

SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA Faculty of Materials Science and Technology in Trnava

2009

CENTRES OF EXCELLENCE

INTERNATIONAL AND NATIONAL PROJECTS

PROJECTS IN COLLABORATION WITH INDUSTRIAL PRACTICE

> INFRASTRUCTURE AND MODERNIZATION

PROJECTS OF TECHNOLOGIES

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Slovak University of Technology Faculty of Materials Science and Technology in Trnava

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SCIENTIFIC PROFILE OF THE FACULTY

The research orientation of the Slovak University of Technology Faculty of Materials Science and Technology in Trnava (FMST) corresponds with its pedagogic profile and the long-term SUT orientation. As amended by section 30, paragraph 1, sub-paragraph c of Act 131/2002 of the Coll. on Universities, and as amended by other acts, the Faculty Scientific Board evaluates the Faculty's activity in the field of science and technology once a year.

Orientation of the research

The scientific and research activity of FMST research and pedagogical staff is carried out in the following forms:

- research and pedagogical projects within Slovak grant agencies
- projects solved within international programmes
- projects of international collaboration
- projects of applied research and development
- projects of contractual research and development
- Participation in the 7th work frame programme of EU.

The research content is oriented to the following fields:

- materials research with a focus on the research, development and technological processing of basic and new kinds of technical materials,
- research, development and optimization of new technologies of industrial production oriented particularly on the technological processing of modern technical materials and ecologically clean processes and products, numerical simulation of technological processes,
- process identification, automation and control, as well as information support for technological, production and organization systems,
- research and verification of managerial control principles and their organization structures,
- quality control and certification of processes and products,
- safety and reliability of technological equipment and systems, while emphasising the analysis methods and systems synthesis,
- humanities and social sciences with emphasis on the improvement and innovation of the teaching methods and forms in the training of technical intelligentsia.

Concept and focus of the research activities

Types:

- research and pedagogical projects within VEGA & KEGA grant agencies,
- international programmes and projects of MVTS,
- internally funded projects,
- contractual research and development projects funded by business and industry.

Topics support the Faculty majors and fields of study:

- research with orientation on new metallic and non-metallic materials,
- research and development of new technologies of industrial production with a focus on environment-friendly productions,
- implementation of information technology into technological, production and organisational systems, as well as process identification, automation and control,
- research and verification of management principles and organisational structures,
- quality management, product certification and conversions of machine production,
- safety and reliability of technological equipment and systems with emphasis on methods, analysis and synthesis,
- humane and social sciences with emphasis on improvement and innovation of teaching methods and forms in the conditions of training and education of technical intelligentsia.

The Centre for Technologies Transfer has been established with the goal of implementing research results into practice.

The Agency for Science and Technology Support, established in 2002, manages governmental research programmes where the Faculty researchers participate.



SCIENTIFIC PROFILE OF THE FACULTY

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RESEARCH AND DEVELOPMENT PROJECTS

> 1. CENTRES OF EXCELLENCE

2. INTERNATIONAL AND NATIONAL PROJECTS

> 3. PROJECTS IN COLLABORATION WITH INDUSTRIAL PRACTICE

4. INFRASTRUCTURE AND MODERNIZATION

> 5. PROJECTS OF TECHNOLOGIES TRANSFER



CENTRE OF

CENTER FOR DEVELOPMENT AND APPLICATION OF ADVANCED DIAGNOSTIC METHODS IN PROCESSING OF METALLIC AND NON-METALLIC MATERIALS

The main focus of the project is the establishment of a centre of excellence with emphasis on the development and application of advanced diagnostic methods in processing the metal and non-metal material. This is within the framework of item number 2.1 of the operation program oriented on research and development entitled "Increasing the quality of the workplace and support of excellent research, with a focus on the strategic areas important for next developments of economy and society". Therefore the main aim of the project, which has been approved, is to build a research infrastructure in accordance with the Innovation policy of the second generation. meaning at the regional level and in accordance with priority No1 of the Innovation strategy of the Slovak Republic: "Infrastructure with a high quality and an effective system for innovation development". In this way the proposed centre of excellence will support realization of the strategy of competitiveness in the Slovak Republic into 2010, which is an important transfer into innovation policy of the third generation, with the task of integrating innovations into all policies. We plan to create a modern dynamic centre of excellence. The centre will focus on analytical methods for applying the most contemporary knowledge on the interaction of electron and laser energies with masses of various types. It will also focus on advanced detection systems with high sensitivity, modern mechanical processes, and observation of electrical and non-electrical variables oriented to the evaluation of specific properties, especially progressive metal and non-metal materials prepared by the most modern technological processes. We expect that the project will help to improve the research infrastructure in the Trnava region, and provide a direct connection to the rest of Slovakia (the Faculty of Materials Science and Technology cooperates with dozens of production companies throughout all of Slovakia and with other education and research institutes). The project will also connect the Faculty to other European and Asian research bodies (we cooperate with POSTECH - Pohang University of Science and Technology, South Korea, IFW and FZD in Dresden, Germany, Bekaert in Zwevegem, Belgium). Finally, the project will improve the quality of education and popularise science and technology among unspecialized people.

The content of the project has the aim of supporting a concentration of the best faculty employees in a monothematic centre based on the application of the most modern experimental processes associated with specific material properties, consistent with the objectives of the Materials study program and the study field of Physical Metallurgy. Activities are focused on the attraction of secondary school students who will potentially study fields of technical materials. The project will also provide access for all interested specialists to modern technical equipment in the centre, as well as the organisation of seminars and summer schools and expansion of materials research and its successful representation in the media.

The centre will be equipped with the following modern technical equipment:

- A High Resolution Scanning Electron Microscope operating with a thermal FEG cathode and equipped with compatible detection systems EDS, WDS
 and EBSD along with particular equipment for preparation of samples by ion milling.
- Laser Confocal Microscope with two independent beams for wavelengths 400 and 600 nm.
- Universal Testing Machine for evaluation of mechanical properties of metal and non-metal materials
- Testing equipment for the observation of dynamic failure processes
- · Equipment for measurement of direct and alternating conductivity of non-metal materials at high temperatures
- Spectral analyzer for measurement of direct and alternating impedance and modular spectra of non-metal materials and composites
- Rotation Viscosimeter
- Vulcanization Measurement Equipment

APRODIMET

CENTRE OF

CENTRE OF EXCELLENCE FOR FIVE-AXIS MACHINING

In the previous issue of this Annual Report, we introduced the orientation of the university's faculty research and we mentioned the emerging Centres of Excellence and the concept of the project Slovakion. In this article we would like to introduce more about the Centre of Excellence covering Five-Axis Machining.

