved accuracy of dimensions and achieved roughness of machined surfaces.

VEGA 1/0060/08 (01.01.2008- 31.12.2010)

Jozef Bílik, Assoc. Prof. PhD.

Numerical simulation and experimental verification of laser welded tailored blanks formability for the automotive industry

The project submits a proposal of formability prediction of laser welded tailored blanks of different thicknesses and properties using the numerical simulation and its subsequent experimental verification. The aim of the project will be to observe the kinds of tailor welded blanks failure and welded joints location influence on their formability.

VEGA 1/0381/08 (01.01.2008- 31.12.2010)

Roman Koleňák, Assoc. Prof. PhD.

Study of the effect of physico-metallurgical aspect of high-temperature brazing on the structure of joints in metallic and ceramic materials

The physico-metallurgical characteristics of high-temperature brazing of high-alloy steels Ti, Ta, Mo, Co alloys etc. were investigated, Structural characteristics of brazing alloy during high-temperature brazing were studied.

VEGA 1/0842/09 (01.01.2009- 31.12.2011)

Milan Turňa, Professor, PhD. EWE

Special methods for metallurgical bonding of hard-to-weld materials and their application in manufacture of new materials with high technical parameters.

Design, experimental approval, and scientific reasoning of progressive metallurgical bonding of special and combined materials. A selection of special technologies of welding, soldering, etc. of hard-to-weld materials and materials sensitive to degradation in the process of technological processing. An application of new technologies of metallurgical bonding for manufacture of special materials with high technical parameters. Here can be mentioned for example the technologies of solid state welding (explosion, diffusion, MPW:FSW), welding and soldering with concentrated power sources (LB, EB, IB), RS and WS soldering. Engineering of special surfaces. Simulation of technological processes. Diagnosing the structural stability of fabricated joints by thermodynamical calculations with utilisation of CALPHAD program and databases for elucidation of mechanisms of joint formation. Design of workplace for explosion welding and building the laboratory for diffusion bonding and soldering with induction heating.

VEGA 1/0111/10 (01.01.2010 - 31.12.2011)

Erika Hodúlová, PhD.

Research of the creation and growth of the reaction products in the area of interface solder joints produced by the environmentally suitable alloys in consideration of lifetime and reliability

The study of the interface of solder joints made by lead-free solders and the identifying of reaction products which are created in soldering process for low and high temperatures.

Acquisition of knowledge on creation and growth of the reaction products in formed lead-free solder joints. Calculation of diffusion coefficient and activation energy in soldering process and activation energy in the diffusion process which brings a complex picture on the mechanism in the process of soldering. It is important to describe the mechanism of solder joint formation with a possibility of influence on joint quality to understand better reactions by soldering. Designed steps of calculation of reaction products rate defines the lifetime and reliability of solder joints.

VEGA 1/0383/10 (01.01.2010 - 31.12.2011)

Matej Beznák, Assoc. Prof. PhD.

The determination of suitable parameters for precision casting production by centrifugal spin casting into silicon moulds.

The project subject is a method of centrifugal spin casting of low-melting alloys into silicon moulds with Tekcast method. The priority aim is to determine a technological process and appropriate parameters by production of moulds and to provide the highest possible productivity, exactness and quality of castings.

KEGA 3/6370/08

Peter Šugár, Assoc. Prof. PhD.

Innovations in teaching of production technologies and materials on base of e-learning.

The project which is in cooperation with KVVM FEVT TU Zvolen, is focused on problem solution by implementation of electronic information tools to the education process in the first and second degree of technical university study. It solves the question of intensification of teaching process with the aim to remove the problem of knowledge volume increase which is needed for study programme in specific time. The project output is a practical example of bilingual multimedia web application which presents an evaluation problematic of mechanical and technological properties of metal and non-metal technical materials.

Projects 2010 - INSTITUTE OF PRODUCTION SYSTEMS AND APPLIED MECHANICS

PROJECT OF TECHNOLOGY TRANSFER

Laboratory of flexible manufacturing systems with robotized manipulation supported by no-drawing production

The aim of the project is to create an elastic production system with robotic regulation which will enable design-free production. The product will be modeled with a PC in an appropriate 3D CAD program, then the regulation program will be generated and it will be started in an elastic production system which will produce a component. It will provide the possibility to produce the necessary components for a concrete product. All produced components will be controlled during production, so the likelihood of failure of finished products will be decreased. This prototype device will help to observe the influence of different production strategies on production costs, time, which is necessary to produce a certain product amount, and other important efficiency parameters of the production. The advantages of design-free production and influence on efficiency of the whole process will be observed and presented in pre-production and production phases.



