JRET

REGIONAL UNIVERSITY
KNOWLEDGE CENTER
FOR VEHICLE INDUSTRY
SZÉCHENYI ISTVÁN UNIVERSITY GYŐR

Annual Report 2006

Péter Pázmány program

Established by the support of the National Office for Research and Technology.

NKTH
National Office for Research and Technology

Our partners:

SZÉCHENYI ISTVÁN UNIVERSITY
GYŐR

Széchenyi István University
9026 Győr, Egyetem sq 1.
www.sze.hu

RÁBA Axle Ltd.
9027 Győr, Martin st 1.
www.raba.hu

Borsodi Műhely Ltd.
9027 Győr, Juharfa st. 8.
www.borsodimuhely.hu

schefenacker

SAPU Lp.
9245 Mosonszolnok,
Szabadság st. 35.
www.schefenacker.com

JRET

REGIONAL UNIVERSITY
KNOWLEDGE CENTER
FOR VEHICLE INDUSTRY
SZÉCHENYI ISTVÁN UNIVERSITY GYŐR

Széchenyi István University, 9026 Győr, Egyetem sq 1.
A Building 102–104 office • www.jret.sze.hu

Table of contents

Mission statement

The mission of the Knowledge Center is to act as a scientific and technological innovation center in the field of vehicle industry in cooperation with the economic sector, to operate an outstanding research and development network in the region and thereby to enhance the country's competitiveness and to support the region's economic development.

The Knowledge Center offers a research infrastructure and human resources that are available for every enterprise in order to elaborate and implement new technologies as well as to create competitive automotive products.

On the long-term it intends to operate as a center of excellence, which is one of the determinant factors in automotive innovations in the Austrian-Slovakian-Hungarian border region.


Az Audi TT oldalfal-lemez gyártási
Herstellung des Seitenwand-rahm

Overall aims (strategy)

The Regional University Knowledge Center for Vehicle Industry serves the research and development needs of the automotive industry belonging to the economic catchment area of Győr. This concentration has a nationally outstanding role as 57% of those employed in the domestic automotive industry work in the Middle and West-Transdanubian region. Within this, the activity of Győr-Moson-Sopron County in the vehicle industry is 4.7-fold compared to the national average.

Internationally the Central European car manufacturers count on producing 4-5 million vehicles and 3 million engines by 2010. One of the natural centers of this region is Győr, where parallel to the manufacturing boom, there is about to be a considerable need for R&D activities in the future.

In line with the development of the regional and European vehicle industry, the Knowledge Center considers the predominance of three key aspects as its goal: safety, environmentally friendly operation and economical manufacturing. The research of the modern materials and technologies related to vehicle manufacturing and the indication of new possibilities in mechanical constructions both serve the realization of these aims.

The technological research realizing the overall aims embrace the most important primary shaping processes and secondary operations used in manufacturing technologies and finishing processing used in the vehicle industry. Among the primary shaping processes, casting, polymer molding and metal forming operations have a considerable role.

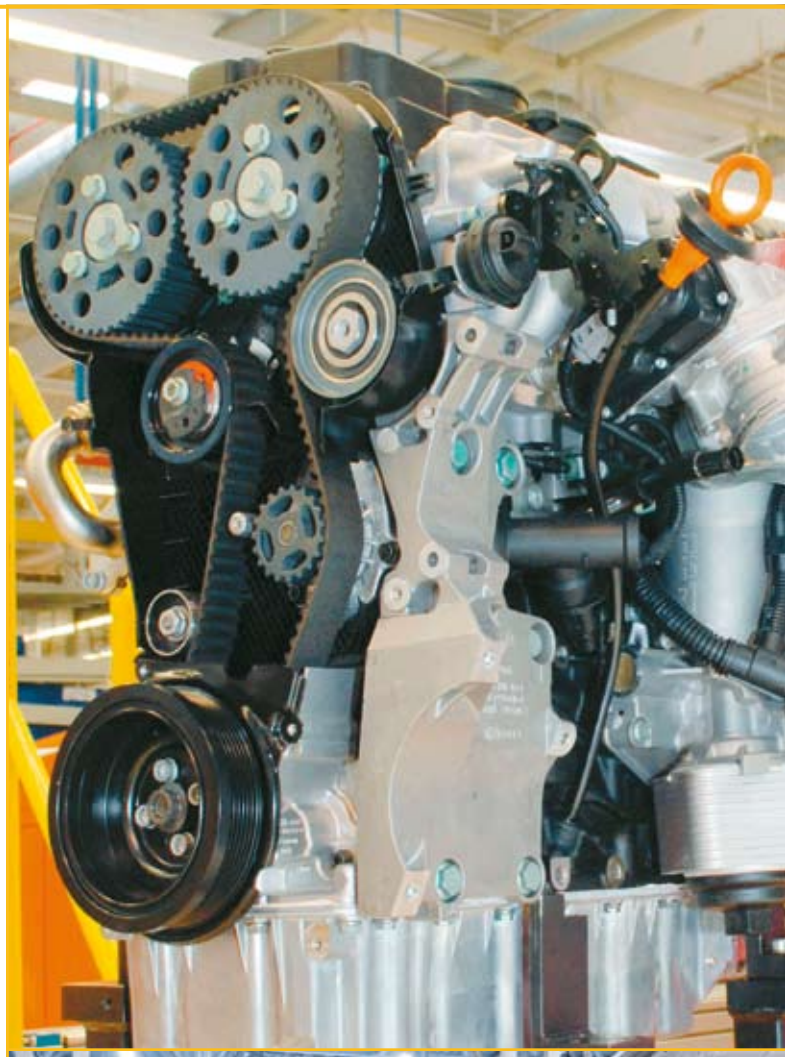
In secondary processes, the key areas are high-speed cutting as well as shaping 5D components and surface techniques. The research on the application of modern surface treatments focuses on tools as well as parts exposed to high temperature and vehicle parts moving on one another.

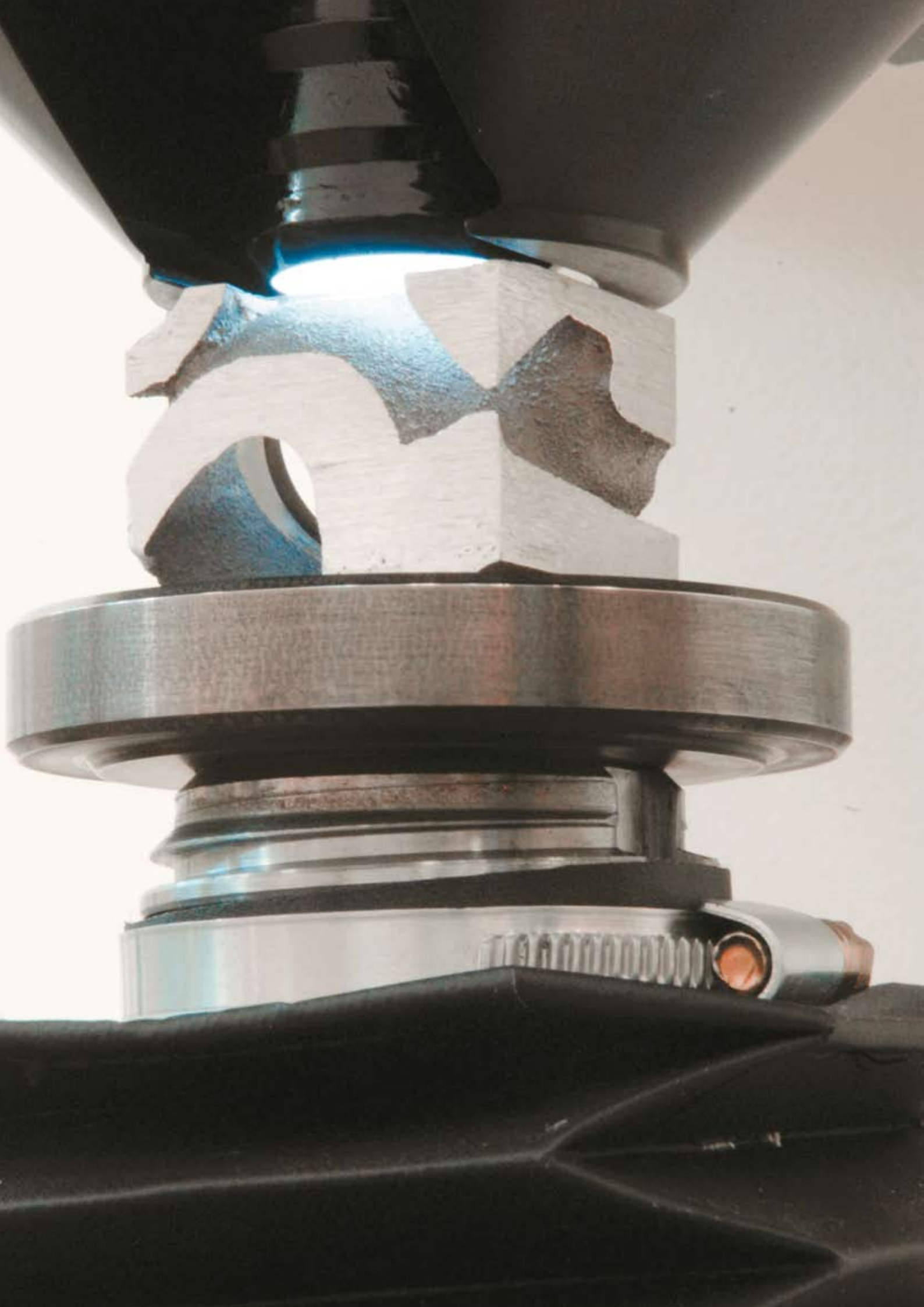
The research related to constructions includes the theoretical bases of developing vehicle part-units and the concrete realization of several prototypes as well. Within this the research on gauging bearings and gears just as the search for solutions resulting in minimum noise emission are paid special attention to. Vehicle unit development is oriented towards new axle solutions and their main fields of application are agricultural power machines and vehicles.

Computer simulation plays a key role in both technology development and construction, which is highly useful in both modeling technological processes and in solving complex problems connected to flow and thermal conduction that take place in vehicles. The simulation laboratory that is uniquely complex in the region, aims at applying and further developing these techniques. This lab demonstrates a new quality in technology development and in the realization of "design for manufacturing" constructions by integrating the CAD and FEM procedures.

The strategic aim of the center is to create world-class research potential in the outlined research field at the knowledge base of Széchenyi István University, with 8-10 full-time researchers, the university's lecturers and students as well as modern research tools and methods. It will help the consortium partners and the companies connected to the Knowledge Center to develop and manufacture products that are competitive on the world market and have a high value added.

Besides it is of high priority that the Knowledge Center with its emanative effect should promote education at the university and continuing professional education at the companies. The applied technologies, the new methods and instruments should efficiently promote undergraduate, graduate and doctoral education, and the scientific workshops should provide an ideal framework for educating young researchers. These goals related to university education are supplemented by achieving excellence in knowledge and technology transfer towards the companies.





Executive summary

The three-year program of the Regional University Knowledge Center for Vehicle Industry is based on the theory of gradual build-up. The focus point of the first year has been competence development: acquiring the comprehensive knowledge related to the research topics, establishing the research infrastructure and achieving initial research results on this base. In the second year, relying on the advanced research infrastructure and expertise, industrially exploitable results and new applications will be created then in the third year, as a continuation of these developments, new and internationally acknowledged procedures and equipment will be elaborated. They will allow launching newer domestic and international projects, elaborating new procedures and patents and the self-supporting operation of the Knowledge Center.

In the first year of the program, the aims laid out have been achieved. The geometric dimension measurement, material testing and manufacturing laboratories serving the developments of the whole consortium have been established at the university in a highly appropriate environment. The modern instruments and manufacturing equipment of these labs are on a par with the region's highest standard company labs. A complex laboratory has been established on a high-level hardware platform for the computer simulation of the manufacturing processes and for supporting the design activities.

For the operation of these modern facilities and equipment, the Knowledge Center has concentrated considerable intellectual capacity. At Széchenyi István University in 2006 five full-time researchers, seven part-time project leaders, twenty university lecturers and engineers employed with contracts of agency and 4 students per semester could be considered as permanent employees who were complemented by further lecturers involved in the implementation of several projects when necessary. Project management is performed by three full-time employees in cooperation with the university's administrative/economic organization.

The three consortium partners have also fulfilled their research tasks planned for the year 2006. Involved in the "Developing modern cutting technologies and design algorithms" topic, Borsodi Műhely Kft. (Borsodi Műhely Ltd.) were engaged in elaborating a test environment for the 8-axe turning center procured in the framework of the project and in developing the machining technology. Rába Futómű Kft. (Rába Axle Ltd.) cooperated in developing primary shaping technologies and managed the complex activity called "Developing modern vehicle constructions" as project leader. SAPU Bt. (SAPU Lp.) realized considerable technological development by establishing the pilot environment of the gas-assisted injection molding technology and by adapting and further developing the technological know-how.

From the summary it can be stated that the professional aims of the first year's activity plan have been achieved according to the scheduled program. The efficient fulfillment of next year's tasks will be supported by the established IT platform and the management experiences acquired in the first year.

Organizational structure and management

The Regional University Knowledge Center for Vehicle Industry operates as an individual business unit of Széchenyi István University and belongs to the Rector's sphere of authority. It is directly supervised by the Vice-Rector for Innovation and Development. The Founders' Assembly, made up of the top managers of the consortium members, is the primary decision-making body of the JRET. The Steering Committee, commissioned by the Founders' Assembly is responsible for completing the whole project. The president of the Committee oversees the fulfillment of the research tasks. His work is supported by the Scientific Committee, which due to its name, defines the main directions of research and development activities and assesses the results achieved. The management leader of JRET is the manager director, whose work is supported by a project manager and an economic administrator. Financial settlement is done integrated into the university's economic organization with the coordination of an independent financial administrator. The research projects are overseen by project leaders, who involve the university's lecturers and students as well as external experts in the realization process.

The composition of the individual bodies is as follows:

Founders' Assembly:
Dr. Tamás Szekeres - Rector - Széchenyi István University
István Pintér – President, Chief Executive Officer - Rába Plc.
László Borsodi – Managing Director - Borsodi Műhely Ltd.
Antal Mihalicz – Managing Director - SAPU Lp.

Steering Committee:
Dr. Imre Czinege – Professor, President of the Steering Committee – Széchenyi István University
Dr. Károly Kardos – Vice-Rector for Innovation and Development – Széchenyi István University
Dr. Károly Szőcs – Director for Business Development – Rába Axle Ltd.
Szabolcs Horváth – Technical Manager – Borsodi Műhely Ltd.
Zoltán Ódor – Head of the Injection Molding Plant – SAPU Lp.

