



COST 526

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

Half-Yearly Report

To be sent to V.Tesch@access.rwth-aachen.de until **August 31, 2002**

1. Reporting Period	1.1.2002 – 30.6.2002
Project title	Optimization of Fatigue Resistance of Cold Forging Tools by Considering Damage Mechanisms at Micro Scale
Project leader Organization	Dr. Igor Gresovnik C3M
Main collaborators involved	Faculty of Natural Sciences and Technology, University of Ljubljana, Slovenia.

2. Funding Situation

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

2.9 kEuros
0 kEuros

3. International Collaboration

(mention group and type of work done in collaboration during the reporting period)

Participation in the Working Group Meeting in Saint-Dié des Vosges + project progress report

- YES ➔
 NO

IPPT Warsaw; Contact sensitivities and preliminary overview of smooth contact formulations.
Rockfield Software, Swansea; definition of interfacing utilities between the optimisation shell and the simulation programme “Elfen”.

4. Industry participation

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

Iskra-Avtoelektrika. Analysis of service life of tooling systems

5. Meetings, visits, exchange of scientists, short-term scientific missions	Location, date
Working Group Meeting Meetings with Iskra-Avtoelektrika	Saint-Dié des Vosges, 21-22/05/02 Ljubljana, Nova Gorica, 3 meetings

6. Progress within the reporting period

(Not exceeding 3 pages, including tables and figures)

C3M’s goal is to develop a versatile software environment convenient for efficient optimisation of various parameters of the forming processes. This environment will enable definition of the objectives and constraints for a variety of practical situations, application of different mathematical algorithms to solve the resulting optimisation problems, and immediate inclusion of finite element analysis in the solution scheme. Flexibility at solving different problems will be retained and the environment will be easily extensible with independent modules that can supplement the functionality when new types of problems are faced.

The framework of the optimisation environment has been set up in form of the optimisation shell “Inverse” and has been applied to finite element environment “Elfen” which is available in C3M.

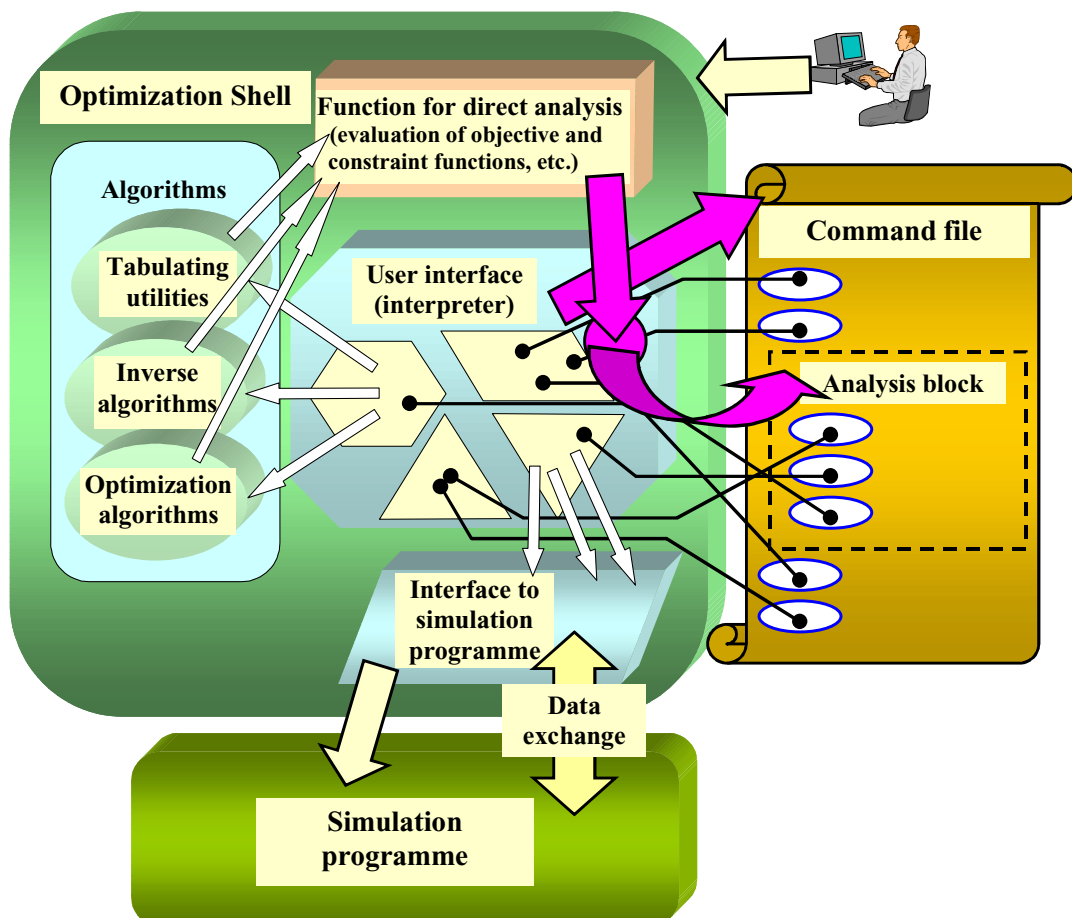


Figure 1: Function scheme of the optimisation shell “Inverse”

The optimisation shell is built around an interpreter, through which all the functionality is accessed. This enables arbitrary combination of the built-in utilities in the solution scheme for any particular problem. The core of the system are the optimisation algorithms, which can interact with the finite element numerical simulation through user definitions of the analysis block in the command file and through the available interfacing methods.

In the scope of this project, the possibilities of improving the fatigue resistance of the tools will be investigated by our optimisation system. Main activities are going on in the area of the definition of the suitable interface between the optimisation shell and the simulation programme. The interface will base on running the simulation programme using the operating system facilities and data exchange through input and output files. For this aim, a set of general file manipulation routines has been implemented in the shell and made accessible through the installed interpreter functions.

7. List of publications

a) Published

I. Grešovnik, T. Rodic, "Practical considerations regarding optimisation of shape in forming processes", V: M. Pietrzyk, Z. Mitura, J. Kaczmar (eds.), *"The 5th International ESAFORM Conference on Material Forming"*, str. 27-30, Akademia Górnictwo-Hutnicza Kraków, 2002; ISBN 83-7108-098-0; Krakow, Poland, 14.-17. april. 2002.

I. Grešovnik, T. Rodi , S. Stupkiewicz, D. Cukjati, *"Application of Optimisation Techniques in Metal Forming"*, *"34th Solid Mechanics Conference – volume of abstracts"*, str. 109-110, Institute of Fundamental Technological Research, Polish Academy of Sciences (press: ATOS Poligrafia-Reklama), 2002; Solmech 2002, Zakopane, Poland, 2.-7. september 2002.

b) Submitted for publications

c) In preparation