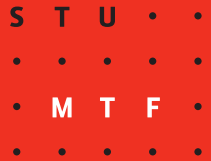


SLOVAK UNIVERSITY OF TECHNOLOGY IN BRATISLAVA
Faculty of Materials Science and Technology

# SCIENCE • RESEARCH • PROJECTS

Editor: Kvetoslava Rešetová, MSc.Dr.

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# RESEARCH AT THE FACULTY OF MATERIALS SCIENCE AND TECHNOLOGY

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.

# Project EUREKA E 3437
# PROGRESSIVE SURFACING OF METALS

Scientific goals of the project

The main and general goal of the project is to improve and optimize of surface properties of advanced metallic materials through the physical- and chemical deposition of thin and hard layers and their combinations.

Achieved (or expected) results

The role of the Faculty of Materials Science and Technology will be divided into three basic goals:

Structural analysis of the layered cold-work steels: CALMAX, Vanadis 4 (made by Udelholm), K 110, K190 ( Böhler Edelstahl). PVD – layers will be investigated mainly by the X-ray phase analysis and transmission electron microscopy. Selected substrate materials will be pre- treated via pulse plasma nitriding and subsequently coated with following coatings: TiN/TiCN, (Al, Ti)N, TiCN, CrN and their structure investigated in similarly as stated above.
The materials K 190 and Vanadis 4 will be boronized and the developed layers will be investigated (structure, hardness, other mechanical properties...)

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| Project co-ordinator: | ECOSOND, ECOSOND s.r.o.,Křižová 1018, 150 00 Prague 5, CZECH REPUBLIC |
| Contact person: | Dr. Ing. Peter Jurči |
| Research period: | 2005 – 2008 |
| Project partners: | Faculty of Materials Science and Technology, Slovak University of Technology, J. Bottu 24 917 24 Trnava, |
| Contact person: | Ing. Mária Hudáková, PhD.<br>VSCHT, Faculty of Chemical Technology, Department of Metals and Corrosion Engineering,<br>Technická 6, 160 00 Prague 6, CZECH REPUBLIC, |
| Contact person: | Dr. Ing. Dalibor Vojtěch<br>IMT, Institute of Metals and Technology, 1 000 Ljubljana, Lepi pot 11, SLOVENIA, |
| Contact person: | Asist. Prof. Borivoj Šuštaršič,<br>MSAI, Moscow State Institute of Steel and Alloys (Technological University), Leninsky<br>prospekt 4, 119049 Moscow, RUSSIAN FEDERATION, Contact person:<br>Academician, Prof. Evgeny Levashov, DrSc. |

# Project VEGA 1/2111/05
# STUDY AND NUMERICAL SIMULATION OF DEGRADATION PROCESSES IN MATERIALS



The research project deals with the study of degradation processes and failure of parts depending on microstructural and technological properties for selective methods of the heat treatment.
The experiments will be performed using simultaneously computer simulation and numerical methods of solution in the field of degradation and testing procedures of materials. The development of new computing techniques, material's models, and application of non-linear structural elements for selective tests of materials will be also introduced in the project.

1. Numerical simulation of the thermal fields and stress-deformation states of the materials and structures in the technological processes of the heat treatment and in the selective tests of the materials, and first of all:
   elastic-plastic behaviour of the materials into the technological interval of temperatures, effect of the phase transformations on the thermal and stress fields, evaluation of the residual stresses and deformations, analysis of the relationships between the parameters of the technological processes and working properties of the advanced materials.
2. Fatigue tests of the materials.
3. Study of the materials specimens' degradation.
4. Study of the morphological changes of the specimens' structures.
5. Analysis of the relationships between parameters of the technological processes, degradation processes, and working properties of the advanced materials.
6. Analysis of the effect of input data accuracy on the results of the numerical simulation in terms of their correlation with the experiments.
7. Statistical evaluation of the numerical simulation results and their verification in comparison with experimental measurements.

Principal investigator: Doc. Ing. Marian HAZLINGER, PhD.
Research period: 2005 – 2007

# Project VEGA 1/2113/05
# STUDY OF INFLUENCE OF PLASTIC DEFORMATION ON THE CORROSION RESISTANCE OF THE SELECTED AUSTENITIC STAINLESS STEELS

The main goal of this project is the study of the influence of different factors (mainly a cold plastic deformation) on sensitisation of austenitic stainless steels (ASSs) of the AISI 304 and AISI 316 types with respect to the thermodynamics and kinetics of precipitation of carbides and other secondary phases at the grain boundaries. Besides the influence of the degree of strain, influences of the steel bulk composition (mainly contents of interstitial elements), grain size, grain boundary character distribution, and time-temperature exposition will also be assessed. The different time-temperature conditions will be chosen based on the TTS (temperature-time-sensitisation) diagrams with the respect to the degree of strain.

These are the goals of the project:

specifying the influence of the time-temperature exposition on sensitisation of the analysed ASSs,

determination of influence of the different strain degrees and time-temperature expositions on the microstructure and precipitation of secondary phases,

identification of secondary phases precipitated at the grain boundaries, specifying the carbide density and changes in their chemical compositions,

verification of the phase stability and corrosion resistance characteristics of the unstabilised austenitic stainless steels and considering the application possibility of the achieved results in predictions of the steel reliability and residual life.

Principal investigator: Ing. Mária DOMÁNKOVÁ, PhD.
Research period: 2005 – 2007

# Project VEGA 1/3032/06
# PREPARATION AND PHYSICAL PROPERTIES OF LEAD-FREE SOLDERS



Scientific goals of the project:

The aim of this project is to increase the basic knowledge 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.

Achieved (or expected) results:

To obtain reliable data on thermal properties, surface tension and microstructure of solder alloys. To set up a suitable method of surface tension measurement. We assume it will be a goniometric method, which may be used at different temperatures and atmospheres and can offer information also on intrinsic surface tension. To establish correlation among the microstructure of solders and their properties and the influence of chosen additives on microstructure and properties of the solders. As the solders are rather very soft solids, we expect also some contribution to the microscopic inspection and preparation of samples. We expect also to increase our knowledge on kinetics of intermetallic compounds formation at the lead-free solder alloy/substrate interface during soldering and subsequent aging. Here we will focus on reaction and diffusion processes dominated by interfacial aspects.

Principal investigator: prof. RNDr. Milan OŽVOLD, CSc.
Research period: 2006 – 2008

# Project VEGA 1/1080/04
# OPTIMALIZATION OF ADVANCED MATERIALS PREPARATION TECHNOLOGY BY MEANS OF NUMERICAL MODELLING

Scientific goals of the project:
The optimalization of composition and preparation technology of the materials by utilization of electrical and dielectrical methods was the aim of the project. We utilized the sensibility of material properties to both the technology and the materials composition as a basis for the proposal of physical theories explaining the correlation between technology and physical properties of materials. With regard to difficulties of the work we assumed that the utilization of the computer simulation could be a suitable tool accelerating the investigation process. It was necessary to find out the structure and microstructure development of the materials during preparation process and next to confront the electrical properties of the investigated materials by means of computer models and to evaluate dependence of achieved results on structure and microstructure parameters. The interest was oriented mainly on the materials with disorder structure as a optical glasses, materials prepared by driving crystallization, and plastics.