Scientific Committee:
Dr. Tamás Réti - Professor, President of the Scientific Committee - Széchenyi István University
Dr. Csaba Koren - Professor, Vice-Rector - Széchenyi István University
Dr. Károly Kardos – Associate professor, Vice-Rector - Széchenyi István University
Károly Falvi – Scientific Advisor – Rába Plc.
Dr. Ilona Rácz – Senior Scientific Officer - BAYATI
Dr. Tibor Bercsey - Professor, Institute Director – Budapest University of Technology and Economics
Dr. Tibor Czigány - Professor, Head of Department - Budapest University of Technology and Economics
Dr. Miklós Tisza - Professor, Head of Department – University of Miskolc

JRET management:
Péter Tamás Szilasi – Manager Director – Széchenyi István University
Ildikó Kóbor – Project Manager – Széchenyi István University
Szabina Nagy – Project Assistant - Széchenyi István University
Mária Peterka Németh – Economic Administrator – Széchenyi István University


Dr. Tamás Szekeres


István Pintér


László Borsodi


Antal Mihalicz


Dr. Imre Czinege

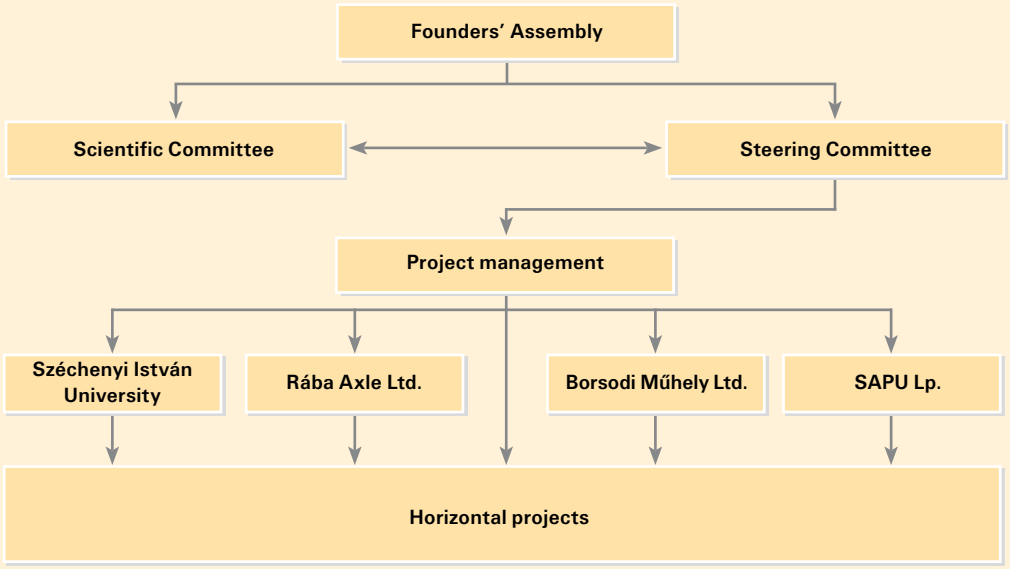

Dr. Tamás Réti


Dr. Károly Kardos


Péter Tamás Szilasi

Research and development structure and managers

The relationship between the managing bodies of the Knowledge Center and the organization carrying out the research activities is depicted by the following organizational chart:



The managers of the project activity and the leaders of the individual projects are shown in the following table.

Name	Workplace	Time spent on the project	Function
Dr. Imre Czinege	SZE	30%	President, Steering Committee
Dr. Tamás Réti	SZE	20%	President, Scientific Committee
Dr. Károly Kardos	SZE	20%	Leader, R&D program no. I.
Dr. Károly Szőcs	RÁBA	20%	Leader, R&D program no. II.
P. Tamás Szilasi	SZE-JRET	100%	Leader, R&D program no. III. Manager director
Dr. Ernő Fülöp	RÁBA		Consortium member, project leader
Szabolcs Horváth	BORSODI	20%	Consortium member, project leader
Zoltán Ódor	SAPU	20%	Consortium member, project leader
Dr. Ernő Halbritter	SZE	30%	Research project leader
János Jósvai	SZE	50%	Research project leader
Imre Herczeg	RÁBA	30%	Research project leader
Andor Opitz	RÁBA	30%	Research project leader
Kálmán Rákóczy	RÁBA	30%	Research project leader
Dr. Péter Gál	SZE	20%	Research project leader
Dr. Zoltán Horváth	SZE	20%	Research project leader

Consortium partners:

SZÉCHENYI ISTVÁN EGYETEM
GYŐR

The leader of the consortium, Széchenyi István University is involved in engineering, economic, law, nurse, social worker and music teacher education. The university's intellectual capacity and the rate of lecturers disposing of scientific degree makes the institution suitable for high-standard research and development activities. As a result of the above, the university is a dominant institution of the West-Transdanubian region, outstandingly developed in the national comparison, and is closely connected to the economy of Győr and its region, which have the second strongest potential for income production after Budapest. Its main majors rely on the electronic and vehicle industry, which are remarkably strong in the region, moreover on infrastructural development and operation and on the management and international relations of the companies and public institutions working in this field. The university's infrastructural facilities, supplemented by the planned developments, are suitable for the educational and research tasks on the long run. The corporate partners of the Knowledge Center are the region's significant companies in the vehicle industry, which represent the whole cross-section of the vehicle industry's supplier structure due to the differences in their ownership structure and company size.

RÁBA

As a traditional Hungarian large company, the interest of Rába Axle Ltd. in research and development is already obvious because of their existing traditions, which is justified by several innovation awards as well. The company employing some two thousand people is present on the world market in several significant product groups. The firm manufactures axles and their components, respectively, for medium-size and heavy trucks, buses and agricultural and power machines. The product scale includes the front, the rear, the driven and non-driven, the steered and non-steered and portal axles, their most important components, main units or head assemblies, the differential gears, their gears, the I-beams and the knuckles.

As a Hungarian-owned, stably developing medium enterprise, Borsodi Műhely Ltd. cooperate in technological development and applications in an efficient way based on their supplier experiences in high technology. Their main strength lies in high-level cutting technology, precision assembly and measurement. Their profile is constantly expanding and through their activities, the aircraft industry also appears as a target field in the work of the knowledge center.

schefenacker

Based in Mosonszolnok, SAPU Lp. (a subsidiary of the German Schefenacker Company Group) supplies internal and external rearview mirrors to almost all considerable companies in the automotive industry. Their largest customers are MERCEDES, OPEL, AUDI, VW, Ford and BMW. Assembly technology has been developed for 11 years at the firm and the large-series painting of plastic covers for 2 years.

As a member of the consortium, they are involved in adapting and further developing modern polymer shaping technologies. Within the company group, SAPU set the aim of elaborating an independent rearview mirror development basis.

Research programs (2006-2008)

R&D program no. I: **Research on the manufacturing technology and tools of highly complex, high-quality components for the vehicle industry**

Part task I/1: Developing modern primary shaping technologies and tools
Implementers: Széchenyi István University, Rába Axle Ltd., SAPU Lp.

Part task I/2: Developing modern cutting technologies and design algorithms
Implementers: Széchenyi István University, Borsodi Műhely Ltd.

Part task I/3: Research on technological solutions for increasing the life-span of components and tools in the vehicle industry
Implementers: Széchenyi István University, Rába Axle Ltd.

R&D program no. II: **Developing modern vehicle main units and researching their diagnostic methods**

Part task II/1: Research on optimized construction procedures
Implementers: Széchenyi István University, Rába Axle Ltd.

Part task II/2: Developing special axle constructions for agricultural power machines
Implementers: Széchenyi István University, Rába Axle Ltd.

Part task II/3: Developing special axle constructions for vehicles
Implementers: Széchenyi István University, Rába Axle Ltd.

Part task II/4: Analyzing the energy flow of the vehicle main units, revealing the correlations between manufacturing technology and reliability
Implementers: Széchenyi István University, Rába Axle Ltd.

R&D program no. III: **Technology and knowledge transfer**

Part task III/1: Educational and training program

Implementer: Széchenyi István University

Part task III/2: Activities supporting R&D tasks
Implementers: Széchenyi István University, Rába Axle Ltd., Borsodi Műhely Ltd., SAPU Lp.

Summary of the results of the research projects

Research is organized around two professional programs: technology and design. Their results will be transmitted to the two most important user groups – students and company professionals – by the training and technology transfer project. The most important results of the professional programs will be presented as follows:
In the course of the research on the production technology of vehicle industry components, solutions resulting in quality improvement and productivity increase have been created during the computer simulation of forging, deep-drawing and polymer shaping technologies. In the case of all three technologies, such an IT background and expertise have been created, which is able to efficiently support the launch of new products and the solution of the problems arising during current production, respectively. As a result, the mass production of a highly complex I-beam has been started at Rába Axle Ltd. and SAPU Lp. attained a cost reduction of 10% through the simulation of the polymer injection molding technology and through the detailed analysis of the technology. The cutting technology researches were focused on multi-axe machining, as a result whereof the technology of twenty components have been developed in two new product groups at Borsodi Műhely Ltd. and the range of services has been extended, too. These activities resulted in excess revenue of HUF 30 million at the consortium partner, which made it possible to establish 3 new workplaces, out of which two are researcher jobs. In order to develop the test background of the technologies, Széchenyi István University developed new sheet metal testing equipment, for which there is already a currently significant market interest. The software supporting the application of surface technologies also fits into the line of new products.
In the topic of modern vehicle main unit development, remarkable results have been reached both in applied research supporting designers' work and in the formation of the new main unit. In theoretical support research, new computer-aided bearing design software has been developed and the application of the finite element technique has also considerably improved in the production of new designs. In experimental techniques, we managed to acquire new information in the field of noise measurement and analysis, which result in the noise level reduction in the case of axles and whole vehicles. In the course of developing the main units of agricultural power machines and utility vehicles, two new products have been developed in each category and preparations have been made for developing further

products. The new products already sold resulted in revenue increase of HUF 65 million at Rába Axle Ltd. The most spectacular result of the technology transfer activity was international conference and exhibition entitled "Tech4Auto" on vehicle manufacturing technology, where the Knowledge Center presented the development results of year 2006 in 11 lectures. The co-workers of the Knowledge Center reported on the research in 35 publications and 30 conference lectures altogether, out of which 14 were articles in foreign periodicals and 5 were international conference lectures. The most important element of the educational program is talent care, which is extended to doctoral education as well as to involve undergraduate students in the research projects. As a result, three students among those involved in the projects already work for the partner

companies as researchers and developers.
Among the indices characterizing the summary results of the researches it is worth emphasizing that 14 new workplaces have been established, out of which 9 are researcher workplaces. Twenty-seven new products, services and technologies have been created, while the excess revenue attracted by the researched is HUF 182 million, out is which HUF 75 million is export. In parallel with this, the consortium partner companies have attained a cost reduction of HUF 140 million. All these results show that the project has met the most important aims in the first year and has founded the following years' research.

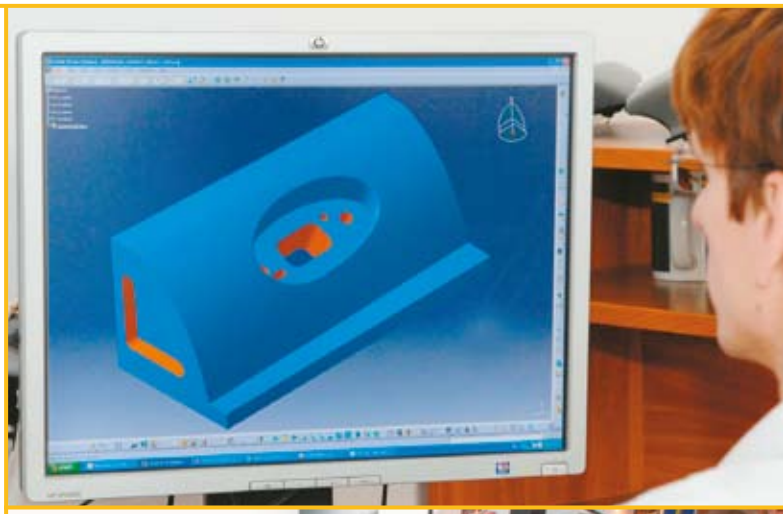
I/1-1: Modeling and experimental analysis of primary shaping processes

Project leader: Dr. Ernő Halbritter (SZE-AJT)

Subproject leaders: Attila Buczkó, Krisztián Tóth, Gábor Dogossy (SZE-JRET), Ferenc Tancsics (RÁBA), Zoltán Ódor (SAPU)

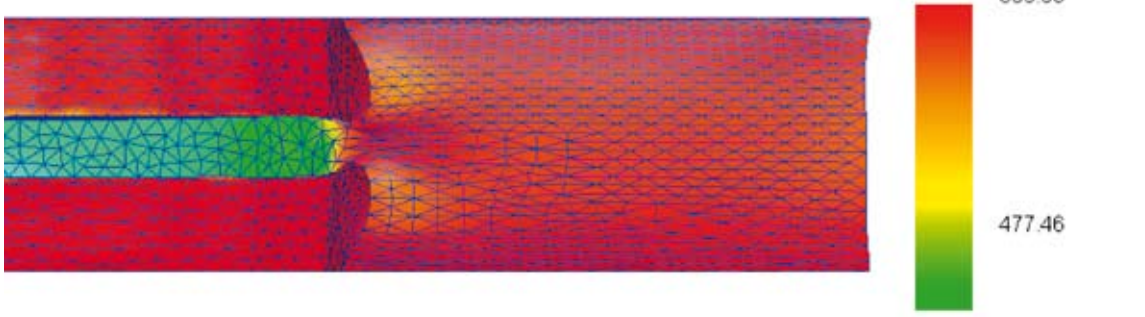
Overview

The new computer simulation laboratory serving technology and construction development integrates the most important CAD systems used in vehicle development (Catia v5, Pro-E wildfire3, Unigraphics NX4), the technological process simulation software (Wincast, AutoForm, Deform 3D, MoldFlow Adviser), the finite element software analyzing the thermodynamic and flow processes (Hypermesh, Fluent) as well as the software for cutting technology design and manufacturing process optimization (TDM, Powermill, Tecnomatix). The hardware tools are absolutely up-to-date and are able to fulfill the significant computation needs efficiently. This uniquely complex system serves the region's enterprises by solving problems in technology simulation and process modeling and provides assistance for implementing them.



