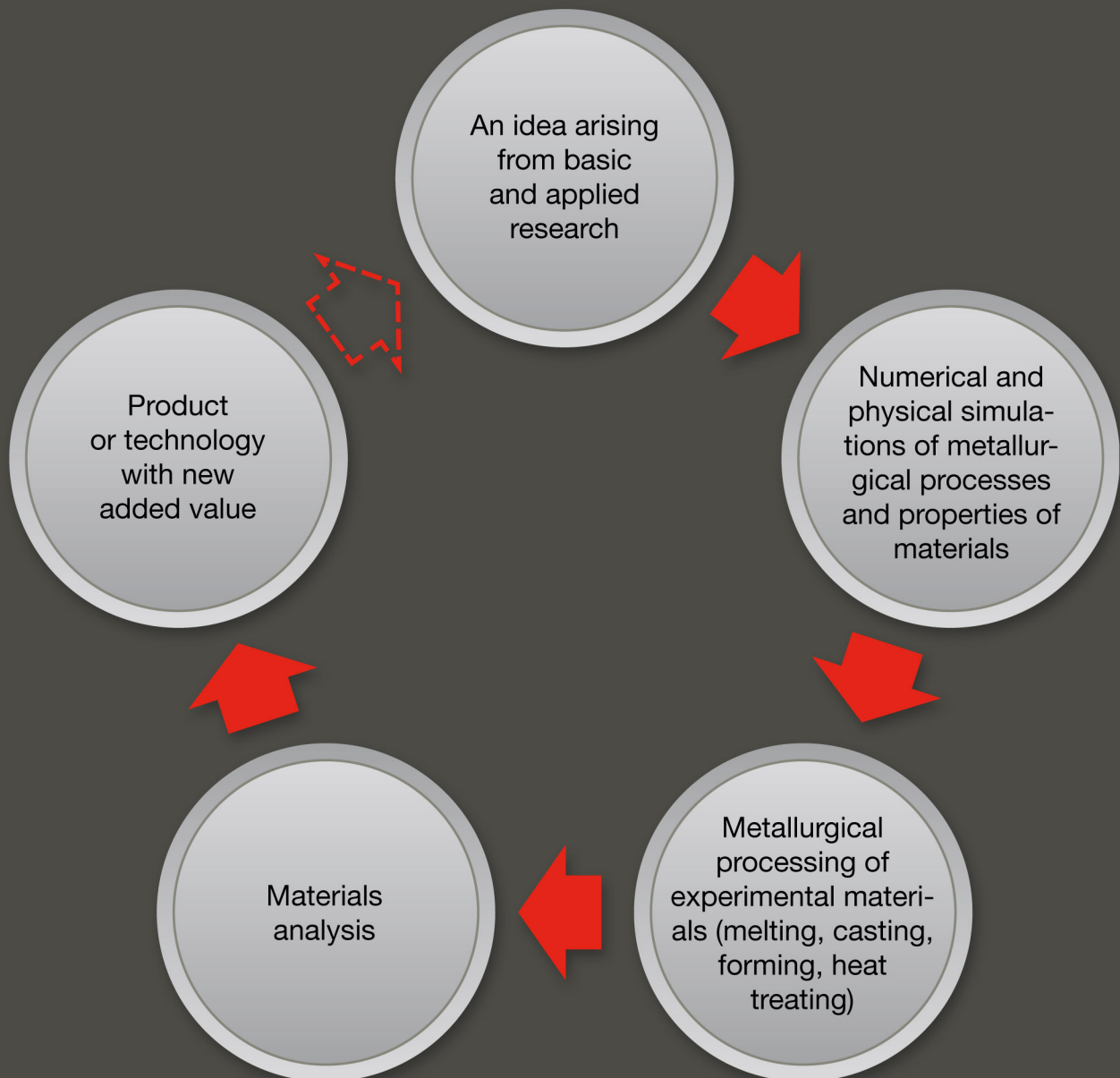




**Cutting-Edge Research and Development
for Innovation and Enhanced Competitiveness**

KNOW-HOW / Professionalism / Flexibility



The mission of COMTES FHT, a company founded in the year 2000, is to provide highly specialized services in the field of research and development of metallic materials. The company's main focus is the forming and heat treatment of materials.

