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

2008 • SCIENCE • RESEARCH • PROJECTS

Editor: PhDr. Kvetoslava Rešetová, PhD

2008

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SCIENTIFIC PROFILE OF THE FACULTY

The scientific and research activity of STU MTF research staff is carried out in the following forms:

- research and pedagogical projects within VEGA and KEGA grant agencies
- projects solved within international programmes
- projects of international collaboration
- projects of applied research and development
- projects of contractual research and development.

The research content is oriented to the following fields:

- materials research with a focus on the research, development and technological processing of the basic kinds of technical materials
- research and development of new technologies of industrial production oriented particularly on the technological processing of modern technical materials and ecologically clean products,
- 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.

Established in 2002, the Agency for Science and Technology Support manages the governmental research programmes involving the Faculty researchers.

INSTITUTE OF MATERIALS SCIENCE

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RESEARCH TARGETS

- vacuum metallurgy, metal refining and solidification
- powder metallurgy, properties of rapidly solidified particles
- tool steels, creep and/or corrosion resistant steels
- weldability and surface treatment (boridation) of steels
- complex metallic alloys and amorphous materials
- nickel and titanium based alloys
- biocompatible materials
- physical properties of ceramics, non-metallic composites, plastics, rubbers, fluoride, oxide and chalcogenide special glasses, as well as fluoride and oxide superionics
- segregation phenomena and grain boundary engineering
- modelling and simulation of solid structures
- lead free solders

RESEARCH CHARACTERISTICS

The Institute of Materials Science was established on 1st of January, 2007 joining the former departments into a larger unit achieving an improvement of scientific and research activities as well as of international cooperation. The Institute is responsible for materials and physics

oriented courses at MTF. On bachelor degree, the Institute guarantees study program Materials Engineering, on engineering and doctorate degrees it guarantees study programs Materials Engineering, Processing and Application of Non-metals as well as Surface Engineering of Advanced Materials.

Research and expertise activities of the Institute are aimed at crystallization of metals and alloys, tool material and nickel-based alloys, powder metallurgy, bio-compatible materials, stainless steels, steels for power plants, weldability of steels, magnetic materials, thermal treatments and surface modification of materials, complex metallic alloys, grain boundary engineering as well as ceramic and polymer materials.

At present, the Institute possesses' 7 laboratories equipped with a number of modern experimental techniques (for example: high resolution transmission electron microscopy Philips CM300, X-ray diffractometer Philips PW 1710, differential scanning calorimeter Perkin Elmer). In areas, research and education, the Institute established intensive cooperation with local and foreign institutes. It became a part of a network of foreign academic and commercial institutes which gives an opportunity for extensive exchange of students and academic staff members of the Institute contributing to dynamic and sustainable professional growth. As the most prestigious academic institutes could be mentioned Leibnitz Institute of Solid State and Materials Research Dresden (Germany), Institute Jožef Stefan, Ljubljana (Slovenia), Vienna University of Technology (Austria), Research Center Dresden-Rossendorf (Germany), Institute of Physics of Materials, Academy of Sciences of the Czech Republic, Brno (Czech Republic), Faculty of Mechanical Engineering, University of Ljubljana (Slovenia) and other Slovak universities and institutes of the Slovak Academy of Sciences. From the list of industrial partners the most recognized are Bekaert SA (Belgium), Böhter - Edelstahl and Branson div. Emerson.

The Institute has long term tradition in cooperation with regional industrial partners as INA Skalica, Ltd., Skalica,

VUJE corp., Jaslovské Bohunice, ZF Sachs Slovakia, corp., Trnava, Zlievareň, corp., Trnava, HKS Forge Ltd. Trnava; MANZ, corp. Nové Mesto nad Váhom; SONY Slovakia, Nitra; Samsung Electronics Slovakia, Galanta, Voderady; Faurecia Trnava; PSA Peugeot Citroen, Trnava; Noble International, Ltd. Senica; TRW Steering System Slovakia Ltd., Nové Mesto nad Váhom; Hella Lighting Slovakia, Kočovce; Kinex-KLF, corp., Kysucké Nové Mesto; PSL, corp. Považská Bystrica; EMO, corp. Mochovce; Johns Manville, corp. Trnava; Sauer Danfoss, corp., Považská Bystrica; ŽOS corp., Trnava; PFS, corp., Brezová pod Bradlom; Kompozitum Topoľčany; Fremach, Trnava; Slovalco, corp. Žiar nad Hronom; IMS Kupa, corp. Nováky

INTERNATIONAL PROJECTS

FZD MTF STU (01.01.2007-31.12.2008)

Prof. Ing. Jozef Janovec, DrSc.

Slovakion - Research of cluster structures and nanomaterials The Faculty of Materials Science and Technology of STU acquired from the Forschungszentrum Dresden-Rosendorf a high-resolution transmission electron microscope PHILIPS CM300 with acceleration voltage of 300 kV, LaB6 cathode, and lateral resolution of 0.14 nm. It enables also nanodiffraction and EDS. After small modifications of the microscope the electron tomography presenting 3D-images of nanoparticles will also be available. The microscope is unique equipment in Slovakia from the technical parameters point of view. The microscope will be used mainly for the characterization of thin layers, nanolayers, multilayers, interfaces, complicated cluster structures in complex metallic alloys and ceramics, and 3D-nanopartricles of various types. A complex nanoscale analysis of the material possible

in the microscope will also extend the state of knowledge about conventional materials (e.g. high-strength low-alloy steels, aluminium and titanium alloys, nickel superalloys).

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 ancillary units for TEM (Delta Abrasiment).

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.

EUREKA E!3437 (01.01.2005-01.01.2008)

Ing. Mária Hudáková, PhD.

Progressive surfacing of metals

The main and general goal of the project is to improve and optimize surface properties of advanced metallic materials through the physical and chemical deposition of thin and hard layers and their combinations. The efforts leading to the reduction of wear, corrosion, and generally to the prolonging of the service-time of tools and engineering parts is the main driving force for development of suitable surface technologies for the metallic materials.