Activities completed

A CAD-CAM-CAE Laboratory had been established at Széchenyi István University. After the specification, purchase and installation of the simulation software, the researchers were trained then the software was tested on the components selected together with the consortium partners in the case of bulk and sheet metal forming as well as polymer molding. In line with this, the features of the shaped products were tested in a complex way. The theoretical and experimental results were compared for the individual components.



Results

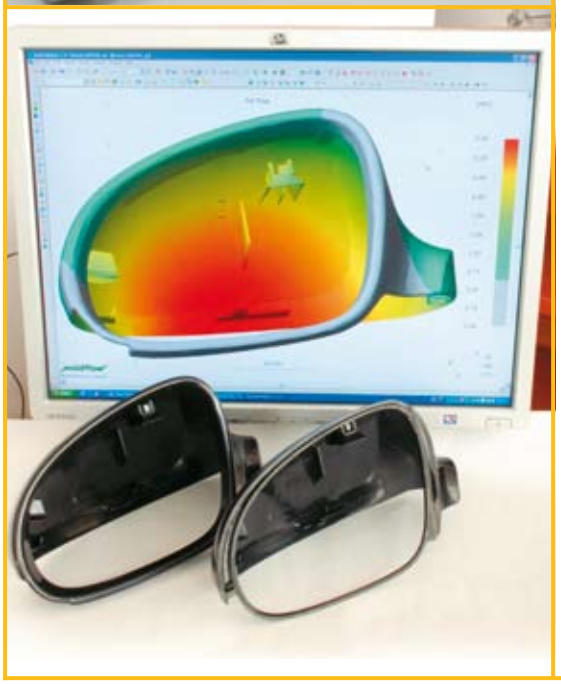
The topmost result of the competence development project is that the complex simulation laboratory has been established on a solid hardware platform, the installed software have proved their efficiency and the young researchers have mastered the software's theoretical background as well as the technical details of application.

Based on the simulated comparison checked by experiments, the information in connection with the software's efficiency and the optimization of the peripheral conditions are available.

In possession thereof, the first industrial applications have also been implemented: forging and polymer injection molding technologies have been analyzed in the framework of the JRET, and in the case of manufacturing process optimization and plate technology development as a service to further partner companies.

Future tasks

To analyze the critical points of the computer simulation systems put into application, to elaborate and to test new algorithms under laboratory circumstances. To further extend the applications in the circle of consortium partners and to other enterprises.



I/1-2: Research on primary shaping technologies and tools

Project leader: Dr. Károly Kardos (SZE-AJT)

Subproject leaders: Dr. Imre Czinege, Dr. Mária Kirchfeld (SZE-AJT), Ágnes Böröcz (SZE-JRET)

Overview

This complex technology development project includes several activities. It is focused on the development of sheet metal forming technologies and tools as well as on testing sheet metals. These activities are supported by the newly elaborated sheet metal testing equipment and the development of the related testing technique.

The materials of the small batch size sheet forming tools were examined through realistic forming experiments and the advancement of wear was detected by up-to-date geometric and surface roughness measuring instruments. The abrasive water-jet cutting technology and equipment serve the optimization experiments of the sheet metal forming operations and the modern micro-plasma welding device enables the research on the car-body panel joining processes.

Activities completed

For testing sheet metal characteristics, a sheet metal testing device has been developed, which is suitable for executing the most standardized tests known from professional literature. The equipment is capable of exerting a force of 600 kN, developed in the framework of the JRET program, was manufactured by consortium partner Borsodi Műhely Ltd. and Jankovits Hydraulics Ltd.

A specialty of the equipment is the digital optical measurement and evaluation system, with which the local deformation of sheet can be measured during shaping. In the course of the life-span tests carried out on metal, plastic and galvanic-coated plastic tools, the change of the tool's geometry and surface topology could be analyzed during ten thousands of pressing experiments. The water-jet cutting equipment and the cutting technology have been adapted; the first experiments are under process.

Results

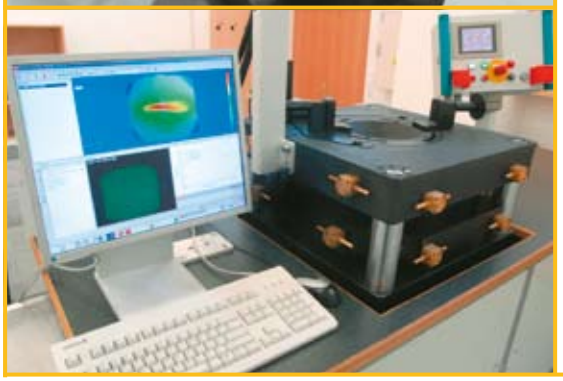
The sheet metal testing equipment and the other equipment purchased in the framework of the project are adequate for the complex testing of the strength, anisotropy and formability of sheets used in the automotive industry. By systematizing the testing methods, a qualification system has been created, which efficiently serves the region's industrial companies

One more order has already been received for the equipment so the elaborated new product has proved its marketability within a short time. The determination of the life-span of the small batch-size tools for different material qualities resulted in the elaboration of promising compositions for increasing the wear resistance of plastic tools. The series of geometric and surface roughness measurement as a method used for the evaluation can be applied for further tool wear tests.

Future tasks

To supply the sheet metal testing equipment with more tools for further sheet metal tests and to make it suitable for high-temperature tests. To elaborate new testing technologies and complex parameters for automotive applications.

To expand the tool life-span experiments to further material and technology couples. To theoretically develop the optimization of the blanks for deep drawing and to examine it through experiments.



I/1-3: Research on the production technology of polymer components

Project leader: Zoltán Ódor (SAPU)

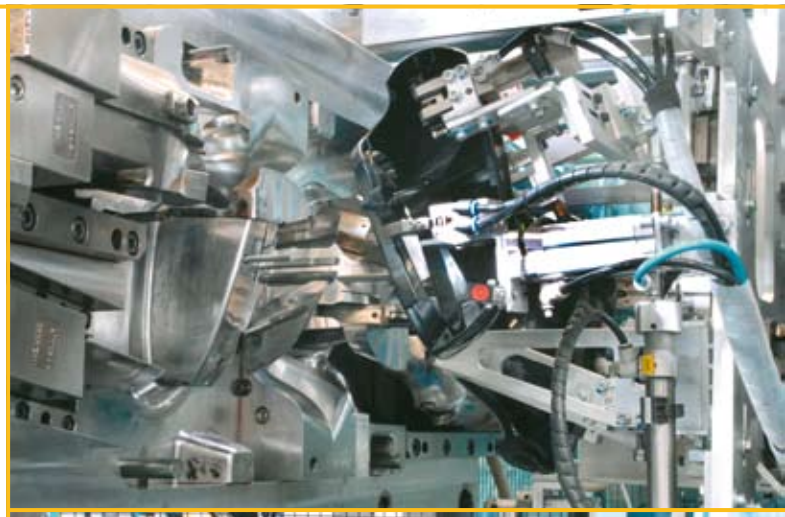
Subproject leaders: Gábor Dogossy (SZE-JRET), Péter Stasztny (SAPU), Dr. Ilona Rácz (BAYATI – commissioned by SAPU), Jim Gaffney (Managed Programs, LLC/ ValTech LLC – commissioned by SAPU)

Overview

The project aims at the complex research on gas-assisted injection molding technology. After the pilot environment had been established, the quality parameters of production were defined, the possible errors were mapped, detected and their reasons were analyzed. The technological experiments executed in order to increase productivity and to decrease cycle time all met success. The recycling of the emerging scrap results in decreasing the environmental load and in making production more economical.

Activities completed

Establishing the pilot environment with 1 piece of KM 350 C - LR 150 Krauss Maffei injection molding machine with robot, protective grill and piece-conveyor belt, by installing the RM/500/ 0/2 gas-pressure control box, the 3 pieces of HB-100 tool temperer and the Motan HLSX-15 material-sucking device. Quality management training for experiment planning (APQP, PPAP, 6 Sigma), detecting the surface defects created during production, executing the measurement series (SPC training, installing the measurement station), revealing the reasons for surface defects, compiling a list of defects and implementing it into the process of quality control. Elaborating the reutilization of unvarnished scrap: determining the appropriate blending ratio, analyzing the processing of defective products and their recycling into production directly after manufacturing. Optimizing the production technology and research on the possibilities to decrease cycle time. Defining the ways to attain this goal and estimating the expected tool costs.



Results

Adapting a new technology at the SAPU plant site in order to decrease logistics costs and strengthening the position within the concern. Creating a competitive advantage through decreasing costs, namely by decreasing the cycle time and scrap ratio of GID injection molding as well as by developing the recycling of injection materials. Further developing the gas-assisted injection molding process, increasing the robustness of manufacturing. Elaborating and applying a technological know-how in the production process.

Future tasks

To further develop the production and laboratory test environment, to analyze newer technological experiments and the produced components. To optimize the hollow shaping technology of the gas-injection tool. To analyze the effect of the technological parameters on component sizes and on the efficiency of painting.

I/2-1: Research on cutting technologies

Project leader: János Jósvai (SZE-JRET)

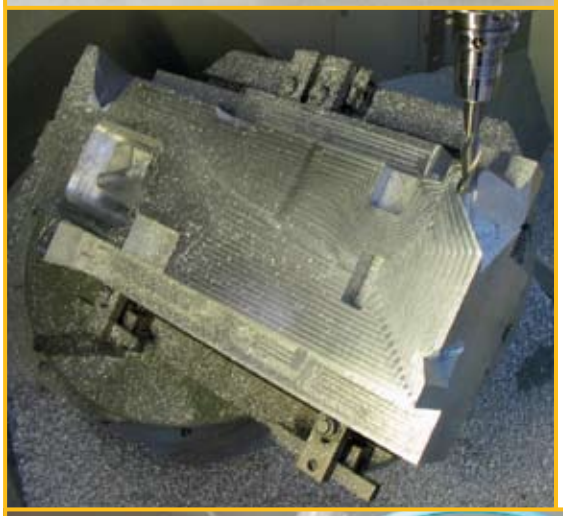
Subproject leaders: Mrs. Ferenc Csizmazia dr. (SZE-AJT), Márton Barbély (BORSODI)

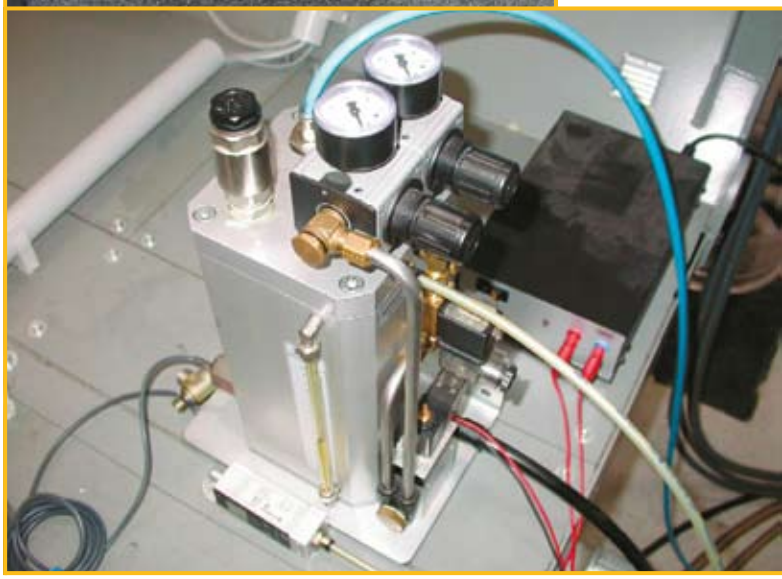
Overview

The project analyses the cutting strategy of the 5D components within the machining process, moreover deals with optimization algorithms and their practical realization. Its focus points are planning the machining of experimental component, carrying out the machining experiments and the evaluation of their results. Based on all the above, such a technological know-how will be acquired, which leads to results applicable even among SMEs. Concrete cutting process planning appears embedded into complex manufacturing process planning, for which the research group is enabled by the applied TDM cutting process planning software and the Technomatics software.

Activities completed

Purchasing and installing the software necessary for simulating manufacturing processes and for planning cutting technologies, in the framework of an integrated simulation laboratory. Research on the 5D machining technology and its instruments. Planning and experimentally testing the machining of typical components, with special regard to aircraft parts. Defining component material groups, systematizing material features, elaborating machining technologies for the materials and the typical parts. Taking over the know-how of designing a machining process.



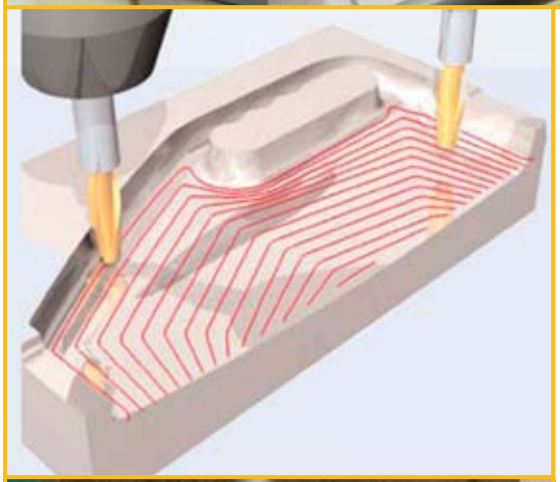


Results

Developing the machining process simulation onto a level useable in the industry, resolving concrete applications for the vehicle industry. Mastering and applying the 5D machining know-how. Compiling a knowledge base for optimizing the cutting process. Proficiency in aircraft component machining technologies and materials, reinforcing market acquisition prospects. Designing a machining process based on corporate needs for a domestic vehicle factory.

Future tasks

To transmit the results achieved in machining process optimization and in the development of manufacturing technology of 5D surfaces onto newer applications. To acquire and to systematize the knowledge that can be acquired on this base. The integration of the process- and technology-level tasks will also be studied thoroughly in the years to come.



