PROJECT LEADERS
C Vuik

RESEARCH THEME
Complex dynamics of fluids

PARTICIPANTS
CW Oosterlee, C Vuik, P Wesseling, A Segal, M Ur Rehman

COOPERATIONS
TNO-Science and Industry, GMD, CPS University of Zaragoza, Sepra

FUNDED
STW, TUD, TNO-Science and Industry, Nuffic-HEC
1st 25% 2nd 50% 3rd 25%

START OF THE PROJECT
1992

INFORMATION
C Vuik
015 278 5530
C.Vuik@tudelft.nl
http://ta.twi.tudelft.nl/users/vuik/

PROJECT AIM

New preconditioners for the discretized Navier-Stokes equations will be developed. Parallel deflation methods will be included.

PROGRESS

The discrete Navier-Stokes equations are solved by the SIMPLE(R) iteration method. To decrease the very large number of iterations, we have proposed multigrid and Krylov accelerated versions: GCR-SIMPLE(R). The properties of these methods are being investigated for simple two-dimensional flows and three-dimensional flows in industrial glass melting furnaces. These methods are generalised to a colocated discretization and combined with the deflated multiblock approach and parallel computing. Now we try to generalize these solvers to our FEM discretization (SEPRAN) and compare our methods with the recently developed methods given by Elman, Wather, Sylvester, Benzi, Reusken and Schilders. It appears that MSIMPLER, a new variant of SIMPLER, leads to the fastest results.

DISSERTATIONS

-

SCIENTIFIC PUBLICATIONS

1. M. ur Rehman and C. Vuik and G. Segal. Preconditioners for the steady incompressible Navier-Stokes problem. International Journal of Applied Mathematics,38, pp. 223-232, 2008.
2. M. ur Rehman and C. Vuik and G. Segal. A comparison of preconditioners for incompressible Navier-Stokes solvers. Int. J. Num. Meth. in Fluids, 57, pp. 1731-1751, 2008.
3. M. ur Rehman and C. Vuik and G. Segal. Numerical solution techniques for the steady incompressible Navier-Stokes problem. World Congress on Engineering 2008, London, U.K., 2-4 July, 2008, Volume II; Editors S.I. Ao and L. Gelman and D.W.L. Hukins and A. Hunter and A.M. Korsunsky, pp. 844--848, International Association of Engineers, Hong Kong, 2008.