



# Research Center of Manufacturing Technology | RCMT

# RCMT

## Your partner for research and development



## 01 RCMT Profile

Research Center of Manufacturing Technology (RCMT) was founded in July 2000 with direct financial support from the Ministry of Education, Youth and Sport and Association of Engineering Technology. Since January 2012, RCMT has been part of the Department of Production Machines and Equipment (Ú12135), Faculty of Mechanical Engineering, Czech Technical University in Prague. RCMT's Strategic Agenda includes the following:

- **Research and development in the field of production machines and manufacturing technology.**
- **Support to companies in the field of production machines and technology.**
- **Education of young experts.**

## 02 Collaboration with Industry

RCMT's research activities centre on topics defined and developed in cooperation with the industry. The main long-term research programme for the 2012 to 2019 period is the project Centre of Competence - Manufacturing technology (CK-SVT) supported by the Technology Agency of the Czech Republic. The main mission of the project is to enhance technological excellence, competitiveness and production of leading manufacturing technology producers and to provide support to the entire field in the Czech Republic.

Support to production machine manufacturers and users is provided in each stage of machine development, production and application, and includes development, simulation, design, preparation of specification documents, machine assembly, commissioning and adjusting, manufacturing technology proposal and optimization as well as diagnostics and measurement of adverse machine behaviour. The comprehensive approach is the result of work of RCMT professionals from the following three experts sections:

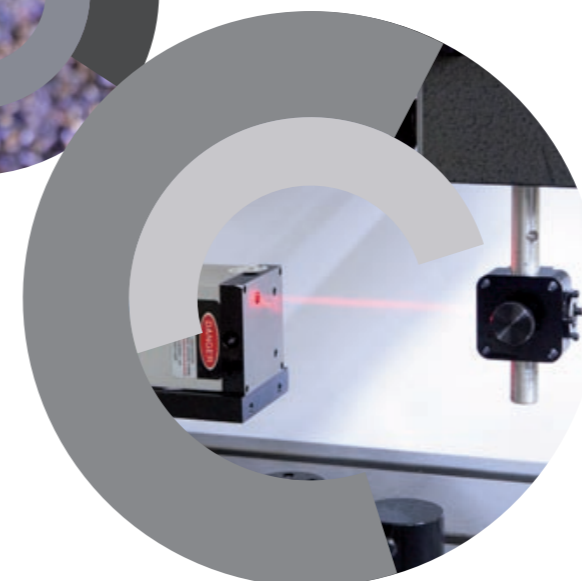
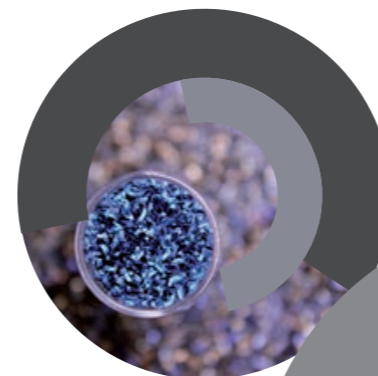
- Machine Tool Development Section,
- Machine Tool Operation Section,
- Technology Section.

## 03 Projects and results



RCMT investigates a number of projects of applied R&D announced and supported by the Technology Agency of the Czech Republic and the Czech Ministry of Industry and Trade. RCMT also closely collaborates with machine users in the area of manufacturing technology and is an experienced research partner.

In the international field, RCMT initiates and participates in EU projects within the Horizon2020 programme and is active in the International Academy for Production Engineering (CIRP). RCMT has been gaining expertise through collaboration with a number of leading foreign research institutes and companies. All this contributes to RCMT being a professional and reliable partner for R&D.