I/2-2. Research on multi-axe machining

Project leader: Szabolcs Horváth (BORSODI)

Subproject leaders: Károly Torda, Gábor Ónodi, Szabolcs Lendvai (BORSODI)

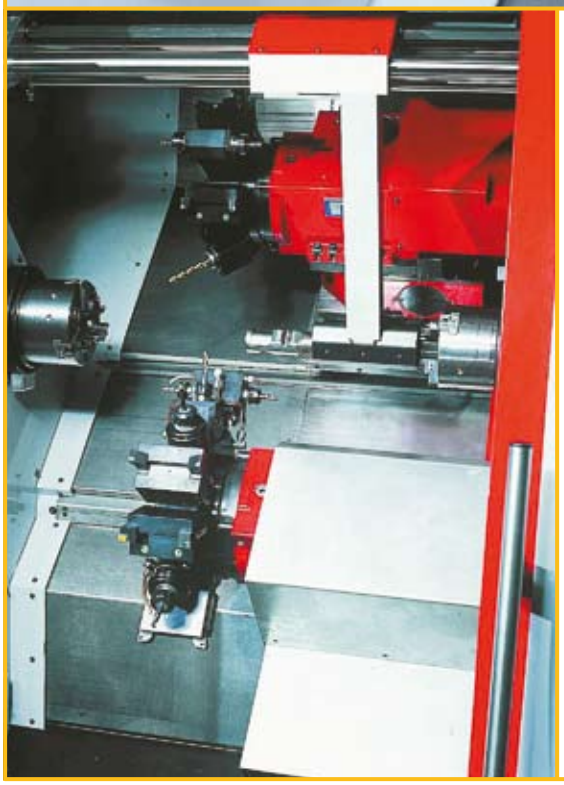
Overview

Establishing a test environment in conformity with Borsodi Műhely Ltd.'s technological design and quality management system for carrying out 8-axe cutting experiments. Installing the machining center, technological development in the field of multi-axe machining. Through this development, adapting a new high technology into manufacturing, creating an opportunity to join the component supply chain of the cutting-edge industries.

Activities completed

Elaborating a chip-removing strategy suitable for multi-axe machining, elaborating a method suitable for preparing an optimized machining order plan. Planning and carrying out cutting experiments on ground vehicle and aircraft components. Processing and assessing the results of the technological experiments.

Based on the results, establishing a database of optimal technological parameters. Based on the experimental results, indicating the directives of cutting technological planning and the methods of defining the technological parameters in Borsodi Műhely Ltd.'s documentation system.

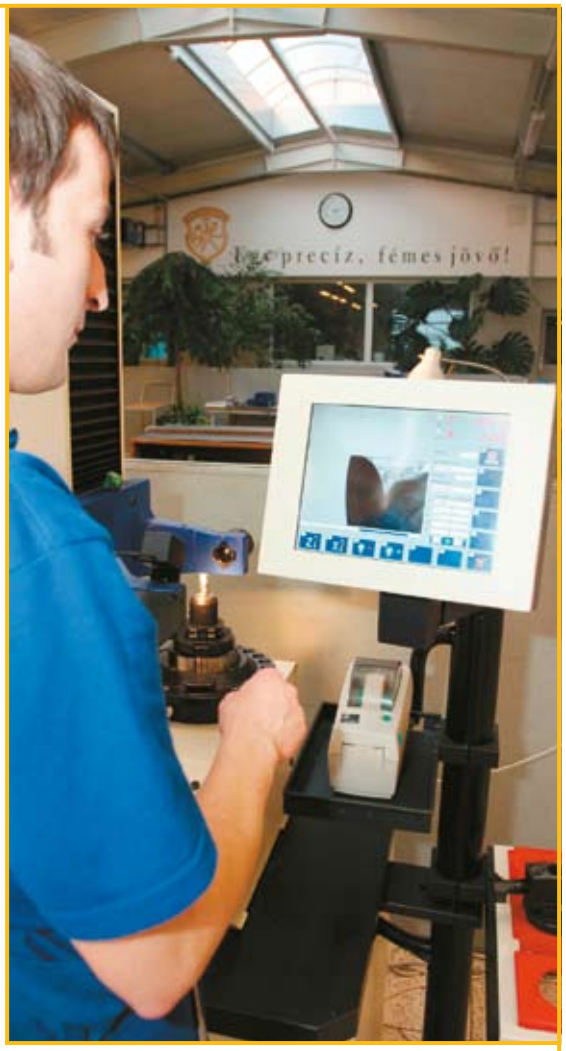


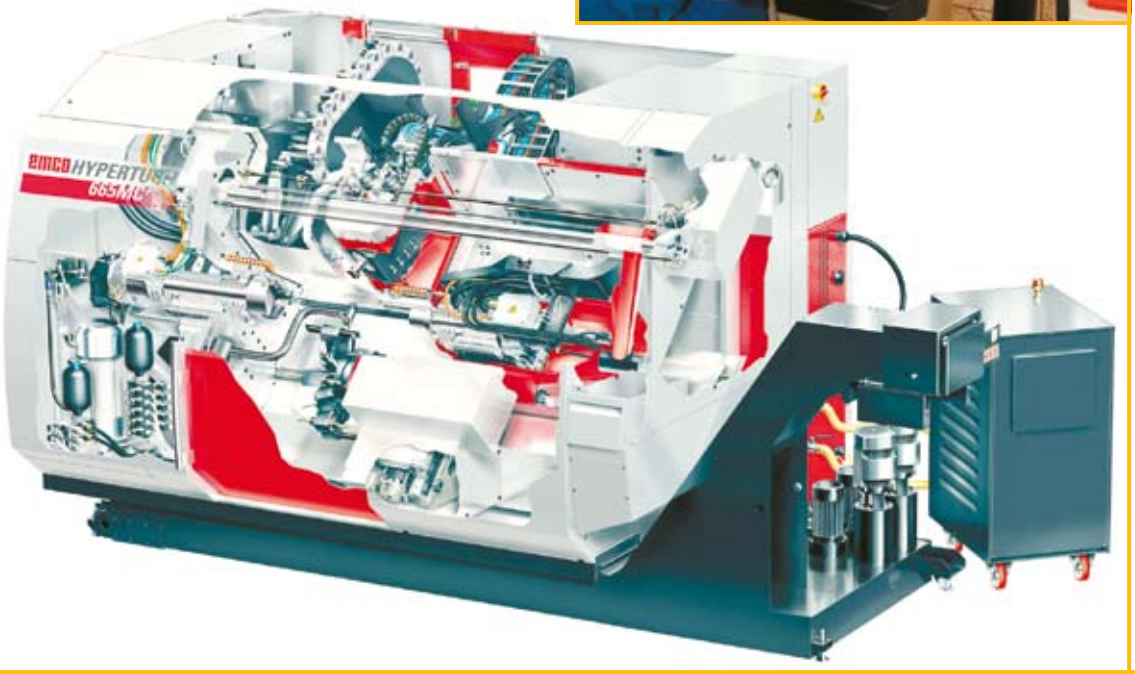
Results

Elaborating a cutting technology applied on a multi-axe machining center for high-alloy steels as well as nickel- and titan-based alloys and adapting it into the plant practice of Borsodi Műhely Ltd. By machining reference components, justifying the efficiency of the technologies and expanding the supplier activity into the aircraft industry.

Future tasks

Based on the elaborated new cutting technology, to increase the circle of machinable parts and to acquire new markets. To adapt a new heat treatment technology and equipment for creating the conditions of hard machining, to elaborate a heat treatment technology for the modern ground vehicle and aircraft components.





I/3. Research on surface technologies

Project leader: Dr. Tamás Réti (SZE-AJT)

Subproject leaders: Imre Felde (BAYATI), Dr. Gyula Bagyinszky (BMF-BGK), Ferenc Táncsics (RÁBA)

Overview

The two main fields of application of surface technologies in the vehicle industry are the surface treatment of vehicle structure elements and of the tools manufacturing the components. In the framework of the project, application technique research is being carried out in both topics. This year research has been focused on compiling a scientific database that would contain the main coating types and surface treatments, respectively, as well as their optimal application.

Activities completed

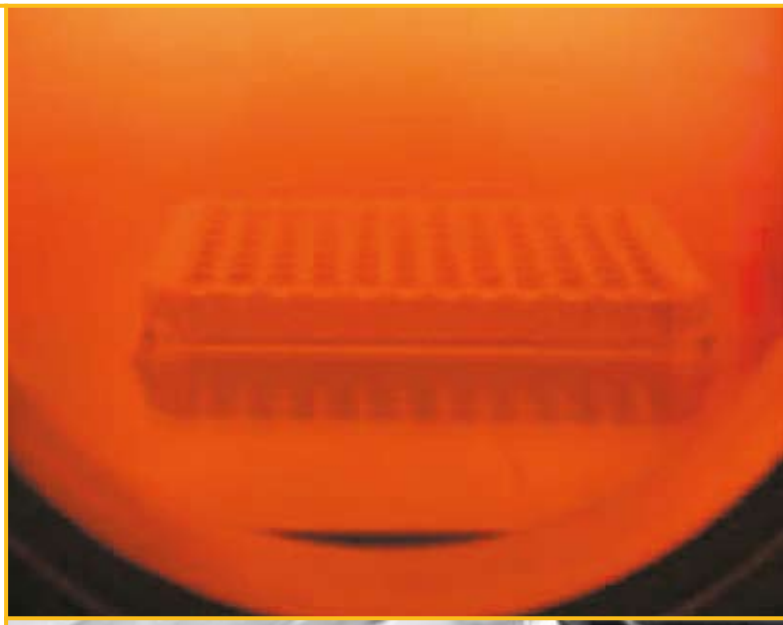
Systemizing the surface techniques and coatable components according to their function, material, utilization and coating type. Setting up a system of rules, turning it into an algorithm and connecting it with the information base. Connecting the technological database and the applications database. Detailed analysis of characteristic surface treatment techniques (PVD, treatment with laser and electron beams), determining the possibility of application. Theoretical and experimental testing of the possibility to increase the life-span of the forging die.

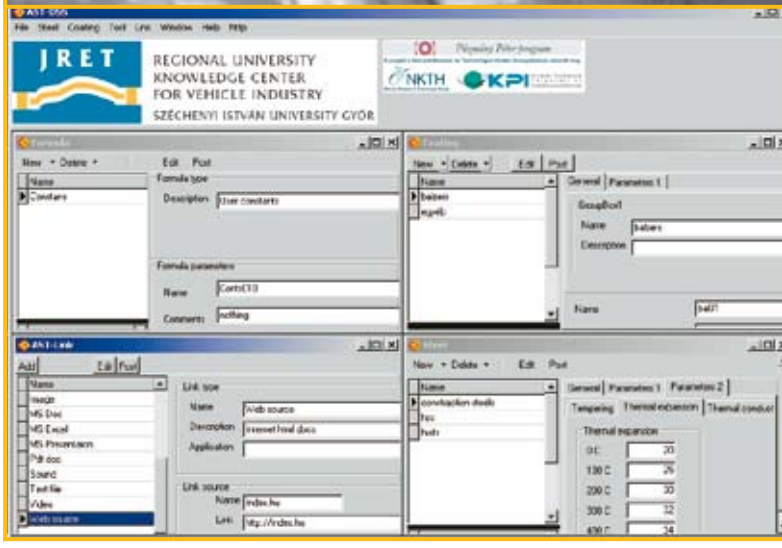
Results

The established decision support system approaches the topic of surface techniques and their application in a modern way. After appropriate testing and experimental checking, the elaborated software can be developed into a marketable product. The theoretical model developed in the field of laser surface treatment is convenient for exactly simulating the process and for estimating the expectable characteristics. Modeling and experimentally checking forging technology substantially decreases the testing time of the various treatments and increases their efficiency.

Future tasks

Relying on the elaborated knowledge base, to implement new surface technological applications and to check their conditions of operation on experimental tools. To launch new research in the field of high energy-density treatments with industrial partners.





II/1-1. Research on optimized construction procedures

Project leader: Imre Herczeg (RÁBA)

Subproject leaders: Dr. Ernő Fülöp (RÁBA), Péter Beke, Dr. Péter Horváth (SZE-MGT)

Overview

The project deals with three substantial dimensioning procedures of vehicle part unit development, namely with finite element calculation based on fatigue estimation measurements, with the development of the geometry and manufacturing of low noise-level gear boxes as well as with the computer-aided design of multi-point build-in bearings. All three subprojects include both theoretical and experimental work, which help to verify the results.

Activities completed

In the topic of fatigue, those material qualities have been specified, the characteristics whereof are determinant factors in the constructional design of axles. Based on literature data, an internal database has been prepared for the selected material qualities, which contains the life-span and the effect of the factors influencing it. The plan of the testing examinations has been prepared with respect to the materials selected for the experiments, which includes the advantaged examination of medium stress, heat treatment, surface rolling and particle sprinkling.

In the topic of noise tests, the effect of the cone-disc wheel drives of the axles used in vehicles on the cab noise level has been decreased. In the course of installing axle type 360.69 into a midibus, cab noise was measured in the moving vehicle under different travel conditions, changing more than 36 design, setting and material quality parameters of the body in the case of an unchanged axle.

In the topic of bearing design, the in- and output parameters have been systematized and the dimensioning algorithm and software have also been prepared. The software supports the selection and life-span calculation of cone- and disc wheel bearing of heavy-duty bearings (primarily axles) and of wheel hub bearing.

Results

In the topic of fatigue, the computer-based database has been prepared, which contains the most important information necessary for axle development based on literature data. From the results of noise measurement, we managed to identify 25 parameters having noise- and vibration level increasing, decreasing or neutral effects. Based on these, we could define the interaction between the axle and the body as well as the structure that assures the lowest possible noise- and vibration level in the case of given gear boxes. The computer program elaborated in the topic of bearing design has been tested. Based on the experiences acquired during running, the software will be efficiently applicable in the course of axle development.

Future tasks

The next step in the research on fatigue is to carry out fatigue experiments based on the elaborated research program and to set up generalized relations in design and to incorporate them into the database. In noise testing research, gear boxes of different micro-geometry will be created, examined in the laboratory and then incorporated into the minimum-noise-level body experimented above. It is based on these tests that the design and manufacturing parameter group will be created, which – through the gears – can further reduce the noise level of the minimum-noise-level body elaborated so far. When the bearing design algorithm and program are further developed, such an interface will be elaborated, which will effectively support the multi-purpose use of the software. Afterwards, when testing the software, feedback will be given on the experiences of the specific incorporations.