What is five-axis machining?

Free shaped surfaces are surfaces that can not easily be described analytically, they are increasingly in demand due to their attractive appearance. The machining technology that is used to create this manufacturing is called Five – Axis Machining.

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 project is designed under the Operational Program, with direct access to support research and development and precautionary measures.

Promoting networks with excellent research and development of departments as pillars of regional development and the support of sub-regional cooperation.

Activities of the project.

Formal:

- Development of internal rules and guidelines for the functioning of the university's 'Centre of Excellence, five-axis machining'.
- To define the basic long term directions of development.

Implementation:

- · Procurement and installation of machinery, equipment, accessories and tools,
- Initiating the pilot operation of mechanical instruments and the CE base,
- Provision and installation of CAD/CAM software,
- Introduction of the pilot operating software for the CE base.

The project will consist of two departments:

- 1. A CNC HSC WORKPLACE of HIGH-TECHNOLOGY FOR FIVE-AXIS MACHINING;
- 2. A CAD/CAM WORKPLACE of HIGH TECHNOLOGY FOR FIVE-AXIS MACHINING.

THE CNC HSC WORKPLACE of HIGH-TECHNOLOGY of 5-axis machining consists of three machine tools:

- 1.1 CNC HSC five-axis milling machine;
- 1.2 CNC HSC five-axis ultrasonic machine,
- 1.3 Five-axis CNC turning machine with a counter shaft.

CAD/CAM WORKPLACE of HIGH-TECHNOLOGY for 5-axis machining consisting of the following software:

- 2.1 CAD software for 3D modelling and the designing of moulds,
- 2.2 CAM software for 3D and 5D set up NC programs and the simulation of the 5D machining tool,
- 2.3 CAD/CAM software for the modelling and machining of reliefs,
- 2.4 CAD/CAQ software for the reconstruction of shape and control surfaces.
- 1.1 CNC HSC five-axis milling machine

We are using a machine called "HSC 105 linear". With high-dynamic linear drives in all axes this machine reaches accelerations of up to 2g and 90m/min rapid speed, which allows an increase in productivity of up to 20%. The rigid bridge type design and the direct measuring systems in combination with the high speed 3D control iTNC 530 guarantee maximum precision. Simultaneous 5 axis machining (option) is another in novation, realised by a swivelling axis in the spindle head and a NC- table. An optional automatic pallet changer as well as a shelf type tool magazine for up to 120 tools complete the modular field of application of the HSC 105 linear [gildemeister.com].

CENTRE OF

1.2 CNC HSC five-axis ultrasonic machine

We are using the CNC machine called "ULTRASONIC 20 linear, SAUER". This machine conquers the market of micro and precision machining. High-tech at a cutting-edge level: the linear drives lead to maximum acceleration in X, Y, Z > 1.4 g, a positioning accuracy of 2.5 m | 0.0001 in. and a repeat accuracy of as little as 1 m | 0.00004 in. The optional expansion into a 4-/ 5-axis-machine with a torque motor in the C-axis and servo motors in the A-axis, brings unrivalled flexibility. The water-cooled USB 40-machining spindle with up 40,000 rpm. opens up a wide spectrum of diverse applications in the sector of hard machining and HSC-milling. Excellent vibration absorption, sturdiness and stability for such applications is ensured by the cast-mineral base in monoBLOCK design [gildemeister.com].

1.3 Five-axis CNC turning machine with a counter shaft.

We are using the "CTX alpha 500", designed to complete machining with a counter spindle and Y-axis. This machine series is particularly suitable for heavy bar, chuck and shaft machining. [gildemeister.com]

The Faculty of Materials Science and Technology (FMST) has extensive experience with the working use of the CAD/CAM technology company DELCO in 3D modelling and 3D machining. This project is expanding the 3D CAD/CAM department to CAD/CAM 5D machining.

- 2.1 CAD software for 3D modelling and the designing of moulds is called 'vyu69van7' CAD Design and Modelling software "PowerShape" designed to conceptualise 3D modelling and the designing of moulds [delcam.com].
- 2.2 CAM software for 3D and 5D set up NC programs and the simulation of the 5D machining tool. The core of the programs will be NC CAM software, "PowerMill" which is specialist software for the manufacture of the complex shapes typically found in the toolmaking, automotive and aerospace industries. This software offers key features which includes a wide range of strategies, including the high-efficiency roughing, high-speed finishing and five-axis machining techniques. The PowerMill software is CAM software for High Speed Machining, Multi Axis Machining and electrode manufacture [delcam.com].

2.3 CAD/CAM software for the modelling and machining of reliefs,

We are using software "ArtCAM" that provides a CAD modelling and CNC CAM machining solution of 3D relief on the plane. ArtCAM allows the creation of high quality products from 2D artwork [delcam.com]. In cooperation with software 'ArtCAM' – 'PowerShape'-'PowerMill' we will be able to implement five-axis simulation and CNC machining of reliefs on free form surfaces.

2.4 CAD/CAQ software for the reconstruction of shape and control surfaces.

The software known as "CopyCAD" gives a specific and complete point data, manipulation and transformation solution. CopyCAD offers control over a point cloud data set, rapid surface generation, triangulation wizard cuts processing time down to a minimum. CopyCAD's position in the Power Solution (with software PowerMill) offers the capability to quickly and accurately machine scanned models in PowerMill [delcam.com].

Project objectives.

Application of high-technology five-axis machining:

- Multi axis CNC machining,
- Complex CNC machining,
- HSC and HSM technologies,
- · Multi-energy methods of machining,
- Multi axis CA technologies.

Project outputs.

In the Centre of Excellence we are able to create:

- Research methods and strategies, all 5-axis machining adjusters, intermittent and continuous CNC milling of shaped surfaces.
- Research of HSC CNC milling and turning shaped surfaces.
- Research of CNC ultrasonic machines that can machine materials that are hard to machine.
- Research into the use of CA technologies in the categories of CAD/CAM / CNC / CAQ.