Achieved results:
in the area of the optical glasses:
optimal chemical composition of chalcogenide glasses based on Se-Te from the rare earth concentration point of view was found preparation process of glasses based on heavy metals oxides as Te02, Sb2O3, PbO was observed for the reason to achieve as small as number of defects (clusters, inhomogenities); optimal preparation process of investigated glass was found to achieve reproducibility of the material properties and structure arrangement of material with required optical properties; time and temperature characteristics necessary for the glass fibres mounting and processing were found; model of temperature chracteristics of physical properties of glasses was proposed in the area of the composite materials prepared by driving crystallization:
microstructural parameters of composite materials were found by quantitative metalographic analysis; preferential orientation and orientation relationships of phases were evaluated by means of electron difraction; observation and analysis of electrical properties were carried out by means of impedance spectroscopy; material electrical properties were modelled and supplementary circuit was proposed by means of LEVM 7.11 software; correlations among structure, microstructure and electrical properties of investigated composites were observed
in the area of the plastics:
experimenal methods for the plastics structure investigation were proposed; relationships among the plastics structure and their mechanical properties were investigate; field of temperature model in the plastics welding process was proposed; influences of the static tension and deformation on the properties of plastics were determined; experimental measurements of thermophysical parameters and electrical properties of plastics was realized; model for the plastics welding process optimalization was proposed

Principal investigator: Doc. Ing. Stanislav MINÁRIK, CSc.
Research period: 2004 – 2006

# Project VEGA 1/4111/07
# IMPLANTATION OF DIFFERENTIAL AND OTHER MATHEMATICAL METHODS INTO ANALYTICAL THEORY OF MACHINING



Project summary

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 is possible to solve by using procedures 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.

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| Principal investigator: | Prof. Ing. Zdenko LIPA, PhD. |
| Research period: | 2007 – 2009 |
| Co-operation: | Prof. Ing. S. Adamczak, DrSc., Polytechnika Swiatokryzska, Kielce, Poland |
| | Prof. Ing. K. Kocman, DrSc., VUT Brno, Czech Rebublic |
| | Prof. Ing. J. Kundrák, PhD., Univerzity of Miskolc, Hungary |
| | Prof. Ing. H. Osanna, TU Vienna, Austria |

# Project VEGA 1/4108/07
# NEW TRENDS AND NEXT DEVELOPMENT OF SUPERFINISHING TECHNOLOGY

Project summary

Introduced project is oriented into new ambit evolution of superfinishing, because always is possible to give into technology the new information, improved all machining process thereby, that reduce wear of tools and machine tools, increase machining surface quality by superfinishing (reducing surface roughness), enable cutting difficult approachable places of surface machine part, reduce production costs, or reduce time of superfinishing. Main goal of this project is contribute to problem of the machined surface quality after superfinishing, which is depending from surface condition after machining. This is defined by machined surface macrogeometry and microgeometry and physical-mechanical properties of surface layer. For the possibility to use this technology better the more precise analysis is needed.

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| Principal investigator: | Ing. Monika BÓNIŠOVÁ, PhD. |
| Research period: | 2007 - 2009 |
| Co-operation: | Polytechnika Swiatokryzska, Kielce, Poland |
| | TU Vienna, Austria |
| | Tomas Bata University in Zlin, Czech Rebublic |

# Project VEGA 1/3162/06
# DETERMINING OF THE ACCURATE CHARACTERISTIC OF PRODUCTION EQUIPMENT, OF THEIR PRODUCTS



Project summary

Triennial project in the first, theoretical period, analyses methods of accuracy measurement and determining of measurement uncertainty in area of machine-tools, with special sight on turning and milling type of machining centres. 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 centres, existing on project solving workplace, with utilizing of available measuring technique and another measuring technique, planned to buy in period of solving first period of project. Experiments in area of measurement will be exactly evaluated.

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| Principal investigator: | Prof. Ing. Alexander JANÁČ, PhD. |
| Research period: | 2006 - 2008 |
| Co-operation: | Kielce University of Technology, Faculty of Mechatronic and Machinery Design<br>University of Zagreb, Faculty of Mechanical Engineering and Naval Architecture<br>Technische Universität Wien, Fakultät für Maschinenbau<br>Institut für Fertigungstechnik, Faculty of Mechanical Engineering,<br>Department of Production Engineering, Belgrade |

# Project VEGA 1/3163/06
# OBJECTIVE METHOD OF DESIGN OF ASSEMBLED PRODUCT AND ASSEMBLY SYSTEM

Project summary

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 falls 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 imported to Slovakia, mainly for final assembly, have low level of humanization.

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| Principal investigator: | Prof. Dr. Ing. Jozef PETERKA |
| Research period: | 2006 – 2008 |
| Co-operation: | More deeply will be existed cooperation's with foreign work places aimed on assembly mainly in Poland<br>(prof. Łunarski, University of Rzeszow)<br>and Czech Republic<br>(Doc. Lacko, University of Liberec).<br>The aim is to find the common attitude to common problems the new countries of EuropeUnion. In the field of development of production systems will be continue the collaboration<br>with Hungary<br>(prof. Alpek)<br>and Austria<br>(prof. Katalinič). |

# Project VEGA 1/2070/05
# NON-CONVENTIONAL HIGH-PARAMETER FORGING



Project summary

The project is focused on the research of thermomechanical effects during forging to achieve the reguired high metallurgical (chemical composition, structure and phases) and technological (shape, size and properties) parameters especially at dynamically loaded parts with wear of surface layers. The research contains isothermal forging processes of Al, Ti and their alloys and also processes of surface layers inversion forging and forging related to elektroflux melting. The project deals not only with forged pieces required shape and dimensions achievment but also with controlling of forged pieces properties and influencing of surface layers properties.
This is important especially for dynamically loaded parts, for example in automotive industry. The controlling of forged pieces properties in whole volume depends on degree of deformation and effects during heating, cooling, statical and dynamical recrystalization. The controlling of surface layers properties depends on effects of plastic deformations cumulation in surface layer and on effects in structure.

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| Principal investigator: | doc. Ing. Jozef BÍLIK, PhD. |
| Research period: | 2005 - 2007 |
| Co-operations: | Politechnika Šlaska Katowice, Poland |
| | Vienna Univerzity of Technology, Vienna, Austria |
| | HKS Forge s.r.o. Trnava, Slovakia |

# Project VEGA 1/2102/05
# NITROOXIDATION OF STEEL SHEET METALS AND ITS INFLUENCE ON STRENGTH CHARACTERISTICS OF PRESSED PIECES

Project summary

The main purpose of the project is to monitor the influence of nitrooxidation on mechanical and forming properties of chosen materials. It is supposed improvement of mechanical properties at maintaining of forming properties of sheet metals by simultaneous decreasing of energy consumption and saving of materials. Therefore capability to competition is increased (within EU), especially in automotive industry.

Application of this new procedure of thermo-chemical treatment is at the same time environment- friendly due to its ecological cleanness. The aim of the project is also to evaluate the suitability of process for chosen materials before or after forming.