The staff of the newly-founded company comprised seven former employees of ŠKODA VÝZKUM s. r. o. and of the University of West Bohemia in Pilsen. In 2004, participation in a research plan supported by the Czech Ministry of Education spurred the company's growth. Research premises were purchased and developed, the number of employees increased and new forming, heat treatment and electron microscopy laboratories were built, as was a shop for making specimens. In 2005, the company implemented the ISO 9001 quality management system. In 2006, an accredited materials testing laboratory was established according to the ISO 17025 standard and a mechanical testing shop was set up. Becoming an active participant in the POTENTIAL programme of support in the framework of the Enterprise and Innovations Operational Programme enabled the company to grow further and to relocate to new research premises in the town of Dobřany, 90 kilometres south-west of Prague. In the same year, the company was transformed into a joint stock company.

In 2011, COMTES FHT obtained funding for a capital project entitled "West-Bohemian Centre of Materials and Metallurgy" (WBCMM) from the EU structural funds programme Research and Development for Innovations. As part of this project, two new laboratory buildings were erected and the equipment in all departments was expanded on a substantial scale. The key investment item was the new metallurgical hall with a vacuum furnace, a hydraulic press and a rolling mill.

COMTES FHT offers comprehensive services in the following fields:

- Selection of materials
- Design of new technologies (forming, heat treating)
- Engineering design of tools, jigs and special equipment
- Analysis of materials properties (mechanical, thermomechanical, thermophysical and magnetic properties and microstructural characteristics)
- Numerical and physical modelling of metallurgical processes
- Numerical and physical modelling of materials properties
- Preparing expert opinion reports and specialist reports
- Preparing and conducting national and international research and capital projects



Libor Kraus
Chairman of the Board



Dr. Zbyšek Nový
Vice-Chairman of the Board

Achievements in Research and Development

Patents

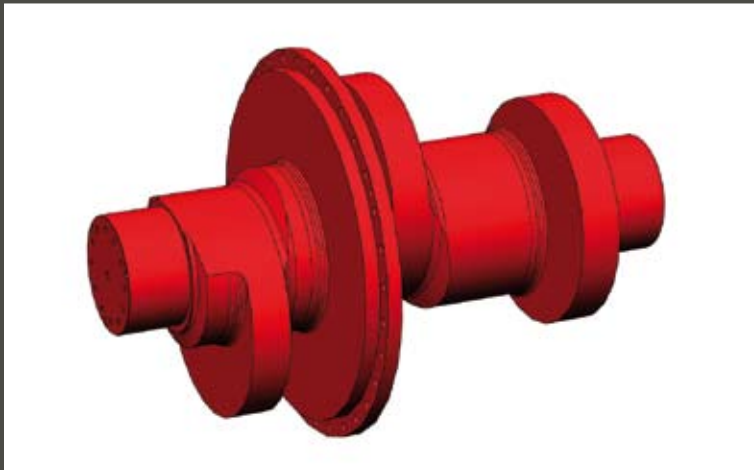
- 299495: Method of Production of High-Strength Low-Alloyed Steel Tubes
- 301718: Method of Treating Steel Stock above Ac1 Temperature
- 302676: Method of Annealing Steel Workpiece
- 302940: Method and Equipment for Mechanical Strengthening of Surface of Metal Workpiece

Utility Designs

- 22084: Seat Frame of a Public Transport Vehicle
- 23289: Equipment for Corrosion Testing in High-Temperature Steam
- 24922: Forming Equipment for Continuous Production of Fine-Grained Semi-Finished Products from High-Strength Metals