New information - follow-up project.

The Slovak University of Technology, as a beneficiary, once again responded to the call of the "Operačného programu Výskum a vývoj OPVaV 2007 – 2013 OPVaV-2009/2.1/02-SORO", especially to the challenge of networks of excellent workplaces, their research and regional pillar development together with the development and promotion of subregional cooperation. The deadline was the 1st of June 2009 according to the 'Agency of the Ministry of Education for the structural funds'. The post-secondary project 'Centre of Excellence five-axis machining' is almost worth 2.6 million Euros under the name of 'Centre of Excellence for 5-axis machining - High-tech research experimental base', and it was successful.

CENTRE OF

What are the aims of the next project?

The project aims at expanding the 'Centre of Excellence for five-axis machining' with new high technologies.

We are planning to construct the following workplaces:

- 1. CNC HSC WORKPLACE of HIGH-TECHNOLOGY FOR FIVE-AXIS MACHINING;
- 2. WORKPLACE CONTROLS AND MEASUREMENTS.
- 1. CNC HSC WORKPLACE of HIGH-TECHNOLOGY FOR TREATMENT OF 5-axis machining will be extended to the CNC machines in the laboratory:
- I. LABORATORY CNC MACHINE TOOLS
- 1.II.1 CNC HSC five-axis milling machine construction of a new cradle,
- 1.II.2 CNC HSC CNC five-axis laser machine,
- 1.11.3 Multi-axis CNC Tool grinders.The following CNC robots are used for machining in the laboratory:
- II. CNC LABORATORY ROBOT FOR MACHININING
- 1.II.4 CNC multi-axis milling machining for ROBOT milling machines.
- 1.II.5 CNC multi-axis ROBOT for the manipulation of workpieces.
- 1.II.6 CNC multi-axis ROBOT for laser machining.
- WORKPLACE CONTROLS AND MEASUREMENTS for the CE FIVE-Axis machining is made up of the following devices:
- 2.1 DYNAMOMATER (rotating and stationary) with equipment for measuring cutting forces during cutting and strategies of five-axis machining.
- 2.2 MEASURING multi-axis machine that measures the tools' cutting forces including any accessories measurement and control of the shape and dimensions of cutting tools (cutters, drills, etc.).
- 2.3 A stabilisation device with accessories for stabilising the running of -cutting tools used for HSC machining,
- 2.4 MONITORING SYSTEM of cutting fluids used to control the properties of the cutting fluids,
- 2.5 3D scanner used to obtain a digital shape of the worked surfaces.

Finally.

Using high-speed machining equipment HSM (High Speed Machining), HSC (High Speed Cutting), multi-technology 5-axis machining (ultrasonic, laser) and different techniques of CE 5-axis machining are added among the workplaces which have an experimental base for high-tech research. 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.

Production of tools (dies, models, moulds and forging dies etc.) for production technologies is one dominant field of engineering in industry all over the world. The best economics dispose of the best developed and best quality production of moulds and dies. Our opinion is that Slovak manufacturing without the best mould and die manufacturers will never be able to compete or be on the same level as world top leaders.

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

7700070100

PROJECTS

INSTITUTE OF MATERIALS SCIENCE

COST MP0602 (COST) (05.08.2008-15.05.2011)

Prof. Ing. Jozef Janovec, 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)

prof. Ing. Jozef Janovec, 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)

prof. Ing. Jozef Janovec, DrSc. Metal matrix composites reinforced with complex metallic alloys

No. S-13-2005 (01.09.2005-31.12.2009)

Ing. Martin Kusý, PhD.

Visegrad Scholarship-Structure and properties of X40CrMoV5-1 hot-work steel melted and alloyed by tungsten carbide WC with the high power diode laser (HPDL)

As has been determined on the basis of research it is feasible to develop the surface layers on X40CrMoV5-1 hot-work tool steel by remelting and alloying with tungsten carbide using a high power diode laser (HPDL). The structure of the material solidifying after laser remelting is characteristic of the diversified morphology connected with repeated changes of the crystals' growth direction, from small dendrites, whose principal axes are oriented in accordance with heat removal directions at the boundary between the solid and liquid phases, clusters of carbides arranged in

accordance with swirls caused by the metallic liquid convection motion, and partially non-remelted WC conglomerates as alloying material in the central zone. The very fast heat removal from the remelting zone by the material core with a much larger thermal capacity controls the materistic transformation of the austenite originated due to crystallization, and the lathe martensite developed in this process, partially twinned, is characteristic of the significant refinement of the martensite with the martensite lathes' length several times smaller than ones of the martensite developed during the conventional quenching. Laser remelting and alloying with tungsten carbide results in the refinement of the structure in the entire laser power range and in the remelted zone is about twenty times smaller compared to the conventionally heat treated material. An increase of the steel surface hardness to 66.5 HRC occurs due to refinement of the structure. The research results indicate the feasibility and purpose of the practical use of remelting and alloying with tungsten carbide laser, e.g. for making new tools or for regeneration of used ones from the X40CrMoV5-1 hot-work tool steel.

Bekaert, Zwevegem, Belgium (26.05.2008-25.05.2010)

Ing. Martin Kusý, 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.

INSTITUTE OF PRODUCTION TECHNOLOGIES

TOWARDS A COMMON RESEARCH PROJECT (01.10.2008-31.12.2011)

prof. Dr. Ing. Jozef Peterka

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. RP EU (01.09.2009 - 31.12.2011)

doc. Ing. Peter Šugár, CSc. Multivariete optimization of the metal spinning processes-research and development Specific innovation objectives, state-of-the art, needs addressed, market impact and potential benefits.

INTERNATIONAL

3700070100

PROJECTS

INSTITUTE OF PRODUCTION SYSTEMS AND APPLIED MECHANICS

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

doc. Ing. Peter Košťál, 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 means 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 competences in a board 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 operation.

INSTITUTE OF SAFETY AND ENVIRONMENTAL ENGINEERING

G/404/2000-2 (01.01.2000-31.12.2050)

Prof. Ing. Karol Balog, PhD. Ecological aspects and control of major-accident hazards involving dangenerous substances

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

doc. Ing. Ivana Tureková, PhD.