NO. S-13-2005 (01.09.2005-31.12.2050)

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 (HP-DL) It was found out, based on the research carried out, that it is feasible to develop the surface layers on the X40CrMoV5-1 hot-work tool steel by remelting and alloying with the tungsten carbide using the high power diode laser (HPDL). The structure of the material solidifying after laser remelting is characteristic of the diversified morphology connected with the repeated changes of the crystals' growth direction, from small dendrites, whose principal axes are oriented in accordance with the heat removal directions at the boundary between the solid and liquid phases, clusters of carbides arranged in accordance with the 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 the much larger thermal capacity, decides the martensitic transformation of the austenite originated due to crystallization, and the lathe martenzite developed in this process, partially twinned, is characteristic of the significant refinement of the martenzite with the martenzite lathes' length several times smaller that than of the ones of the martenzite developed during the conventional quenching. Laser remelting and alloying with the 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. Increase of the steel surface hardness to 66.5 HRC occurs due to refinement of the structure. The research results indicate to the feasibility and purposefulness of the practical use of the remelting and alloying with the tungsten carbide using the high power diode laser, e.g. for making new tools or for regeneration of the 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

NATIONAL PROJECTS

APVV-20-043505 (01.01.2006-31.12.2008)

Marian Kubliha, doc., Ing., PhD.

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

To characterize internal arrangement of choosen kind of non-metallic materials (special glasses determined as active elements in infrared area of spectra, caoutchoouc mixtures for the automobile rubber preparation)on the basis of precise measurements of choosen physical properties. To utilize mentioned information at optimalization of composition and single parameters of mentioned materials preparation technology. It is possible to briefly resume the treatment on the physical properties description, the recovery correlations among reached values of measured physical properities and internal arrangement parameters, verification of obtained informations by means of other methods, results valuation, proposal of solutions, prospective optimalization of determining parameters, conclusion.

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 high melting point, and also at the research of 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 required alloying elements and minimisation of impurity content. Thus, required properties for extreme conditions will be obtained.

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".

Target of the project is multimedial promotion of subject named "Diagnostic methods in material engineering" redrafted for magister educational program "Materials engineering" by means of multimedial lectures and other teaching aids. Innovated laboratory measurements will be included to the subject too. Attractivenes of education will be increased by application of multimedial technologies, knowledges of students will be enhanced and creative approach to study will be stimulated. Extended version of subject will be exploited also for graduant preparation.

KEGA 3/4057/06 (12.02.2008-13.02.2008)

prof. Ing. Palček, Peter, PhD.

Electronic interactive Slovak-Slovak and Slovak-English dictionary of Material Engineering.

Project is aimed at developing the electronic dictionary of Material Engineering on a web page available for universities and the Slovak Academy of Science free of charge.

The dictionary is designed for teachers and researchers in the Slovak universities. It comprises 1 200 selected expressions from the field on Material Engineering, while any workplace can contribute and enhance it via its web administrator. The explanation will be illustrated by schemes, video-sequences, photographs and examples. English equivalent is also given with individual expressions.

VEGA 1/3032/06 (01.01.2006-01.01.2006)

Milan Ožvold, prof., RNDr., CSc.

Preparation and physical properties of lead/free solders

The aim of this project is to increase the basic konwledge on lead-free solders as an interconnecting material. The work will cover the areas of physical, metallurgical and partially mechanical properties. Due to the special importance of today s application in electronics industry, the top four physical properties are:melting point temperature, electrical conductivity, thermal conductivity and surface tension. The surface tension of molten solder is a basic parameter affecting wettability and therefore solderability. The wettability and wetting reaction of the solder alloy are influenced by the interface reaction and intermetallic growth between solder and under bump metallization. The aim is establishing (micro) structure-property relations and potential reliability issue of Pb-free solders.

VEGA 1/3190/06 (01.01.2006-31.12.2008)

Peter Grgač, prof., Ing., CSc.

Study of the transformations processes in the rapidly solidified polycomponent multiphase alloys

Rapid solidification of undercooled melts in non-equilibrium conditions is used in several modern production technologies of high alloyed alloys and superalloys. These procedures are based on the production of rapidly solidified powders by inert gas atomisation. In the dependence on the chemical composition, size of a rapidly solidified particle and cooling conditions the variable metastable multiphase solidification microstructures are developed and later quantitatively and qualitatively altered during compaction processes. Project is focused on the detailed study of primary metastable structures and their transformations in the thermodeformation densification processes of polycomponent high alloyed technical alloys with intermediate phases of solidification origin. The main object of the project is on the base of experimental study and theoretical computations to develop a set of mutually

connected knowledge providing a detailed description of transformation processes during the production and technological processing of high alloyed iron and nickel based alloys with the aim to contribute to optimistion of their chemical composition, production parameters and following technological processing.

VEGA 1/4107/07 (01.01.2007-31.12.2009)

Janovec Jozef, prof. Ing. DrSc.

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

The project aim is to characterise the phases in Al-Pd-Fe, Al-Pd-Co and Al-Pd-Rh-based alloys. The attention will be devoted to the description of lamellar forms accompanying transformations of quasi-crystalline phases. Stabile quasi-crystals, quasi-crystalline approximants and related crystalline phases will be characterised by means of transmission electron microscopy including electron diffraction, X-ray diffraction, thermal analysis and other methods. The examined samples will be supplied either by 6. RP EK Complex metallic alloys, Network of Excellence, or will be prepared in our own laboratories. The project contribution dwells in its connection with international scientific network uniting the experts from various fields and types of organisations (Academies of Science, universities). The project output will be also used in the study of progressive materials by means of modern experimental methods. The project reflects technological and physical aspects of Materials Science and can be considered a base research with the direct impact on the knowledge pool in the field and information exchange.

VEGA 1/0126/08 (01.01.2008-31.12.2010)

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 the stainless steels. The main goal of this project is characterisation of the influence of the chosen 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 transilition 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 Moravčík, Phd.

Analysis of prepared by progressive powder metallurgy processes the tool materials

Project will be primary oriented to the analysis of distinguished parameters of atomisation process to distinguished characteristics of the microstructure of rapidly solidifed powder particles, which were prepared form highalloyed materials of tool steels and properties with respect of application possibilities. Obtained knowledge will be the base for correlation model design which simulates relations between rapid solidification of materials produced by powder matallurgy 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 fo NMR properties of molecules. We will explore trends of all important contributions such as electron correlations 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.

INSTITUTE OF PRODUCTION TECHNOLOGIES

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RESEARCH TARGETS

- soldering and brazing
- explosive welding
- weldability of steels
- welding plastic materials
- surfacing and tribology
- adhesive bounding
- foundry technology – preparation of the molten metal
- preparation of moulding materials
- powder metallurgy – technology of powder processing
- plasma-electrolytic technology – surface treatment of metals
- art foundry
- development of new foundry alloys
- theory of machined parts manufacturing, creatics, measurement and assembly
- CIM, CAD/CAM, CAPP, CAQ, CAA
- 3D art engraving
- manufacturing of dies
- qualitity of measurement
- formability of new materials
- high parametrical forming
- hardening surface layer
- experimental methods for forming
- computer simulation

RESEARCH CHARACTERISTICS

The research of the Institute of production technologies is oriented to the industrial technologies with respect to research and development in the sphere of high-tech technologies. The main fields of the industrial technologies on the Institute of production technologies are: machining, forming, foundry and welding.