Implemented Technologies

- Technology of forging of Hastelloy N alloy
- Technology of bulk forming in toothed dies
- New technology of thermomechanical treatment of bearing rings
- Technology for making bars from nickel and nickel alloys by pressing and forming
- Procedure for final cooling of blades upon forging and quenching
- Technology of forming titanium bars in the Conform™ S315i equipment
- Forming of neck for thread
- Technology of forging of cams



Publications

- Papers in journals with impact factor, citations and others

Our vision is to be a leading research organization offering a wide range of services in the field of metallic materials. The underlying premise of our research centre is that its success will depend upon the ability to manufacture state-of-the-art products and to employ new technology. We strive to achieve this by supporting our industrial partners in their implementation of the results of research and development in their businesses.



*Dr. Michal Zemko
Managing Director and member
of the Board*

Your requests challenge us to find solutions. Toward achieving our set goals, we have at our disposal cutting-edge experimental facilities, as well as our collective knowledge gained through the many years of experience of our leading specialists. We perform research contracts for our industrial partners and conduct a number of research projects on both a national and international scale. We are always open to meeting interesting research partners.



*Dr. Jan Džugan
Research and Development
Director and member of the
Board*

COMTES FHT is the only privately-owned Czech research organization to enter the entire European market, as well other markets, with the unique concept based on full-scale research services across a wide range of fields. This philosophy, coupled with high-level expertise and flexibility, guarantees all manufacturers enhanced competitiveness and a greater potential for exporting the results of research, development and innovation achieved on the Czech market.



*Richard Šulko
Sales Director and member of
the Board*



*Pavel Šuchmann
Head of the Metallurgical
Technologies workgroup*

The Metallurgical Technologies workgroup focuses on research and development of fundamental metallurgical processes ranging from the production of metals, through hot and cold forming, heat treating and thermomechanical treatment, to hardening and thermochemical treatment. Typical deliverables of the workgroup include new types of metallic materials and comprehensive technological procedures tailored to the needs of industrial companies. We take an individual approach to each and every customer and our development activities are steered rigorously towards specific industrial applications.

Key Equipment

1 / VACUUM INDUCTION FURNACE

- Melting and casting of ingots and shaped castings
- Charge weight: 50–400 kg
- Processed materials: steels, nickel superalloys, aluminium alloys and other metals

2 / HYDRAULIC FORGING PRESS

- Maximum force: 2500 tf
- Closed die and open die forging
- Simulation of operation of various types of presses and hammers
- Adapted for “Software-Controlled Forging”

3 / ROLLING MILL

- Reversing rolling
- Hot rolling of strips and sheets (two-high roll arrangement) and cold rolling of strips and sheets (four-high roll arrangement)
- Thermomechanical rolling
- Straightening and grinding of rolled products

4 / HEAT TREATING

- Conventional hardening and hardening in vacuum
- Annealing in special atmospheres
- Thermochemical treatment (nitriding, carburizing, boriding and others)
- Surface hardening using induction heating

5 / SPECIAL FORMING PROCESSES

- Continuous extrusion in Conform™ S315i machine and grain refinement by the ECAP – Conform method
- Grain refinement by ECAP method



Casting of ingots and shaped cast parts in a vacuum furnace with a capacity of up to 50 litres (steel, nickel superalloys, aluminium alloys and others)

Alloy adding in protective atmosphere



Converting experimental specimens, ingots up to the weight of one tonne and other stock

Open die and closed die forging

Software-Controlled Forging (automated open die forging)

<i>Maximum press force</i>	<i>2 500 tf</i>
<i>Working area</i>	<i>800 × 800 mm</i>
<i>Max. stroke</i>	<i>500 mm</i>
<i>Max. shut height</i>	<i>900 mm</i>



Rolling of strips and sheets up to the width of 400 mm in a reversing rolling mill