# RCMT Your **partner** for research and development



**01** | MACHINES  
with higher  
added value for  
customers

HIGHER  
PRODUCTIVITY  
and lower  
machining costs

**02**



Support for  
EFFECTIVE OPERATION  
of customer manufacturing  
systems

**03**

Professional  
EMPLOYEE  
DEVELOPMENT  
for knowledge  
and competence  
enhancement

**04**



# MACHINES with higher added value for customers

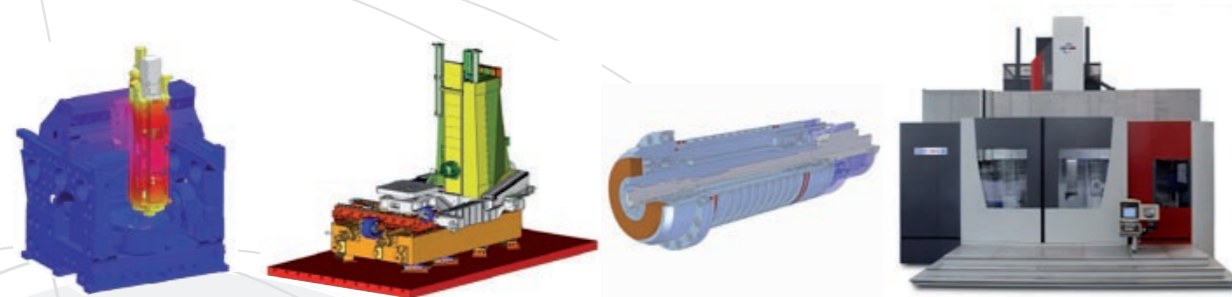
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All customers look for a suitable solution for their production in order to achieve the best ratio of the main parameters (particularly accuracy and performance) and price. Each such solution involves a machine designed appropriately to the last detail as well as well-functioning manufacturing technology. In order to achieve a perfect result within a short period of time, RCMT offers machine producers support in these main topics:

## Design

We offer complete **implementation of design concepts** from the first technical sketch to complete drawing documentation. The properties of the machine being designed can be verified and enhanced using **simulations** and **optimization of structural and thermal** properties. We offer **creation of an industrial design concept** to emphasize good-quality parameters of the machine.

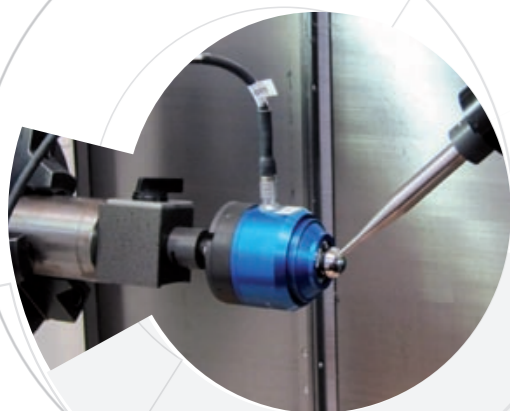
01



02

## Measurement and testing of machines

Machine tool behaviour can be verified using **accredited measurement** of geometric accuracy, structural and thermal properties, noise and vibrations of entire machines and their components. **Performance testing** of machines allows identification of weak spots in the structure with respect to **manufacturing technology**.



03

## Machine commissioning and adjusting

An assembled machine can only meet customer requirements if **the mechanical and electric part of the machine** is adjusted correctly. **The productivity of component production** in the required **accuracy** can be enhanced by suitable adjustment of feed drive and control system parameters.



04

## Preparation of customized technology

Our extensive know-how in the area of machining technology can be used for the **preparation of customized technology**. In specific cases, technology can be proposed and verified using a **virtual model** of the machine, which **reduces the time** of technology development.





# HIGHER PRODUCTIVITY and lower machining costs

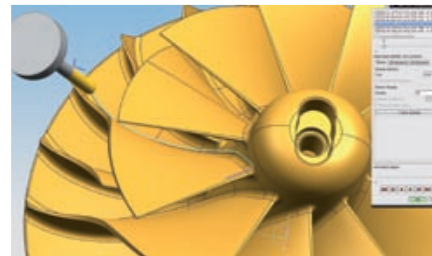
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Enhancing machine productivity is the key to reducing the costs of entire manufacturing technologies. Both new and existing machining technologies have the potential for production time reduction. This can be achieved using one of the following methods:



## 01 Optimal adjustment of control systems and feed drives

Suitable adjustment of servocontrol **parameters** and of control system interpolator **parameters** according to a particular manufacturing technology and dynamic capabilities of the machine allow us to enhance **machining productivity** as well as the required surface **accuracy and quality**.