Key directions of scientific research activity of the Institute of production technologies are focused on the support of the development of individual science and educational branches. It is safeguards to the responsibilities for the special growth of workers. The attention is devoted first to the actual and perspective questions related with industrial technologies in conditions of SR, at which are made provision for international trends as well as the integration processes to EU. Mark of scientific research work and activity are determined with originality of scientific orientation of the teachers and scientific research workers, material supply of main workstations and of the solution of scientific and socially best known questions of social work. The Institute of production technologies is oriented to the trans-regional own pedagogic and scientific activity in many aspects, cooperates and enlarging the co-operation with the more renowned scientific research institutes abroad. International co-operation in research is implemented mainly with the change of information, results, knowledge for education of PhD students (fellowships, educational visits, workshops).

The scientific directions of main workstations are determined to the long time and covered the production and technologiecal aspects of exploitation of all resources and solutions of the actual questions in a given branches. The lay of projects is oriented mostly to the production technologies in co-operation with industrial practice on the basic of actual global problems.

Center of sphere of the scientific research are:

- Production and controlling of components with complex form and strict surface.

- Numerical simulation and optimalization of production in surface and volume forming of the metallic materials - prediction of formability.
- Modification of surface of the stainless steel with plasma discharge in electrolyte.
- Art casting.
- Classical and special method of joining, cutting metallic and non-metallic materials.
- Tribology and surface engineering.

All important and original results are presented in our institute on the seminars and conferences at home and abroad, are published in reviewed or non-reviewed scientific journals and in the professional journals.

The results from the research activity are transferred to the educational process within the subjects also the solution of bachelor, diploma and PhD works.

INTERNATIONAL PROJECTS

TOWARDS COMMON RESEARCH PROJECT (01.10.2008-31.12.2011)

prof.Dr.Ing. Jozef Peterka

The main purpose of the project is to expand theoretical concept 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 conditions of university.

CEEPUS CII-RO-0058-03-0708 (01.01.2007-31.12.2008)

Ing.Ladislav Morovič

THE IMPLEMENTATION OF EUROPEAN CREDIT TRANSFER SYSTEM INTO THE SHORT TIME HIGHER EDUCATION WITHIN BOLOGNA PROCESS AT TECHNICAL UNIVERSITY OF CLUJ NAPOCA

The present CEEPUS proposal intends to continue the

actual CII-RO-0058-02-0607 (CII-RO-0058-01-0506) network focused on ECTS at academic long time studies in the frame of Bologna process. The result will be the establishment of ECTS for the new specializations "Industrial Engineering" and "Economical Engineering" beginning at Alba Iulia in 2006. It is connected with other networks, developed since 1999 till present such as Ro103, Ro129, using the acquired information and materials developed in the frame of these networks.

CEEPUS CII-PL-0007-03-0708 (01.01.2007-31.12.2008)

Ing.Ladislav Morovič

Geometrical Product Specifications - a new tendency in the design and implementation of technological processes

To produce goods or provide services companies need standards. Standardization is applied to achieve a certain level of orderliness that is optimal under specific circumstances by formulating procedures for general and repeated use and providing solutions to the existing or possible problems. In industry standards are necessary, for example, to specify the ways of communication and preparation of documents at the particular stages of product design and construction. They are responsible for process smoothness and the quality of semi- and finished goods. Of significance are also the quality assessment and control methods.

NATIONAL PROJECTS

VMSP-P0008-07 (01.01.2008-31.12.2008)

prof. Ing. Koloman Ulrich, CSc.

Non-deformation welding of indoor beams by four torches

The research deals with non-deformation welding technology and the design of functional nods model of a single-purpose welding machine by four torches

for welding the indoor beams. The welding machine has the high shape and dimension adaptability with the exploitation of a completely new method of arc automatic MIG/MAG welding methods by four torches simultaneously in horizontal and overhead positions from both sides of I-shaped indoor beam by fillet weld. The new technology will increase the productivity and quality of the welded indoor beams‘ production.

SK-SRB-00407 (01.01.2008-31.12.2010)

doc. Ing Augustín Görög, PhD.

Accurary of machining and machine tools

APVV-0057-07 (08.08.2008-09.08.2008)

doc. Ing. Milan Marônek, CSC.

Research into welding and forming the nitrooxidation-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 welding of nitroocidatively treated sheets.

KEGA 3/416/06 (01.01.2006-31.12.2008)

Bílik Jozef, doc., Ing., PhD.

Increase of adaptability and practical readiness of graduates study program forming for actual praxis

The target of showed project is building of virtual laboratory, this laboratory will be used for teaching new technology. Laboratory will serve such very effective and visual toolin process of acquirement professional knowledge. Advancement of project for students is purchase of knowledge in study major, acquisition of Internet accomplishment too.

KEGA 3/4157/06 (01.01.2006-31.12.2008)

Ulrich Koloman, prof., Ing., PhD. IWE

Developing multimedia programs for the training of welding specialists

Multimedia programs including videoclips of modern welding and joining technologies focused on education of top welding engineers in welding engineering branch. Processing of selected company's materials, experience and research results of welding department of Faculty of Materials Science and Technology into a modern presentation way.

KEGA 3/6140/08 (01.01.2008-31.12.2010)

prof. Dr. Ing.Ivan Kuric

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

Instrument for the achievement of goals will be the implementation of modern electronical instruments as WEB aplications and e-education, mobility of students. Will be suggested and realized the complex e-education system. Methods of the project will be the combination of classic approach of study with realization of mobilities on partnership universities and the work with the electronic education system.

VEGA 1/3191/06 (01.01.2006-31.12.2008)

prof. Ing Milan Turňa, PhD.

Progresive metalurgical joining (and allied processes) of special and combined materials by ecologically friendly technologies and consumables

Design, experimental approval and scientific reasoning of progressive metallurgical joining and adhesive bonding of special and combined materials by ecologically friendly technologies and consumables. Selection of special, modified and hybrid technologies fo welding, brazing/ soldering, adhesive bonding, cutting and allied processes apllied for hard-to-weld materials and materials sensitive

to degradation in the process of technological treatment or at their implementation into technical practice.

VEGA 1/3162/06 (01.01.2006-31.12.2008)

prof. Ing. Alexander Janáč, CSc.

Determining of the accurate characteristics of production equipment, of their products and uncertainty of their measurement.