Modelling the dispersion of emmissions of dangerous substances during major industrial accidents. The project deals with the ways of supporting the international collaboration in research into the modeling 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 modeling the dangerous states.

INSTITUTE OF APPLIED INFORMATICS, AUTOMATION AND MATHEMATICS

DIVERSITY (01.01.2009 - 31.12.2011)

prof.Dr.Ing. Oliver Moravčík

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.

INSTITUTE OF INDUSTRIAL ENGINEERING, MANAGEMENT AND QUALITY

ERDC (01.06.2008-30.05.2010)

doc. Ing. Renata Nováková, 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 appropiate) in the region.

NATIONAL PROJECTS

INSTITUTE OF MATERIALS SCIENCE

APVV-20-043505 (01.01.2006-30.04.2009)

doc. Ing. Marian Kubliha, PhD.

Study of disordered structures of non-metalllic materials by chosen physical methods.

The aim of the project is to characterize the internal arrangement of chosen non-metal materials (special glasses determined as active elements in the infrared area of spectra, caoutchoouc mixtures for the automobile rubber preparation) by precise physical measurements and to utilize the mentioned information for optimizing the composition and technological parameters of the mentioned materials. The correlations among the measured values and the internal arrangement parameters will be discovered, and the obtained results will also be verified by alternative methods.

KEGA 3/5178/07 (01.01.2007-31.12.2009)

Prof. RNDr. Slabeycius, Juraj, CSc.

Multimedial support and conception of subject named "Diagnostic methods in material engineering". The target of the project is multimedial promotion of the subject named "Diagnostic methods in material engineering" redrafted for the master's education program "Materials engineering" by means of multimedial lectures and other teaching aids. The innovated laboratory measurements will be included in the subject too. The attractivenes of education will be increased by application of multimedial technologies, the knowledge of students will be enhanced, and the creative approach to study will be stimulated. An extended version of subject will be exploited also for graduate preparation.

VEGA 1/4107/07 (01.01.2007-31.12.2009)

prof. Ing. Janovec Jozef, DrSc.

Characterisation of quasicrystals and quasicrystalline approximants in Al-Pd-TM alloys (TM= transition metal)

The characterization of phases in alloys corresponding to Al-Pd-Fe, Al-Pd-Rh systems is the main aim of the proposed project. Attention will be paid to the description of lamellate structures accompanying formation and/or transformations of quasicrystalline phases. Stable quasicrystals, quasicrystalline approximants and neighbouring crystalline phases will be characterised by transmission electron microscopy including electron diffraction, X-ray diffraction, thermal analysis and other techniques. The investigated samples will be delivered by partners from the Network of Excellence Complex metallic alloys of 6th FP of EK and partially produced in our own facilities.

VEGA 1/0126/08 (01.01.2008- 31.12.2010)

doc.Ing. Mária Dománková, 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)

Ing. Viera Trnovcová, CSc.

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, supernonics and dosimetry. To determine relations between properties, composition, defect structure and preparation technique.

VEGA 1/0148/08 (01.01.2008- 31.12.2010)

Ing. Roman Moravčik, 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 solidifed powder particles, which were prepared form 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)

RNDr. 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.

NATIONAL PROJECTS

INSTITUTE OF PRODUCTION TECHNOLOGIES

APVV-0057-07 (02.06.2008-31.12.2010)

doc. Ing. Milan Marônek, CSC.

Research of welding and Forming of Nitrooxidatively Treated Steel Sheets

The nitrooxidative layers enhance significantly mechanical and anticorrosive properties of metal sheets. The project deals with the research of nitrooxidative layers making on metal sheets, the research of appropriate welding methods of such treated plates and with the study fo 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 weldin of nitrooxidatively treated sheets.

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

Ing. František Kolenič, PhD. – project participant for MTF – prof. Ing. Koloman Ulrich, PhD. Complex of technological electrorays of welding, welding on and surface material treatment. The project deals with a module and nets research of universal electronrays 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 80 mm. 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.

KEGA 3/6140/08 (01.01.2008- 31.12.2010)

prof. Dr. Ing.Ivan Kuric

Globalization of education of the academical technical orientation of undergraduates with aspect to increasing their flexibility, mobility and skills

The instrument for the achievement of goals will be the implementation of modern electronical instruments as WEB aplications and e-education, mobility of students. It will be suggested and

achieved a complex e-education system. Methods of the project will be the combination of the classic approach of study with realization of mobilities on partnership universities and the work with the electronic education system.

VEGA 1/4109/07 (01.01.2007-31.12.2009)

prof. Ing. Čaus Alexander, DrSc.

Optimisation of heat treatment conditions of steels for cast cutting and forging tools.

The goal of the project is acquisition of new findings from the field of heat treatment of steels for cast cutting and forging tools which will enable the purposeful increase of durability and life of the tools. It is a study of the effect of heat treatment conditions on the structure and basic properties of the steels for cast cutting and die tools of the usual chemical composition, as well as the steels to be treated with inoculants and modifiers. First of all we will pay attention in the study to the effect of heat treatment on the kinetics of tranformation of primary structure and phase composition of the steels studied with establishment of relationships between technological parameters of operations of annealing, quensching and tempering on the one hand and the structural changes and final properties on the other hand. Taking into consideration the fact that tool materials' carbide phases are very important factors affecting drastically their finale properties, in the project we will study morphology and character of distribution of the eutectic and secondary carbides in the structure steels studied after annealing, quenching and tempering from the properties of steels point of view. On the basis of the gained results, the optimisation of heat treatment conditions of the steels for cast cutting and forging tools will be held.

VEGA 1/4108/07 (01.01.2007-31.12.2009)

prof. Ing. Ivan Baránek, CSc.

New trends and next developments of superfinishing technology.

The introduced project is oriented into new ambit evolution of superfinishing, because it always is possible to give into technology the new information, improving all machining process thereby, that reduce wear of tools and machine tools, increase machining surface quality in superfinishing (reducing surface roughness), enable cutting difficult approachable places of surface machine part, reduce production costs, or reduce time of superfinishing.

