

# Centre for Designing and Rapid Prototyping

## ► Studies and research on:

- new design of patterns, castings and other components made by rapid prototyping methods,
- application of numerical methods in designing and prototyping of technologies,
- near-net-shape casting (e.g. investment casting, Shaw process, plaster moulds, evaporative pattern casting, centrifugal casting in silicone moulds),
- designing and manufacture of specialised control-measuring apparatus.

## ► The scope of studies and research:

- application of modern computer-aided systems in:
  - development of technology - CAD systems,
  - analysis and optimising of casting process parameters for sand mould castings, layered castings and metal mould castings - MAGMASoft system,
  - analysis and optimising of casting design in the aspect of own and performance stresses - a combination of MAGMASoft and ABAQUS systems,
- physico-chemical phenomena accompanying the process of making compound, ceramic foundry moulds for investment casting in the aspect of cast products quality improvement,
- physico-chemical phenomena occurring in mould cavity reproduced from polystyrene patterns - determination of their effect on casting properties,
- investigation of physico-chemical and technological properties of moulding and auxiliary materials used in near-net-shape casting technologies for further improvement of these technologies.

## ► The scope of work on casting technology:

- making prototype castings and tooling by rapid prototyping techniques,
- application of numerical computations in casting design optimising and technology verification,
- development of technology for the near-net-shape casting manufacture using environment-friendly, liquid ceramic slurries of new generation,
- technology of casting manufacture by the evaporative pattern process,
- technology for manufacture of special-purpose castings from the noble metal alloys and reactive metals (e.g. titanium alloys) using vacuum-assisted induction furnace for centrifugal casting,

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- technology for manufacture of castings from non-ferrous metal alloys in silicone moulds by centrifugal casting,
  - technology for manufacture of decorative castings by traditional and near-net-shape methods.
- ▶ The scope of work on moulding and auxiliary materials:
- investigation of physico-chemical and technological properties of the components of liquid ceramic slurries used for manufacture of compound and solid block foundry moulds for investment casting to determine properties of ceramic foundry moulds necessary for computer simulation,
  - improvements in the methods of investigation of physico-chemical and technological properties and in the apparatus assigned for these investigations,
  - investigation of the properties of materials assigned for the manufacture of foundry patterns and pattern tooling used in rapid prototyping systems,
  - investigation of properties of materials for dies to make patterns assigned for investment casting.

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