Európska únia
Európsky fond regionálneho rozvoja

International Project

SK-HU-0011-08 (29.05.2009-31.12.2010)

Peter Košťál, Assoc. Prof. PhD.

Implementation of Production Logistics into Learning System

The field of production logistics, with many reserves hidden, presents a great opportunity for making the production logistics more effective. Logistic optimization in production implies a real global task. To solve this task, there is a great worldwide effort mainly on the part of large-scale industrial concerns. This really means a matter of dedication. Solution of this problem needs specialists with professional competence in a broad extent concerning this field. Such specialists can manage the principles of production technology, production engineering, as well as production logistics within the sufficient range. Besides the management of the mentioned principles, they also need to be capable of useful exploitation within the design and creation of production systems, as well as already existing systems of operation.

SK-CZ-0180-09 (01.01.2010-31.12.2011)

Mária Behúlová, Assoc. Prof. PhD.

Development of models for numerical simulation and optimization of processes of unconventional material processing in semi-solid state

The project is focused on the design, analysis and optimization of material processing in semi-solid state with the aim to obtain final products with very fine microstructures and unique material properties. The main aim of the project covers the attainment of experimental, model and simulation support for the design and optimization of forming processes in semi-solid state and their application for the production of small products from high-alloyed tool steels. The solution methodology will be based on the close coupling of up-to-date experimental and diagnostic methods with the advanced methods of mathematic modeling and numerical simulation of material behavior in semi-solid state. For this purpose, a unique technical, laboratory and software equipment of both workplaces will be exploited.

AU-SK 2009-10-150001 (01.01.2010-31.12.2010)

Mária Behúlová, Assoc. Prof. PhD.

Computer Aided Design and Optimisation of Production Technologies

The main object of the project covers a very close coupling between advanced high-tech experimental measurements and computer aided design, numerical simulation and optimization of unconventional laser production technologies in the direct relationship to the practice. The principal effort will be focused on the introduction of efficient cooperation of academic institutions and small and medium enterprises in the regions of Trnava and Vienna. The final aim is the establishment of a wide platform

for the permanent communication of industrial companies with researchers, teachers and students in order to increase their competitiveness through the solution of technological problems and dissemination of up-to-date scientific knowledge to practice.

National Projects

VEGA 1/0206/09 (01.01.2009- 31.12.2012)

Karol Velíšek, Professor, PhD.

Intelligent Assembly Cell

A flexible and intelligent assembly cell concept includes a new solution for how to create structures of assembly systems. No external industrial robot is used for manipulation or for assembly. Intelligent behaviour of the system will rely on monitoring of important parameters of the system and there will also be monitored information about the system's interaction with its surroundings. Surrounding interaction information will be taken with many advantages, such as bringing flexible reactions of the system to manufacturing changes, building up the area of saving, lowering building costs, and higher use effects of the whole device.

VEGA 1/0163/10 (01.01.2010 – 31.12.2011)

Peter Košťál, Assoc. Prof. PhD.

Clamping fixtures in intelligent production systems

A new generation of clamping fixtures presents systems of clamping fixtures that are applicable for use in intelligent production systems. A distinctive effect of incidental time reduction is possible to achieve by automated clamping and manipulating operations or by a defined degree of clamping fixture intelligence. It is also possible to achieve a relevant increase of production process effectivity in the present increase of process quality by use of fixture clamping.

KEGA 3/7131/09 (01.01.2009- 31.12.2011)

Peter Košťál, Assoc. Prof. PhD.

Laboratory of Production System Program Control

The Laboratory of Production Systems Program Control will be used for automated program control learning. In this laboratory real industrial parts for automation (PLC, sensors, stepper motors, servo motors and others) will be used. Students in this laboratory will learn about automation in the field of flexible production, and they will get new experiences about automated production works. They will get key competencies needed by industrial praxis from graduates of technical universities. In the frame of this project new studying materials about automated program control systems will be created.

VEGA 1/0721/08 (01.01.2008- 31.12.2010)

Bohumil Taraba, Assoc. Prof. PhD.

Quantification of Cooling Properties of Coolants in the Field of Heat Thermal Treatment Processes Supported by Computer Modeling Support of Dominantly Thermal Technological Processes.