VEGA 1/4111/07 (01.01.2007-31.12.2009)

prof. Ing. Lipa Zdenko, CSc.

Implantation of differential and other mathematical methods into analytical theory of machining

Analytic theory of machining worked till now mainly by mathematical tools of lower level and did not utilize the possibilities of various mathematical and physical methods. Some machining problems are possible to solve by using procedures and methods utilized in other scientific discipline (transformational and rheological methods). We can also use Mathematical analysis, Dimensional analysis, Energetic analysis, especially in Dynamics of machining, in machining forces theory, in Thermodynamics of machining (thermic and temperature conditions) and in research of all attendant phenomena in machining.

NATIONAL PROJECTS

VEGA 1/0354/08 (01.01.2008- 31.12.2010)

Ing. Štefan Podhorský, PhD.

The technologic and the environmental 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)

doc. Ing. Peter Pokorný, 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 influence CAM strategies 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)

doc. Ing. Jozef Bílik, 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)

doc. Ing. Roman Koleňák, PhD.

Study of 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)

prof. Ing. Milan Turňa, 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 matallurgical bonding of special and combined materials. A selection of special technologies of welding, soldering, etc. or 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.

INSTITUTE OF PRODUCTION SYSTEMS AND APPLIED MECHANICS

VEGA 1/0206/09 (01.01.2009- 31.12.2012)

prof. Ing. Karol Velíšek, CSc. 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 and also for assembly. Intelligent behaviour of the system will repose on monitoring of important parameters of the system and also will be monitored information about system 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 of area saving, lower building costs, and higher use effects of the whole device.

KEGA 3/5211/07 (01.01.2007- 31.12.2009)

prof. Ing. Velíšek Karol, CSc.

Building of Pneumatics and Electro Pneumatics System Controling Virtual Laboratory

A virtual laboratory of pneumatics and electro pneumatics systems control will be supported for principle training of pneumatics and electro pneumatics system control sorting and for operation simulation of these systems. In this type of laboratory the students will operate by Internet and will confirm their technical skills and abilities in this laboratory.

NATIONAL PROJECTS

KEGA 3/7131/09 (01.01.2009-31.12.2011)

doc. Ing. Peter Košťál, 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)

doc. Ing. Bohumil Taraba, CSc.

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 surface. 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 surface temperature function, momentary heat fluxes from the cooled surface, and cooling rates.

VEGA 1/0832/08 (01.01.2008- 31.12.2010)

Ing. Helena Kraváriková, PhD.

Thermo-mechanical Analysis of the Welding Process using the Experimental and Modelling 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. 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)

doc. Ing. František Pecháček, PhD.

Optimalized 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)

doc. RNDr. Mária Behúlová, CSc.

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

The submitted 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 behaviour 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)

Ing. Milan Naď, CSc.

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.

NATIONAL PROJECTS

INSTITUTE OF SAFETY AND ENVIRONMENTAL ENGINEERING

LPP-0171-07 (01.04.2008-31.03.2011)

Ing. Anna Michalíková

Natural phenomenon for small and big ones 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. Ematerials 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 copmetition). During the preparation of materials, from teacher 's requirements experiments will be determined which are not able to be realized due dangerous chemicals, absence of tools and instruments).

KEGA 3/6431/08 (01.01.2008- 31.12.2010)

doc. Ing. Černecký Jozef, CSc.

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 eduction on subjects such as "Techniques of air protection" and "Technical devices of measurement and montitoring" which will focus on measurment, scoring and optimalization of particulate and gaseous emissions. After completion, the proposed project will by explored and documented by research on the practical application of theoretical knowledge.

VEGA 1/0488/08 (01.01.2008- 31.12.2010)

doc. Ing. Ivana Tureková, PhD.

Enviromental 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. Thes information is necesary for each fire-intervention to reduce the negative impact on the environment.

VEGA 1/0798/08 (01.01.2008- 31.12.2010)

Ing. 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 hydrodynamic principal. The rolling fluid machine device is of a simple construction. It is able 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 modeled. 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)

doc. Ing. Maroš Soldán, PhD.

The expositation 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.

NATIONAL PROJECTS

INSTITUTE OF APPLIED INFORMATICS, AUTOMATION AND MATHEMATICS

LPP-0202-06 (27.10.2006-31.10.2009)

prof. Dr. Ing. Oliver Moravčík

Science closer to students

The project of science and technology popularization is oriented to students of secondary schools with the aim of increasing their interest in new knowledge in the field of science, research and development, and to improve education quality. The main aim of the project is support education and scientific-research work through motivation tools for students and improving quality of education.

APVV-0308-07 (02.09.2008-30.06.2010)

doc. Ing. Peter Schreiber, CSc.

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)

Ing. Pavol Božek, CSc.

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 aformentioned written university textbooks.

VEGA 1/4078/07 (01.01.2007-31.12.2009)

doc. Ing. Pavol Tanuška, PhD.

Proposal of testing methodology within the process of data warehouse validation

A methodology of testing in the process of validation should determine basic approaches to data warehouse analysis. During the validation of data storage, it is necessary to implement such activities to create an evident and validated proof which provides a high level of warranty, and thus all parts of systems will be constantly and properly working as soon as they are introducing into the operation. We suggest particular activities that need to be implemented during testing of data storage validation. We are aiming for those which are related to the suggestion of a multidimensional database, ETT processes, metadata, optimisation of command scripts and others which are different from standard information systems. One part of the testing procedure proposal will be the proposal of testing hypotheses, script of testing and its implementation as well.

VEGA 1/0282/08 (01.01.2008- 31.12.2010)

doc. Ing. Jozef Vaský, CSc.

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)

Mgr. Róbert Vrábeľ, PhD.

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

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)

doc. Ing. Pavel Važan, PhD.

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

NATIONAL PROJECTS

VEGA 1/0582/08 (01.01.2008- 31.12.2010)

RNDr. 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)

doc. Ing. Peter Schreiber, CSc.

Artifical intelligence in flexible manufacturing systems control

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

INSTITUTE OF INDUSTRIAL ENGINEERING, MANAGEMENT AND QUALITY

LPP-0384-09 (03.09.2009-31.08.2012)

prof. Ing. Peter Sakál, CSc.