Cold rolling of sheets with an option of thermo-mechanical rolling

<i>Roll arrangement</i>	<i>two-high mill</i>
<i>Max. temperature</i>	<i>1 250 °C</i>
<i>Maximum thickness</i>	<i>100 mm</i>
<i>Minimum thickness</i>	<i>2 mm</i>

Cold rolling of sheet and strip

<i>Roll arrangement</i>	<i>four-high mill</i>
<i>Max. sheet thickness</i>	<i>10 mm</i>
<i>Max. strip thickness</i>	<i>10 mm</i>
<i>Min. thickness</i>	<i>0,2 mm</i>

Computer Modelling



*Dr. Filip Tikal
Head of the Computer
Modelling workgroup*

Services involving development and optimization of structures and technologies in a virtual environment are provided by the Computer Modelling workgroup. Two teams within the workgroup deal with the following two areas:

1 / DEVELOPMENT DESIGN

The team specializes in the following:

- Development of components and structures; static and dynamic analyses
- Optimization of structures, materials selection
- Extending the life of structures
- Design of tools and fixtures for conventional and special technologies
- Fixture prototypes for mechanical testing shops
- Construction of 2D and 3D models for numerical simulation
- Development of alternative joints of special materials
- Programming of CNC machine tools

Equipment

CAD software packages: AutoCAD, SolidWorks, SolidEdge

CAM software: GibbsCAM

CAE tools: MSC.Marc, Nastran, Dytran, XFlow

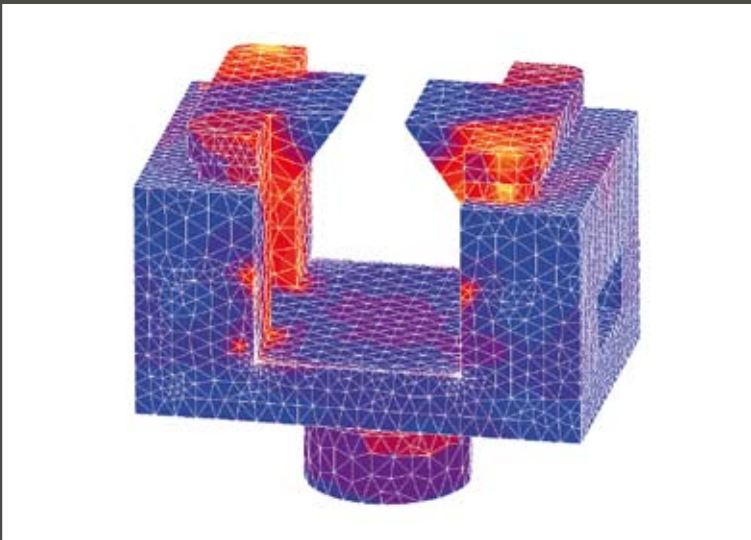
2 / SIMULATION OF MANUFACTURING PROCESSES

Main activities of the team:

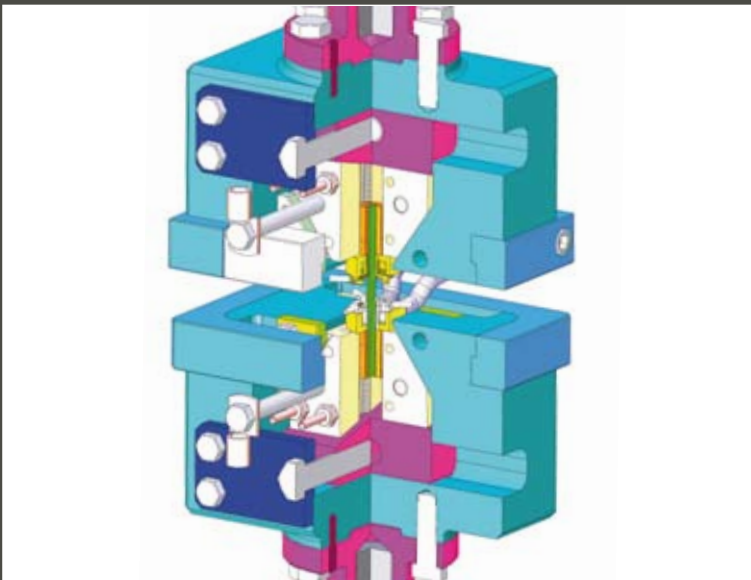
- Development of material models for numerical simulation
- Calculation of work hardening curves and mechanical properties of materials on the basis of their chemical composition
- Design and optimization of forming processes (forging, rolling, extrusion and tube production)
- Development of special forming processes (hydroforming, SPD, explosive forming and microforming)
- Selection of schedules for heat treating, thermochemical and thermomechanical treatment processes
- Development of induction and resistance heating solutions
- Development of the Software-Controlled Forging application: an advanced software-based solution for open die forging