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| Principal investigator: | Ing. Roman LAZAR, PhD. |
| Research period: | 2005 - 2007 |
| Co-operation: | Kaliareň, s.r.o., Považská Bystrica |

# Project KEGA 2006 3/416/06
# INCREASE OF ADAPTABILITY AND PRACTICAL READINESS OF GRADUATES STUDY PROGRAM FORMING FOR ACTUAL PRAXIS



Project summary

The project is oriented for enhancement of teaching process and education of students for praxis. The form of theoretical teaching is alleged in teaching process, practical samples in laboratories are not ample for full understanding of lectured themes. The target of project is creating a virtual laboratory, this laboratory will be used for teaching by modern method. Laboratory will serve such very effective and visual tool in process of acquirement professional attainments. It is needed to create educational examples from forming major, in the first place virtual models of 3D tools construction for sheet metal and for bulk forming, virtual production of final products on the base analyze of material flow, tightnesses, surveillance of thermodynamical changes in production process. With application of teaching by this method the students can assume the attainments in more extensive continuities, can eliminate mistakes in suggestions and to approach at real conditions. Advancement of project for students is purchase of knowledge in study major, acquisition of internet accomplishment too.

Principal investigator: Doc. Ing. Jozef BÍLIK, PhD.
Research period: 2006 - 2008

# Project VEGA 1/4109/07
# OPTIMISATION OF HEAT TREATMENT CONDITIONS OF STEELS FOR CAST CUTTING AND FORGING TOOLS

Project summary

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 to purposefully increase durability and life of the tools taking into account the working conditions of those tools. 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 on the study of the effect of heat treatment on the kinetics of transformation of primary structure and phase composition of the steels studied with establishment of relationships between technological parameters of operations of annealing, quenching and tempering on the one hand and the structural changes and final properties on the other hand. Taking into consideration the fact that for cast tool materials carbide phases are very important factor 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 gained results the optimisation of heat treatment conditions of the steels for cast cutting and forging tools will be held.

Principal investigator: Prof. Ing. Alexander S. CHAUS, DrSc.
Research period: 2007 - 2009

# Project APVT 20-020904
# RESEARCH OF MECHATRONIC SYSTEMS AND PROGRESSIVE TECHNOLOGIES FOR SURFACE MATERIAL ENGINEERING



Project summary

Project focuses on the complex task solution in the field of the technological proceses control and the surface material engineering technological proceses based on laser and electron beam welding. The theoretical questions of monitoring of laser proceses are going to be studied as well as the theoretical aspects of structural and thermal effect of powder applications. The influence of basic parameters of laser and electron beam powder application to the structure of applied layer and joint quality will be investigated by computer simulation. There will be taken into account also parameter influence and conndition of technological layers treatment to the quality of applied layers with the aim to propose and test the new technical procedures in the area of laser and electron beam creation of layers used in the industry.

Principal investigator: Prof. Ing. Koloman ULRICH, PhD.
Research period: 2005 - 2007

# Project APVT 99-P01205
# LASER DEPOSITION OF LAYERS IMPROVING THE UTILITY PROPERTIES AND LIFE OF PRODUCTION TOOLS

Project summary

Laser surfacing or deposition of materials in the form of powders or wires on metallic surfaces with the aim to produce thin layers with excellent tribological and anti-corrosion properties with a direct orientation on industrial application represents almost totally new method. This method was developed only at several workplaces in the world, including our company. The first results are not older than 8 – 10 years. The experimental works were performed mainly by laser fusion of a thin layer deposited by flame or plasma spraying of powders or by other method with the aim to attain a uniform layer metallurgically bound with the substrate, what is the main precondition of a high-strength bond of the layer with the substrate material. The results of those experiments have clearly shown a great potential of application of this procedure for a wide spectrum of applications in industry, mainly for an operative deposition of local or large-area layers with special properties.

Principal investigator: Prof. Ing. Koloman ULRICH, PhD.
Research period: 2005 - 2007

# Project APVT 20-011004
# OPTIMALIZATION OF WELDING TECHNOLOGY AT PROCESSING OF DISTINGUISHED FRAGMENTS MANUFACTURE IN PROGRESIVE AGRICULTURE EQUIPMENTS



Project summary

The project is focused to the optimization of welding in the production of modular components of progressive agriculture equipments. The project part is the expert system of steels and filler materials selection with the complex system date base of optimal structure using the computer support for the new generation of agriculture equipments. The system will be focused to the technology optimization of welding structure and their parts, focused to the quality increasing an the life time and reliability elongation. The estimation of design solution will be the assumed economical effectiveness of new technology methods, increasing of work productivity and competitiveness. In the sequence to the optimal welding technology selection, it will be create material catalogue with the aim of their exploitation also for the other products. The aim is the system modul structure with the possibility simple put in the newest information from various fields.

Principal investigator: Prof. Ing. Pavel BLAŠKOVITŠ, DrSc.

# Project APVT 20-010804
# DEVELOPMENT OF THE LEADFREE ACTIVE SOLDER AND RESEARCH OF MATERIALSOLDERABILITY OF METALLIC AND CERAMIC MATERIALS WITH THE UTILIZATION OF ULTRASONIC ACTIVATION

Project summary

The project objectives respect the latest trends in material joining, such as the usage of non-toxic and recyclable consumables - solders without the content of lead and cadmium and fluxes without the content of halogens. Another trend is the universal nature of the soldering technology, where it is required to join non-metallic, ceramic and metallic materials with the same kind of materials, as well as in mutual combinations.

Principal investigator: Ing. Roman KOLEŇÁK, PhD.
Research period: 2005 - 2007

# Project KEGA 3/4157/06
# CREATION OF MULTIMEDIA PROGRAMS FOR WELDING SPECIALIST EDUCATION



Project summary

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

Principal investigator: Prof. Ing. Koloman ULRICH, PhD.
Research period: 2006 - 2008

# Project VEGA 1/2099/05
# IDENTIFICATION OF METHODS FOR MEASURING TRIBOLOGICAL PARAMETERS IN MECHANICAL ENGINEERING AND METALLURGY

Project summary

Identification of methods for measuring of tribological parameters in mechanical engineering and metallurgy. Bibliography review of application of testing methods for friction wear and lubrication in the field of mechanical engineering and metallurgy. Research of laboratory equipment used for friction tests, wear and lubrication in engineering and metallurgy area. Scientific verification and comparison with world standards and praxis. After verification practical ispection of testing laboratories. Final reccomendations for optimization of testing methods to the world standard level.

Principal investigator: Prof. Ing. Pavel BLAŠKOVITŠ, DrSc.
Research period: 2005 - 2007

# Project VEGA 1/2068/05
# DETERMINATION OF DEFECT ADMISSIBILITY IN FUSION WELD JOINTS

Institute
of Production
Technologies

Project summary

One of new approaches for the evaluation of defect significance in welded structures represents the critical analysis of factors and conditions of reliable and safe operation of a welded structure in which defects have been revealed. The admissibility limits of defects derived from the assessment of the structure for the given fitness for purpose can be wider and/or less strict. Applying the critical analysis methods these limits can be assessed as still satisfactory for the given conditions. The aim is to elaborate defect admissibility limits in fusion welded joints more than 10 mm in thickness for ferritic steels for pressure vessels and structures.

Principal investigator: Prof. Ing. Koloman ULRICH, PhD.
Research period: 2005 - 2007

# Project VEGA 1/3191/06
# PROGRESSIVE METALURGICAL JOINING (AND ALLIED PROCESSES) OF SPECIAL AND COMBINED MATERILAS BY ECOLOGICALLY FRIENDLY TECHNOLOGIES AND CONSUMABLES

**Project summary**

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 of welding, brazing/soldering, adhesive bonding, cutting and allied processes applied for hard-to-weld materials and materials sensitive to degradation in the process of technological treatment or at their implementation into technical practice. Creation of special surfaces by the available technologies, or in cooperation with foreign partners (special deposits of materials for microelectronics). Regarding the consumables, the lead-free solders for soldering in microelectronics, ecological filler metals, fluxes and protective gases for fusion welding and adhesive bonding can be mentioned. By confrontation of modelling technological processes and experimental activity contribute to elucidation of mechanisms of joint formation at special technologies and thus allow to predict the utility properties of joints. Reasoning the economical and ecological priorities of individual technologies.