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 process on the workplaces of MTF STU Trnava.

VEGA 1/0229/08 (01.01.2008- 31.12.2010)

doc. Ing. Iveta Paulová, 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 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)

doc. Ing. Andrea Holková, 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)

doc. Ing. Šujanová Jana, CSc.

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 the achievement of the 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 to increase their effectiveness and sustainable competitiveness.

NATIONAL PROJECTS

INSTITUTE OF ENGINEERING PEDAGOGY AND HUMANITIES

KEGA 3/6026/08 (01.01.2008- 31.12.2010)

doc. Ing. Hrmo Roman, 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 practise 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)

Ing. Krpálková Krelová Katarína, PhD.

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

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

KEGA 3/6253/08 (01.01.2008-31.12.2010)

Ing. Milan Petráš, CSc.

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

The aim 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 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 the 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.

VEGA 1/4512/07 (01.01.2007-31.12.2009)

prof. Paed Dr. Milan Kips, PhD.

Outstanding Slovak educators of the 20th century (Professor Čečetka, Professor Mátej, Professor Brťka, Professor Václavík)

A research project on four outstanding educators' scientific work (Professor Čečetka, Professor Mátej, Professor Brťka, Professor Václavík); an analysis of their pedagogical work and its contribution to the development of the Slovak pedagogy and educational philosophy.

VEGA 1/0185/08 (01.01.2008- 31.12.2010)

doc. PaedDr. Marián Merica, PhD.

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

Research 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-kinetics 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.

PROJECTS IN COLLABORATION WITH INDUSTRIAL PRACTICE

PROJECTS CARRIED OUT BY INSTITUTE OF MATERIALS SCIENCE

00009-07 (01.06.2008-31.12.2010)

Ing. Juraj Lapin, DrSc.

Metallurgy and development of novel intermetallic materials for extreme loading conditions The project is focused on development of an optimal metallurgical process of highly reactive and melt-resistant Ti based intermetallic alloys, and on research of new original systems suitable for extrerme working conditions like high temperature, aggressive atmosphere, high mechanical and temperature loading.

053-001STU-8/2008 (1.12.2008-31.10.2009)

doc. RNDr. Vladimír Labaš, CSc.

Gravitationally generated horizontal motive force acting on driven mechanism. (expertise) An innovative idea for realization of horizontal motion of mechanisms by means of gravitational force was proposed by an external submitter. Ab initio analysis of dynamics of such a mechanism and computer simulation of the mechanism motion were carried out in the frame of the project. Expert testing of proposed idea was main goal of the project.

4/2007/08 (01.01.2008-31.12.2010)

Ing. Svetozár Demian

Development of metallurgical processing of highly reactive Ti-based intermetallic alloys for extreme stress

The project is aimed at the development of optimum metallurgical processing for highly reactive Ti based intermetallic alloys (TiAl, TiB2 and others) with a high melting point, and also at the research on new systems suitable for extreme conditions characterised by high temperature, aggressive environment, high mechanical and thermal stress. The required chemical composition and lower price of the new generation of polyphase Ti-based intermetallic alloy will be achieved using precursors prepared from initial material using the original method of an isostatic reaction compaction followed by remelting in plasma or arc furnace. This approach will ensure significant improvement of chemical homogeneity, high flexibility in alloying with the required alloying elements, and minimisation of impurity content. Thus, the required properties for extreme conditions will be obtained.

7/2009, 36/2009 (02.01.2009-31.12.2009)

doc. Ing. Ľubomír Čaplovič, PhD.

Retained austenite measurement

The dependence of the parameters of heat treatment on the content of retained austenite in bearing steel was determined using the X-ray powder diffraction method.

2/2009, 3/2009, 42/2009 (05.01.2009-21.12.2009)

doc. Ing. Marián Hazlinger, CSc. Metallographic analyses and mechanical tests of materials Experience oriented on the material degradation during exploitation and on the failure of engineering parts.

12/2009, 13/2009, 59/2009 84/2009 (02.02.2009-14.10.2009)

doc. Ing. Ľubomír Čaplovič, PhD. Microstructure analysis of bearing steels Using the methods of metallographic analysis, this study showed the primary cause of cracks in bearing steels.

22/2009, 62/2009 (13.03.2009-07.07.2009)

doc. Ing. Marián Hazlinger, CSc Microstructure analysis and hardness of casting

A study of material degradation using scanning electron microscopy and fractography, it describes the processing, evaluation and summary of results of mechanical tests and material working properties, numerical simulation and experimental measurements, with the aim of optimizing the studied technological processes and gaining other knowledge in the field of degradation processes of the materials.

27/2009, 58/2009 (27.03.2009-26.06.2009)

doc. Ing. Mária Hudáková, PhD. Measurement of hardness HV10 of 3pcs of welded joints Measuring the hardness of welded joints according to standards. PROJECTS IN COLLABORATION WITH INDUSTRIAL PRACTICE

38/2009 (30.04.2009-04.05.2009)

doc. Ing. Marián Hazlinger, CSc. Damage analysis of broken conrod Fractographic analysis of experimental specimens after their degradation.

40/2009 (04.05.2009-15.05.2009)

prof. Ing. Jozef Janovec, DrSc. Analysis of steel samples The samples prepared from alloy steels were analysed by TEM, electron diffraction, and EDX. The obtained results were used for the modification of the material design of steels.

52/2009 (08.06.2009-12.06.2009)

prof. Ing. Jozef Janovec, DrSc. Complex metallographic and TEM analyses of delivered samples Samples prepared from alloy steels were analysed by TEM, electron diffraction, and EDX. The obtained results were used for the modification of the material design of steels.

PROJECTS CARRIED OUT BY INSTITUTE OF PRODUCTION TECHNOLOGIES

11/2009 (28.01.2009-06.02.2009)

doc. Ing. Peter Pokorný, PhD. Research and testing production board testers In the project we address the design and production testers for testing integrated circuits in LCD TVs. Research was also done on production test series testers and subsequent testing in the assembly.

14/2009 (10.02.2009-17.02.2009)

doc. Ing. Peter Pokorný, PhD. Research and testing of the assembly plant In the project we address the design and manufacture of assembly plants for the automotive industry. Research has also manufactured a series of test preparation and subsequent testing in the assembly.