Triennial project in the first, theoretical period, analyses methods of accuracy measurement and determinig of measurement uncertainty in area of machine-tools, with special sight on turning and milling type of machining centers. It is concerned to all known methods, from traditional rules of former concern TST, through standardized methods. till methods utilized new measuring technique. Conclusions obtained by analysis applies in the second period to accuracy measurement and to determining of measurement uncertainty of turning and milling type machining centers, existing on project solving workplace, with utilizing of available measuring technique and another measuring technique, planned to buy in period of solving first perod of project. Experiments in area of measurement will be exactly evaluated with aim to obtain new scientific knowledge.

VEGA 1/3192/06 (01.01.2006-31.12.2008)

Mária Kapustová, Ing., PhD.

New trends solving and other development of die forging technology.

The project submits application and processing of technological and economic measures that are inevitable condition for rationalization of production in our die forges. The model submission for gainful production of forgeds bases on application of new materials and nontraditional technologies, for purpose of increased forgeds quality and achievement of lower usage energy and materials. After this manner the production of forgeds will be cheaper, what essentially increases competitiveness

our forges within countries of EU.Sizeable material saving representatives die forging technology without fin, enentually forging with partial overflow, i.e. with bridge. The software programmers have great stature for advisement and the finite option of forging technology. In term of lower energy consumption it is necessary to assert in the productive zone warm forming technology, it brings the higher quality of forgeds production. The achievement of its application is conditional by following of temperature influence for formability of materials. The important economic effect representatives forges workbench ecologization.The provision of healthy workbench is one of the basic legislative tasks of employer.

VEGA 1/3163/06 (01.01.2006-31.12.2008)

prof.Dr. Ing. Jozef Peterka

Objective method of design of assembled product and assembly system

The assembly in Slovakia will be the main industrial activity.In Slovakia will be produced and assembled the most of automobiles per thousand citizens.The level of DFA (Design for Assembly) in the all world is not sufficient.The using methods DFA are too subjective or are based on the false economical calculations. There are missing the objective methods leaned on laws of mechanics and mathematics. The first works in this field was elaborated by us. The assembly systems inported to Slovakia, mainly for final assembly, have low level of humanization. The goals of project are to remove these two problems by elaborating of two methodologies. Contemporary will be bounded the narrow collaboration with goal to interested Slovak intelligence in the solution of over given problems.

VEGA 1/4108/07 (01.01.2007-31.12.2009)

Bónišová Monika, Ing. PhD.

New trends and next development of superfinishing technology.

The project focuses on the new fields in the development of superfinishing. Latest information will be applied to improve the technology of machining, to reduce the wear of tools and machines, improve the quality of the machined surfaces in superfinishing, enable the machining of the surface which is difficult to reach, decrease production costs and save the time of superfinishing.

VEGA 1/4111/07 (01.01.2007-31.12.2009)

Lipa Zdenko, prof. Ing. 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 procedutes and methods utilized in other scientific discipline (transformational and rheological methods).We can also use the 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.

VEGA 1/0354/08 (01.01.2008-31.12.2010)

Ing. Štefan Podhorský, PhD.

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

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

VEGA 1/0130/08 (01.01.2008-31.12.2010)

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 submit 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.

INSTITUTE OF PRODUCTION SYSTEMS AND APPLIED MECHANICS

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RESEARCH TARGETS

- intelligent workpiececlamping
- thematic network on manufacturing technologies
- new concept of integrated multifunction manufacturing system
- modelling, analysis, simulation and experimental investigation of machine aggregates as mechatronic systems
- investigation of new materials with progressive tribological properties
- research and application of new approaches in numerical methods – analysis and simulation of technological and industrial processes, static and dynamic analysis of engineering structures
- numerical simulation of heat transfer processes, fluid-structure interaction
- reserach and development in the field of theoretical and applied mechanics

RESEARCH CHARACTERISTICS

The research works at Institute of Production systems and Applied Mechanics are focused to support and development of several degrees of studying subjects realized at our institute. The following studying subjects are realized at our institute, bachelor degree: Production Devices and Systems, Mechatronics of Production Devices and Systems, master degree: Production Devices

and Systems. Our institute takes part in the PhD degree study program Machine Technologies and Materials.
The research activities of our institute are focused on solving actual tasks from the field of production systems and devices and applied mechanics so as to support the institute staff's professional growth.

Main topics of research activities:

- Flexible manufacturing systems,
- Intelligent clamping systems,
- Special production systems,
- Pneumatics and electro-pneumatics in control systems,
- Material flow in production,
- Use of computers in design and manufacturing of machines and devices,
- Modeling, analyses and simulations of mechanical systems and machine aggregates,
- Mechatronical principles application to production devices,
- Methods of diagnostics and identification,
- Mechanical systems reliability,
- Vibrations, acoustics and biomechanics,
- Determination of cooling characteristics for heat treating mediums,
- Mechanical, thermal, fluid and other analyses for mechanical parts of machine and skeletons,
- Modeling, numerical simulations, analyses and optimisation for processes of forming, welding, founding and heat treatment.

Our institute has at this time the following laboratories: laboratory of robotics, virtual laboratory of pneumatics and electro-pneumatics systems, laboratory of pneumatics, FESTO laboratory, laboratory of CAD systems, laboratory of machine mechanics, laboratory of tribology, laboratory of thermo and fluid mechanics, laboratory of numerical analyses, laboratory of modeling, laboratory for vibration and acoustics research, mechanical workshop.

INSTITUTE OF PRODUCTION SYSTEMS AND APPLIED MECHANICS

In the frame of cooperation between research and praxis our institute has cooperation with several industrial enterprises and research centres (FESTO spol. s r.o. Bratislava; SMC Priemyselná automatizácia spol. s r.o. Bratislava; ZF Sachs Slovakia, a.s. Trnava; TOMA INDUSTRIES spol. s r.o. Trnava; ŽOS, a.s. Trnava; INA Skalica, spol. s r.o. Skalica; VUJE, a.s. Trnava; EBO Slovenské elektrárne, a.s. Jaslovské Bohunice; JAVYS, a.s. Jaslovské Bohunice; AllDeco, spol. s r.o. Jaslovské Bohunice) and by institutes of SAV.

An important part of the research activities of our institute is represented by cooperation with abroad universities. Most inportant partners are TU Vienna, TU Miskolc, TU Cluj-Napoca, TU Poznaň, VUT Brno, UTB Zlín, VŠB Ostrava, TU Brašov, TU Chamnitz, ZČU Plzeň, TU Iževsk, and a lot more.

Results of our research activities are presented at domestic and international scientific journals and conferences and symposiums. These results are applied to educational processes at our institute too.