Principal investigator: Prof. Ing. Milan TURŇA, PhD.
Research period: 2006 - 2008

# Project VEGA 1/3164/06
# APPLICATION OF INTELLIGENT FIXTURES IN MANUFACTURING AND ASSEMBLY PROCESS



At present days increasing of cutting speed (decreasing of cutting time) has no significant effects to productivity increasing. Thence we fade to decreasing of supplementary time (workpiece and tool clamping time, tool changing time, ...). This have a significant effects by short time repeated operations. The supplementary time decreasing is a main condition for increasing of productivity and for decreasing of production costs. The one of ways to supplementary time decreasing is suitable fixture using and supplementary time operations automation.The fixture provide clamping of workpiece on machine desk, so as the workpiece had the right position toward tool. This position must be retain in machining time too.Fixture using increasing of production quality, increasing of productivity and decreasing of production costs. In some cases are fixture using necessary. The fixture design are dependent on the batches of production. In small batches we use fixture designed from modular system and in large batches we can use the dedicated fixtures. The clamping fixture providing these basic functions:
Workpiece positioning on the desk of machine
To prevent of workpiece deformation when cutting and clamping forces are acting In some cases tool support
These Basic functions are provided by positioning, clamping and supporting elements (active elements) of fixture.
These elements can be placed on standalone unit or on some units or can bee mounted to machine or some its part.

Principal investigator: Ing. Peter KOŠŤÁL, PhD.
Research period: 2006 – 2008

# Project VEGA 1/3193/06
# MULTIFUNCTION MANUFACTURING ASSEMBLY CELL

Project summary

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

Principal investigator: Prof. Ing. Karol VELÍŠEK, PhD.
Research period: 2006 – 2008
Coworkers: KOŠŤÁL Peter , Ing. ,PhD., PECHÁČEK František, Ing., CHARBULOVÁ Marcela, Ing., MATÚŠOVÁ Miriam, Ing., JAVOROVÁ Angela, Ing., VELÍŠEK Karol, Doc., Ing., CSc., ZVOLENSKÝ Radovan, Ing., PhD. Student, DANIŠOVÁ Nina, Ing., PhD. Student, MORAVČÍK Oliver, Prof., Dr. Ing., HRUŠKOVÁ Erika, Ing., JAVOROVÁ Angela, Ing.

# Project VEGA 1/2101/05
# COMPUTER MODELING OF TRANSFER PHENOMENA APPLIED FOR CHOSEN TECHNOLOGICAL AND ASSEMBLY PROCESSES AND PROCESSES OF HEAT TREATMENT

Project summary

The research project is aimed at the development and application of computer modeling for the solution of temperature fields and stress-strain states of materials and structures on the conditions of chosen technological and assembly processes. The development of new solution techniques and methodology of the thermal and stress-strain analyzes including contact problems, their verification and implementation to the finite element codes forms a part of the project. It will be used the computer code ANSYS (Ansys-Classic, LS-Dyna, Flotran CFD). Scientific goals of project: The choice of progressive technological processes (laser welding, explosive welding, induction high-speed heating, convectional heat treatment) and assembly joints (tight joint with metal gasket preloading). Creation of methodology for composition and correlation of simulation models in program code ANSYS (electro-magnetism + thermal + structural task), momentum transfer (Flotran CFD) + structural task (Ansys-Classic) time depended stress-strain state (LS-Dyna) + Flotran CFD, etc.

Principal investigator: Doc. Ing. Bohumil TARABA, PhD.
Research period: 2005 – 2008
Coworkers: Doc. Ing. Marián HAZLINGER, PhD., RNDr. Mária BEHÚLOVÁ, PhD.,
Doc., Ing. Jozef JELEMENSKÝ, PhD., Ing. František LACKO, PhD.,
Ing. Peter ŽÚBOR, PhD., Ing. Milan LAŠČEK, Ing. Rastislav ĎURIŠ, Ing. Igor VRAŽIČ

# Project VEGA 1/2076/05
# VIBROACOUSTICAL ENERGY TRANSFER IN NONHOMOGENEOUS SYSTEMS

Project is aimed to fundamental theoretical studies, development of numerical and analytical methods to analyze the power flow and vibroacoustical energy transfer in nonhomogeneous mechanical systems. Fundamental goal of the project is the study, analysis and development of numerical methods suitable to predict the flow of vibroacoustical energy through the system as well as methods to design operational parameters and system characteristics leading to optimal vibroacoustical response. For selected mechanical systems the interaction among subsystems will be analysed with emphasis on minimalization of energy transmission.

Scientific goals of this project:

Development of governing equations for structural elements interacting via dissipative coupling layers. Analytical and numerical solution of selected models of mechanical systems, including implementation of new finite elements into computational systems ANSYS.

Evaluation of suitability and numerical testing of methods of statistical energy analysis (SEA) on deterministic models of mutually coupled mechanical systems. The aim is to disclose the cause of failure of statistical energy analysis at the range of middle and low frequencies.

Modelling of transmission of vibroacoustical energy in anisotropic bodies, composed predominantly from layered structures.

Numerical computations of energy transfer, power flow and power flow paths for different concepts of averaging and review of their suitability for cases of weak and strong interactions as well as in cases of conservative and nonconservative couplings

Experimental verification of computational models of transmission of vibroacoustical energy and models of power flow at layered structures.

Experimental analysis of transmission of vibrational energy at rotating system supported on bearings with dissipative treatment.

Principal investigator: Ing. Milan NAĎ, PhD.
Research period: 2005 - 2007

# Project KEGA 3/4154/06
# ESTABLISHING OF RESEARCH AND PEDAGOGICAL CENTER –GEARING AND TRANSMISSION

The establishing of certified universal laboratory for testing and measurement of mechanical drives. The parameters of drives will be tested and measured for different loading regimes and different types of lubricants. The laboratory will be used to education of students, studying the Master and Doctoral Degree under the subjects of the Environmental and Safety Engineering, Manufacturing Devices and Systems, Information Technology and Automation in Industry on minimalization of energy transmission.

The main aim is to establish the universal laboratory for testing the mechanical drives. The basis of the laboratory is an existing equipment, which is operating in Laboratory of Department of Applied Mechanics. After modernization of this equipment, the identification of drive dynamical parameters will be possible. The mathematical models for different machine aggregates will be created. Computer simulation of mutual interaction of power and control subsystems using simulation codes is planned. The drive will be considered as a mechantronical system. The experimental and numerical results will be compared.

Principal investigator: Doc. Ing. Jozef MUDRIK, CSc.
Research period: 2006 - 2008

# Project AV 4/0102/06
# ANALYSIS OF DYNAMICAL PROPERTIES OF A MECHATRONICAL SYSTEMS WITH GEARING

This project aims in development of a compact collection of theoretical and experimental methods for analysis and synthesis of the machine aggregates executing specific tasks in technological processes. The achievements of this aim involves comprehensive dynamic analysis of mutual interaction between following subsystems: subsystems transmitting power (energy transfer), superior intelligent information subsystem (control and regulation) and impact of operation of machine aggregate on surrounding environment (noise and vibration transmission, effect of heat transfer). Results of the project are expected to find applications in design, diagnostics and operation of machine aggregates of technological equipment.