Equipment

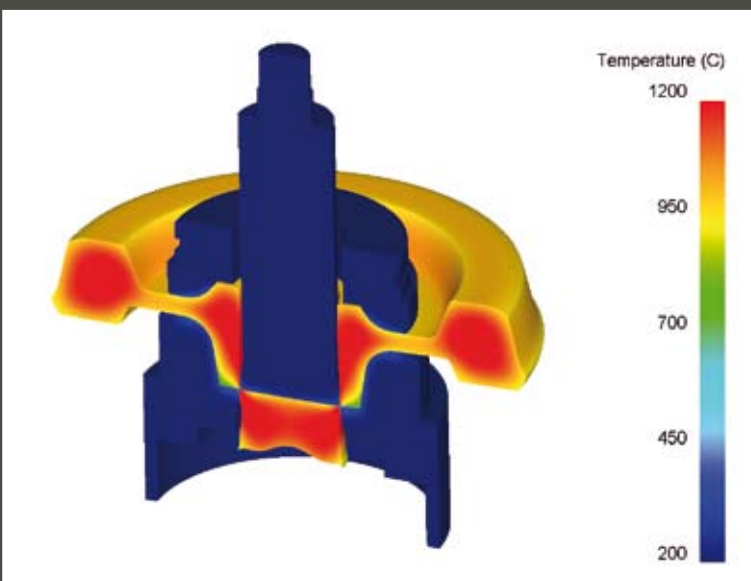
CAE tool DEFORM and JMatPro, a program for computing materials properties and models



Simulation of a component under load performed to verify its load-carrying capacity using MSC.Marc software



Draft design of grips with electrical resistance heating and cooling capabilities; SolidWorks software



Analysis of hot punching of a railway wheel conducted using the DEFORM tool

Materials Analysis



*Dr. Pavel Podaný
Head of the Materials Analysis
workgroup
Materials testing laboratory
(accredited laboratory)*

One of the key items of the comprehensive services offered in the field of metallic materials is the ability to conduct materials analysis. Aluminium and copper alloys, steels of all types, superalloys and titanium alloys are examined on a daily basis. Bulk chemical analyses, microanalyses and examination of high-purity materials, as well as analyses of materials of high chemical complexity are performed. Phases in ultrafine structures are identified using electron microscopes. COMTES FHT has been offering materials analyses since the beginning of the company's operation. The accreditation of our laboratories and more than ten years of experience provide a guarantee of quality, which is valued predominantly in expert reports.