NATIONAL PROJECTS

KEGA 3/4154/06 (01.01.2006-31.12.2008)

Mudrik Jozef, doc., Ing., CSc.

Building a scientific and pedagogical centre "Gearing and Transmission"

The establishment of a certified universal laboratory for testing and measurements of mechanical drives. The parameters of drives will be tested and measured for different loading states and different types of lubricants. The laboratory will be used for preparation of students of Master and Doctoral Degrees - Enviromental and safety engineering, Manufacturing devices and dystems, Information technology and automation in industry.

KEGA 3/5211/07 (01.01.2007-31.12.2009)

Velíšek Karol, Prof.Ing. CSc.

Building of pneumatics and electro pneumatics system controling virtual laboratory

Virtual laboratory of pneumatics and electro pneumatics

systems controling will be supported for principle training of pneumatics and electro pneumatics system control assorting and for operating simulation of these systems. In this type of laboratory, the students will use the Internet and develop their technical skills and abilities.

RAV MŠ SR 4/0102/06 (01.01.2006-31.12.2011)

doc.Ing. Jozef Mudrik, CSc.

Analysis of dynamic properties of selected mechatronic gear systems

The aim of the project is to develop a complex set of theoretical and experimental methods of analysis and synthesis of mechatronic systems with particular application on rotation machine aggregates designed for performing pre-defined technological processes. The project results will be used in the construction and operation of mechatronic systems in mechanical engineering equipment.

VEGA 1/3164/06 (01.01.2006-31.12.2008)

Peter Košťál, Ing., PhD.

Application of intelligent fixtures in manufacturing and assembly process

One of the possibilities of increasing the production efficiency (particularly in small and medium batch production which is dominant in Slovakia) is shortening of incidental times. Considerable effect of shortening of incidental times can be achieved by automation of clamping and manipulation operations. Total exclusion of the influence of the staff in the mentioned procedures represents an important component of automation. It is possible to achieve this aim by increasing the intelligence of whole production device step-by-step. Fixtures create non-detachable facilities of production device.

Intelligent fixtures are equipped also with the sensors recording different external effects (forces in single axis, moments) sending signals to the control system for examination. Based on these signals, the control system can stand-alone, and decide about changes of some production parameters.

VEGA 1/3193/06 (01.01.2006-31.12.2008)

Karol Velíšek, Prof., Ing., CSc.

Multifunction manufacturing-assembly cell

Concept of integrated flexible manufacturing cell dedicated to small batch production system that manipulates with workpieces and produces individual parts from semiproducts for final products. Parts are assembled to final product. Unlike standard production system, in this system the final products are produced and assembled in their workspace mainly from parts produced in this system, eventually from normalised parts. For manipulation and assembly in this system, external industrial robot is not used. Exchange grippers for manipulation and assembly are installed on end effector -vertical axis of system parallel with spindle. Implementation of this concept projected like flexible production-assembly cell brings smaller occupied place, smaller expense, and higher ratio of production device usefulness.

VEGA 1/0837/08 (01.01.2008-31.12.2010)

RNDr. Mária Behúlová, CSc.

Design and optimisation of innovative forming and heat treatment technologies supported by FEM simulation

Submitted project is focused on the application of advanced approaches to the design, analysis and optimisation of chosen innovatives 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 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 object of project creates also the development, verification and application of new simulation

models, material models and computing procedures for numerical simulation of forming and heat treatment processe.

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 suport of dominantly thermal technological processes.

Project is oriented on research of transfer phenomena by 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 the numerical simulation support it is possible to predict the combined heat transfer coefficient as the surface temperature function, momentary heat fluxes from 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 modeling by the finite element method

Modeling and simulation of melt welding process is a very demanding process requiring experience and special knowledge of the welding technology, heat transfer and exploitation of computer techniques. By appropriate application of these skills,you can obtain solution to specific problems in the field of welding process, such as residual thermal stresses and deformations of welded materials or structural changes of phases in heat affected zone (HAZ). Structure changes in 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. Stress gradient is high in 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. Structure changes in HAZ could be satisfactory solved by software SYSWELD.

VEGA 1/0090/08 (01.01.2008-31.12.2010)

Ing. František Pecháček, PhD.

Optimised systems and processes of performance ultrasound

Project is a base research oriented on ultrasonic tool resonators for technology applications of ultrasound. Amplitude and frequence parametres of ultrasonic piezoelectric convertors, wave conductors, concentrators and tools are being analysed.

INSTITUTE OF SAFETY AND ENVIRONMENTAL ENGINEERING

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RESEARCH TARGETS

- assessment of wastes of cutting fluids, cooling emulsion and their life cycle prolongation, changes of composition during microbial contamination
- risk assessment and hazard analysis of industrial fire
- hazard assessment of dangerous wastes and hazardous substances
- fire hazard analysis of industrial dust and flammable materials
- safety analysis of technical systems
- the use of progressive oxidation processes for degradation of organic pollutants
- application of SETUR sprinkler for removal of some water pollutants
- utilization of solar energy
- determination of drinking water quality

RESEARCH CHARACTERISTICS

Laboratory testing:

- testing of combustibility and explosiveness of substances, product and wastes in different states,
- appraisal of fire-fighting foam and spray properties in the aging process,
- monitoring of chosen factors in the work environment, appraisal of noise and lighting at the workplace,
- analysis of drinking water quality,

- determination of biodegradability of cutting fluids,
- determination of organic pollutants using analytical methods

Document elaboration:

- danger characterization and risk appraisal of selected substances, products, wastes and technologies in dependence on the partner requisites,
- elaboration of protocol on identification of the external effects, elaboration of documentation on explosion protection,
- elaboration of emergency plans in accordance with legislation,
- risk assessment and risk analysis of fires in the industry,
- implementation of occupational health and safety assessment series (OHSAS), (internal audits, preparation for certification audits)

Research studies:

- study of limiting conditions of initiation of burning process of powder materials,
- impact of fires and its liquidation to the environment,
- environmental charge from the usage of foam extinguishing agents, appraisal of biological degradability of chosen foaming agents,
- fire danger of PVC cables and theirs protection,
- creation of knowledge database and expert system for the risk appraisal of dangerous substances, products, wastes and technologies and other dangerous processes,
- modeling of impacts of industrial accidents to the environment,
- usage of PC models to the material escape modeling, comparison of different types of modeling programs in the field of dispersion of the materials to the environment,
- study of health and safety aspects of occupational indoor environment,
- progress and utilization of small hydroenergetic source in combination with solar equipments for branch of engineering,

- establishment technical-consulting laboratory for utilizing and consequently propagation of solar energy,
- determination of characteristics of emission quantification and indicators of atmosphere quality in conditions of European legislation,
- The exploitation of advanced oxidation processes in removal of organic pollutants from wastewaters by the use of wastes from production and treatment of metals as catalysts,
- advanced environmentaly suitable methods for utilization and removal of wastes from machine industry,
- research and development of utilization fytomass technologies for liquid fuel production from renewable resources,
- botanic garden as an instrument for environmental consciousness of citizen escalation,

Consulting, training and courses:

- training and courses focused on the health and safety at work, safety education in the sense of international standards, research coordination for the specifically application targets and requirements for the increase of the safety of industrial regions,
- guidance for implementation of occupational health and safety assessment series (OHSAS), consulting in the field of emergency planning,
- consulting in utilization of renewable sources of energy.

