

Comparative Evaluation of Usability of FEM- and VEM-based Casting Simulation Software

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Abstract

Casting simulation is a virtual process which ensures production of defectless castings in the shortest possible time. It involves computer-aided modeling, pattern design, methoding, simulation and optimization. Casting simulation technology has been proven for all major cast metals and processes, giving reliable results even for complex castings. Neither a drop of hot molten metal is needed nor it hampers regular production schedule of the concerned foundry. It, however, does not replace a methods engineer or production manager. It only assists a methods engineer to achieve the best casting design with very few or even no trials and also creates confidence to a foundry manager or entrepreneur to maintain the lead time and to supply the right casting first time and every time to his customer. At present there are many casting simulation softwares which can be used in a foundry. We have concentrated on two popular but different programmes: ProCAST (based on FEM) and AutoCAST (based on VEM) to verify their workability as well as reliability from the user point of view. The simulated results are verified with the help of a benchmark stepped component. It is expected that this work will create interest among practicing engineers and will also assist a methods engineer to work with more confidence.

A good paper initiating comparison between two softwares. Further study in this field and unbiased field feedback from time to time will prove very useful.

Excerpts from the Paper

1. List of Available Casting Simulation Programmes (along with their Vendor Addresses) is given in *Table 1* in the paper. The Table is reproduced below.
2. Some calculations have been given to estimate the likely savings resulting from effective use of casting simulation programmes by Indian foundries (Rs.1200 crore to Rs.1825 crore per year).
3. Comparison between ProCAST and AutoCAST is presented in the paper.

ProCAST is a high end software developed in USA. It is based on FEM. AutoCAST is indigenous software mainly used in Indian foundries. It is based on VEM. Comparison in the following areas are highlighted in the paper:

- Hardware Requirement
- User Inputs
- Steps in Simulation
- Processing Time

Based on their experience and an experiment on a stepped casting the authors have concluded that AutoCAST is more suitable for wide number foundries that do not have R & D of their own.

The authors have observed that AutoCAST is more user-friendly, and could be used by a person without prior training in the computer, whereas ProCAST is a very high ended software which needs a lot of practical thermo-physical inputs. Evaluation of mechanical properties like thermal stress, strength and hardness of as-cast product can be determined in ProCAST.

SYSTEM*	VENDOR*
AFSOLID	AFS, INC., 505 STATE STREET DES PLAINES, ILLINOIS 60016, USA.
AutoCAST	ADVANCED REASONING TECHNOLOGIES PVT. LTD., MUMBAI 400 076, INDIA.
CastCAE	CT-CASTECH, INC., OY P.B. 524, TEKNIKANTIE 21 B, FIN-02151 ESPOO, FINLAND.
EKK	EKK, INC., 2065 WEST MAPLE, SUITE C309, WALLED LAKE, MI 48390, USA.
FLOW-3D	FLOW SCIENCE, INC., 1257 40 TH STREET, LOS ALAMOS, NEW MEXICO 87544, USA.
MAGMASOFT	MAGMA GmbH, KACKERSTRASSE 11, D-52072 AACHEN, GERMANY.
NOVASOLID	NOVA CAST AB, SOFTCENTER, S-RONNEBY, 37225, SWEDEN.
ProCAST	UES SOFTWARE, INC., 4401 DATONE-XENIA ROAD, DAYTON, OHIO, 45432, USA.
SIMTEC	RWP GmbH, ALT-HAARENER-STRASSE 251, D-52080 AACHEN, GERMANY.
SIMULOR	ALUMINIUM PECHINEY, BP 7-38240 VOREPPE, FRANCE.

* SOLIDCast : Information about this system by Finite Solutions Inc., USA does not appear in this list. – Editor