

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

Project Code	FIN 1
Title	Optimization of Cooling Parameters in Continuous Casting Processes
Project Leader	Dr. Erkki Laitinen
Organization	University of Oulu, dept. of math. sciences
Address	P.O. Box 3000, University of Oulu, Finland
Tel	+358 8 5531737
Fax	+358 8 5531730
E-Mail	erkki.laitinen@oulu.fi
Main collaborators involved	B. Sarler, B. Filipic

Funding Situation (for the whole project)

Amount of money received specifically for COST	0kEuros
Other resources partially used for the project	365 kEuros

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

SI 1 (prof. B. Filipic): optimization methods
 SI 4 (prof. B. Sarler): mathematical models

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

Rautaruukki steel, Raahe steel works
 Installation of new control software

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

	Location, date
Project meeting	St Die Vosges, 21-22.5 2002
Project meeting	Budapest, 28-29.11 2002
Project meeting	Brussels, 26-27.05 2003
Project meeting	Krakov 27-28.11 2003
Project meeting	Brno 18-19.11 04
Project meeting	Morschach 30-31.05 2005
STSM meeting	Ljubljana 22-29.6 2003
bilateral collaboration meeting with B. Filipic	Ljubljana 8-15.10 2004

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

The main outcome was the development of fast iterative algorithms for the optimization model of steel continuous casting and their implementation into the Dyncool 3D software.

Publications, related to this project

Published

A. Lapin, E. Laitinen and J. Pieskä:

"Asynchronous domain decomposition methods for continuous casting problem",
J. of Computational and Applied Mathematics

E. Laitinen, J. Pieskä, V. Toivonen: "On 3D-modelling and control of continuous casting process",
EUROTHERM 69, June 25-27, 2003, Ljubljana, Slovenia

A. Lapin, E. Laitinen, J. Pieskä: "parallel solution of Stefan problem with prescribed convection",
in proc. of Parallel Computational Fluid Dynamics, May 13-15, 2003, Moscow, Russia

E. Laitinen, A.V. Lapin and J. Pieskä: "Numerical experiments with multilevel subdomain decomposition method", Lobachevskii Journal of Mathematics, Vol.13, pp.67-80

R.F. Kadyrov, E. Laitinen, and A.V. Lapin: "Using explicit schemes for control problems in continuous casting process", Lobachevskii Journal of Mathematics, Vol.13, pp.25-38

R. Dautov, R. Kadyrov, E. Laitinen, A. Lapin, J. Pieska, V. Toivonen: "On 3d dynamic control of secondary cooling in continuous casting process", Lobachevskii Journal of Mathematics, Vol.13, pp.3-13

Laitinen E., Lapin A., Pieskä J., Predictor-Corrector methods for solving continuous casting problem,
Proceedings of the DD15 International Conference on Domain Decomposition Methods, **Berlin**, Germany, 2003.

E. Laitinen, J. Pieskä and V. Toivonen: "On 3D Dynamic Control of Secondary Cooling in Continuous Slab Casting Process", in proc. Of Moving Boundaries 2003, Seventh International Conference on Computational Modelling of Free and Moving Boundary Problems, 4-6 November 2003 Santa Fe, **New Mexico**, USA.

Submitted for publication

In preparation

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

X
Yes No

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

X
Yes No

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

X
Yes No