INTERNATIONAL PROJECTS

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.

14150100019 (01.08.2006-28.02.2008)

prof. ing. Karol Balog, PhD.

Establishment of the technical-consulting laboratory for the utilisation and consequent promotion of solar energy. The project is oriented on an alternative source of energy promotion - solar energy through thermal and photovoltaic panels. The established technical-consulting laboratory will provide consultations, presentations and lectures with practical demontrations of several working solar systems. The actual power of the installed solar equipment can be seen online.

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

11230100437 (01.01.2007-31.10.2008)

doc. Jasenák

Increasing the competencies and education of PhD students

NATIONAL PROJECTS

LPP-0171-07 (01.04.2008-31.03.2011)

Ing. Anna Michalíková

Natural phenomena in experiments for children and adults

After consultations with the basic and secondary school teachers, a communication portal oriented on the following ideas will be developed: environmental education and health, physics in common life, astronomy, alternative

energy sources, wastes and recycling. The website will contain e-materials with visual experiments which cannot be carried out in the classroom due to the dangerous chemicals and the absence of related tools and instruments. The e-learning courses developed in collaboration with the teachers could be used in pedagogical process and also in the preparation of talented students for specialised competitions and will be available for interested parties. The project output will facilitate the communication with public, teachers and students of basic and secondary schools.

VMSP-P-0054-07 (06.08.2008-07.08.2008)

doc. Ing. Jozef Jasenák, PhD.

Optimisation and research of palletes components by progressive technologies

Optimisation and research of palletes components systems for tyres, automobiles, automobile components, rolled profiles etc. will utilise the introduction of the elements and nods on a palette via semi-automatic and automatic process, as well as the progressive ways of production of the components such as plasma, laser and cutting which are currently replacing classical technologies. The research of the optimal construction of the basic frame regarding the type of loading capacity is an important component of the research. The palettes have limited dynamic load and life cycle. The automated system will be based on the calculation of the new construction of the palette and its components, which directly influences the dynamic load, lifecycle and also the price on the market with tough competition.

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 the European legislation cinditions Project is focused on particular results of the state and production of atmosphere

VEGA 1/0488/08 (01.01.2008-31.12.2010)

doc. Ing. Ivana Tureková, PhD.

Enviromental impacts of the fire-fighting foams from the extinguishing fires in nature

If fires in nature are not extinguished early, they can seriously endanger nature. Fire-fighting foams used by the fire-interventions bring these substances into natural environment and can cause the contamination of environment. It is important therefore to know the foam in terms of fire-fighting properties and also of the enviromental impact. Due to the absence of information about ecotoxicological properties and biological degradation of fire-fighting foams, the physical and chemical properties and also the effect external conditions on the effeciency and stability of foam will be searched. The valuation system of parameters and screening for selection of foams will be also designed. This information is necesary to reduce the negative impact on environment.

VEGA 1/0798/08 (01.01.2008-31.12.2010)

doc. Ing. Stanislav Hostin, PhD.

Development and utilization of small hydroenergetic power source combined with solar systems in machine Technologies

Small hydroenergetic power source with rolling fluid machine represents a unique, patent protected device working on a yet unknown hydrodynamic principal. The device rolling fluid machine is of a simple construction. It is able convert hitherto not utilize, low hydropotential to mechanic or electric energy with function of the rolling fluid machine. On the base of this finding, together with methods of hydraulic with methods of hydraulic similarity of machines, to model various types of hydroenergetic sources. Also designed and testing small hydroenergetic power source combined with solar equipment that to utilize in machine technologies for example to producing electrical energy on power supplying measurement and regulation systems, to pumping, transport, heating or cooling liquids etc.

INSTITUTE OF APPLIED INFORMATICS, AUTOMATION AND MATHEMATICS

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RESEARCH TARGETS

- control theory, control systems, control systems sensibility and robustness, PLC
- information and database systems
- client-server architecture systems
- artificial intelligence and expert systems, genetic algorithms, fuzzy sets and systems
- system modelling and simulation
- computer graphics, graphical and CAD/CAM systems
- CIM
- multimedia, virtual reality
- properties of solutions of ordinary differential equations
- metrics and topological properties of real functions
- fractals and chaos
- graph theory – algebraical and topological graph theory
- geometric interpolation of massifs
- rationalization of teaching in the sphere of contents, methods and forms,
- e-learning

RESEARCH CHARACTERISTICS

Institute research is oriented to the process control informatization and automation fields on all levels of

production control, i.e . technological, workshops and managerial in consideration of new trends in the mentioned fields (development of intelligent control methods, new software support, new trends in the information storing, obtaining and using, multimedia and graphic systems, process visualization field, etc.).
With the orientation on production process we reach near co - operation with other MTF institutes. Actually we increase part of applied research at the expense of basic research. This depends on the increasing interest of companies to solve their real problems.

The main fields of research: information and database systems, software engineering, control and regulation systems of technological and production processes, including the questions of control quality, optimality, sensibility and robustness of control systems, as well as control system reliability, modeling and simulation, graphic and multimedia systems, intelligent control systems (genetic algorithms, neuronal networks, fuzzy controllers, expert systems, systems to support decision, ...). The scope of the mathematical part of the institute covers differential equations, real functions, fractals and chaos, graph theory, teachings rationalization methods, E- learning.
Institute AIM provides math, information and automation support.
Except scientist- research projects the institute focuses also on education projects, which are of interest from several views as e.g . research applications, rapprochement contacts, material and financial contributions.

INTERNATIONAL PROJECTS

11230220340 (01.04.2006-30.06.2008)

doc. Ing. Pavol Tanuška, PhD.

Increasing the staff's qaulifications and adaptability via the welding and computational courses
The project is oriented on completion of further training in

order to increase and improve the adaptability through welding technology and PC courses.

11230100458 (01.07.2007-30.06.2008)

doc. Ing. Peter Schreiber, PhD.