II/1-2. Research on optimization algorithms of vehicle main units

Project leader: Dr. Zoltán Horváth (SZE-MSZT)

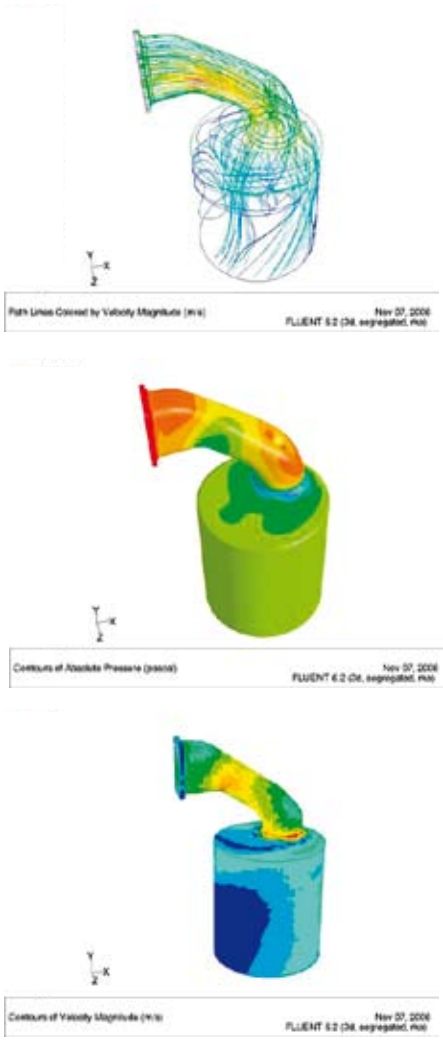
Subproject leaders: Dr. András Horváth (SZE-FKT), Tamás Morauszki, Krisztián Tóth (SZE-JRET), Attila Antal (SZE-KVJ)

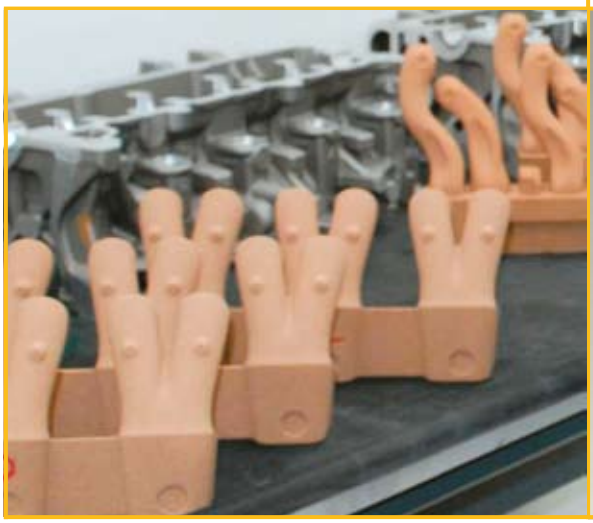
Overview

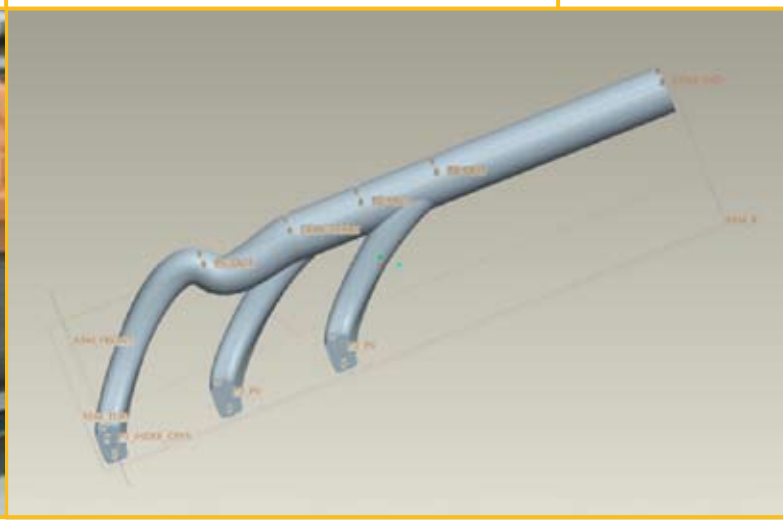
The project deals with optimizing the flow conditions found in vehicle main units, primarily in the engine and its environment. The aim of development is to elaborate a shape-optimization process that integrates the CAD model and the applied flow analyzing software with the help of an intermediate software, thereby making the optimization process automatic until the end result is attained. The optimization parameters (objective function values) can be specified in advance.

Activities completed

Connecting the ProEnginer Wildfire and the Fluent flow analyzing software with an optimization software written in C language, elaborating an iterative solution strategy. Developing the automatic optimization algorithm and testing it on simplified shapes. Modeling the aspiration duct and exhaust pipe system of a Diesel engine, testing the whole algorithm when solving specific problems.







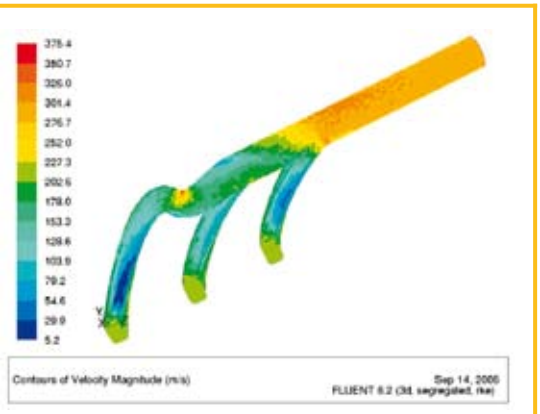
Results

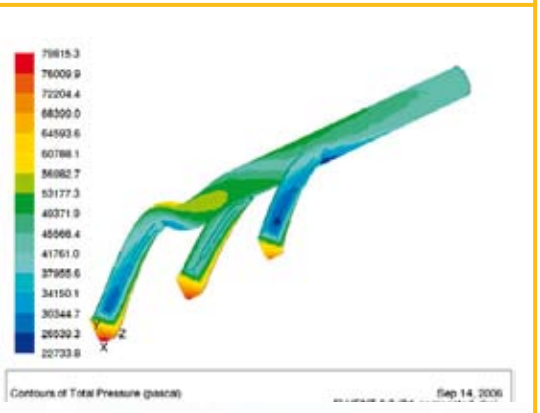
The whole automatic optimization algorithm and its IT installation have been completed. The software system worked well on the test problems and gave realistic results even for solving industrial problems.

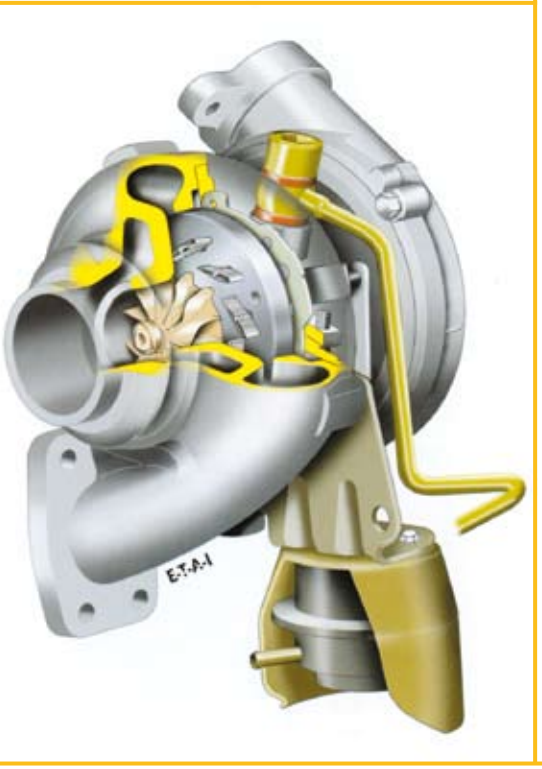
The running results have justified it that compared to the traditional method, the computing time of the problem has been significantly decreased and the results attained have been more favorable than the results of the optimization executed only through designer's control. In the framework of KKK, a virtual wind tunnel simulation task has been solved as an attracted project, which deals with the wind resistance test and optimization of external vehicle-body elements.

Future tasks

To compare the optimization results attained by calculation with the measurement results. To improve the connection of the individual software and to make the automatic operation of the individual components more trouble-free. We wish to launch further corporate projects through research on flows in the combustion chamber of combustion engines and its environment.



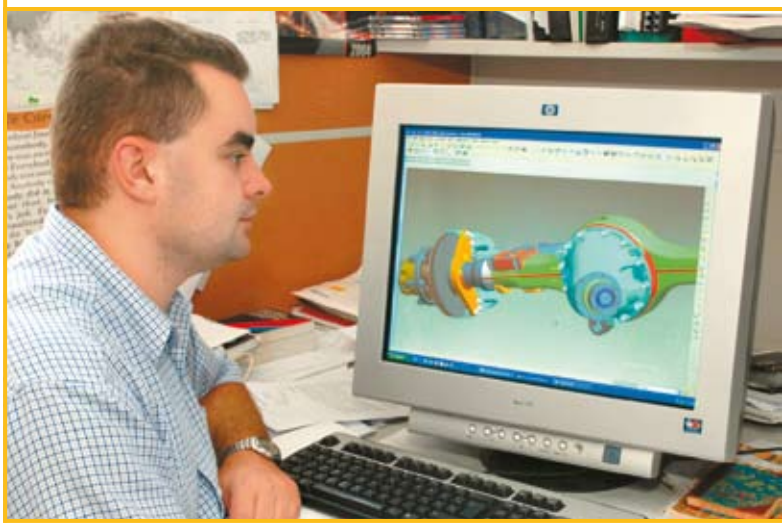




II/2. Developing special axle constructions for agricultural power machines

Project leader: Andor Opitz (RÁBA)

Subproject leaders: László Simon, Jenő Petőfalvi (RÁBA), Dr. Zoltán Varga (SZE-KVJ)



Overview

Further developing the axles of agricultural power machines, making them able to transmit higher power and to attain higher permanent speed while leaving the significant external dimensions, weight and costs of the axle unchanged and maintaining the life-span characteristics, too. Fulfilling these aims by elaborating a new construction for the head assembly and by manufacturing the wheel hub planetary gear through a more advanced technology. During the realization of the project, the power of a four-wheel steering tractor axle will be increased by 10% and its speed will be increased by 25 to 50% for a well-known German manufacturer of agricultural machines. In the case of a rubber-belt tractor axle, to be developed for a similarly market-leading USA manufacturer, power and shaft distance will both be increased by 10%.

Activities completed

The construction development of both tractor axles has been completed and the prototypes of the developed constructions have been tested on a test bench through laboratory experiments.

Based on the result assessment of the experiments, the production of the first 5 experimental units of the axles for the German market has been started. The 300-hour laboratory test has been completed for the second development.

Results

During testing, the new axles met the expected quality requirements, the first results of the life-span tests were positive. Higher performance could be reached by applying a hypoid gearing at the cone-disk wheels instead of a spiral and by the finite element analysis of the axle. At the differential, higher performance was realized by the technological change of the cut equalizing wheel. At the wheel hub planetary gear, higher performance could be reached by a more updated and more economic manufacturing technology. The technology applied for the manufacturing of the newly constructed planetary gear managed to fulfill the expectations thus Rába Axle Ltd. have acquired such a new technological know-how that will make them able to satisfy the increased needs on the world market and to hold on to their market positions in the field of competitive products.

Future tasks

To finish the third phase of axle tests and to implement the development results in mass production. To continuously develop products suiting the market needs, to further increase performance and to carry out further development based on the tests of running dynamic characteristics.

II/3: Developing special axle constructions for vehicles

Project leader: Kálmán Rákóczy (RÁBA)

Subproject leaders: László Hódos, László Légmán, Dezső Szekendy (RÁBA), Dr. Zoltán Varga (SZE-KVJ), András Csiszár (external expert)

Overview

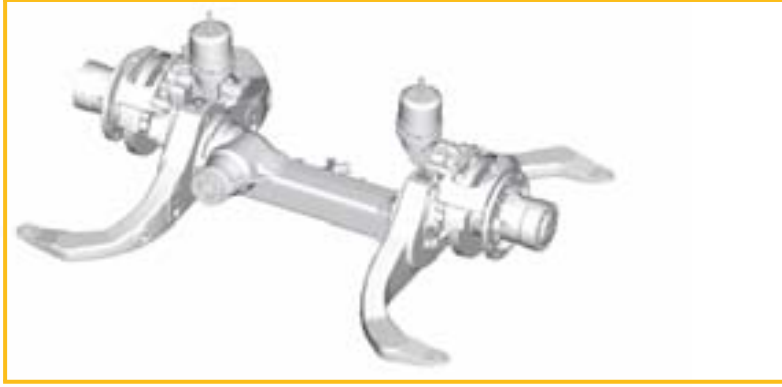
In the course of the project, the Rába axles have been considerably developed in conformity with new application requirements. The development affected all three utility vehicle families – bus, trolleybus and truck axles – and the user partners were among the world's leading vehicle manufacturers. The activity was focused on computer-aided design and the application of modern manufacturing procedures.

Activities completed

In the bus-subproject, the new construction and manufacturing process of the I-beam forged together, to be prepared for a well-known Japanese manufacturer, has been elaborated instead of the previous three-part, pressed-welded version. Trial production was carried out and the test procedure of the prototypes has been started.

The axle suspension of trolleybuses type no. 518.35 running in San Francisco has been further developed and the production technology and tools for the components are all ready. In the course of development, an extensive finite-element simulation model containing the whole incorporation environment has been established, which is suitable for examining the cases characteristic from the perspective of load, mechanical stresses and expected life-span. Thereby it was possible to make the planning goal to be fulfilled entirely.

For a well-known heavy truck family, the development of a heavy-duty tandem axle and of a driven front axle has been started. In the first phase, the conception plans and the feasibility studies have been completed. The offer documentation has been complied and the conditions of manufacturing have been analyzed.

