



INVESTING IN YOUR FUTURE – GRANTS FOR INNOVATIONS

**„RESEARCH ON AND DEVELOPMENT OF MODERN TECHNOLOGY OF
ADVANCED CAST MATERIALS RESISTANT TO THERMAL FATIGUE”**

**Project executed under Innovative Economy Operational Programme,
years 2007-2013**

Priority 1. Research and development of modern technologies

**Measure 1.3. Support for R&D projects executed by scientific entities for the benefit
of entrepreneurs**

Sub-measure 1.3.1. Development projects



The aim of the project is to develop innovative iron-based cast materials of controlled structure, modified with alloying elements and characterised by high service properties under the operating conditions of cyclic temperature changes.

A consolidated team of researchers and a set of unique and versatile apparatus are expected to create the basis necessary for a systematic research to be carried out in the area of a development and implementation of advanced cast materials, characterised by optimum service properties under given operating conditions.

The said aim the authors of the project intend to achieve through application of innovative methods for the determination of true boundary parameters and dynamics of the cyclic changes of temperature and state of stress in large moving objects.

An important stage in project execution will be investigations of the physico-chemical effect of a metal – coating – permanent mould interaction. Using the highly specialised and versatile set of apparatus, a unique one in Poland and one of the very few in the world, for complex high-temperature studies of liquid metals and of a specific type of their interaction in contact with solid bodies (wettability, surface tension, density of metallic liquid, stability and reactivity of metal/ceramic system), it will be possible to choose optimum and most effective insulating coatings, reducing the physico-chemical interaction in a liquid metal-solid body system (mould, tooling, coating).



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The Project will specifically include the following research and application works:

1. Development of modern method for identification of boundary parameters and investigation of the dynamics of cyclic changes of temperature and the state of stress in massive moving objects.
2. Computer simulation of real operating conditions to determine the field of stress in large objects operating under the cyclic changes of temperature. Evaluating the effect of casting design on the formation of operating stresses.
3. Physico-chemical investigation of interactions taking place in a liquid metal – coating – permanent mould system to optimise the choice of mould material and protective insulating coating, and to explain the nature of interactions between the liquid alloy and the permanent mould material.
4. Studies on the effect of chemical composition, alloying microadditives and out-of-furnace heat treatment on the structure and properties of selected alloys.
5. Optimising the chemical composition of selected alloys, using mathematical modelling approach, the methods of statistical planning, and analysis of experiment.
6. Development of the alloy heat treatment technology and parameters to ensure the fabrication of castings characterised by improved wear resistance behaviour when operating under the conditions of cyclic temperature changes.



By proper execution of individual tasks, the adopted technical solutions are expected to bring success in the form of a newly developed modern technology for the fabrication of cast materials resistant to thermal shocks, used for castings of various types.