Most sought-after services of the workgroup's laboratories

- Microstructure identification (ferrous and non-ferrous metals)
- Phase analysis, phase identification and determination of phase volume fraction
- Measurement of porosity in alloys
- Spectrometric measurement of chemical composition, including gas content analysis
- Chemical composition measurement (point, line and areal analysis)
- Fractographic and fracture surface analysis
- Hardness testing (in the laboratory and on site)
- Microhardness measurement
- Microscopic measurement of layer thickness
- Expert reports: analysis of causes of defects and accidents, identification of errors in metallurgical processes

Equipment

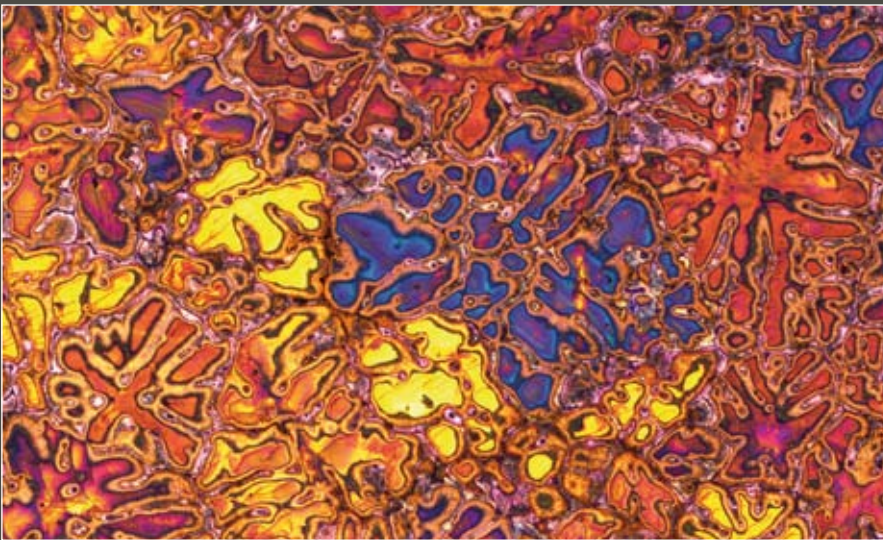
Metallographic sample preparation shop (Struers and Buehler equipment)

Optical microscopes (Nikon and Carl Zeiss)

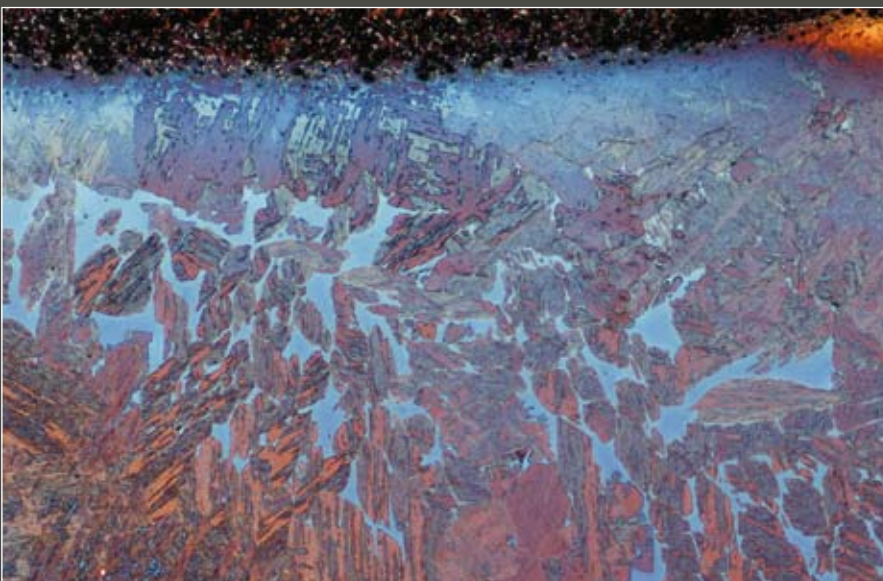
JEOL scanning electron microscopes with EDX and EBSD analysers



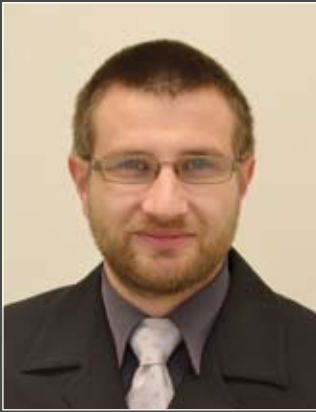
Scanning electron microscopes with EDX analysers and a high-speed EBSD camera