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|---|---|
| Principal investigator: | Doc. Ing. Jozef Mudrik, CSc. |
| Research period: | 2006 – 2008 |
| Partner organization: | TOMA spol.s.r.o Trnava, Ing. Štefan Tomašík |

# The magazine : MANAGER'S FORUM

The magazine MANAGER'S FORUM is scientific periodical publication of the Institute of Industrial Engineering, Management and Quality, MtF STU Bratislava in cooperation with the civil association Vivaeduca where are published the research activity results intended for practice, the practical application outputs of theoretical knowledge of pedagogic worker, research workers, experts in appropriate sphere and rest expert public.

The magazine's aim is to create the opportunity for cooperation between the educational, scientific institutions and economic practice at home and also abroad. The publication of the newest knowledge of research pedagogic and business activity is enabled by magazine editing.

It arose on 4 October 2006 as the quarterly. Five issues of this magazine were edited successfully during the first two years. In 2007 already its third volume started to be published aimed at the quality, finance and investment, strategy and innovation and managerial environmental system.

You can find further information about the magazine and the publication possibilities on web site www.fm.ecentrum.sk.

# Project ESF –
# MODULAR SYSTEM OF DISTANCE LEARNING EDUCATION IN DESIGNING MANAGEMENT WITH THE SUPPORT OF E-LEARNING METHODOLOGY AND IT TECHNOLOGY

The aim of the project is to set out a collection of teaching modules in the area of - project planning, quality, methods of project managing, projecting teams, projecting risks, etc. – coming from the EU methodology and international methodologies IPMA and PMI for education on designing management. The currently being developed and published innovating methodologies: EU-2004, IPMA - 2006, PMI – 2005 will be the starting point for setting up the project.

At the same time, generating the training and consulting place of work, which will provide effective environment for project managers, lecturers, teachers and selected graduates utilizing IT technology and e-learning methodology. To train more than 200 employees according to certain modules of the project. To equip the place of work with IT and organizational technology, gathering of selected software systems, world literature on the subject, and with a secured support of 12 specialistic employees able to carry out consultations, help while working on projects, practical evaluation, and suitability recommendation of certain methods and systems according to a company's particular conditions.

Contact person: Ing. Peter ONČÁK

# INTERNATIONAL PROJECTS

## Transforming Industry in Slovakia Through Participatory Ergonomics (USA) (International Project MVTS 019/2001)

A model for a participatory ergonomics program is specific for countries of Central and Eastern Europe has been generated as a part of conducting a joint USA – Slovak Republic cooperative project „Transformation of Industry in Slovakia through Participatory Ergonomics". Based on four years of work within this „Participatory Ergonomics" project, our HCS 3E model recognizes humans as the object and subject of all our efforts. We focus on the concept that the work environment must maintain each person's quality of life while at the same time sustaining both the environmental and economical conditions. This model has been applied in eighteen enterprises and preliminary results are very promising. We are confident in recommending this model to neighboring Central and Eastern Europe countries. PROJECT 6R.P. -Development and Implementation of Regional Innovation Strategy in the Self-Governing Region of Trnava. The project is focused on developing regional innovation strategy in the self-governing region of the Trnava district. The centrobaric areas of the innovating strategy will be incorporated, such as development of information economy, support of science and research, development of innovating infrastructure, support of information methodology, etc.

NATIONAL PROJECTS

KEGA - Utilization of E-Learning Methodology in Teaching the Subject of Production Logistics
The aim of the presented project is the utilization of the e-learning methodology in teaching a new subject - Production Logistics, which is part of a new study program at Material-Technology faculty of STU (Slovak Technical University) in Trnava. It is a new concept which will be independent from both the hardware and software platforms with the focus on spreading the idea not only among the local university's students but also among the public in general. The positive point of the presented project will be the possibility of disabled people (whether hearing or severely disabled) joining it. The whole theme of the project will be published on the internet for free.
A potential user will be able to sign in to the website through a password anytime and learn and get tested.

VEGA- Implementation of Managerial Quality in Private Medical Institutions
The project is focused on scientific research and theoretical systems of approaches and methodology of implementing and improving the quality of provided services of humanitarian medicine in selected private medical institutions. It will help its providers to understand and implement the philosophy, principles, methodology, tools and equipment of complex quality management, which increase affectivity and efficiency of medical institutions. The output will be a set methodical proposal of a model program of quality management in public medical institutions in a form of publication. It will follow both current European and worldwide trends of quality management applied to public health sector. The layout of the project will be implemented into specifically chosen organizations providing primary and specialised care.

KEGA - Resources for Evaluation and Appropriate Methodology in Teaching Managerial Subjects for Practise
The project is focused on comparing different methodologies used for evaluating and a methodology layout and references for evaluating while teaching managerial subjects. The main focus is on evaluating process which affects or estimates teaching process, as well as on ways of specifying qualities, abilities and performance shown by both students and a teaching program.

VEGA - The Use and Influence of Personnel Indicators on Managing Human Recourses in Business Practise in Connection to Slovakia Joining the EU The basis of the project is to highlight the significance of personnel indicators and to apply them as a possible option of capital indicators in a managerial practise of managers. The main priority of Slovakia joining the EU is to find solutions to the development problems of already existing perspective business organizations and development of new companies, improving their competitiveness in the terms of economy and integrated EU market, and business development accommodation conditioned by international division of work. The project will hold a collection of methods and indicators which are possible to be used while managing certain company activities or educating managers, and possible references for setting up a designing team in term of personnel points, and asset of their application into practise.

VEGA - Analysis of Current Designing Management Trends in the World, Study of Current Situation in Slovakia and a Proposal of Deepening its Usage under Slovak Conditions
The aim of the project is to study the current state of using designing management in Slovakia in the area of both public and private sector. The intention of the project is to map the state and barriers of its future development in detail, to analyse the application measure of program systems for supporting the designing management. Another objective is analysing a different phase of designing management development in developed countries, which is defined by special dynamics and considerable effectiveness in areas of its application into practise. New innovated methodologies of designing management are about to be completed, such as: PMBOOK-2005 in the international organization PMI in the USA, and also in other countries in the area of method standardization and designing management techniques.

VEGA - New Trends in Marketing Management Heading Towards Increasing Competitiveness of a Company
The main idea of the presented project is to study the utilization of new trends in the area of marketing management and marketing communication closely, and demonstrations of their utilization in increasing competitiveness of a company.

KEGA - Application of the Quality Management Subject at Secondary Specialised Schools The projects is focused on a structural proposal of the quality management subject for secondary specialised schools, designing a hypertext manual for distance learning education of teachers teaching the subject and designing a textbook (after consulting with a pedagogical publisher) on the Quality Management subject for secondary specialised schools.

KEGA - The project of Distance Learning Education in the Area of Quality Management of Private Medical Institutions
The project is focused on distance learning form of education of employees at selected private medical institutions in the area of quality securing and improving of provided services of humanitarian medicine. It will help its providers to understand and apply the philosophy and principles, methodology, tools and equipment of complex quality management which increase the affectivity and efficiency of provided health service. The education will be carried through distance learning form combined with lectures on selected topics. The result will produce textbooks, which will, at the same time, be in accordance with the current trends of quality management applied to the health sector.

