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ANALYSIS OF COMPUTER PROGRAMS FOR MODELING CASTING PROCESSES

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The purpose of the research is to compare some computer programs used for the simulation of foundry processes including alloy casting. Magmasoft, SolidCAST, PROCAST computer programs are used for the comparative analysis. Several foundry samples of the various degree of complexity are used for the simulation. The performed computer simulation in the PROCAST system allowed to eliminate the drawing defects identified in the original model. A 2D and a 3D grid networks were built. They improved the quality of the casting mould and made it multifunctional for both a casting and a casting mould. Foundry simulation results in PROCAST program have been received. The obtained results suggest the software system PROCAST to be the most efficient computer program for foundry process simulation of all tested.

Foundry is the main base of engineering, aviation and metallurgical complex, and its development depends on the paced development of these industries as a whole. However, obtaining cast parts based on non-ferrous metal alloys with improved physicochemical characteristics is a very important production task, the solution of which targeted scientists and industrialists. From an analysis of the current state and the prospects for the development of innovative technologies, it follows that, first of all, a significant increase in the volume of investment in science: research and development, the creation of new machines, equipment and technologies, design work, the acquisition of patents or licenses, software products, education and training. These resources are not enough to modernize the foundry. A whole range of technological solutions allowing the most effective implementation of priority areas.

Such a "critical technology" which is able to make the greatest contribution to accelerate economic growth, increasing the competitiveness of products, is information technology (IT). It is implemented through computer design, an electronic archive, in which all the information is added and where it gets to the technologists, to metrologists, and from them to design objects. At the same time, a large number of deficiencies in the organization of our production and there is an opportunity to eliminate them. At present, neo-industrialization, which is a large-scale process, should become one of the main ideas for the development of industry non-waste modernization automated production technologies - computerized and robotic.

These factors allow to formulate the main directions of foundry development strategies in production. These areas cover almost the entire range of problems of modern industrial production, and exactly: state and development directions world

foundry; modern technologies, materials and equipment; diagnostics, certification and quality management of castings; computer technology in foundry; ecology and labor protection; economics and organization of production; training.

As can be seen from the above, one of the main strategic directions for the development of foundry in the current stage is the development of modeling and computer technology.

The main problems when choosing a specific program for modeling technological processes consist in the absence of reliable information about the capabilities of the program itself, the principles work with it.

Foundry simulation software used today in the world mainly vary in degree of completeness of factors taken into account in the simulation, and, accordingly, cost (Table 1). The second significant difference is associated with the methods of obtaining and solving equations: heat and mass transfer equations can be written in differential or integral form.

Table 1 - Programs for casting process simulation and the country of origin

Developer Country	Program	Developer Country	Program
Germany	Magmasoft	USA	Flow3D
Germany	WinCast	USA	PowerCast
France	PROCast	USA	SolidCast
France	QuikCast	USA	CAPCast
France	PAM-Cast	USA	RAPID/CAST
France	CalcoSoft	Korea	AnyCasting
Spain	Vulcan	Finland	CastCAE
Great Britain	Mavis-Flow	India	AutoCast
China	InteCast	Australia	Casttherm

The development of modeling and computer technology involves: modeling the formation of castings in the mold - a synthesis system for all elements of the process; computer-aided design of foundry technology; design of foundry technology and tooling in a CAD system with its subsequent manufacture on machines with numerical program control; development of a rapid prototyping system; computer control of technological equipment.

As a result of computer simulation in the system PROCAST automatically eliminated defects in drawings that were in the original model. 2D and 3D grids were built that provided the form for casting better and more versatile as for casting itself, so for the mold. In SolidCAST it is not available: this program can only prepare the model immediately before casting, without eliminating defects and other functional that uses PROCAST. Also in the program PROCAST there is a flexible system the choice of material for casting, which is not enough in SolidCAST. But in both programs there is a casting and hardening process.

The only drawback of the PROCAST program is its high cost in the market of programs designed for modeling foundry processes. Magmasoft program, which we also tested for modeling of foundry processes, have an extremely complex and inconvenient interface, the complexity of preparing a grid model and data input.