Transformation of the Master degree study programme "Automation and ITC Implementation in Processes" to English language

NATIONAL PROJECTS

LPP-0202-06 (01.10.2006-31.10.2009)

prof. Dr. Ing. Oliver Moravčík

Science closer to students

Project of science and technology popularisation is oriented to students of secondary schools with the aim to increase their interest in new knowledge in the field of science, research and development and to improve the education quality. The main aim of the project is to support education and research through the motivation tools for students and to improve the quality of education.

APVV-0308-07 (01.02.2008-31.12.2009)

doc. Ing. Peter Schreiber, CSc.

Nuclear and radiation safety demonstration methodology of containers for spent fuel transportation based on experimentally achieved data

It is impossible to perform direct measurement of spent fuel residual output in the container. In case the container is presented as a mathematical model of specific thermal system, we would be able to derive residual output based on power proportions or on base of known or measurable physical value (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 3/4110/06 (01.01.2006-31.12.2008)

Strémy Maximilián, Ing.

Virtual laboratory of programmable logic controllers LOGO!12/24 RC and selected control objects

One of the goals of this project is to design and implement a virtual lab of the programmable logic controllers according to the model Siemens LOGO!12/24RC with integrated transfer possibility of the control algorithms from the development and simulation environment LOGO!Soft Comfort v5.0.Solving of the project involves also the design and implementation of the selected control objects applicable for control with virtual PLC described above. The project solving method regards the standard requirements and recommendations using in EU for laboratory building for purposes of the classic approach education, distance form of education, e-learning, involving web environment education.

KEGA 3/4149/06 (01.01.2006-31.12.2008)

doc. RNDr. Hanzel Pavol, CSc.

Designing electronic courses in Mathematics

The project deals with e-learning courses of Mathematics. The materials can be used in any university. The use of the materials will be free of charge and available anytime for any students.

KEGA 3/4153/06 (01.01.2006-31.12.2008)

Mišútová Mária, doc. RNDr., PhD.

The teaching model of mathematical courses with support of ICT.

A research project, granted from KEGA agency is solved by Departments of Mathematics of MTF STU and Department of Informatics of USCM.

VEGA 1/3008/06 (01.01.2006-31.12.2008)

Marcel Abas, RNDr., PhD.

Symmetries of graphs and maps

The purpose of this project is to develop new methods

to investigate symmetric structures in topological graph theory. We will focus on cellular embedings of graphs in surfaces and main objects of our study will be Cayley maps and regular maps. We believe thaht using theory of Cayley maps on surfaces with boundary recent developed, we will able to solve problems unsolvable up to now.

VEGA 1/0368/08 (01.01.2008-31.12.2010)

doc. Ing. Peter Schreiber, CSc.

Artifical intelligence in flexible manufacturing control systems

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.

VEGA 1/0282/08 (01.01.2008-31.12.2010)

doc. Ing. Jozef Vaský, CSc.

3D model generating by means of reconstruction from part engineering drawing orthogonal views

Engineering drawing is a 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 visualizational 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 points boundary value problem of singularly perturbed second-order ordinary differential equations

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

VEGA 1/0170/08 (01.01.2008-31.12.2010)

doc. Ing. Pavel Važan, PhD.

The proposal of alternative procedure of manufacturing lot size determination in flexible manufacturing systems by simulation optimization

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

VEGA 1/0582/08 (01.01.2008-31.12.2010)

doc. RNDr. Jaroslav Červeňanský, CSc.

An extension types of convergence in fuzzy spaces

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

INSTITUTE OF ENGINEERING PEDAGOGY AND HUMANITIES

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RESEARCH TARGETS

- engineering pedagogy and psychology
- key competencies of students
- complementary teacher training and its experimental verification in educational practice
- humane science in technology
- foreign language curriculum improvement based on the needs analysis of the faculty graduates and undergraduates in the field of international professional communication
- investigating of methodological aspects of foreign language teaching and implementation of the research results into educational processes
- physical culture and fitness

RESEARCH CHARACTERISTICS

The expert aim of research activities of the Institute of Engineering Pedagogy and Humanities at MTF STU stems from the profile of the Institute and faculty in the area of pedagogy, and it is in accord with the long-term aim of the development of the Slovak University of Technology in Bratislava and it covers a full range of the Institute's educational activities. The content of the Institute's research activities is directed mainly at research in the area of humanities and social sciences with an emphasis on the development and innovation

of methods and forms of education under the conditions of technical intelligence preparation. The specialty of the Institute's research lies in its division into two research areas:

Research Area No. 1: "Pedagogy".

This area includes the research assignments concerned with engineering pedagogy, preparation of high school teachers, advancement of personality, history of technical educational system, body culture and language skills development.

Research Area No. 14: "Engineering".

This area includes the research assignments concerned with personnel work and preparation of e-learning courses for personnel officers.

The Institute's research activities take the form of Scientific and scientific-pedagogical projects solved within the scope of selection and subsequent support by the grant agencies VEGA and KEGA. Projects solved within the scope of selection and subsequent support by the grant agency APVV. Projects solved within the scope of international programs. The transfer of the outcomes of the Institute's research into practice can be accomplished by the special and expertise activities. Members of the Institute work out a practical training in the enterprises (e.g. Bohunice Nuclear Power Plant, VUJE Trnava and ŽOS Trnava) to the extent of their expertise.

The regular organizing of scientific and expert colloquiums is an important part of the Institute's research and its outcome presentation. The Institute organizes the international scientific conference SCHOLA on a regular basis which takes place under the auspices of the International Society for Engineering Education – IGIP.

The student scholarly activities and the student scientific conference are a stable part of the Institute's care for talented and gifted students. The Institute regularly organizes the conference in the section of humanities and foreign languages.

INSTITUTE OF ENGINEERING PEDAGOGY AND HUMANITIES

NATIONAL PROJECTS

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, Master degree at MTF in Trnava

The European Union stakes out the spirit of enterprise development in all schools types and grades as one of the main goals in the education sphere. Education is a new idea to the enterprise and its contents are not stabilized yet. The submitted project deals with this problem and develops the curriculum of the subject "Guide to the enterprise".

KEGA 3/6253/08 (01.01.2008-31.12.2010)

Ing. Milan Petráš, CSc.

The greatest of the great, the correspondence of Prof. Ing. Aurel Boleslav Stodola /1859-1942/.

The project is aimed at translating, editing and publishing all the available letters of A. Stodola to his brothers and A. Einstein. There is a grand collection of 130 letters of the years 1876-1943 available so far. Stodola's letters (saved from being lost by the project leader) to his brothers were partially used by Ivan Stodola, the playwrite, in Náš strýko Aurel (Our Uncle Aurel, Bratislava, 1968). The intended publication will contain an introductory study and iconographical material and will provide new (hidden so far) aspects of this famous scientist, professor, constructor and philosopher's biography.