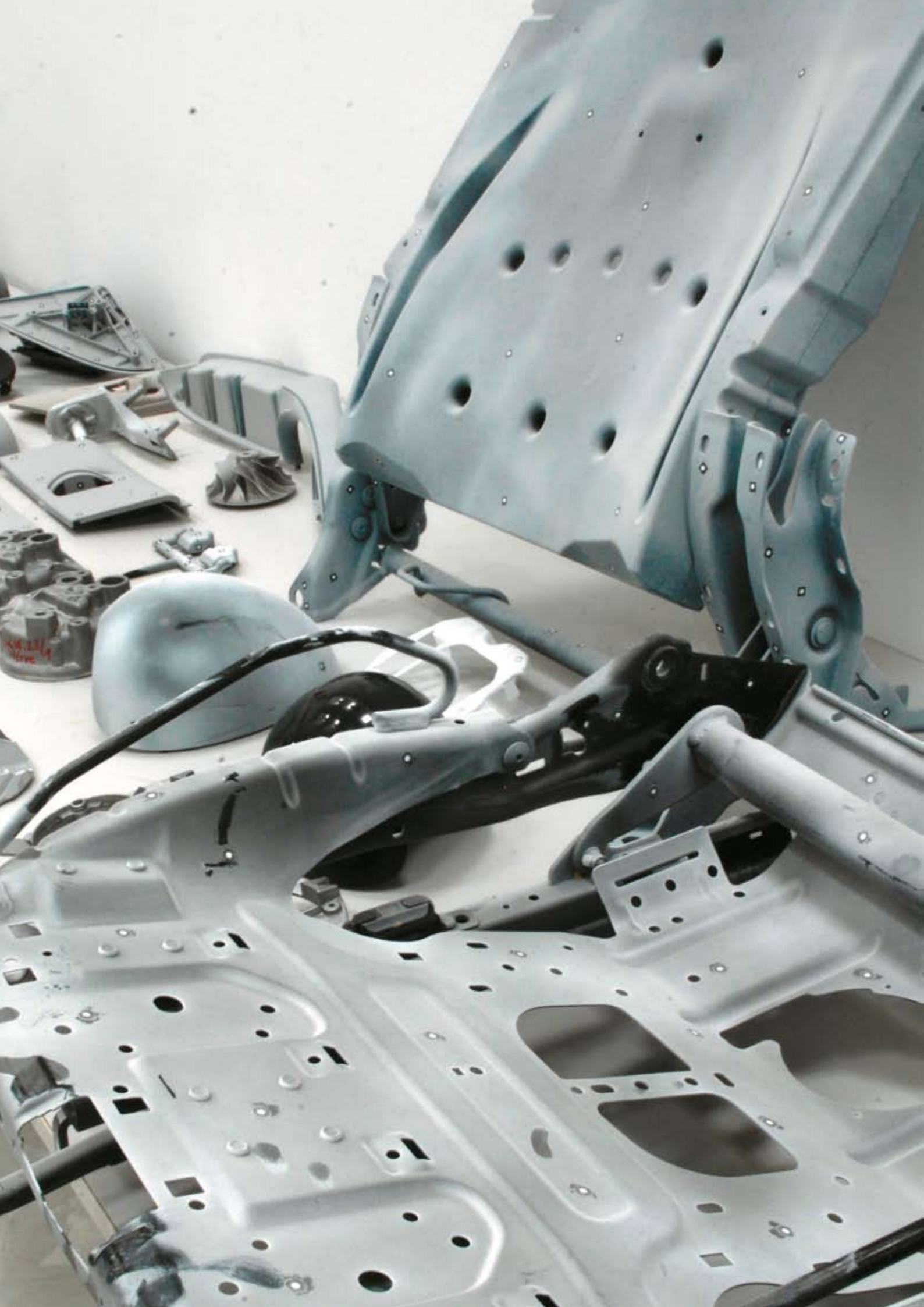


Results

The further developed bus axle part unit has become even more reliable and its production has become more efficient. With the new construction, besides reducing costs by 50%, mass could be reduced by 20% and a 15- to 20-fold life-span increase could be attained. The first fifty experimental pieces of the axles have been completed for trolleybuses running on exigent markets. The heavy-duty tandem axles are preparing the opportunity to get into a new market segment. All the new constructions have been designed with up-to-date CAD tools and finite element technique, the conformity whereof have been justified by the life-span tests carried out after trial production.

Future tasks

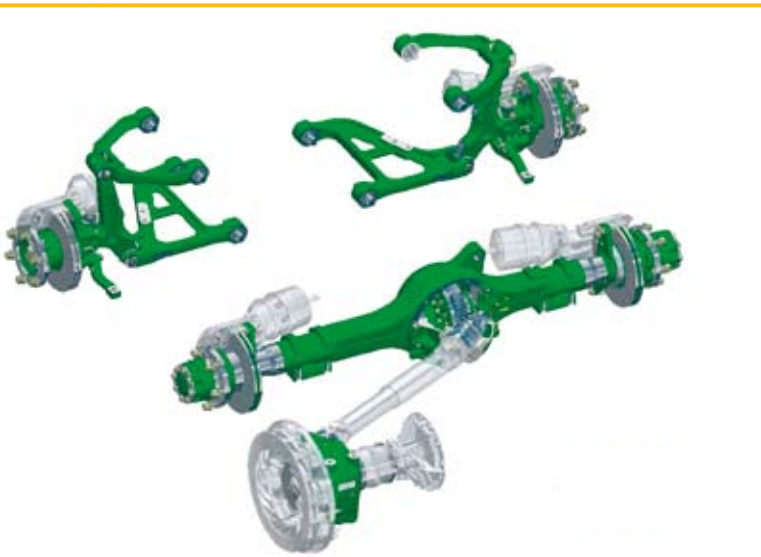
The first two subprojects have been completed, now the aim is to transmit the development results into manufacturing and to reinforce the product's market position. The further phases of the third development will be realized next year; it includes elaborating and testing the prototype.



II/4. Analyzing the energy flow of utility vehicle main units, revealing the correlations between manufacturing technology and reliability

Project leader: Dr. Péter Gál (SZE-KVJ)

Subproject leaders: Attila Antal, Dr. Zoltán Varga (SZE-KVJ)



Overview

The project deals with vehicle run dynamics and energy flow analyses that provide general development support for axle developments. In the first phase, those theoretical relationships have been revealed which are necessary for developing increased-speed axles supporting the faster public road traffic of agricultural power machines and these relationships have been displayed during the development.

Activities completed

Summarizing the need for vehicle dynamical analysis in the case of high-speed tractors demanding independent suspension. Specifying the research tasks, determining the vehicle's drive and steering bearing force, and the effect of the loads on the individual structural elements due to vehicle dynamics. Elaborating and programming a calculation algorithm for a theoretical independent suspension in given run situations and work phases; calculating the forces. The energetic analysis of the break inserted into the drive-chain, the theoretical foundation of defining the mechanical losses.

Results

Based on the theoretical results, a calculation method has been elaborated for the suspension ball-pivot forces of the parallel track-arm axle, a specific type of axle manufactured by Rába Axle Ltd. The ball-pivot forces have been previously determined under different operational conditions. The independent-suspension axles of the heavy vehicles belonging to the consortium partner's sphere of interest have been analyzed. Possibilities have been elaborated for the decrease of mechanical losses for certain driving-gear part units.

Future tasks

To continue elaborating new construction theories for the axle design tasks of heavy-duty agricultural power machines. To analyze the critical parts of the axle with respect to energy efficiency and to reveal new relationships in order to decrease mechanical losses.

III/1 Educational and training program

Project leader: Dr. János Égert (SZE-MGT)

Subproject leaders: Persons responsible for the majors and the subjects (SZE)

Overview

The educational and training project embraces the transfer of the results of the research and infrastructure development going on in the JRET into undergraduate, graduate and doctoral education as well as into corporate trainings. The main task in 2006 has been to elaborate the system of professional relations of the Doctoral School for Multidisciplinary Engineering Sciences and of the JRET, to establish the conditions of cooperation and to integrate the subjects related to the research activity into the educational program. A supplementary activity was to involve the students in the implementation of the JRET projects in the framework of final theses, scientific student work or part-time employment.

Activities completed

In connection with the "Computer science" specialty, detailed proposal has been elaborated for the possible research fields in the topics of modeling technological processes as well as thermodynamic and hydrodynamic processes, moreover for their integration into the program of the Doctoral School. Agreeing with the management and internal members of the Doctoral School on the opportunities to use the JRET infrastructure. Establishing connections with PhD students for supporting the solution of specific topics. Involving graduate students in the research. Calling for a student tender by consortium partner SAPU for resolving corporate tasks. Presentations organized for students in order to present the activity of several industrial companies (Audi, Dana, SAPU).

Results

JRET has elaborated ten possible research topics, which PhD students can work on either as an individual doctoral topic or as a part of their doctoral work. So far three PhD students have showed up with specific topics, the resolution whereof is supported by JRET. The subject called "The simulation of metal forming processes" had been accepted by the Doctoral School as a part of their educational program and the subject has been taught since fall 2006. The graduate students have successfully completed their individual work related to the research projects.

Future tasks

To broaden the scope of collaboration with the Doctoral School, common doctoral topics to be launched by the companies and the university. Within the accredited "MSc in Mechatronic Engineering" licensed to be launched, the aim is to get the students know about the modern measurement processes and instruments and to elaborate proposals for final theses. To transmit the publishable results coming from the research projects into undergraduate education. To expand student activity and to supplement it with even more individual assignments. To support self-motivated student groups in the preparation for the alternative vehicle competition.

III/2 Activities supporting R&D tasks

(Technology transfer, demonstration activities)

Project leader: Péter Tamás Szilasi (SZE-JRET)

Subproject leader: Ildikó Kóbor (SZE-JRET)

Overview

The project includes four activities belonging to the topic of technology transfer in the wider sense. The first activity supports the utilization of the research results and the flow of technological information. The second key task is to evolve and enhance the relations among the region's economic players and the third is to participate in the elaboration of the development concepts in connection with the city and the region. The fourth activity is to realize the corporate research initiated by JRET through the University's departments, relying partly on the intellectual capacity of JRET. The main exploiters of this activity are the companies in the vehicle industry. All these contribute together to enhancing the region's competitiveness and to attracting new activities of high value added.

Activities completed

The publication passing the knowledge acquired and the world's results in technical development on to the enterprises and to the partners is supported by the periodical founded together with the Knowledge Center of the Budapest University of Technology and Economics (EJJT). The first double issue has already been published and the second issue is bound to appear at the end of the year. The dissemination based on information technology is realized through the homepage of JRET. The forum of verbal information pass-on has been the conference and exhibition entitled „Tech4Auto 2006" on vehicle manufacturing technology, which was organized and supported by the Knowledge Center. The exhibition and business forum supports the second activity: relationship building among the region's economic factors. In the framework of the third activity listed, the JRET has actively participated in elaborating and implementing the conception of the AUTOPOLIS West-Hungarian Development Pole and will also continue to do so in the future. In the framework of the corporate R&D activity mentioned as the fourth element, the University implements a research worth HUF 87 million for the region's 10 original vehicle manufacturers and suppliers thus so many projects have been attracted by the irradiation of JRET.

AUTOPOLIS

Nyugat-Magyarországi Fejlesztési Pólus

"A fejlődés vonzásában"

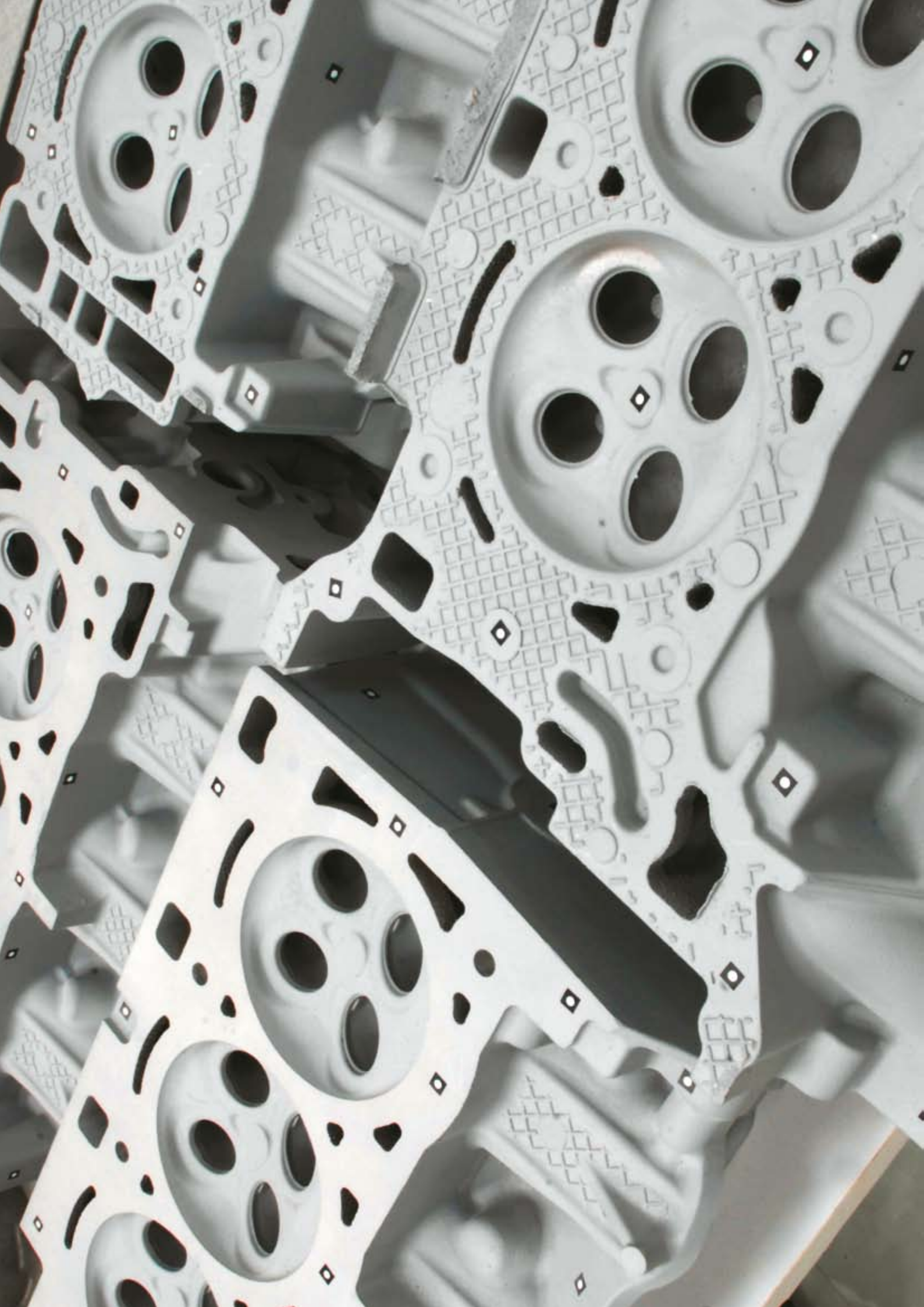
Tech4Auto

Results

The results of a part of the outlined activities cannot be measured in numbers. However the establishment of the publication forums, the meeting of the members of the business sector as well as the elaborated and hopefully realized pole development concept can all be regarded as results. Their effect will only be measurable in the region's economic development and in the strengthening of innovation activity after several years. The concretely measurable result of technology transfer is the mentioned research activity worth HUF 87 million as well as its effect on the company's activity in the field of increasing efficiency and quality improvement.

Future tasks

The technology transfer activity is a continuous task, which means maintaining the created periodical, the annual organization of the conference and exhibition, the participation in the elaboration of the region's development concepts as well as the all the more powerful expansion of corporate research. As a key task, the Knowledge Center continuously supports the implementation process of the AUTOPOLIS project with technological and construction knowledge as well as with human resource development.