KEGA - Distance Learning Education in the Area of Method Improving Affectivity and Efficiency of Complex Quality Management
The carried out project should be of help to future quality managers (e.g. to students of the required fields of study and to employees who should work or are already working as quality managers in all areas of political economy e.g. manufacturing companies, service offering companies, public relation and governmental sector, health sector) heading towards change of attitudes while improving and increasing performance activity and affectivity of general company management. This leads into increasing company's competitiveness and its culture and allowing better enforcement and comparison within the EU.
PROJECT ESF - Modular System of Distance Learning Education in Designing Management with the Support of E-Learning Methodology and IT Technology
The aim of the project is to set out a collection of teaching modules in the area of - project planning, quality, methods of project managing, projecting teams, projecting risks, etc. – coming from the EU methodology and international methodologies IPMA and PMI for education on designing management. The currently being developed and published innovating methodologies: EU-2004, IPMA - 2006, PMI – 2005 will be the starting point for setting up the project. At the same time, generating the training and consulting place of work, which will provide effective environment for project managers, lecturers, teachers and selected graduates utilizing IT technology and e-learning methodology. To train more than 200 employees according to certain modules of the project. To equip the place of work with IT and organizational technology, gathering of selected software systems, world literature on the subject, and with a secured support of 12 specialistic employees able to carry out consultations, help while working on projects, practical evaluation, and suitability recommendation of certain methods and systems according to a company's particular conditions.

# VIVAEDUCA

## Civil association VIVAEDUCA was registred at Home Office on 31.12.2002 and given ICO 37846761 by Statistical office of SR.

The main purposes of VIVAEDUCA are:

developement and protection of spiritual values support and development of behavior and education reducing of unemployment by supporting acquire of knowledge, education, consultancy and by preparation of the graduates to the work experience,increasing of social standing and asserting of graduates

Civil association VIVAEDUCA issues technical paper called Fórum Manažéra (Manager's forum) in cooperation with ex-department of industrial ingeeneering and management of Faculty of Material's Science and Technology in Trnava. The aim of the technical paper is to create an opportunity for cooperation between home and foreign educational, scientific institutions and industrial experience, and to acquire useful outcomes and contacts. The civil association also participates in preparation and realization of conferencies, such as: Automotive 2005 and Knowledge management 2006.

# Project
# IMPLEMENTATION OF QUALITY MANAGEMENT IN NON-GOVERNMENTAL HEALTH–SERVICE INSTITUTIONS

Project summary

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 effectiveness of the services offered. This should consequently improve the population's 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.

Scientific goals of this project

To examine and analyse the substance of current quality policy within the European Union and the harmonised legislative in the Slovak Republic.To examine and monitor the providers' approaches to quality of medical services in non-governmental health-service institutions.
To generalise common outcomes of particular scientific approaches and define basic causal relationships.
To prove the necessity to implement quality management systems into non-governmental health-service institutions and their benefit for the health quality of inhabitants.
To analyse current state of implementation and effective use of quality management, using the method of marketing research in differentiated non-governmental institutions in Slovakia.
To compare the situation in Slovakia with that in the countries with advanced health-care system.
To compare the possibilities of implementation of quality management programmes in individual models of quality management systems applicable in health-care: ISO/IWA 1:2001, EFQM Excellence Model, Baldridge Award, Quality Award in the Slovak Republic.
To design a system solution for quality management in outpatient health-care: the principles of quality management and quality policy.
To design criteria (indicators) of health-care quality: basic values, concepts and structure, standardisation, application and evaluation of standards.
To design a method for implementation and evaluation of the process approach quality as a basic principle of quality management system – modelling and managing processes in outpatient practice in the category of providers of primary outpatient care and providers of specialised outpatient care.

To design a system approach to measuring, monitoring and improving the quality in outpatient practice, including the costs regarding the quality of provided medical services in outpatient practice.
To implement the designed model in particular organisations of providers of primary and specialised outpatient care.
To design a method for quality management implementation for organisations providing health-care services in the form of publication both printed and electronic.
To generalise recommendations for quality improvement, higher efficiency of provided health-care services and ethics of human factor in human medicine.

Principal investigator: Assoc. Prof. Ing. Jarmila Šalgovičová, CSc..

## Project
# DOMINANT DETERMINANTS AND FUNCTIONS OF ENGINEERING PEDAGOGY AFTER INTEGRATION OF SLOVAKIA INTO EU

The Department of Engineering Pedagogy and Psychology solved the VEGA national research grant project „Dominant Determinants and Functions of Engineering Pedagogy after Integration of Slovakia into EU" within the period from January 2005 to December 2007. The Project is focused on the research of the current state of Engineering Pedagogy and on the completion of its theoretical fundamentals in the frame of related interdisciplinary sciences. The goals and contents as well as the forms, methods and technology specific for Engineering Pedagogy are the subject of the research. The solution was established on the basis of Pedagogy and Psychology, particularly on the knowledge obtained and verified empirically. The attention was paid especially to the fields essential for the didactic efficiency improvement in teacher training after integration of Slovakia into EU. The project resulted in designing a model of Engineering Pedagogy implementation into lifelong education.

To disseminate the results of the Project outcome and discuss them in international professional environment, the Department of Engineering Pedagogy and Psychology organized „SCHOLA 2006", the 7th International Scientific Conference under the auspices of the Slovak Ministry of Education. The Conference focused on the Engineering Pedagogy issues, lifelong education of engineers, and the quality of university education. The conference was attended by 80 participants from partnering universities and colleges from the Czech Republic, Poland, Ukraine and Austria.

# Project
# IMPLEMENTATION OF THE „QUALITY OF SCHOOL" COURSE INTO COMPLEMENTARY TEACHER TRAINING CURRICULUM AND ITS EXPERIMENTAL VERIFICATION

The Council of the European Union accentuated the quality of education as the principle aim for all types of schools, levels and areas of education (Council of the European Union, 2000). The trend of a qualitative development in education has influenced the research activities of the Department of Engineering Pedagogy and Psychology, which resulted in the national KEGA grant Project „Implementation of the „Quality of School" Course into Complementary Teacher Training Curriculum and Its Experimental Verification" with the following aims:

To declare the reason for implementation of the Quality of School course into Complementary Teacher Training Curriculum.
To develop the curriculum of the Quality of School course.
To write a textbook for teaching the Quality of School course.
To verify empirically the effectiveness of teaching the Quality of School course.
To optimize the curriculum of the subject Quality of School and related study materials according to the results of the empirical research.

The general aim of launching the Quality of School course was to make students familiar with the concept, critical evaluation and implementation of Quality Management in their teaching practice and to inspire them to creatively develop the Quality Management methods in the educational process. The research was carried out on an experimental sample consisting of 306 complementary teacher-training graduates – teachers of technical subjects at secondary schools, and 68 full-time students. The graduates recommended introducing the course into educational practice. Most students found the Course curriculum, quality of teaching materials and process excellent or very good.

The Department organised „SCHOLA 2006", the International Research Conference focused on quality of education, where the research team presented and evaluated the research results and practical Project outputs, and compared then with those of partnering workplaces from Uniwersytet Rzeszowski, Poland, Universität für Bildungswissenschaften, Klagenfurt, Austria, University of Technology Brno, Czech Republic, University of Palacky, Olomouc, Czech Republic, Technische Universität Wien, Austria, Czech Technical University, Prague, Czech Republic, Ukrainian Engineering–Pedagogical Academy, Kharkov, Ukraine and Berufspädagogische Akademie des Bundes, Graz, Austria.