16/2009 (12.02.2009-19.02.2009)

doc.Ing.Štefan Podhorský The polishing of castings The practical application of the plasma-electrolytic process in the field of the surface polishing of metallic parts for the engineering industry.

25/2009 (13.03.2009-16.03.2009)

doc.Ing.Štefan Podhorský Plasma polishing of samples The practical application of the plasma-electrolytic process in the field of the surface polishing of metallic parts for the engineering industry.

28/2009 (01.04.2009-09.04.2009)

doc. Ing. Peter Pokorný, PhD. Research and testing of the assembly plant In the project we address the design and manufacture of assembly plants for the automotive industry. Research has also manufacture a series of test preparation and subsequent testing in the assembly.

31/2009 (01.04.2009-15.04.2009)

doc.Ing.Štefan Podhorský Plasma polishing of samples The practical application of the plasma-electrolytic process in the field of the surface polishing of metallic parts for the engineering industry.

47/2009 (15.04.2009-13.08.2009)

doc.Ing.Štefan Podhorský Plasma polishing of samples The practical application of the plasma-electrolytic process in the field of the surface polishing of metallic parts for the engineering industry.

33/2009 (22.04.2009-19.06.2009)

doc.Ing.Štefan Podhorský Plasma polishing of samples The practical application of the plasma-electrolytic process in the field of the surface polishing of metallic parts for the engineering industry. PROJECTS IN COLLABORATION WITH INDUSTRIAL PRACTICE



doc. Ing. Peter Pokorný, PhD.

Research and implementation of engineering work-assembly plant

In the project we address the design and manufacture of assembly plants for the automotive industry. Research has also manufactured a series of test preparations and subsequent testing in the assembly.

49/2009 (01.06.2009-05.06.2009)

Ing.Ladislav Morovič ,PhD.

Research and examining of welded parts

The delivered welded parts were scanned with optical method by 3D scanner. The obtained digital 3D CAD models of welded parts were compared with reference to the 3D CAD model of welded parts. The deviations of shape and dimensions were presented on colour deviation maps.

51/2009 (04.06.2009-10.06.2009)

doc. Ing. Peter Pokorný, PhD.

Research and implementation of engineering work-assembly plant

In the project we address the design and manufacture of assembly plants for the automotive industry. Research has also manufactured a series of test preparations and subsequent testing in the assembly.

65/2009 (15.07.2009-20.07.2009)

Ing.Ladislav Morovič ,PhD. Research and measuring of 3D parts

The delivered copper parts were scanned with optical method by 3D scanner. On the obtained digital 3D CAD models of copper parts we determined the measurements of required dimensions.

63/2009 (15.07.2009-22.09.2009)

doc.Ing.Štefan Podhorský Plasma polishing of samples A practical application of the plasma-electrolytic process in the field of surface polishing of metallic parts for the engineering industry.

66/2009 (22.07.2009-24.07.2009)

Ing.Ladislav Morovič ,PhD.

Research and examination of the achievement of a digitized 3D model

The delivered glass parts were scanned with the optical method by 3D scanner. The obtained digital 3D CAD models of glass parts were compared with reference 3D CAD models of glass parts. The deviations of shape and dimensions were presented on colour deviation maps.

85/2009 (20.10.2009- 30.10.2009)

Ing.Ladislav Morovič ,PhD.

Optical 3D scanning of thin sheet metal pressings

The delivered sheet metal pressings were scanned with optical method by 3D scanner. The obtained digital 3D CAD models of pressings were compared with reference to the 3D CAD model of pressing. The deviations of shape and dimensions were presented on colour deviation maps (on the whole surface and in cross section of pressing).

SK-SRB-00407 (01.01.2008-31.12.2010)

Augustín Görög, Assoc. Prof., PhD. Accurary of machining and machine tools.

PROJECTS CARRIED OUT BY INSTITUTE OF SAFETY AND ENVIRONMENTAL ENGINEERING

10/2009 (20.02.2009-20.02.2009)

Ing. Sztankay, CSc.; Ing. Németh

Cooperation in measurements of the noise and the vibrations of vessels

The noise level and the level of mechanic vibrations of vessels is incrementally raised due to growing power of engines and their strength. The parameters of vibration and the noise of the newbuilt vessel are guaranted by the shipbuilders. They are the priority conditions of their quality evaluation by aspects of health promotion. These parameters of vibration and the noise of the vessel are strictly controlled by the international standards ISO, IMO, DIN and by the organisations Germanischer Lloyd, UVV See - BG, etc. The source of the noise and the vibration on the vessels is key for each equipment where vibro-acoustic energy arises. Safe values of the noise and the vibration are defined by the above mentioned organisations, which ignoring may cause heavy economical and financial losses. PROJECTS IN COLLABORATION WITH INDUSTRIAL PRACTICE

29/2009 (13.03.2009-09.04.2009)

prof. Ing. Karol Balog, PhD.

Case study of coal transporting lines in ENO

An analysis of fire initiation and fire development on coal transporting lines; fire prevention precaution and fire technical equipment in the compartment; a proposal of fire prevention precaution; fire sectors, detection of fire, stable extinguishing equipment and fire safety shutters.

67/2009 (24.08.2009-31.12.2011)

prof. Ing. Karol Balog, PhD.

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

73/2009 (09.09.2009-11.11.2009)

doc. Ing. Ivana Tureková, PhD.

Measurement of noise in a cleaning room

The goal of the project was to determine noise exposure for a new position –machine operator in the cleaning room. The measurement results are used to inform the assessment of worker exposure and estimate corrective actions to enhance safety and health at work for the reporting workplace.

PROJECTS CARRIED OUT BY INSTITUTE OF APPLIED INFORMATICS, AUTOMATION AND MATHEMATICS

26/2009 (01.04.2009-30.10.2009)

doc. Ing. Pavol Tanuška, PhD.

The proposal of a control system for inspection standards of nuclear spent fuel elements SVYP-440. The project topic is the development of new control system for inspection standards of nuclear spent fuel elements SVYP-440. The entire control system will be implemented in the Step7 environment for Simatic.

56/2009 (18.06.2009-29.10.2009)

doc. Ing. Pavol Tanuška, PhD.

