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# Description of benchmark Jacobsen91

The Jacobsen91.mod has 5 solutions. They correspond to the steady states of the methanol-propanol column (mass reflux, energy-balances included) discussed in:

E. W. Jacobsen, S. Skogestad;
Multiple Steady States in Ideal Two-Product Distillation;
AIChE Journal, 1991, 37, 499-511.

One solution is infeasible in practice (negative flow rates). Bifurcation diagrams are given in *Figure 8* of that paper.

Solving this problem with the interval methods is discussed in:

A. Baharev, E. Rév;
A complete nonlinear system solver using affine arithmetic;
Interval Analysis and Constraint Propagation for Applications (IntCP 2009);
Workshop held in conjunction with the 15th International Conference on Principles and Practice of Constraint Programming (CP 2009);
Lisbon, Portugal, September 20th, 2009
(manuscript available from http://reliablecomputing.eu)

The first *detailed* report on applying interval methods to this problem seems to be:

A. Baharev;
Application of Interval Methods to Chemical Engineering Problems;
PhD dissertation; *in Hungarian*, Budapest University of Technology and Economics, Department of Chemical and Environmental Process Engineering, 2009
(the dissertation is available from http://reliablecomputing.eu)

High resolution bifurcation diagrams are presented on page 72 of the dissertation.