## Project
# KEY COMPETENCIES OF STUDENTS IN TECHNICAL FIELDS OF STUDY WITHIN THE NATIONAL AND EUROPEAN CONTEXT

The Department of Engineering Pedagogy and Psychology carried out an investigation within the KEGA grant project „Key Competencies of Students in Technical Fields of Study within the National and European Context". The development of students' key competencies in technical branches is gaining a crucial importance within the context of the international education agreements, mainly regarding the demands of widening national labour market, particularly that of automotive industry. Technical universities should train the key competencies and tailor their curricula in individual majors so that to meet those demands.

The project purpose is:
to identify the requirements of potential employers of the technical university graduates,
to monitor and analyse students' competencies defined in the new study programmes,
to diagnose selected preferred key competences of STU undergraduates,
to propose psychological and didactic aids to improve the development of students in the required key competencies.

The Project resulted in the presentation of the research outcomes in the international academic forums. The Department organised SCHOLA 2006, the 7th International Scientific Conference aimed at the topic of key competences, under the auspices of the Ministry of Education, the Slovak Republic. The conference was attended by 80 participants from partnering institutions and universities, such as Uniwersytet Rzeszowski, Poland, Universität fur Bildungswissenschaften, Klagenfurt, Germany, University of Technology Brno, Czech Republic, University of Palacky in Olomouc, Czech Republic, Technische Universität, Wien, Austria, Masaryk Institute of Higher Studies of the Czech Technical University in Prague, Czech Republic, Ukrainian Engineering and Pedagogical Academy, Kharkov, Ukraine and Berufspädagogische Akademie des Bundes, Graz, Austria.

# Project
# DEPARTMENT OF PROFESSIONAL LANGUAGE COMMUNICATION RESEARCH ACTIVITIES

The key strategy of a qualitatively new investigation has roots in the needs analysis of the Faculty graduates and undergraduates. The project elaborated in this field became an outcome for the new syllabus development and a consequent qualitative change in the Department educational and research activities. The results of the research have been presented and disseminated in numerous events. Remarkable results were achieved in the following projects:

The SPEKTRUM project financially supported by the Municipal Council was launched with the aim to gather local tertiary and secondary language teachers and provide them with regular teacher-training. The ambition was to cater for a wide scale of their professional needs and interests, to set the network for professional information exchange and disseminate effective and attractive LSP ideas. In 2002, the Project was awarded the European Label for Innovative Initiatives in Language Education by the European Commission for Education and Culture and the Ministry of Education of the Slovak Republic as the very first and the only project in Slovakia. The Project was financially supported by the grant of the Ministry of Education, SR, to provide a model for on-line teacher training.

English for Professional Communication – Spotlight on Interaction and English for Professional Communication Development are some of the outcomes of successful co-operation with STU FEI Language Department – the long-year reliable partner in research, teacher training and other educational activities. The interactive character of the material enables users to increase their self-confidence in oral and written professional and general communication. It gives students an opportunity not only to take an active part in the process of learning, but also to verify and measure their performance.

Purdue–MtF Model of International Student Collaboration - a mutual project of international student collaboration using English, developed at the Electrical Engineering Technology Department of Purdue University /EET PU/ in Kokomo, Indiana, USA, and the MtF STU Language Department, raised a lot of interest thanks to its deep professional and cultural impact, and financial availability. Besides professional benefit for both groups (engineering information transfer), the project provided the participants with an opportunity to experience and benefit from the distance communication, a progressive way of gaining knowledge and experience. Cultural and humane aspects of the project had deep impact on both sides. Being very close to real situation, on-line conferences offer an ideal stage for freshmen to practice the soft or social skills such as co-operation, willingness to work in team, respecting cultural differences, business etiquette and netiquette along with self-marketing and stress-resistance in less stressful environment and at minimum costs. Participation in the project brought satisfaction and visibility to all parties involved, thus raising their self-confidence and self-esteem and stimulating further activities in the field of international student collaboration.

## Project
# MODELLING THE ADAPTABILITY IN SELECTED SPORTS

The Department of Physical Education and Sports has oriented its research activities on theoretical and practical aspects of physical and sports performance of university students. The VEGA research grant project is aimed at the essential modelling of adaptability in selected sports: baseball (men), swimming, softball (women), tennis and athletics.

The aim of the Project was to define prerequisites for the best achievements of a student-sportsman. In the beginning, the project team carried out a survey concerning the common state of health, parameters of physical development, sports age and performance in particular selected sports. Furthermore, the concept of sports competitions as a component of complex multifactor and multidimensional system in individual sports (swimming, tennis, athletics) and in team sports (baseball and softball) was set up. The researchers defined stages of adaptability for both kinds of sports in time sequence. Then they compared actual state of a sportsman and model characteristics with three significant factors (impulses, mutual relations, performance). These factors were observed and evaluated against the feedback adaptability and regarding the biological, working and psychological conditions of the environment. The research team verified the Project findings, mainly regarding whether the conditioned reflex state in the first phase of adaptation and the „habitual" state in the second phase were achieved.

Academy of Physical Education in Warsaw, Poland and University in Hradec Králové, Czech Republic were the partnering institutions involved in the research.

# Project
# THE GRAPHICAL INFORMATION SYSTEM

The project has been realized for company Nuclear Power Plant, Jaslovské Bohunice - LRKO. The result of project is GIS-based real-time dose rate measurement system.GIS has been implemented in four cars, each equipped with Garmin GPS receiver, dose-rate measurement probe, Racom radio modem and Advantech industrial PC with dose rate monitoring system installed. All data from cars are sending into central server. In case of emergency, measured data (time, position, dose-rate) are shown in the crisis center, together with data from 24 stationary measurement points. The crisis center system allows car-tracking, sending commands for car-drivers, automatic zoom and other functions.

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|---|---|
| Development tools: | Borland Delphi, ActiveMap |
| In operation: | since 2003 |
| Cooperation with | VUJE, a.s. Trnava - The Nuclear Power Plant Research Institute |

# Project
# INFORMATION SYSTEM FOR SPENT NUCLEAR FUEL STORAGE

The project has been realized for company JAVYS a.s. - Spent nuclear fuel storage. The result of the project is the software application, medium information system that serves for evidence of devices and equipments monitoring in the Spent nuclear fuel storage. The information system automatically calls attention to unperformed benchmark.