Microstructure of an aluminium alloy casting at 50× magnification; viewed in Nikon Epiphot 200 optical microscope



Microstructure of martensitic stainless steel in the vicinity of an oxidised layer. An increased proportion of delta ferrite (the light blue phase) can be seen. 50× magnification in Nikon Eclipse MA200 optical microscope



*Pavel Konopík
Head of the Mechanical
Testing and Thermophysical
Measurement workgroup*

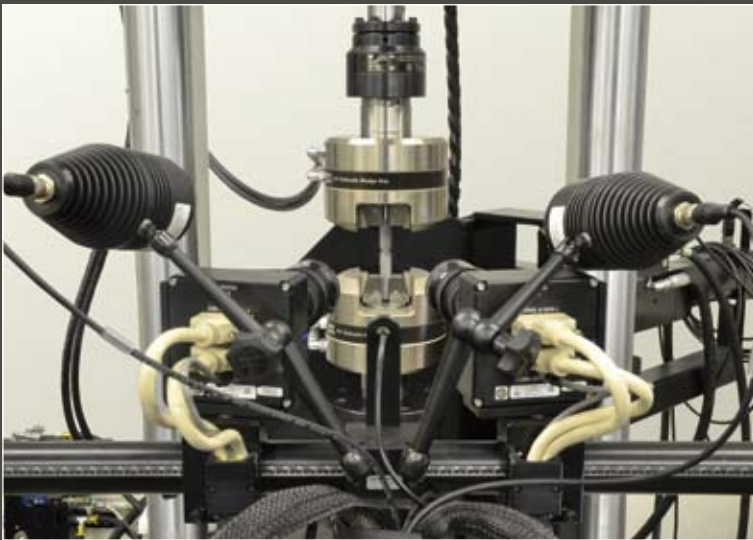
In terms of the number of instruments and devices deployed, this workgroup surpasses all other workgroups. The scope of its activities includes taking samples, production of test specimens, mechanical testing across a wide range of temperatures, loads and velocities, and testing in various, often extreme, environments. An important field of interest of the workgroup is thermophysical measurement, which supplies data for performing correct calculations and for constructing accurate technological models.

The services provided by the workgroup include development and performance of special tests according to customer requirements: e.g. measurement of mechanical properties of undercooled austenite.

Standard services offered by the testing laboratories

- Accredited testing (tension test, instrumented impact test, hardness measurement)
- Static and dynamic tests (in tension, compression and bending), up to the velocity of 25 m/s, and dynamic measurement of Young's modulus
- Extensive range of testing temperatures (-200 °C through 1400 °C)
- High-cycle and low-cycle fatigue testing
- Short-time creep testing
- Testing of miniature samples (the small punch test)
- Testing under torsional and biaxial loading
- Determination of the transition temperature
- Fracture toughness testing
- Forming limit curves (FLC and FLD diagrams)
- Component testing
- Construction of CCT and TTT diagrams
- Measurement of thermal conductivity and expansion of materials