## 02 Optimization of NC code and machining strategy

The manner of **NC code** preparation and **material removal strategies** used often strongly influence the **final productivity** of a particular machining technology. Adjustments on the level of generated toolpaths in CAM or complete NC programmes enable us to **reduce machining time** and simultaneously to maintain the required **component accuracy and quality** as well as appropriate **machine load**.

We develop and implement specific postprocessors for various types of production machines. In order to ensure a proper check of an NC code, we are able to prepare a virtual machine tool model enabling full simulation of the manufacturing process.

# 02

## 03 Optimization of cutting conditions for efficient machining with minimized costs

Machining productivity and **tool wear** intensity can be optimized by selecting suitable **cutting conditions** resulting in **manufacturing cost reduction**. We have expertise in machining a wide range of materials, including **stainless steel, Ti and Ni alloys and composites**.



# Support for EFFECTIVE OPERATION of customer manufacturing systems

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The manufacturing base of each company produces components for its own products or for resale. It is also a major source of costs. We offer the following services for the minimization of machine operation costs and maintenance costs:

## 01

### Machine accuracy check using both standard and specific methods

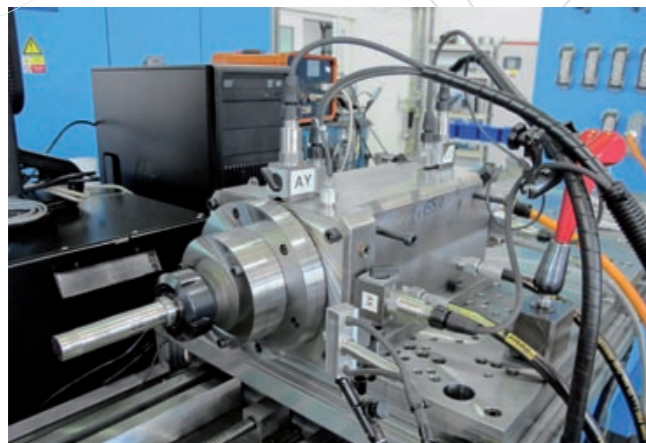
Regular measurement of **machine geometric accuracy** makes it possible to update **machine correction tables** or to ensure timely **servicing** of a machine. Measurement can be performed according to the ČSN ISO 230 and VDI 3441 standards or according to specific customer requirements.



## 02

### Vibration check using both standard diagnostics and customized solutions

**Vibrodiagnostics** of machines and their components (particularly spindles) is another step in improving **machine maintenance and servicing plans**, resulting in the minimization of costs incurred by unplanned machine shutdowns. Besides measurement in situ, we also offer production and implementation of specific **customized solutions**.



## 03

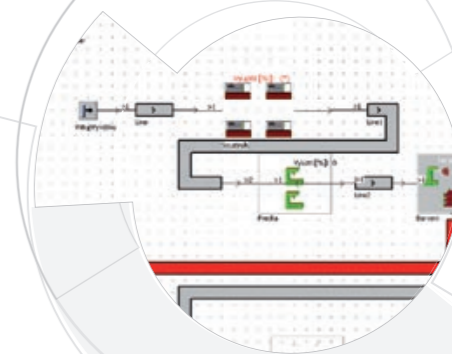
### Energy consumption analysis and savings proposal

Analysis of **energy flows** in production machines (electric, pneumatic, hydraulic, thermal energy etc.) allows the proposal and implementation of specific **saving measures** and thus **minimization of costs** in the manufacturing base.

