

## Non-traditional Technologies and Innovative Manufacturing

Department of Manufacturing Engineering

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[http://www.utcluj.ro/english/machine\\_building/catedra\\_tcm.php](http://www.utcluj.ro/english/machine_building/catedra_tcm.php)

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Fig.1. Vacuum casting machine



Fig.2. CNC-EDM machine

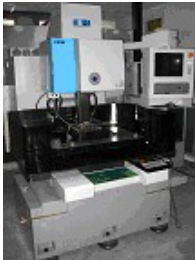


Fig.3. EDM wire cutting machine



Fig.4. Injection moulding machine

### Fields of expertise

- The application and use of the RP (Rapid Prototyping) master models. Rapid Tooling and Innovative Manufacturing of the complex parts, in small and medium volume production;
- Silicone rubber tooling and vacuum casting of the complex plastic parts(e.g. SG-95);
- Rapid tooling by metal spraying for the injection moulding; The metal sprayed moulds are backed up with enforced resins;
- Investment casting of the complex metal parts, starting from the wax models made by RP;
- Hard tools finishing by CNC electrical discharge machining (EDM) of the moulds made by classical technologies, after being hardened by heat treatments;
- Micro-fabrication and precise cutting of the hard metals, using the EDM wire cutting;
- Medical applications of rapid prototyping and rapid tooling in order to manufacture the customized implants in bio-compatible materials

### R&D infrastructure

- MCP 001 PLC vacuum casting machine (illustrated in Fig.1), used both for silicone rubber moulds manufacturing and for vacuum casting of the complex parts in small volume production (30-50 parts);
- MCP-MK8 metal spraying equipment, necessary for rapid tooling of the metal sprayed moulds, backed up with enforced resins;
- 2 ovens for the thermal polymerization, in order to quickly solidify the silicone rubber, resins, etc.;
- The AGIETRON 50 EDM machine (illustrated in Fig.2), which has CNC equipment and the automated tool (electrode) changer, while manufacturing complex shapes in hard metals;
- Precise EDM wire cutting machine for micro-fabrication (illustrated in Fig.3), which has the minimum CNC incremental table movements among the x-y axes, as small as 0,1  $\mu\text{m}$  (one tens of microns);
- The MCP 100 KSA semi-automated injection moulding machine (illustrated in Fig.4), specially designed to work with soft moulds made by rapid tooling.

### Facilities

The team has 2 professors, 1 associate professor, 1 senior-lecturer and 7 research assistants. It is offered both, consultancy and training in the above mentioned fields of expertise, by short-time courses for people from industry and by post-graduate courses. Also, it is offered consultancy and applied research on contractual bases.



**Fig.5.** SLS postprocessing oven

**Access to lab facilities**

The consultancy, cooperation and access to the research facilities are made on contractual bases. The costs of the rapid tooling for external jobs depends on the quantity of the material used, on the machining time and on the labor work involved, for the consultancy and applied research.

**Certificates**

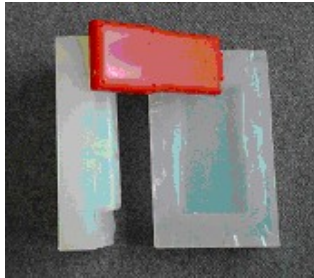
The graduation certificates (acknowledged by the Romanian Ministry of Education and Research) are issued for the training courses attendants, by the Department for Distance Education (DECID) of the Technical University of Cluj-Napoca.



**Fig.6.** Moulds made by innovative technologies

**Research projects**

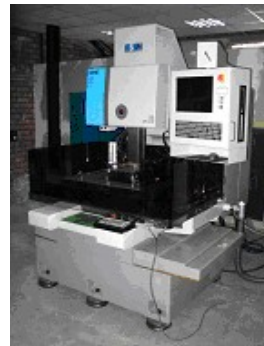
1. "Innovative Manufacturing Network" – Contract CEEEX nr.41/2005 (budget 1.420.000 RON), director: Prof.Dr.Eng. Petru Berce
2. CNCSIS Contract (3 years): "Research regarding the complex metal parts manufacture by selective laser sintering" – finish in 2004 (Director : Dr. Nicolae Bălci) ;
3. 3 years European Project: "National Pilot Centre for Continuing Education in Rapid Prototyping", finished in 2001 ( 252.000 €) (Coordinator: Prof. P. Berce, Contractor: Dr. N. Bălci);
4. "Multiple users research base" – World Bank contract - 2001 (budget 400.000 USD), Director: Prof.dr.ing. Petru Berce
5. "Center for Manufacturing" – funded by the KOICA (KOREAN INTERNATIONAL COOPERATION AGENCY), 2005, (budget 325.000 USD), Director: Prof.dr.ing. Petru Berce



**Fig.7.** Vacuum casting in silicon rubber moulds

The current project (2005-2008) of excellence (contract 41/2005) is focused on research within the innovative manufacturing network, coordinated by the Technical University of Cluj-Napoca. The partners are as follows:

The Transylvania University from Braşov, The Polytechnic University of Timisoara and The University for Medicine and Pharmacy from Cluj-Napoca. Project manager: Prof.dr.ing. Petru Berce; Scientific coordinator: Dr. Nicolae Bălci.



**Fig.8.** General views of the laboratory (rooms G14 / G19)