Main functions: evidence of devices and equipments, benchmark planning, protocols evidence, technical drawing evidence, benchmark evaluation, export information to MS Word

| | |
|---|---|
| Architecture: | Client/Server |
| Development tools: | Deplhi6, ErWin/ERX, Oracle9i |
| In operation | since 2004 |
| Cooperation with | VUJE, a.s. Trnava - The Nuclear Power Plant Research Institute |

# Project
# THE MEASURING AND EVALUATING SYSTEM FOR VW Slovakia, a.s.

The project has been realized for company Volkswagen Slovakia, a.s. The developed application scans a position of two or four pins on a shunting platform and evaluates the displacement length and direction.

| | |
|---|---|
| Main functions: | laser scanner measurement (Sick LMS400), RFID card identification, visualization of measured and evaluated data and also historical records. |
| Architecture: | single user |
| Development tools: | Delphi 6, MS Visual Studio 2003, SQLite 3 |
| In operation: | since 2007 |
| Cooperation with | PIR s.r.o., Bratislava |

# Project
# INFORMATION SYSTEM FOR NDS a.s.

The project has been realized for company Národná diaľničná spoločnosť a.s. Bratislava (NDS a.s.). The result of the project is the software application, small information system that serves for planning, monitoring, and administration of the capital assets in the process of the roads buildings realization.
Main functions: annual planning, month planning, monitoring of capital costs, evidence and evaluation of invoices, evidence of motorway's building-up, print summaries, import and export from and to MS Excel

| | |
|---|---|
| Architecture: | Client/Server |
| Development tools: | Deplhi6, ErWin/ERX, Oracle9i |
| In operation: | since 2005 |
| Cooperation with | MMS Softec, s.r.o. Trnava |

# Project
# VIRTUAL CONTROLLERS KRGN 90 AND UDC 3300

The poster presents two virtual controllers developed (2004-2006) on the Department of Information Technology and Automation. The virtual controllers have implemented subset program modules of the original controller firmware:
simulation model of the industrial programmable controller KRGN 90

- eight independent control loops
- designed for small and middle control applications to monitor and control tens to hundreds information points simulation model of the industrial programmable controller UDC 3300
- microprocessor-based stand alone controller
- ideal for regulating temperature and other process variables in numerous heating and cooling applications, in metal working, food, and pharmaceuticals, and testing and environmental work

The virtual controllers have been successfully used for the operator training during training courses in Pro CS a.s. Šaľa, Rautenbach a.s. Žiar nad Hronom and Continental a.s. Púchov.

# Project APVV LPP 0202-06
# SCIENCE CLOSER TO STUDENTS



Project summary

The main aim of project is education and scientific-research support through motivation tools for students and increase of education. Thereby it could reduce an absence of the young researchers and young higher educated students in general at this dynamic field, which is the key factor for modem society based on knowledge.

From the main aim results the part aims

- Analyze of the students attitude towards the scientific- research community, activities and consequence of the science in society
- Analyze of students interests and relations to the science and education quality
- Improve young people to bear on science, research and education quality through involve themselves in particular tasks and project activities, therefore to create the first students contact with science and technique.
- Leading, aiming and orientation of students through scientific consultation providing and seminars with university lecturers and also researchers in particular scientific fields and with practice specialists

Research period: 2006 – 2010

# Project VEGA 1/2112/05
# OBJECTIFICATION AND OPTIMALIZATION OF THE RISKS VALUATION IN TECHNOLOGICAL PROCESSES

Scientific goals of this project

Analyses of the reason occurrence to the risks and hazards in technological processes and analyze of the technical and technological facilities used for the risks minimization, methodic and methods used for the risk analyze and assessment. Acquirement information about existence of the risks values in the world.

Upon the processed analyses will evolved operating hypothesis where will be processed mathematical model for objectification and optimalization to the identified hazards and risks values in technological processes. Elaboration of the hypothesis will concern development and exploitation of the mathematical statistics knowledge, expectation theory in methods and models which are utilizable by the objectification and optimalization identified hazards and risks in technological processes. The successful work on this academic project can be verified by the creation of the theory to the confirmation or negation of this hypothesis .

The processing of the project mathematical model to create relevant data bank of identified risks and hazards values. The processing of the model project to inquiries relevant statements about risks and hazards values in the technological processes and by using their application in this project .

International scientific co-operation

We established co-operation in this field with The Faculty of Safety Engineering VŠB TU Ostrava, because of the long-time and good coactions. This co-operation will involve primarily of the mathematics model data bank suggestion and its practical application at verification of the optimalization model values to the risks and hazards in technological processes.

Research period: 2005 – 2007

# Project VEGA 1/2421/05
# LIMITING CONDITION OF NONFLAMING AND FLAMING INITIATION AND PROPAGATION OF BURNING PROCESS OF WOOD AND WOOD SAWDUST

Scientific goals of this project

Investigation of bimodality of burning process of wood and wood sawdust in dependence on thermal exposition, oxygen concentration in surrounding atmosphere, ingredient and geometrical arrangement of specimens.

Studies of smoldering initiation under prolonged heat exposition. Modeling of limiting conditions of steady self-supporting flaming and no flaming burning.

Correlation of flammability parameters of wood and wood sawdust at investigation of mass burning rate, heat release at thermal degradation, rate of spread of burning propagation, flash and self ignition temperature, time to ignition and activation energy with physic-chemical properties of wood and wood sawdust, CO and CO2 release and fire retardants. One output of the project studies will be the proposal of method for the fire risk assessment of materials with tendency to nonflaming and flaming burning process propagation.

Mathematical modeling and computer simulation of limiting conditions of steady self-supporting flaming and nonflaming burning of wood and wood sawdust. Proposal of method for fire the risk assessment of materials with tendency to flaming and nonflaming burning propagation. Contribution to elucidation of chemical mechanism of transition nonflaming to flaming burning.

International scientific co-operation

We established co-operation in this field with The Faculty of Safety Engineering VŠB TU Ostrava, VŠB - Technical University of Ostrava, Czech Republic and The Technical University, Budapest, Hungary and The Czech University of Agriculture, Prague, Czech Republic.

Research period: 2005 – 2007

# Project
# THE PROGRESSIVE, ENVIRONMENTALLY APPROPRIATE METHODS FOR VALORIZATION AND DISPOSAL OF THE MATERIALS FROM THE MACHINE INDUSTRY

Selection of the waste materials from machine technology, above all from the shaping of metal superficies, welding, soldering and casting, judgement of their environmental risks, application of appropriate methods on the disposal of their toxic elements with the aim of their possible next utilization (ozonization, aeration, bioremediation with soil bacteria, phytoremediation), observation of the effeciency of these detoxication and regeneration processes by progressive analytical methods chemical, physical, physicochemical and biological (HPLC, GC, polarography, UV-VIS spectrophotometry, measurement of the ecotoxicity). Development of new environmentally appropriate materials: solder, catalyzators from abrasive muds

Scientific goals of this project

Elaboration of the literary research from the given field. Characterization of the actual state of this problem solution what_s about the recovery and liquidation of waste materials from machine technology in SR and abroad. Modification and attest of the necessary analytical and check actions and methods on the following re-format and recovery of junkies from machine production.To characterize the chosen junky material from machine production by its physical and chemical composition, with respect to its ecotoxicity, to choose the appropriate methods for its re-format, eventually recovery, to control hereof method, the characterization of resultant products, the processing of prospective by-products alternatively junkies.

Research period: 2005 - 2007

# Program European community initiative programme INTERREG IIIA AT-SR ESTABLISHMENT TECHNICAL-CONSULTING LABORATORY FOR UTILIZING AND PROPAGATION OF SOLAR ENERGY

Project summary

An exploitation of renewable resources is still at a very low level in Slovakia. The problems are mainly with required technology assuring and also with implementation and retain of the projects focused on the renewable resources exploitation. Goals of Technical-consulting laboratory for utilization and propagation of solar energy is: to cooperate with special centres in Slovakia focused on the research, development and build up equipment using solar energy, to organize periodical scientific seminars and workshops focused on this field, to realize research and development in the field of solar energy usage, to provide advisory services during the creation of projects for solar energy usage – to help to implement this projects. Laboratory consists of office, laboratories with active solar equipments and premises.

Research period: 2006 – 2008
Partners: DANUBE – European Training & Technology, Vienna, AT
Europaisches Yentrum für Erneuerbare Energie GMBH Güssing, AT

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