The project is oriented towards research on transfer phenomena in cooling of parts in chosen coolants used in industrial production. The aim is the quantification effect of coolants on vertical, horizontal and skewed parts surfaces. By experimental temperature measurement in the chosen point of the cooled part, and with numerical simulation support, it is possible to predict the combined heat transfer coefficient as a surface temperature function, momentary heat fluxes from the cooled surface, and cooling rates.

VEGA 1/0832/08 (01.01.2008- 31.12.2010)

Helena Kraváriková, PhD.

Thermo-mechanical Analysis of the Welding Process using the Experimental and Modeling by the Finite Element Method

Modeling and simulation of the melt welding process is very demanding work. This work requires experience and special knowledge of welding technology, heat transfer and exploitation of computer techniques. By appropriate application of these skills you can obtain solutions to specific problems in

the field of welding processes, such as residual thermal stresses and deformations of welded materials or structural changes of phases in the heat affected zone (HAZ). Structure changes in the HAZ are caused by changed temperature as a result of introduced heat into weld. Structure changes in HAZ cause changes of mechanical properties of welded materials. The stress gradient is high in the HAZ because of its thickness. Measurement of parameters obtained from experiments are used for verification of results achieved by FEM. The engineering-scientific software ANSYS is suitable for solving thermo-mechanical analysis of the welding process by FEM. Structural changes in HAZ could be satisfactorily solved by the software SYSWELD.

VEGA 1/0090/08 (01.01.2008- 31.12.2010)

František Pecháček, Assoc. Prof. PhD.

Optimized Systems and Processes of Performance Ultrasound

The project is basic research oriented to ultrasonic tool resonators for technology applications of ultrasound. Amplitude and frequency parameters of ultrasonic piezoelectric convertors, wave conductors, concentrators and tools are being analysed.

VEGA 1/0837/08 (01.01.2008- 31.12.2010)

Mária Behúlová, Assoc. Prof. PhD.

Design and Optimisation of Innovative Forming and Heat Treatment Technologies Supported by FEM Simulation

The project is focused on the application of advanced approaches to the design, analysis and optimisation of chosen innovative forming processes, including incremental deformations in order to achieve final products with very fine microstructures and specific material properties. From the theoretical point of view, the project should contribute to an advance in knowledge in the field of material behavior under conditions of intensive deformations, to the explanation of physical and metallurgical reasons of microstructure development in the processes of incremental forming and their influence on the material, technological and utility properties of chosen materials. Further, the attention will be aimed at the study of rapid solidification processes during thixoforming. The objective of the project also creates the development, verification and application of new simulation models, material models and computing procedures for numerical simulation of forming and heat treatment processes.

VEGA 1/0256/09 (01.01.2009- 31.12.2011)

Milan Nad', Assoc. Prof. PhD.

Experimental and Simulation Methods of Dynamical Analysis of Mechatronic Subsystems of Technological Equipments

A mechatronical approach to modelling, analysis, and design of effective modern technological equipment is forced by the inevitable mutual integration of mechanical, electrical, electronic and control subsystems, as well as by their integration with the terminal technological process. This type of integration calls for development of methods for analysis and synthesis of energetic and information flow among subsystems with regard to efficient satisfaction of the functional objectives of the complete technological system.

Projects 2010 - INSTITUTE OF INDUSTRIAL ENGINEERING, MANAGEMENT AND QUALITY

International Projects

ERDC (01.06.2008-30.05.2010)

Renata Nováková, Assoc. Prof. PhD.

Emergence of Research Driven Clusters in Central Europe

The project aims at supporting regional authorities and governments in convergence regions with know-how, methods and financial instruments necessary to create capacities for stimulation and emergence of research-driven clusters. This will lead to clustering research institutions, universities, R&D companies, SMEs, large companies and financial institutions (if appropriate) in the region.

South East Europe Transnational Cooperation Programme : “The international cooperation network of educational and research institution with subcontractors and other bodies active in Automotive Industry“ (1.12.2009-28.2.2012)

Project team: Miloš Čambál, Assoc. Prof. PhD., Dagmar Cagáňová, PhD., Miriam Šefčíková, PhD., Zdenka Gyurak-Bábelová, PhD., Zuzana Lenhardtová, PhD., Jana Šujanová, Assoc. Prof. PhD.

