

# Fast Simulation of Fluid Models with Colored Jacobians

Willi Braun<sup>a</sup> Stephanie Gallardo Yances<sup>b</sup> Kilian Link<sup>b</sup> Bernhard Bachmann<sup>a</sup>

<sup>a</sup>University of Applied Sciences Bielefeld, Bielefeld, Germany

<sup>b</sup>Siemens AG, Energy Sector, Erlangen

The industrial usage of the open-source Modelica tool OpenModelica was limited so far for power plant applications, due to performance of the large fluid systems. This paper presents some efforts to improve the simulation time on benchmark fluid models proposed by Siemens Energy.

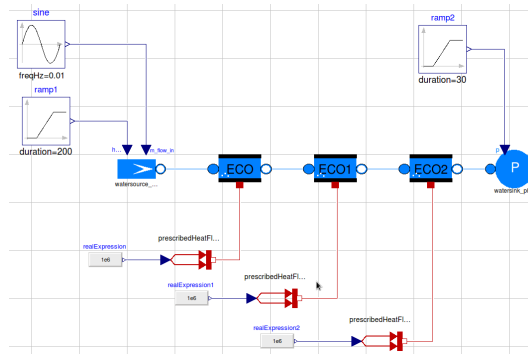


Figure 1: Pipes benchmark model

The main aspects presented here to achieve a faster simulation are an efficient evaluation of the jacobian matrix. This is done by extracting efficient the sparsity pattern of the jacobian matrix from the original model during the compile process. The information about the sparsity pattern make an compression of the jacobian matrix possible. The compression means that columns of the jacobians are combined and could calculated at once. The decision which is columns could be combined is determined by a coloring technique which is resulting a an colored jacobian matrix. Therefore the techniques are scratched, applied and shown that the effect is significant, moreover this feature pushes OpenModelica further to an efficient simulation environment for relevant industrial problems.

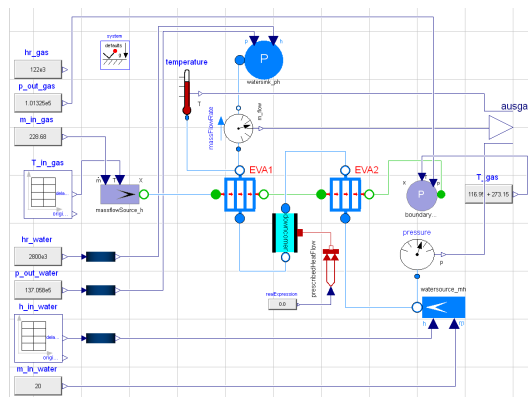


Figure 2: Heat exchanger benchmark model