

COST 526 - 'Automatic Process Optimization in Materials Technology' – (APOMAT)
Final Report – 31 July 2005
Summary sheet

Project Code	CH4
Title	Modelling, Simulating and Analysing EQ-Casting and Quenching Processes
Project Leader	Prof. Dr. Norbert Hofmann
Organization Address	University of Applied Sciences Aargau, Northwestern Switzerland Steinackerstrass 5, CH 5210 Windisch
Tel	+41 56 462 40 61, +41 56 462 44 00
Fax	+41 56 462 44 15
E-Mail	Norbert.hofmann@fh-aargau.ch
Main collaborators involved	Dr. Dirk Büche, Jürgen Jackumeit

Funding Situation (for the whole project)

Amount of money received specifically for COST	0 kEuros
Other resources partially used for the project	0 kEuros

International Collaboration (mention group and type of work done in collaboration during the whole project)

- ACCESS e.V. in Germany: Diploma work and collaboration in the field of optimisation algorithm (Jürgen Jackumeit, D4)
- Workshop & Presentation of optimisation tools applied casting processes, Saint Die, France, J.L. Batoz (F2), J.C. Gelin (F3), F. Hediger (D4)
- Collaboration with Martin Balliel (CH2)
- Colenco Power Engineering, Rainer Schwarz and Georg Klubertanz (CH3)
- ETH-Zürich, ICOS Institute for computational Science, Prof. Dr. Pedros Kommoutsakos, Stefan Kern, development of Open Source Code OpenOPAL for optimisation and integration of simulation problems
- Swiss Working Group Meeting (CH1, CH2, CH3, CH4)

Industry participation (mention name of companies and work done in collaboration during the whole project)

- ALSTOM (Switzerland) Ltd, Baden, Switzerland
- Partly ABB Turbo Systems in the field of inverse modelling of physical properties
- Colenco Power Engineering: common software development for graphical user interfaces

Meetings, visits, exchange of scientists, short term scientific missions (mention main events during the whole project)

	Location, date
- ACCESS e.V.	Aachen, Germany, several meeting between 2001 and 2005
- Final Workshop COST526 Preparation Meeting 1 with J.L. Batoz, J.C. Gelin, F. Hediger,	Saint Die, France, 24. September 2004
- Diploma Work together with ACCESS. E.V. software development for an optimization tool	Aachen, 26. November 2004

<ul style="list-style-type: none">- Workshop & Presentation of optimisation tools applied casting processes, Saint Die, France, J.L. Batoz, J.C. Gelin, F. Hediger,- Kick of meeting of swiss APOMAT groups	<p>Saint Die, France, 10. March 2005</p> <p>University of applied Sciences, Windisch, Switzerland, 11. September 2002</p>
--	---

Main Outcome of the project (mention only the major points)

- Sensitivity study of relevant casting parameters for EQ-investment casting processes
- Optimisation of EQ-casting process with Design of Experiment approach and response surface evaluation
- Thermal simulation of radial compress quenching process and validation with experiment to perform residual stress and material strength analysis (confidential)

Publications, related to this project

Published

1. Frank Busse, Norbert Hofmann: **US-Patent** US 6,714,900 B1, 30. March 2004, "Method for generating a shell mold for a casting",
2. Frank Busse, Norbert Hofmann: **EU-Patent** EP 0 986 027, Publication 6. October 2004, "Method for generating a shell mold for a casting"
3. D. Büche, N. Hofmann, and P. Sälzle, „Berechnung des Abschreckverhaltens großer Aluminiumverdichterräder und der resultierenden Eigenspannungen“, Deutschsprachige ABAQUS Benutzerkonferenz, 20.-21. Sept. 2004, Königswinter bei Bonn, Germany
4. Dirk Büche, S. Kern, S. D. Müller, N. Hansen, D. Büche, J. Ocenasek, P. Koumoutsakos, Learning Probability Distributions in Continuous Evolutionary Algorithms - A Comparative Review , Natural Computing, Volume 3, Issue 1, Pages 77 - 112, 2004
5. D. Büche, N. N. Schraudolph, and P. Koumoutsakos, Accelerating Evolutionary Algorithms with Gaussian Process Fitness Function Models , IEEE Transactions on Systems, Man and Cybernetics, Part C, Special Issue on Knowledge Extraction and Incorporation in Evolutionary Computation, 2004
6. D. Büche, N. Hofmann, and P. Sälzle, A Finite Element Approach for Simulating the Quenching of Large Aluminium Compressor Wheels , NAFEMS World Congress 2005, p.32, Malta, 2005

Diploma thesis

1. M. Rugue, „Berechnung der Spannungsverteilung in grossen Verdichterräder im Betrieb mit FEM unter Berücksichtigung von Vorspannungen durch Schleudern und Eigenspannungen aus einer Wärme-behandlung“, Diplomarbeit bei ABB TUS, 2004
2. Germano Bosco und Patrick Walter, „Optimierungstoolbox mit XML-Interface“, Semester- und Diplomarbeit 2004 (Ausgezeichnet an der Fachhochschule Aargau)
3. Adrian Hüsler und Markus Benz, „Optimierung eines Giessprozesses“, Weiterentwicklung der Optimierungstoolbox, Semester- und Diplomarbeit 2004
4. Dusan Mitrovic und André Sommer, „Migration von VB6 auf VB.NET“, Semesterarbeit 2003

Submitted for publication

In preparation

Will you continue the actual cooperation with your partners after the end of the action?

Yes

No

Would you participate in a possible "spin-off" action continuing the present one?

Yes

No

Will you continue your present work/collaboration with another European action?

Yes

No