The Project brings together Universities, R&D institutions, SME support facilities from EU-15, NMS as well as IPA to prepare and create the first automotive network in South East Europe. The second level clustering activities proposed by the project are strictly oriented on the activities which are improving the innovation capacities in the region and improve technology and know-how transfer - improving the innovation circle. The project in the first stage analyses the cluster's development and best practices across the regions as well as creating the connection with other existing European activities in the automotive clustering. The project focuses highly towards producing concrete results and addresses the main challenges that are particularly specific for the SEE region, particularly the same across the whole EU territory.

During the project, activities which should promote the automotive industry and increase the cooperation between universities and SME's will be realized as well - one permanent exchange program will be carried out. The project will summarize the earned experienced and know-how on the Common Methodology which will be elaborated close to the project closure to help in other regions and different industries in second level clustering focused on innovation.

The following activities were organised in 2010 as a part of the project No. SEE/A/594/1.2/X with the name „International net of education and research organisations with suppliers and other organisations which are active in the automobile industry,“ with the acronym AUTOCLUSTERS:

1. Members of project team organised an educational seminar on the “Future of the automobile industry“ during International doctoral seminar 2010 which was prepared by the Faculty of Materials Science and Technology from the 16th to the 19th of May 2010. The educational seminar provided space for presentation of project contributions, analysis of the contemporary situation in the automobile industry, as well as future expectations.



2. On the 23.8.2010 the Faculty of Materials Science and Technology organised the next educational seminar called “Innovative trends and main challenges of automobile industry in the South-East Europe.“ During this seminar speeches with the topics: “Strategy of company cooperation in the time of globalisation“, “Global trends in the automobile industry“, and “Innovative trends and main challenges of automobile industry in South-East Europe“ were presented.



3. In August 2010 the partners of the project AUTOCLUSTERS were presented at the meetings in Albena on the Bulgarian coast of the Black Sea. The results of the third project period were analysed. Proposals of 11 small projects were discussed and considered. Project

partners selected three from them and they considered their future process. The participants visited the company ZMDI – Varna during the summit. This company develops special chips for automobile electronics. Some new Bulgarian electric automobiles were presented; they were developed with the companies Kaproni - Kazanlak and Belchev Motors - Stara Zagora.

4. On the 19th through 22nd of September 2010 the International Conference IGIP-SEFI 2010 *"Diversity unifies - Diversity in Engineering Education"* took place in Trnava. Part of the international conference was also an exhibition with more than 300 participants and an educational seminar on the project AUTOCLUSTERS „Innovative trends and challenges in the South-East Europe“, which took place on **21.09.2010**.



5.

Team members of the project AUTOCLUSTERS visited the 5th meeting of project partners in Iasi (**Romania**) on 29–30.11.2010. The aim of the meeting was to form and support the creation of the first cooperative and innovative net for automobile industry in the region of South-East Europe. The project results on the contemporary status of the tasks and plans for 2011 were presented during the meeting. The team members presented a so-called “small innovative pilot project“. The mentioned “small project“ (or sub-project) is focused on analysis of infrastructure for electric vehicles in the region of South-East Europe with the aim to map and identify the potential of countries/regions of the project partners from the view of technical and physical infrastructure for electrical vehicles and from the research infrastructure perspective also for electric vehicles.

6. At the end of 2010 three seminars on the future of electric vehicles, batteries, problems with charging and infrastructure for electric vehicles were organised. The University of Technology-Gabrovo prepared an exhibition on the same theme with more than 300 participants. In December the Romanian partners from Iasi organised a regular meeting of partners of the project AUTOCLUSTERS, where the results of the fourth period, together with small projects and possibilities to be a part of the 7th frame programme, were analysed.

7th Framework Programme (01.01.2009 - 31.12.2011)

DIVERSITY. Improving the gender diversity of management in materials research institutions.

Research team: Oliver Moravčík, Professor, PhD., Dagmar Cagáňová, PhD., František Horňák, Assoc. Prof. PhD.

The project's objective is to identify policies and implementation activities to improve gender diversity of management in materials research institutions by: Strengthening the role of women scientists in decision making processes, Supporting and implementing a more transparent career appraisal system and stimulating the research environment in the spirit of the European Charter for Researchers and the Code of Conduct for Recruitment Enhancing solidarity and involvement of (male) decision-makers in promoting gender equality in scientific decision-making, Raising the awareness within the scientific

community, in the general public and among policy-makers about gender and research. The DIVERSITY project is an international consortium of 14 partners from 11 European countries: Germany, Austria, Belgium, France, Spain, Italy, Sweden, Slovenia, UK, Slovakia, and Greece. Project "DIVERSITY" is a 36 month project funded by the European Union within the 7th Framework Programme

National Projects

LPP-0384-09 (03.09.2009-31.08.2012)

Peter Sakál, Professor, PhD.