Evaluation of acoustic emission measurement

The project's topic is a measurement proposal, measurement and thereafter the evaluation of particular signals of acoustic emission from detectors assembled in 4 basins inside of nuclear spent fuel elements storage.

DEVELOPMENT AT THE FACULTY OF MATERIALS SCIENCE AND TECHNOLOGY

INFRASTRUCTURE

Strategic goal of the project:

- the upgrading of the educational infrastructure, the STU will gradually become one of the fundamental elements driving the development in the region of Trnava regarding education and scientific activities.
- upgrading of the educational infrastructure STU significantly improves the conditions for the implementation of cutting-edge research at the University.
- to create a significant contribution towards improving the technical infrastructure of top
 educational sites in priority areas relating to a strategic development potential.
- Better infrastructure, the STU allows better cooperation and interaction with the practice, which
 will also help strengthen the competitiveness of the region, create jobs and improve the
 quality of human potential within the region.
- The creation of favourable conditions for the transfer of new knowledge into practice focusing on Technology in the context of cluster initiatives within the automotive and electronics industries based in the Trnava region.



Support of universities infrastructure to improve the conditions of education.

The aim of project is to create the universities infrastructure and modernisation of their internal equipment to imrove the conditions of education process. The project result will be modernisation of computer nets, datacenter building on the Bottova and Botanicka street, improvement of printing system, modernisation of classes. In the classrooms there will be dataprojectors and other modern education tools. In the faculty buildings there will be added Internet places for the students, Next multimedia classrooms will be created and the number of connection points to Internet WiFi will be increased. Next important step is creation of information faculty security and especially by net monitoring, firewall solutions for all LAN MTF, providing of computers for students also in dormitory. PROJECTS OF TECHNOLOGIES TRANSFER

OPERATION PROGRAM RESEARCH



Európska únia Európsky fond regionálneho rozvoja



LABORATORY OF ELASTIC PRODUCTION SYSTEMS WITH ROBOTIC REGULATION IN THE AREA OF DESIGN-FREE 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 phase.

Project carried out by: INSTITUTE OF PRODUCTION SYSTEMS AND APPLIED MECHANICS

HYBRID POWER SUPPLY FOR TECHNICAL CONSULTANCY LABORATORY FOR THE USE AND PROMOTION OF RENEWABLE SOURCES AND ENERGY

Prototype hybrid source-based RES construction (hydropotential, 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.

Project carried out by: INSTITUTE OF SAFETY AND ENVIRONMENTAL ENGINEERING

CENTER OF KNOWLEDGE ORGANISATION OF INTELLECTUAL PROPERTY

The project aims to promote the scientific potential of intellectual capital and is based on long-term objectives in order to increase the degree of responsibility for knowledge transfer and technology. The subject of intellectual property is the result of creative or intellectual activity. More recently, there is a harmonization of the laws relating to intellectual property rights not only in the EU, but also within international organizations, scientific and educational institutions. The quality of knowledge and intellectual potential of the institution and the intensity of its development is associated with information management. Transfer of knowledge, a review of the status of knowledge in the value hierarchy of the organization. The basis for a comprehensive promotion of science and research was determine then added to give value to the information processes of the faculty. Based on these inputs as an Action Plan project, which is the integrity of the educational-research-innovation, the decision to Create a knowledge centre or Intellectual Property Organization, the functionalities of virtual libraries and digital archives, a comprehensive treatment of intellectual property and expert scientific and teaching work is the result of globalization trends as a faculty for a knowledge centre society. It will be a model of knowledge management defined on the basis of survey information, information behaviour, knowledge, organization, interaction and the access to information. The benefits of a comprehensive information package for the area of intellectual property, a knowledge-based institution, which wants to become a faculty. The most important benefit of the project is that it will constitute a good basis for the developing support mechanisms within successful research universities and for the scientific community with no barriers to access. The project is a system that with a logically organized approach to tackling the scientific methodologies: the emergence of a virtual library and digital archive is requ

PROJECTS OF TECHNOLOGIES TRANSFER

relating to intellectual property rights and the transfer of knowledge, the use of methodologies and tools of information management such as academic libraries, communication and information technologies.

The functionality of the expert teaching of scientific work is a verification of good theoretical knowledge gained via scientific research. Value-added information may be defined as a means for attributing to the data needed for the transformation of knowledge into an experience involving quality. Timeline issues based on the knowledge that information is an important factor for the effective functioning of the existing universities thus determining the level of attractiveness and quality of its processes that are subject to quality scientific research activities.

The project is linked with the strategy of building cognitive science organizations and state policy goals. Research and education are the most effective factors in the development of investments, which may take two forms: innovative and streamlines, the process of creating commercial value in the educational and research organization, and the creation of conditions for their own development within organizations. The efficiency and effectiveness of the knowledge management must be confirmed by the quantity and quality of outputs. Knowledge should be seen as a universal benefit which facilitates the organization via the support of systems and scientific research. Knowledge management can be characterized as a process promoting an integrated approach and the use of information related activities together with resources within scientific research. The project was preceded by an analysis of the status quo, which confirmed the conclusions and the urgency to address the issue. The project confirms the ambition and a comprehensive program of care for the management of intellectual property rights.

Project carried out by: DIVISION OF KNOWLEDGE MANAGEMENT

OPERATION PROGRAM EDUCATION

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.

Project carried out by: INSTITUTE OF ENGINEERING PEDAGOGY AND HUMANITIES

KNOWLEDGE REGULATED SYSTEM OF OBSERVATION TOOLS OF GRADUATES CARRIER IN THE INTEGRATION PROCESS TO THE EU

Strategic aim of the project is focused on a support of quality increase and flexibility of the tools for observation of graduates carrier as a output of adaptation of education system to the needs of knowledge society via innovation forms of development of faculty intelectual capital. It is based on the longterm aim to increase responsibility of knowledge transfer and development of knowledge society. The quality of intellectual and knowledge institution potential, intensity of its development is connected with knowledge management. The transfer of knowledge presents a revision of knowledge position in the organisation value hierarchy. The project presents an education integrity - innovations and knowledge.

Project carried out by: DIVISION OF KNOWLDEGE MANAGEMENT





Európska únia Európsky sociálny fond

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