



COST 526

**“Automatic Process Optimization in Materials Technology”  
(APOMAT)**

**Half-Yearly Report**

<b>1. Reporting Period</b>	<b>1.7.2002 – 31.12.2002</b>
Project title	Distributed simulation-based Optimization in Sheet Metal Forming
Project leader	<b>Prof. Dr. Ing. Manfred Grauer</b>
Organization	University of Siegen Institute of Information Systems
Main collaborators involved	Fischer&Kaufmann GmbH & Co KG, Finnentrop, Germany INPRO GmbH, Berlin, Germany Linde+ Wiemann Profiltechnik GmbH Dillenburg Germany

<b>2. Funding Situation</b>	
Amount of money received specifically for COST	100 kEuros
Other resources partially used for the project	150 kEuros

<b>3. International Collaboration</b> (mention group and type of work done in collaboration during the reporting period)
Participation in the Working Group Meeting in Budapest + project progress report <input type="checkbox"/> YES
Meeting with the Team of Prof. Dr. Ing. A. Wierzbicki at the Technical University of Warsaw and preparation of a joint publication on “Grid-technology for future manufacturing” (Oct. 2002).  Workshop with Prof. Dr. Ing. H. Nakayama (Konan University, Kobe/Japan) at the International Institute for Applied Systems Analysis in Laxenburg/Austria about “Methodologies and Tools for Complex Modeling” (Sept. 2002).

<b>4. Industry participation</b> (mention name of companies and work done in collaboration during the whole project)
With Fischer&Kaufmann: Further analysis of nonsymmetrical forming processes and its optimization. Comparison of simulation results with industrial measurements for this case.  With Linde+Wiemann: Further analysis of the simulation of wrinkling effects and comparison of different simulators (Autoform).  With INPRO: Installation of the new INDEED-Version via the Softwarehouse GNS in Braunschweig.

<b>5. Meetings, visits, exchange of scientists, short-term scientific</b>	<b>Location, date</b>
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<b>missions</b>	
Conference-Participation with the Paper: <b>About Performance-Models for the Distributed solution of simulation-based Optimizations in Computational Engineering</b>	Int. Conference on Computational and Mathematical Methods in Science and Engineering (CMMSE 2002), September, 2002, Alicante
Invited paper: <b>Grid Technology for Virtual Prototyping as an Infrastructure in Future Manufacturing</b>	4-th Global Research Village OECD-Conference: Importance of ICT for Research and Science, October 2002, Warsaw
Invited paper: <b>Verteilte simulationsbasierte Produkt- und Prozessoptimierung</b>	Workshop with local industrial partners, Festkolloquium „10 Jahre FOMAAS“, November 2002, Universität Siegen

## **6. Progress within the reporting period**

(Not exceeding 3 pages, including tables and figures)

- (I) The main result in the reporting period is the software-prototyp for the automatic optimization of a symmetrical part (one stage forming) by the connection of the CAD-System CATIA with the FEM-Software INDEED and the optimization software OpTiX. This was on the meeting Budapest presented and discussed.
- (II) For the management of the complex simulation and optimization results the integration of INDEED with the Productdatamanagementsystem PRO\*File was implemented.
- (III) The German national science foundation and the ministry of sciences in North-Rhine-Westphalia have supported our proposal (940 k€) for the 256-CPU-Cluster in November 2002.
- (IV) To develop the cluster further towards a gridsystem for virtual sheet metal forming the first prototyp of the GLOBUS-Gridsystem was successful installed and tested.

## **7. List of publications**

### **a) Published**

M. Gerdes, T. Barth, M. Grauer: **About Performance-Models for the Distributed solution of simulation-based Optimizations in Computational Engineering**, in: Proc. of Int. Conference on Computational and Mathematical Methods in Science and Engineering (CMMSE 2002), September, 2002, Alicante

M. Grauer: **Grid Technology for Virtual Prototyping as an Infrastructure in Future Manufacturing**, Proc. of the 4-th Global Research Village Conference: Importance of ICT for Research and Science, October 2002, Warsaw

M. Grauer: **Verteilte simulationsbasierte Produkt- und Prozessoptimierung**, Festkolloquium „10 Jahre FOMAAS“, November 2002, Universität Siegen

M. Grauer, O. Arndt, T. Barth: **A Neural Network Approach to the Solution of Optimization Problems in Computational Engineering**, 16-th JISR-IIASA Workshop on Methodologies and Tools for Complex Modeling and Integrated Policy Assessment, International Institute for Applied Systems Analysis (IIASA), Laxenburg, July 2002

W. Hansel, A. Treptow, W. Becker, B. Freisleben: **A Heuristic and a Genetic Topology Optimization Algorithm for Weight-Minimal Laminate Structures**, in: Composite Structures, Vol. 58, pp. 287-294, 2002

S. Paal, R. Kammüller, B. Freisleben: **Customizable Deployment, Composition and Hosting of Distributed Java Applications**, in: Proc. of the 2002 Intern. Symposium on Distributed Objects and Appl. (DOA), Irvine, 2002

T. Friese, B. Freisleben, S. Rusitschka, A. Southhall: **A Framework for Resource Management in Peer-to-Peer Networks**, in: Proc. of NetObjectdays 2002, Erfurt, 2002

Th. Barth, M. Grauer: **Grid Computing-Ansätze für verteiltes virtuelles Prototyping**, in: Peer-to-Peer, Springer-Verlag, 2002, S. 153-172

b) Submitted for publications

M. Grauer, G. Stuff, T. Barth, P. Neuser, O. Reichert, M. Gerdes: **A Concept for simulation-based Optimization of Sheet Metal Forming Processes**, accepted for: The 4-th International Conference on Intelligent Processing and Manufacturing of Materials (IPMM'03), Sendai, May 2003

C. Seiler, M. Grauer, W. Schäfer: **Produktlebenszyklusmanagement**, in Zeitschrift WIRTSCHAFTSINFORMATIK 45 (2003) 1 (Rubrik state of the art)

M. Grauer, O. Arndt, T. Barth: **A Neural Network Approach to the Solution of Optimization Problems in Computational Engineering**, submitted to EJOR

c) In preparation

**About simulation-based optimization of sheet-metal-forming processes**, for the Journal of Material Processing Technology, Elsevier