The concept of the HCS model 3E vs. the concept of the Corporate Social Responsibility (CSR)

The aim of the mentioned project is to enlarge the results of the research project Number 019/2001: "Transforming Industry in Slovakia through Participatory Ergonomics" (financially supported by a common Slovak-American fund for research cooperation) and also of the project KEGA MŠ SR Number 3-3111-05. In these days the research continues in cooperation with the company CHIRANA PROGRESS, s.r.o. Piešťany in the area of permanent development (TUR) and Corporate Social Responsibility (CSR). The aim of this research is to contribute to the vision implementation of Agenda 21 and the Lisbon strategy, in particular the strategy for the parts TUR in conditions of research and pedagogical processes on the workplaces of MTF STU Trnava.

KEGA 144-039STU-4/2010

Rudolf Rybanský, Assoc. Prof. PhD.

Creation of teaching material of the secondary school subject "Security technology" with using of interactivity MM of education software and e-learning.

The project is focused on creation of interactive multimedia teaching applications to increase the level of the pedagogical process with necessary video sequences, pictures and other multimedia aspects of the subject Security technology. It is for students of the secondary schools with an identical specialisation. One more intensive, more efficient and rational perception of information in specific subjects enables presentation of multimedia in many forms (text, schemes, photographs, speech, animation, video, tests). Today it is very important to find the main idea and aim of a studied subject in a flow of information. Interactive multimedia and hypertext where students can enter are the correct tools to support studied information, easy search, testing and easy orientation in them.

VEGA 1/0229/08 (01.01.2008- 31.12.2010)

Iveta Paulová, Assoc. Prof. PhD.

Perspectives of quality management development in accordance with requirements of the Slovak Republic's market

The project is aimed to exploration and analysis of contemporary theoretical knowledge of quality management and expected trends of theory and practice requirements (requirements and needs of market). The elaboration of information and the results of the evaluation for the explored industry will be discussed on the basis of the analysis. The evaluation of process application is related to quality management in the explored branches of industrial practice, in comparison with requirements of individual models of the quality management system (ISO 9001:2000, TS 16 949, AQAP). Elaboration of proposals for process improvement in the areas where the biggest failures were discovered will also be completed. The output will be the elaboration of a system solving proposal for more effective requirements application in the area of quality management for requirements of plant practice.

VEGA 1/0156/08 (01.01.2008- 31.12.2010)

Andrea Holková, Assoc. Prof. PhD.

Key manager competence in the range of specific functional management areas and their applicable development concept.

The merit of the project is to justify the importance of management competencies in human resource management as a crucial factor of organization success and competitiveness. The project is focused on comparison of variable approaches to management competencies, their identification and key

manager competency definitions. Identification and development of manager competencies is necessarily needed for key managerial high performance. The project is also focused on methods and techniques of manager competence evaluation, creation of competency models and selection of applicable methods for key manager competence development.

VEGA 1/0491/09 (01.01.2009- 31.12.2011)

Jana Šujanová, Assoc. Prof. PhD.

Project Management Processes of Maturity Control as a Tool for the Improvement of Mechanical Engineering Enterprise Competitiveness

Management is one of the most dynamically developing business disciplines. One of the outputs of this development is the growing number of international standards, along with methodologies and project management tools. Business practice has to face the problem of the effective implementation of those standards in their internal project management processes and more in the project quality control that should lead to the achievement of a higher project maturity level. A higher project management maturity level in business practice means achievement of the project goals with less resources, lower costs and shorter time. All this could not be accomplished without the proper tools. Therefore the objective of this project is to prepare a widely applicable reference manual and tool for the project management processes maturity control in Slovak mechanical engineering enterprises, with the aim of increasing their effectiveness and sustainable competitiveness.

Projects 2010 - INSTITUTE OF SAFETY AND ENVIRONMENTAL ENGINEERING

PROJECT OF TECHNOLOGY TRANSFER

Hybrid power supply for technical consultancy laboratory for the use and promotion of renewable sources and energy

Prototype of a hybrid source-based RES construction (hydro-potential, solar, biogas and bioethanol) for long term testing and promotion. Through the proposed interventions the prestige of research will be increased, which will also lead to increased interest in the quest for talent and higher employment in this field. The benefit will be new creative ideas and flexible responses to the needs of small enterprises and their closer cooperation. The resulting effect will be more competitive research teams within the national research, more interest in small and medium enterprises to conduct research focused on innovation in public research institutions, universities and other research centers. Slovak research teams will also compete at the international level, bringing the Slovak research development greater cooperation with the international environment and higher success of Slovak applicants in the 7th Framework Program of EU and other EU initiatives.