Publications

1. Réti T., Boroczky K.: Topological characterization of finite cellular systems represented by 4-dimensional polytopes. MATER SCI FORUM 473-474: 381-388 (2005)
2. Réti T., Bitay E., Kosztolányi Zs.: On the Polyhedral Graphs with Positive Combinatorial Curvature. ACTA POLYTECH HUNG 2: 19-37 (2005)
3. Réti T, Felde I., Smoljan B., Colas R.: Modeling of non-isokinetic transformation processes. In: Smoljan B., Jager H., Leskovsek V. (eds.) Proceedings of the International Conference on Heat Treatment and Surface Engineering of Tools and Dies, Zagreb: Croatian Society for Heat Treatment and Surface Engineering, pp. 367-373 (2005)
4. Réti T., Zsoldos L.: A possible extension of the Aboav-Weaire law. MATER SCI FORUM 473-474: 389-398 (2005)
5. Felde I., Réti T., Segerberg S., Bodin J., Sarmiento S.: Numerical methods for safeguarding the performance of the quenching process. MATER SCI FORUM 473-474: 335-339 (2005)
6. Csizmazia A., Réti T., Horváth M., Oláh N. H.: Partial electron beam hardening of cast iron camshafts. MATER SCI FORUM 473-474: 447-452 (2005)
7. Costa L., Vilar R., Réti T., Colaco R., Deus A. M., Felde I.: Simulation of phase transformations in steel parts produced by laser powder deposition. MATER SCI FORUM 473-474: 315-320 (2005)
8. Costa L., Vilar R., Réti T., Deus A. M.: Rapid tooling by laser powder deposition: Process simulation using finite element analysis. ACTA MATER 53: 3987-3999 (2005)
9. Bitay E., Réti T.: Topological characterization of a polyhedron micro-structure by using shape factors. In: Bitay E. (ed.) Technical Scientific Papers: 10th Scientific Conference of Young Technical Experts, Cluj Napoca (Romania), Transylvanian Museum Association, 2005. pp. 213-222
10. Smoljan B., Tomasic N., Iljkic D., Felde I., Réti T.: Application of JM-Test in 3D simulation of quenching. Journal of Achievements in Materials and Manufacturing Engineering 17: (1-2) 281-284 (2006)
11. Simsir C., Gür C. H., Réti T., Felde I.: Determination of the effect of phase transformation on residual stress distribution in the quenched steel components by finite element modeling. Proc. of the 3rd International Conference on Thermal Process Modeling and Simulation, Budapest: GTE, 2006. pp. O-V/15-O-V/15
12. Smoljan B., Tomasic N., Iljkic D., Felde I., Réti T.: 3D simulation of quenching of steel specimen. Proc. of 3rd International Conference on Thermal Process Modeling and Simulation, Budapest: GTE, 2006. pp. O-I/11-1-O-I/11-6
13. Martinez-Delgado D. I., Felde I., Réti T., Guerro-Mata M. P., Colas R.: Experimental determination of heat flows in different cooling media. Proc. of the 3rd International Conference on Thermal Process Modeling and Simulation, Budapest: GTE, pp. O-IV/2-1-O-IV/2-5 (2006)
14. Felde I., Czinege I., Réti T., Smoljan B., Colas R.: Quenchant evaluation by using quality function. Proc. of the 3rd International Conference of Thermal Process Modeling and Simulation, Budapest: GTE, pp. O-I/8-1-O-I/8-6 (2006)
15. Costa L., Vilar R., Réti T.: Laser powder deposition of tool steels: Strategies leading to homogeneous parts. MATER SCI FORUM 514-516: 739-743 (2006)
16. Bitay E., Réti T.: Topologic characterization of aperiodic cell systems. In: Bitay E. (ed.). Technical Scientific Papers: 11th Scientific Conference of Young Technical Experts, Cluj Napoca (Romania): Transylvanian Museum Association, 2006, pp. 47-56
17. Dogossy G., Czigány T.: Modeling and investigation of the reinforcing effect of maize hull in PE matrix composites, Polymers for Advanced Technologies, accepted, under publishing
18. Dogossy G., Czigány T.: Failure mode characterization in maize hull filled polyethylene composites by acoustic emission, Polymer Testing, 25, 2006, 353-357
19. Gáspár M., Benkő Zs., Dogossy G., Réczey K., Czigány T.: Reducing water absorption in compostable starch-based plastics, Polymer Degradation and Stability, 90, 2005, 563-569
20. Horváth P.: Some measurement technique applications of the optical gate in mechatronic education. GÉP, volume LVII, 2006. p.3.
21. Gál P.: Tribologic relations of modern valve controls. GÉP, volume LVII., 2006. p.6.
22. Lakatos I.: Testing the charge change timing of the four-stroke, uncharged Otto-engine with a mathematical model. GÉP, volume LVII, 2006. p.9.
23. Varga Z.: Extending the replacement period of autobus servo-wheels through regular diagnostics. GÉP, volume LVII, 2006. p.13.
24. Balogh T., Eleőd, A.: The examination of wearing and the possibilities for modeling in the case of dry friction. GÉP, volume LVII, 2006. p.18.
25. Molnárka Gy., Gáspár Cs., Horváth A., Horváth Z., Lotfi A.: Mathematical and computer modeling of high-voltage circuit-breakers. GÉP, volume LVII, 2006. p.23.
26. Gulan L., Bukoveczky Gy.: Platform creation in the case of modular structure power machines. GÉP, volume LVII, 2006. p.27.
27. Triesz P.: The stability examination of the surface-collision phenomenon in rotor-dynamics by taking the gyroscopic effect into account. GÉP, volume LVII, 2006. p.30.
28. Kardos K., Jósvai J.: Corporate process management with technological input. GÉP, volume LVII, 2006. p.39.
29. Czinege I., Kardos K.: The materials of car body plates and their qualification Material Testing in Practice Conference, 2006.
30. Csizmazia Fné, Ódor Z.: Examination of painted plastic components. Material Examination in Practice Conference, 2006.
31. Kirchfeld M., Böröcz Á.: Complex qualification of coated vehicle body plates. Material Examination in Practice Conference, 2006.
32. Jósvai J.: Eight-shaft machining. The vehicle of the future 2006. Nr. 1-2. p.87.
33. Szilasi P.T.: Introduction of existing capacities and future development plans of university R&D at Széchenyi István University of Győr, AKJ Automotive Hungary Conference, 2006.
34. Rákóczy, Kálmán: Developing a front I-beam forged together, http://www.unitis.hu/portfolionk/cad/cad_hirlevel/apro_hirek_2006/raba.php
35. Borsodi Műhely Ltd.'s Yearbook

Events, presentations

1. 08. 31. 2005.: Mihalicz Antal: The technological development of SAPU Lp., painting and injection molding of plastic components, the GID technology. GTE Vehicle Industry Conference, Section 5., Budapest
2. 10. 14. 2005: Czinege I.: Vehicle industry research at Széchenyi István University. MEETING OF AUSTRIAN-HUNGARIAN AUTOMOTIVE SUPPLIERS, Győr
3. 11. 10. 2005: Dogossy G., Czigány T.: Tool design for degrading polymer material integrated plates, 21st National Seminar for Machine Designers and Product Developers, Miskolc
4. 11. 15. 2005: Kardos K.: One of the results of the cooperation between Széchenyi István University and PANAC is the successful REGINS „SHEMET" tender. 3rd International Pannon Automotive Conference, Győr
5. 01. 11. 2006: Czinege I.: Vehicle industry research at Széchenyi István University. Meeting of the Vehicle Division of the Scientific Society of Mechanical Engineering
6. 01. 16. 2006: Czinege I.: Presenting the Regional University Knowledge Center for Vehicle Industry at Széchenyi István University. "Universities in frontier cooperation", MTA RKK Workshop, Győr
7. 01. 20. 2006: Horváth Sz.: The technology of 8-axe machining. Chamber of Commerce and Industry for Győr-Moson-Sopron County, Professional Meeting on Chipping Technology
8. 01. 27. 2006: Horváth Sz.: The JRET project's research and development results achieved so far. Supplier day at Borsodi Műhely Ltd.
9. 02. 17. 2006: Czinege I.: Presenting the Regional University Knowledge Center for Vehicle Industry. NKTH-KPI Workshop
10. 03. 16. 2006: Horváth Sz.: Professional presentation of high technology at Borsodi Műhely Ltd. Meeting on Professional Education.
11. 04. 26. 2006: Horváth Sz.: The technological and quality control system, the developments planned in the JRET project. Extramural session of the Quality Club of the Chamber of Commerce and Industry for Győr-Moson-Sopron County, Borsodi Műhely Ltd, Győr
12. 05. 03. 2006: Stasztny P.: Innovation projects at an automotive supplier. Pannon Novum Regional Innovation Conference, Szombathely
13. 06. 01. 2006: Csizmazia F-né, Ódor Z.: Testing painted plastic components. Material Testing in Practice Conference, Baja
14. 06. 21. 2006: Szilasi P.T.: Existing capacities and future development plans of University R&D at Széchenyi István University. AKJ Automotive Hungary Conference, Győr
15. 09. 23. 2006: The research activity of JRET. Poster presentation at the "Researchers' Night" event organized by Széchenyi István University
16. 09. 26. 2006: Szilasi P. T.: Creating a competitive research and service university at Széchenyi István University. Universities in frontier cooperation - Interreg IIIA Programm Österreich-Ungarn Conference
17. 10. 5. 2006: Szilasi P.T.: Examples of national R&D programs executed at Széchenyi István University. 1st Interregional Expert Group workshop, CORINNA Project, Eisenstadt, AT.
18. 10. 18. 2006.: Szilasi P. T.: INNO-RAAB Knowledge Park and R&D cooperation – Creating a competitive research and service university at Széchenyi István University. AUTOPOLIS Conference, Chamber of Commerce and Industry for Győr-Moson-Sopron County, Győr
19. 11. 7. 2006: Kardos K., Kirchfeld M., J. H. C. de Souza: Wearing test of small-series tools. Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr
20. 11. 7. 2006: Czinege I.: Developing the complex plate testing technique. Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr
21. 11.7. 2006: Halbritter E., Tisza M., Tancsics F.: Testing thread placation at volume shaping with finite element method Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr
22. 11. 8. 2006: Horváth Z.: The integration of CAD-FEM systems. Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr
23. 11. 8. 2006: Kardos K., Jósvai J., Békési Z.: Manufacturing process simulation. Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr

24. 11. 8. 2006: Réti T.: Simulation of surface treatment with laser. Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr
25. 11. 8. 2006: Dogossy G., Ódor Z.: Simulation of plastic injection molding. Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr
26. 11. 8. 2006: Kozma I.: Industrial application of the digital optical measurement systems of Széchenyi István University. Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr
27. 11. 8. 2006: Solecki L., Palásti Kovács B., Szerencsi R.: Research on the topology of laser-honed surfaces. Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr
28. 11. 8. 2006: Pintér J., Igaz J., Kodácsy J.: Technology development with minimal greasing
29. 11. 8. 2006: Csizmazia F-né, Horváth Sz.: Structural materials and technology of aircraft components. Vehicle Industry Innovation – International Scientific Conference on Manufacturing Technology, Győr

Media appearances

1. 10. 09. 2005: Revita TV: Report on the activities of JRET and KKK, presentation of the laboratories
2. December 2005: SAPU Tükör (SAPU Mirror): Successful tender for the establishment of a knowledge center
3. 01.03. 2006: Rechnitzer J.: Duna TV, "University of Knowledge" – Why do people live better in Transdanubia than on the Plains? Regional differences and handling techniques
4. 01. 17. 2006: Kisalföld: The Regional University Knowledge Center for Vehicle Industry began working
5. February 2006: Plastic and rubber: SAPU Lp. from Mosonszolnok: an expert on mirror manufacturing
6. May 2006: SAPU Tükör (SAPU Mirror): Knowledge Center: A three-year cooperation
7. 10. 13. 2006: MTV, Ideal(ly). The research activity of JRET and KKK
8. 10. 16. 2006: Hungarian National Radio, Győr, report on Universities in border cooperation - Interreg IIIA Programm Österreich-Ungarn Conference
9. 10. 18. 2006: JRET Press Conference
10. 10 18. 2006: Klick Netlap: Regional University Knowledge Center for Vehicle Industry in Győr (http://www.klick.hu/cikk.php?cikk_id=14818&PHPSESSID=6a708befe6832bf70a69f7eef8d36593)
11. 10. 18. 2006: Autopolis Portal: Interview with Péter Tamás Szilasi in connection with the Autopolis Conference (sound material) (http://www.autopolis.hu/index.php?mod=docs_listcat&catid=18)
12. 10. 19. 2006: Kisalföld: The vehicles of the future are being designed
13. 10. 19. 2006: Kisalföld: Pole program: A Győr example for joining forces between research and the economic sector– Where does Autopolis currently stand?
14. 10. 19. 2006: Knowledge and research center. A program by the Győr studio of Hungarian National Radio
15. 10.22. 2006: BMC Radio, Report on the Autopolis Conference, an interview with Péter Tamás Szilasi
16. 10.25. 2006: MTV Regional Studio, Report on the educational relations of the JRET. Interview with Imre Czinege
17. October 2006: SAPU Tükör (SAPU Mirror): The present and future of SAPU development
18. 10. 26. 2006: Kisalföld: University plans: The designers have dreamt of research laboratories, workshops and a park– Where are you going, Széchenyi University?
19. 10. 28. 2006: Kisalföld: Development center in Mosonszolnok
20. 11. 07. 2006: Kisalföld: Vehicle manufacturing in focus

