Reliable supply of drinking water for the population is of great importance. In this context, besides the required water quality energy efficiency becomes an increasing issue for water supply companies. In order to optimize corresponding interplay between energy consumption for pump operation and satisfaction of water demands, a dynamical mathematical simulation of hydraulics and energy is required.

For realizing such computations, simulator TWaveSim was developed. It is based on special modelling approaches for processes of water extraction and treatment in water works and subsequent dissemination into large networks. TWaveSim allows for different modes such as simulation and forecast. In simulation mode the adaption to measured tank levels is possible. Single model elements like pumps, valves, pipes, tanks etc. are described by linear or nonlinear equations as well as ordinary or partial differential equations. The simulator collects all occurring modelling equations and coupling conditions into one large DAE system by applying an appropriate network approach using the method of lines and suitable semidiscretization of given hyperbolic PDEs [1][2].

In this talk, simulator TWaveSim is introduced in detail. Implemented equations for pipes, control valves and speed controled pumps are presented and the special structure of the resulting DAE system is discussed. This structure must be exploited by the proposed linearly-implicit Rosenbrock-Wanner (ROW) methods [3][4] for time-integration of the given DAE system. Finally, some simulation and forecast results will be presented and discussed as well.

Results show dynamical flow behaviour within single reaches and thus motivate applying generalized ROW-type methods [5] in order to further increase efficency of time-integration. Corresponding considerations are subject of Tim Jax’s talk ”Generalized ROW-Type Methods for Simulating Water Supply Networks”.

Keywords: Water supply network simulation, network approach, method of lines, DAEs

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REFERENCES