KEGA 3/6026/08 (01.01.2008-31.12.2010)

doc. Ing. Hrmo Roman, PhD.

Innovation study program teaching of technical professions subjects in MTF STU

The goal of the research team is the evaluation and innovation of the study programme Teaching of technical professions subjects, which was accredited at MTF STU. The researchers intend to introduce the following innovation into practice: optimization profile of a graduate in study

programme and placement of a graduate on the labour market, optimization of proportions between lectures and exercises in the study programme, improvement of the study materials and innovation of teaching methods.

VEGA 1/3640/06 (01.01.2006-31.12.2008)

Silvester Sawicki, Mgr., PhD.

Psychological, pedagogical and psychospiritual methods of diagnosis of psychospiritual crisis and ways of impact on it

Our project is focused on the diagnosis of psycho-spiritual crisis (frequently confused with mental diseases) and possibilities of its psychological, educational, social and spiritual impact. This phenomenon appears in the phase of spiritual maturation and transformation of personality. It is manifested by temporary mental and social disorders with some signs of a mental disease. The American Psychiatrists Association (APA) has labelled it as a spiritual emergency (DSM IV), as non-psychotic diagnosis. They recommend non-psychiatric treatment. APA advises to treat it with psychological, social, educational and spiritual methods. At present, we still do not have relevant diagnostic methods and techniques for its distinction from mental diseases. Most of the psychologists and psychiatrists do not differentiate psycho-spiritual crisis from psychotic diseases, mainly schizophrenia, because of prejudices towards spiritual experiences.

VEGA 1/4547/07 (01.01.2007-31.12.2008)

Bernát Libor, PhDr., ThMgr., CSc.

MIkuláš Drábik – a prophet, mystifier and chiliast

The main concern of the project focuses on the person of clergyman Mikulas Drabik (+1671) and the analysis of his writings. As a clergymen, he worked as a co-worker with Jan Amos Comenius (up to 1628) in Lednica. The project tries to reconstruct his curriculum vitae, based on Drabik's own biography. There is also the ambition to analyse his writings - especially Lux ex tenebris, Mikulase Drabika Zjevení (1617-1671), a heritage of Rottal in the Morava Regional Archives in Brno. The main emphasis is

on Drabik's ideas development and his millenaristic, eschatologistic and apocalyptic claims. Comenius polemics with his fellows will be included as well.

VEGA 1/0185/08 (01.01.2008-31.12.2010)

doc. PaedDr. Marián Merica, PhD.

Optimisation of motor programs as the basis for health improvement and the development of fitness and sports performance capacity.

Solving the way of how to stop the increase of occurence of some kinds of illnesses and health defects. Finding the possibilities of hypokinetics remotion of the pre-school, school and university population on the basis of 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 the following sports: swimming, tennis, athletics, football, body building, baseball and softball. Searching of motor programs optimisation with the aim of increasing the fitness and sport performance of our programs.

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RESEARCH TARGETS

- progressive forms of manager education
- human resource management
- environmental management
- organizational culture
- project management
- advanced information technologies implementation
- quality control in industrial enterprises, service enterprises and public organisations
- quality of communication with customers
- monitoring customer satisfaction in quality management and marketing

RESEARCH CHARACTERISTICS

Concept and focus of the research activities:

- Research and pedagogical projects within VEGA & KEGA grant agencies
- International programmes and projects
- Internally funded projects
- Contractual research and development projects funded by business and industry

Major fields of research: Progressive approaches in the area of the organization management, Human resources

management, Development of managerial competences, Knowledge management, Project management, Sustainable development, Ergonomics, Logistics, production, marketing, Quality management Products and processes certification.

INTERNATIONAL PROJECTS

37 IRE 6 (01.06.2005-28.02.2008)

Prof. Ing. Alexander Linczényi, CSc.

Development and Implementation of Regional Innovation Strategy in the Self-Governing Region of Trnava

Needs of regional companies, mainly technology-based SMEs in terms of research, inovation and technology development and to compare these needs with the offer of innovation infrastructure in the region, to compare the companies needs in implementing and partner region, to introduce innovation audits into the SMEs.

11230220391 (01.04.2006-30.09.2008)

Ing.Ončák Peter

Modular system of distance education in project management with e-learningu and information technologies support.

The project aim comprises an intention to build a training and consultation workplace equipped with appropriate program tools for effective training of project managers.

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.

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NATIONAL PROJECTS

KEGA 3/4155/06 (01.01.2006-31.12.2008)

Holková Andrea, doc., Ing., PhD.

The evaluating resources and the applicable methods for management objects teaching practice

Project is aimed at the methods confrontation used for the evaluation and methodology and recommendation proposal for management objects teaching evaluation. It is mainly centred on evaluating processes which can influence or evaluate the teaching process as well as quality, qualification and effort assessment ways documented by students and by the teaching platform. The emphasis is laying on informative and collective aspects of the evaluation and their task at the quality and effectiveness of the management objects teaching improving.

VEGA 1/3764/06 (01.01.2006-31.12.2008)

Jarmila Šalgovičová doc., Ing., CSc.

Implementation of Quality Management in Non-governmental Health-Service Institutions

The project analyses the methods and approaches to implementation and improvement of services quality in the area of human medicine in selected non-governmental health-service institutions. It should help providers understand and implement the philosophy and principles, methods, tools and techniques of total quality management, which can increase the efficiency and efectivenss of the services offered. This should consequently improve the populationś health state and clients satisfaction, decrease the costs and bring better economic results to the providers of medical health care. The project outcome will become a model of quality management programme in non-governmental health-service institutions. The publication will respect the current European and world trends applied in quality management in the field of health service. The model will be implemented in selected organisations of providers of both primary and specialised outpatient health care.

VEGA 1/0229/08 (01.01.2008-31.12.2010)

doc. Ing. Iveta Paulová, PhD.

Perspectives of quality management development in coherence with requirements of the Slovak Republic market

Project is aimed at the 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 results evaluation for explored industry on the base of analysis. Evaluation of process application related to quality management in 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 processes improvement in the areas where the biggest failures were discovered. The output will be the elaboration of 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 managerial competences in the range of specific functional management areas and their applicable development concept.

The merit of the project is to vindicate 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 managerial competencies definition. Identification and development of managerial competencies is necessarily needed for high performance of key managers. The project is also focused on methods and techniques of managerial competencies evaluation, development of competency models and selection of applicable methods for key managerial competencies development.

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