## 04

### Modelling of manufacturing plants

Virtual modelling of the manufacturing base is a powerful tool for the **analysis and planning** of material flow capacity in manufacturing. Simulation of variants allows **minimization of financial and technical risks** during restructuring of the manufacturing base or in planning the purchase of new machines.





# Professional EMPLOYEE DEVELOPMENT for knowledge and competence enhancement

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An accomplished and erudite employee is the key to the success of a company. Lifelong education of current employees and recruitment of new employees, including cooperation with students, is part of a company's development and growth.

## 01

### Increasing employee qualification

Trainings and courses tailored to the needs of technologists, designers, technicians, foremen and other employees increase their qualification and prestige as well as the competitiveness of a company. Trainings focus on CAM programming and CNC control as well as on model generation in CAD. We are able to prepare trainings based on customer requirements.



## 03

### Cooperation with students

To start cooperation with students already during their studies is one way how to recruit an accomplished graduate of the demanded specialization in the future. While dealing with specific assignments from a company, the student is supervised by a company specialist and an allocated supervisor from RCMT.

## 02

### New employee recruitment

By announcing job openings on the premises of the faculty, companies improve their chances of recruiting mechanical engineering graduates and acquainting students with the company name.



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Our SUCCESS STORIES with industrial partners:

## 01 TOS Kuřim, ČKD Blansko

Structural properties of load-bearing assemblies of machine tools are essential for achieving the required accuracy and quality of machining as well required machine tool productivity. Traditional methods of enhancing static and dynamic stiffness of machine tools commonly involve increasing the material volume resulting in undesirable increase in manufacturing costs.

The load-bearing structures of the new FCU horizontal machine tools, FRU gantry-type machining centres using elements of modularity and rotary tables for vertical lathes have been designed and optimized by a team of designers and specialists from the TOS Kuřim and ČKD Blansko companies and RCMT, using cutting-edge simulation methods based on

FEM. Up to 30 % potential decrease in mass has been identified while the original structural properties have been maintained. „For instance, decreasing the mass of a cross beam by 20 %, reduces the price of the casting by up to CZK 90,000, which constitutes a significant saving in repetitive manufacturing,“ says the technical director of TOS Kuřim and ČKD Blansko Dušan Malášek.



## Kovosvit MAS 02 AXA CNC STROJE, s. r. o. 03

The Kovosvit MAS company tests its machines in its own manufacturing plant under full production conditions. The MCU700 five-axis milling centre is used for series machining of castings from grey cast iron. The machine runs under a three-shift regime. The total energy consumption is one of the significant factors influencing machine tool operating costs.



Based on an analysis of data measured during manufacturing, a team of experts from the Kovosvit MAS company and RCMT proposed and applied measures to reduce the total machine tool energy consumption. The proposed modifications concerned additional units and pressure air. The main changes in the machine involved a different type of filter unit, installation of a new dual-circuit cooling unit and a modification in overpressure sealing of the measurement system. „A 20 % reduction in total energy consumption of the machine represents a saving of CZK 135,000 a year,“ says the company’s technology specialist Jiří Mindl.

Aircraft manufacturing makes high demands on productivity and quality of machined parts. The final result of machining in this type of production is significantly influenced by a whole chain of aspects, starting with a CAD model of the part, preparation of the tool path in CAM, creation of the NC code using a postprocessor, NC code processing in the interpolator of the control system, drive response and the entire machine tool structure.



The AXA CNC STROJE company, which uses its own machine tools for mass production of aircraft components from aluminium alloys, consulted RCMT about the possibilities of increasing productivity of its manufacturing technology. The result involved changes in interpolator adjustment and in machine tool feed drives, which helped reduce manufacturing time from 35 to 28 minutes. „By shortening the machine cycle time in parallel manufacturing on two machines by 20 %, we were able to save one shift, which represents a significant saving,“ says the company’s representative Adolf Valášek.

OUR PARTNERS







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of Manufacturing Technology

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