INTERNATIONAL PROJECTS

EUREKA E!3266/STU/08 (01.01.2008-31.12.2011)

Ivana Tureková, Assoc. Prof. PhD.

Modelling the dispersion of emissions of dangerous substances during major industrial accidents. The project deals with the ways of supporting the international collaboration in research into the modelling of dispersion of emissions of dangerous substances during major industrial accidents. The STU MTF Department of safety Engineering is a partner - candidate for EUREKA E! 3266-EUROENVIRON VEBAIR project. The software programs purchased will enable to calculate the dispersion of emissions in residential and industrial areas. The output will be a practical application of monitoring and modelling the dangerous states.

NATIONAL PROJECTS

LPP-0171-07 (01.04.2008-31.03.2011)

Anna Michalíková, MSc. Eng.

Natural phenomenon for small and big issues in experiments

A communication portal will be created that will be oriented to the pilot ideas: environmental education and health, physics in common life, astronomy, alternative sources of energy, wastes and recycling ... (Realize after consultations - investigation - with teacher from basic and secondary schools). It will

facilitate communication with the public and students of basic and secondary schools. E-materials and recorded experiments will be published on the created web page (it could be used in pedagogical process, also in preparation of talented students to some competition). During the preparation of materials, from teacher's requirements for experiments will be determined which are not able to be realized due to dangerous chemicals, absence of tools and instruments).

67/2009 (24.08.2009-31.12.2011)

Karol Balog, Professor, PhD.

Follows the aging process of fire resistance coating on testing samples deposited in the operations environment of nuclear power plants at Bohunice. Tests the function of the intumescent fire resistance coat by use of thermal analysis, high temperature stressing in air condition, and measurement of intumescent ability.

KEGA 3/6431/08 (01.01.2008- 31.12.2010)

Černecký Jozef, Assoc. Prof. PhD.

Determination of emission quantification and indicators of atmosphere quality in European legislation conditions

The project is focused specifically on the results of research on the subject of state detection and emission production to air in acceptance of changed conditions by European legislation. The research results are missing in actual educational materials. Within the frame of finding a solution, the project will be prepared to complete educational materials for education on subjects such as "Techniques of air protection" and "Technical devices of measurement and monitoring" which will focus on measurement, scoring and optimization of particulate and gaseous emissions. After completion, the proposed project will be explored and documented by research on the practical application of theoretical knowledge.

KEGA 3/6431/08 (doba trvania)

Maroš Soldán, Assoc. Prof. PhD.

Determination of emission quantities and quality indicators of air in conditions of the European legislation

The project is focused on concrete results of research when state and production of emissions to air are observed. The conditions modified with European legislative are accepted. The research results are still missing in the study materials. One complete study material for teaching of the subject "Technology of air protection" and "Technical tools of measurement and monitoring" will be prepared and it will be specialized in measurement, evaluation and optimal amount of emissions of solid and gas polluting substances. This project will highlight an importance of the problematic and research will show a practical application of theory.

KEGA 015-002TUZVO-4/2010

Karol Balog, Professor, PhD.

Materials in fire protection –university textbook and modern teaching material in the major Protection of person and property and in similar majors

Definition of fire characteristics of combustible materials from aspect of inflammability, rate of flame spread, heat creation by fire and toxic gases of combustion. The methods of parameter determination of material combustibility regarding to particular stages of fire in closed area. Application of fire and life safety characteristics of substances in practice.

VEGA 1/0488/08 (01.01.2008- 31.12.2010)

Ivana Tureková, Assoc. Prof. PhD.

Environmental impacts of fire-fighting foams from extinguishing fires in nature

If fires in nature are not extinguished early they can seriously endanger nature. Fire-fighting foams used in fire-interventions present insertion of these substances into the natural environment and they can cause contamination of the environment. Therefore knowledge of the foam in terms of fire-fighting properties is important, and also of the environmental effect. Because of the actual absence of information about eco-toxicological properties and biological degradation of fire-fighting foams the research focuses on the physical and chemical properties and also the effect of external conditions on

the efficiency and stability of foam. An evaluation system of parameters and process for screening the selection of foams will also be designed. This information is necessary for each fire-intervention to reduce the negative impact on the environment.