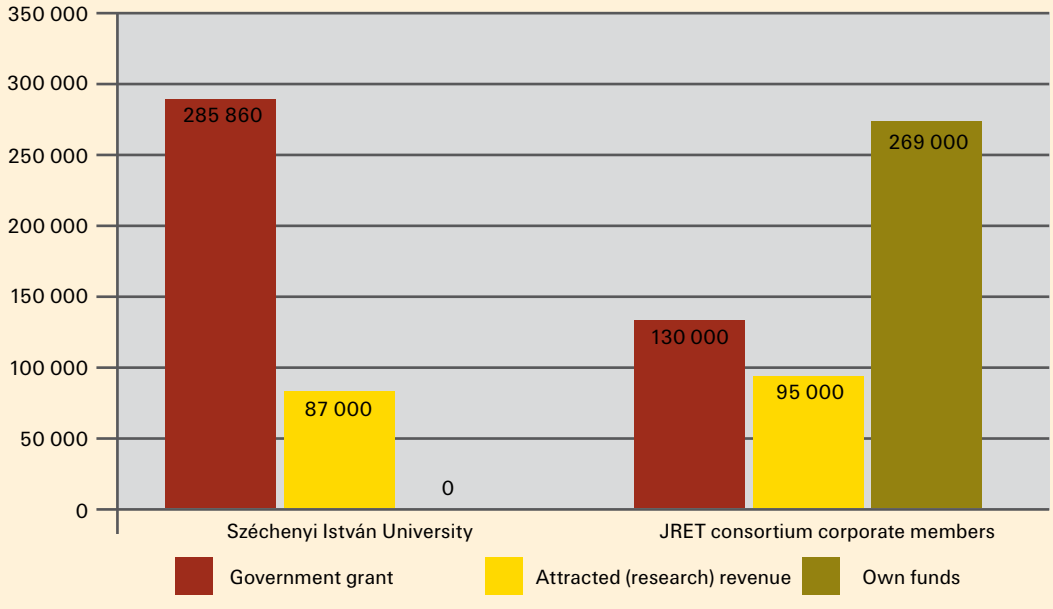
Tech4Auto **2006** Conference and Exhibition on Vehicle Production Technology, November 7–9. 2006, Széchenyi István University

The development of performance indicators

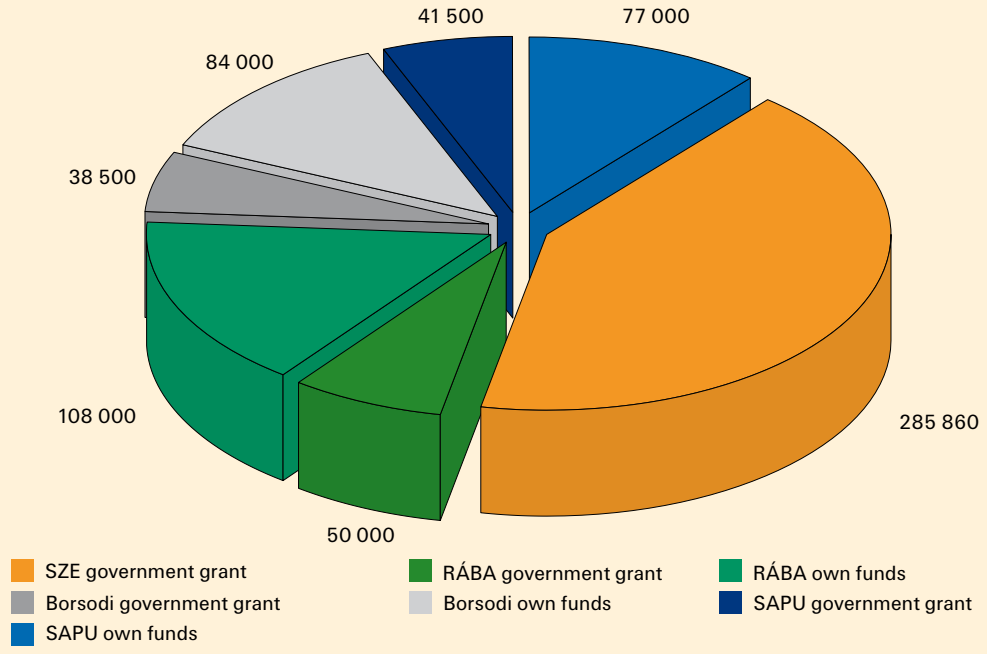
Result	Fact	Plan
The exploitable result of the project		
Developed new		
products (piece)	24	20
services (piece)	1	2
technologies (piece)	1	2
applications (piece)	1	1
prototypes (piece)	22	20
Scientific results		
Publications (including presentations)		
Domestic (piece x impact factor)	46	14 pcs
International (piece x impact factor)	19	7 pcs
Human resources		
Are the project results utilized in education/training? (Y/N), in what form?	Yes	Yes
Number of persons involved in the project		
university students (person)	16	11
PhD students (person)	6	5
young researchers (person)	7	6
Number of researchers having gained a scientific degree due to the project (person)	0	0
Number of workplaces created due to the project		
at enterprises (piece)	6	11
at research entities (piece)	8	5
Out of this: researcher workplace (piece)	9	4
(Note: in full-time equivalence)	7,7	
Economic utilization		
Number of participating entities in the center's activities		
number of research entities (piece)	4	3
number of enterprises (piece)	4	3
Number of firms utilizing the results (piece), contact data	8	8-10
Financial results achieved as the result of the project		
Surplus revenue (HUF)	182 million	30 million
out of this, export revenue (HUF)	75 million	10 million
Cost reduction (HUF)	140 million	100 million

Main financial indices, summary tables

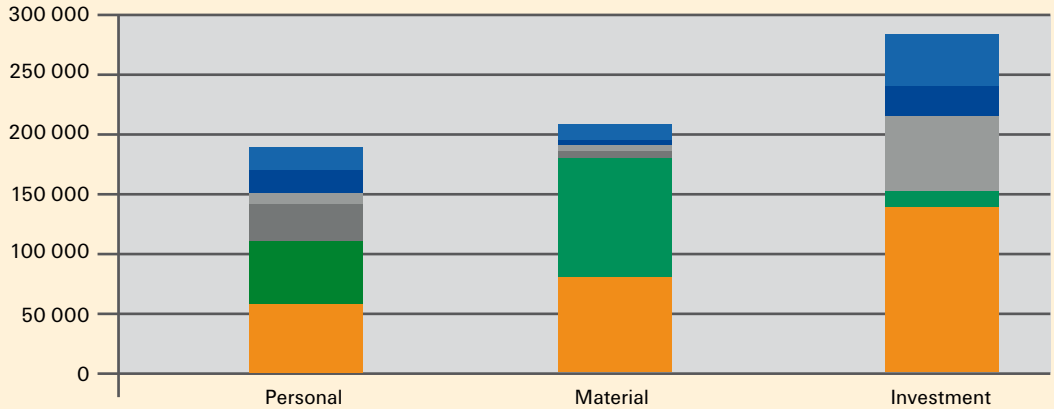
Financing structure of the Regional University Knowledge Center, Research year 2006



JRET tender cost distribution by project partner (HUF thousand), Research year 2006

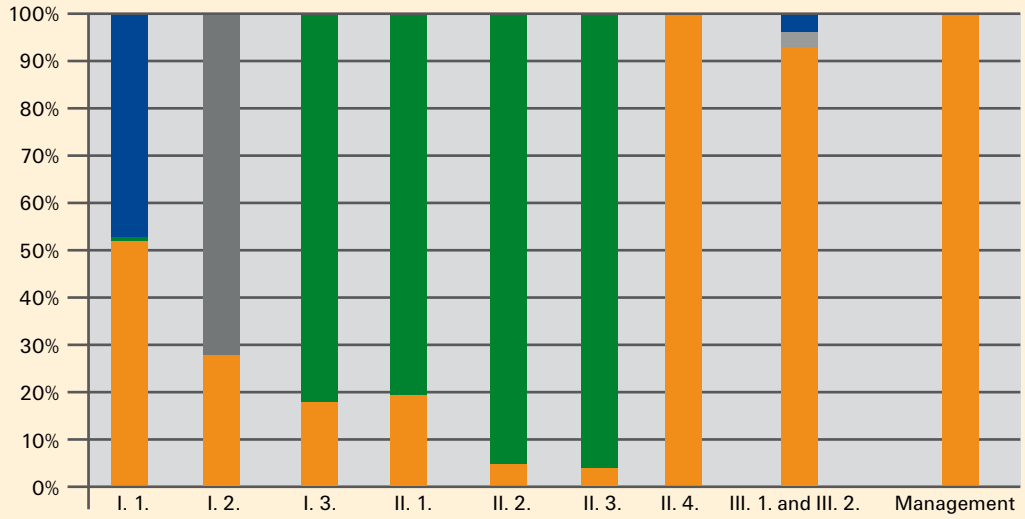


Utilization of the project partners' resources by cost types (HUF thousand), Research year 2006



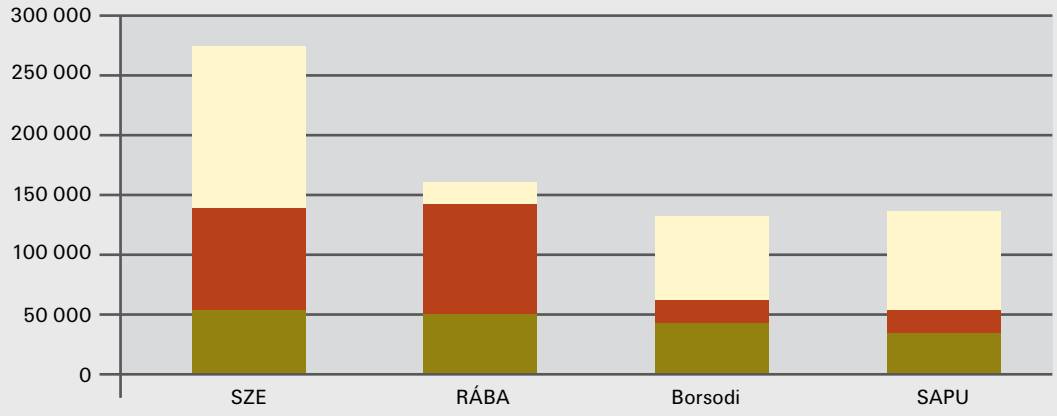
	Personal	Material	Investment
SAPU – own funds	18 465	8 749	50 056
SAPU – government grant	18 465	4 710	18 298
Borsodi – own funds	10 268	5 546	71 755
Borsodi – government grant	32 500	6 000	0
RÁBA – own funds	0	96 359	11 695
RÁBA – government grant	50 000	0	0
SZE – own funds	0	0	0
SZE – government grant	58 750	84 450	142 660

The proportion of the JRET consortium partners' participation in the individual research projects (in %), Research year 2006



	I. 1.	I. 2.	I. 3.	II. 1.	II. 2.	II. 3.	II. 4.	III. 1. and III. 2.	Management
SAPU	116 389	0	0	0	0	0	0	2 354	0
Borsodi	0	124 088	0	0	0	0	0	1 981	0
RÁBA	4 500	0	8 062	28 655	49 874	66 963	0	0	0
SZE	131 810	57 000	3 000	9 450	3 000	3 000	2 800	37 800	38 000

Project cost distribution by project partner (HUF thousand), Research year 2006



	SZE	RÁBA	Borsodi	SAPU
Investment	142 660	11 695	71 755	68 354
Material expenditures	84 450	96 359	11 546	13 459
Personal costs	58 750	50 000	42 768	36 930

Research tools of significant value and high importance, purchased in the framework of the project:

Széchenyi István University	
7 pieces of heavy-duty HP workstation configuration and plotter	I/1-1
CAD and CAE software: Pro-E, UG NX, Moldflow, Autoform, Deform, Wincast, Autodesk Inventor Professional 11	I/1-1
Hydraulic plate-testing equipment (SZE-JRET development)	I/1-2
Advanced Video Extensometer	I/1-2
Water-jet cutting equipment	I/1-2
Hardness measurement equipment	I/1-2
Plasmatic welding machine	I/1-2
Thermovision camera	I/1-2
Circle-shape testing equipment	I/2
CAM and PLM software (Powermill, Tecnomatix, MarVision)	I/2
CAE and FEA software (Star CD, Fluent, HyperWorks, LGO)	II/1-2
Rába Axle Ltd.	
Vibration and noise measurement system	II/1.1
Borsodi Műhely Ltd.	
Hyperturn 645 Mcplus 8-shaft CNC machining center	I/2-2
Smile v500 tool measurement system	I/2-2
SAPU Lp.	
KM 350 C - LR 150 Krauss Maffei plastic injection molding machine and peripheries	I/1-3

List of abbreviations:

SZE-JRET – Széchenyi István University, Regional University Knowledge Center for Vehicle Industry
IT – Steering Committee
TT – Scientific Committee
SZE-AJT – Széchenyi István University, Faculty of Engineering Sciences, Institute of Informatics, Electrical and Mechanical Engineering, Department of Materials and Vehicle Manufacturing
SZE-MGT – Széchenyi István University, Faculty of Engineering Sciences, Institute of Informatics, Electrical and Mechanical Engineering, Department of Machine Design and Mechanics
SZE-KVJ – Széchenyi István University, Faculty of Engineering Sciences, Institute of Informatics, Electrical and Mechanical Engineering, Department of Automotive and Railway Engineering
SZE-MSZT – Széchenyi István University, Faculty of Engineering Sciences, Institute of Informatics, Electrical and Mechanical Engineering, Department of Mathematics and Computer Sciences
SZE-FKT – Széchenyi István University, Faculty of Engineering Sciences, Institute of Informatics, Electrical and Mechanical Engineering, Department of Physics and Chemistry
KKK – Cooperation Research Center
CAD – Computer Aided Design
CAM – Computer Aided Manufacturing
CAE – Computer Aided Engineering
FEM – Finite Element Methods
GID – Gasinnendruck – Gas-assisted (injection molding)
TDM – Tool Data Management
BMF-BGK – Technical College of Budapest, Bánki Donát Faculty of Mechanical Engineering
PVD - Physical Vapor Deposition
EJJT – Advanced Vehicle Control Knowledge Center

This publication has been published within Péter Pázmány program funded by the National Office for Research and Technology.

Published by Széchenyi István University – Regional University Knowledge Center for Vehicle Industry

Person in charge for this publication: Péter Tamás Szilasi • Graphic design: X-Meditor Ltd. • Printed by: Direct Média Ltd. • Number of copies: 250 • Photos: Károly Matusz

Our partners:

SZÉCHENYI ISTVÁN UNIVERSITY
GYŐR

Széchenyi István University
9026 Győr, Egyetem sq 1.
www.sze.hu

RÁBA Axle Ltd.
9027 Győr, Martin st 1.
www.raba.hu

Borsodi Műhely Ltd.
9027 Győr, Juharfa st. 8.
www.borsodimuhely.hu

schefenacker

SAPU Lp.
9245 Mosonszolnok,
Szabadság st. 35.
www.schefenacker.com

JRET

REGIONAL UNIVERSITY
KNOWLEDGE CENTER
FOR VEHICLE INDUSTRY
SZÉCHENYI ISTVÁN UNIVERSITY GYŐR

Széchenyi István University, 9026 Győr, Egyetem sq 1.
A Building 102–104 office • www.jret.sze.hu