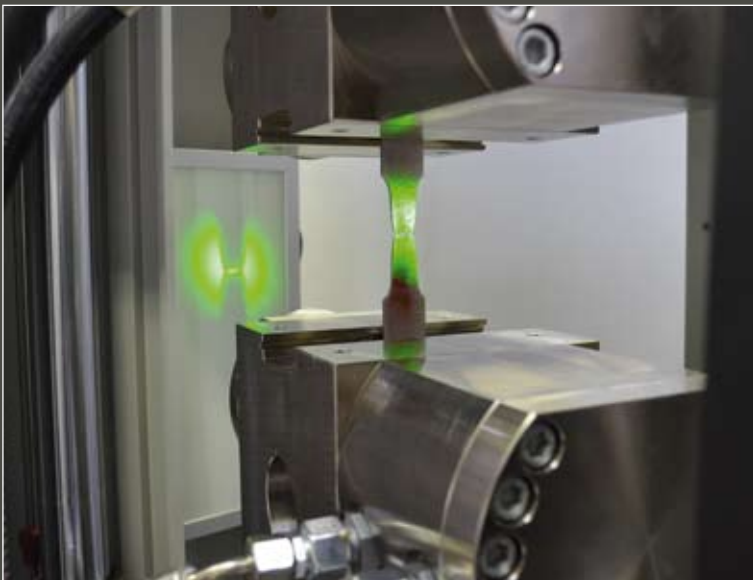
For deformation measurement, the testing shop uses ARAMIS, an optical measuring system, a high-speed camera, laser extensometers and a video extensometer. Very small samples for analysis can be taken on site by means of Electric Discharge Sampling Equipment.



3D optical measurement of specimen deformation using the ARAMIS system

Load combinations: tension-compression, torsion, sideways bending

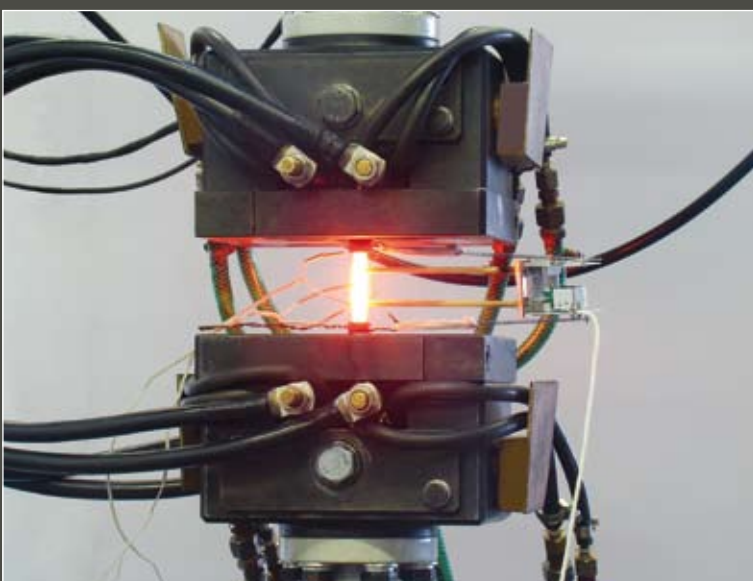
Machine used: MST BIONIX



Conventional tension test

Strain measurement by means of laser extensometers

Machine used: Zwick/Roell 250 kN



Physical simulation using specimens

Supplementary electrical resistance heating – deformation measurement by a high-temperature extensometer

Machine used: MTS 810



Company of the Pilsen Region 2011



Best Innovator 2012

References

Doosan Škoda Power s. r. o.
 ŠKODA AUTO a. s.
 BENTELER Tube Management GmbH
 BONATRANS GROUP a. s.
 Schaeffler Technologies AG&Co.KG
 Bilstein GmbH & Co. KG
 Schmolz + Bickenbach Guss GmbH
 VÍTKOVICE HEAVY MACHINERY a. s.
 ŠKODA JS a. s.
 ŽDAS, a. s.
 and others



EVROPSKÁ UNIE
EVROPSKÝ FOND PRO REGIONÁLNÍ ROZVOJ
INVESTICE DO VAŠÍ BUDOUCNOSTI



OP Výzkum a vývoj
pro inovace



Contact

COMTES FHT a. s.
Průmyslová 995
334 41 Dobřany
Czech Republic
Phone: +420 377 197 311
Fax: +420 377 197 310
GPS: 49°39'24.768"N, 13°18'18.950"E
E-mail: comtes@comtesfht.cz
www.comtesfht.cz