VEGA 1/0798/08 (01.01.2008- 31.12.2010)

Kristína Gerulová, PhD.

Development and utilization of a small hydro-energetic power source combined with solar systems in machine Technologies

A small hydro-energetic power source with rolling fluid machine represents a unique, patent protected device working on a yet unknown hydro-dynamic principal. The rolling fluid machine device is of a simple construction. It is able to convert hitherto unutilized, low hydropotential into mechanic or electric energy through the function of the rolling fluid machine. On the basis of this finding, together with methods of hydraulics similar to machines, various types of hydroenergetic sources will be modelled. Also designed and tested will be a small hydro-energetic power source combined with solar equipment to utilize in machine Technologies, for example to produce electrical energy for power supply measurement and regulation systems, for pumping, transport, heating or cooling liquids, etc.

VEGA 1/0352/09 (01.01.2009- 31.12.2011)

Maroš Soldán, Assoc. Prof. PhD.

The exposition of advanced oxidation processes in removal of organic pollutants from machine industry wastewaters by the use of wastes from production and treatment of metals as catalysts

The research focuses on innovation of degradation processes of organic pollutants in wastewaters by the use of oxidation in the presence of catalysts. Some wastes from treatment and production of metals will be used, such as red mud, black nickel mud, etc. The new possibilities for reduction of environmental impact from cutting and surface processes will be tested.

Projects 2010 - INSTITUTE OF APPLIED INFORMATICS, AUTOMATION AND MATHEMATICS

International Projects

Diversity (01.01.2009 - 31.12.2011)

Oliver Moravčík, Professor, PhD.

Improving gender diversity management in materials research institutions

The DIVERSITY project is an international consortium of 14 partners from 11 European countries: Germany, Austria, Belgium, France, Spain, Italy, Sweden, Slovenia, UK, Slovakia, and Greece. Project "DIVERSITY" is a 36 month project funded by the European Union within the 7th Framework Programme.

National Projects

APVV-0308-07 (02.09.2008-30.06.2010)

Peter Schreiber, Assoc. Prof. PhD.

Nuclear and radiation safety demonstration methodology for spent fuel container transportation based on experimentally acquired data

It is impossible to perform direct measurement of spent fuel residual output in the container. In the case that the container is presented as a mathematical model of a specific thermal system, we would be able to derive residual output based on power proportions, or on the basis of known or measurable physical values (heat capacity, surface, the container and surrounding temperature, heat transition coefficient, etc.).

These values could be a link to residual output computation. Obtained values should be compared with values received from standard atomic-physical computation.

KEGA 3/7285/09 (01.01.2009- 31.12.2011)

Pavol Božek, Assoc. Prof. PhD.

Content Integration and Design of University Textbook "Specialized Robotic Systems" in Print and Interactive Modules for University of Technology in Zvolen, Trenčín University and Slovak University of Technology in Bratislava.

The project aims to develop an undergraduate textbook writing and interactive multimedia form. Movies made on robotechnologic specialist departments will complement each chapter and the aforementioned written university textbooks.

VEGA 1/0282/08 (01.01.2008- 31.12.2010)

Jozef Vaský, Assoc. Prof. PhD.

A 3D model generated by means of reconstruction from partial engineering drawing orthogonal views

Engineering drawing is the formal 2D notation of geometrical, material and technological features of a real part. Today's CAD/CAM systems are based on 3D solid modeling. They make it possible to generate drawings from visual and technological operations. It would be therefore effective to transform paper drawings of parts right into 3D representation.

VEGA 1/0068/08 (01.01.2008- 31.12.2010)

Róbert Vrábek, Assoc. Prof. PhD.

Analysis of the boundary layers for three and four point boundary value problems of singularly perturbed second-order ordinary differential equations

We provide geometric and quantitative analysis of the dynamics of three and four point boundary value problems for singularly perturbed second-order ordinary differential equations $\epsilon y'' = f(x, y, y')$ near to the critical manifold (hyperbolic and non-hyperbolic).

VEGA 1/0170/08 (01.01.2008- 31.12.2010)

Pavel Važan, Assoc. Prof. PhD.

Proposal of an alternative procedure for manufacturing lot size determination in flexible manufacturing systems by simulation optimization

The main goal of the project is the proposal of an alternative procedure of manufacturing lot size determination in flexible manufacturing systems by simulation optimization. The procedure will be designed and verified for piece and batch production.

VEGA 1/0582/08 (01.01.2008- 31.12.2010)

Renáta Masárová, PhD.

Extension types of convergence in fuzzy spaces

Analysis of various types of convergence in fuzzy spaces, fuzzy metrics and types of convergence in these metrics, problem analysis according to commonplace axioms and selection optimal application and numerical time-consuming algorithm.

VEGA 1/0368/08 (01.01.2008- 31.12.2010)

Peter Schreiber, Assoc. Prof. PhD.

Artificial intelligence in flexible manufacturing systems control

The traditional procedural (imperative) approach is used in the programming of programmable production systems. A sequence of instructions must be given in order to execute a required function.

Projects 2010 - INSTITUTE OF ENGINEERING PEDAGOGY AND HUMANITIES

PROJECT OF TECHNOLOGY TRANSFER

The agency of the Ministry of Education of the Slovak Republic, administering the Structural Funds of the EU in the frame of the Operational Programme for Education, accepted a project led by Roman Hrmó, Assoc. Professor, PhD. called Teaching Skills Development of PhD Students at The Faculty of Materials Science and Technology in Trnava. The goals of the project are to develop teaching skills and to support academic growth of PhD students of both full-time and part-time formats of their study. The goals will be reached by promotion of teaching skills of PhD students through direct educational activities and by coordination of their mobility.



NATIONAL PROJECTS

KEGA 3/6026/08 (01.01.2008- 31.12.2010)

Hrmó Roman, Assoc. Prof. PhD.

Innovation study program teaching for technical profession subjects at MTF STU

The goal of the research team is evaluation and innovation in the study program "Teaching of technical professions subjects," which was accredited at MTF STU. After three years in practice of the study program the researchers will put into practice the following innovation: an optimization profile of graduates in study program and application of the graduate on the labour market, optimization of

proportions between lectures and exercises in the study program, reworking of the study materials and innovation of teaching methods.

KEGA 3/6216/08 (01.01.2008- 31.12.2010)

Krpáľková Krelová Katarína, PhD.

Application of the subject "Guide to enterprise" in the study program "Teaching of technical profession subjects, II. Level" at MTF in Trnava

The European Union stakes out the spirit of enterprise development at all school types and grades as one of the main goals in the education sphere. Education for enterprise is a new idea, the contents of which still are not stabilized. The suggested project solves this problem. The basis of the project is in the curriculum design of the subject "Guide to enterprise".

KEGA 3/6253/08 (01.01.2008- 31.12.2010)

Milan Petráš, PhD.

Aurel B. Stodola: The best among the greatest - Translation of correspondence

The aim of the project is to prepare translation and written comments, and publish all available letters of A. Stodola (to his brothers and A. Einstein). Today there are 130 letters (1876-1943) available. We do not expect that this number will be increased. The letters to his brothers were kept. Some of them were published by Ivan Stodola in the book *Náš strýko Aurel* (Our uncle Aurel, Bratislava, 1968). The letters will be translated and published with commentaries. The publication will include an introduction and it will be completed with iconographic material. It will provide a new perspective on the biography of this scientist, professor, technical designer, and thinker. They were not available till now.

KEGA 035STU-4/2010

Katarína Tináková, PhD.

Models of project education at secondary vocational schools (SOŠ)

The concept of education development in the Slovak Republic in the next 15-20 years highlights a need for school orientation modification from traditional provision of knowledge to methods of absorption and application of knowledge by students. Project education is based on solving of complex theoretical or practical problems with activity of students. The main aim of the project is to scan the contemporary state in project education at SOŠ in the Slovak Republic and form a structured educational text as a methodological material for teachers of technical subjects.

VEGA 1/0185/08 (01.01.2008- 31.12.2010)

Marián Merica, Assoc. Prof. PhD.

Optimization of motor programs as the basis for health improvement and the development of fitness and sport performance capacity.

The research is on the ways to stop the increasing occurrence of some kinds of illnesses and health defects that top the health condition statistics of a wide population spectrum. Finding the possibilities for hypo-kinetic motion of the pre-school, school and university population on the basis of learned characteristics of their health condition, evaluation of their attitude to movement and to individual specific motor activities, and on the basis of their body and motor development analysis. In realisation of selected sports: swimming, tennis, athletics, football, body

building, baseball and softball, searching for motor program optimisation with the aim of increasing the fitness and sport performance of our programs and with the constant attentiveness on the each individual's health.