

## SIWA Optim – Operating water networks in a resource-saving and efficient way

The operation optimization system SIWA Optim assists the user in an efficient operation of his network while ensuring water supply to all consumers.

The economic operation of pumps is one of the biggest challenges in the operation of water networks due to different energy tariffs and the increasing number of renewable energies. Since pumps are the largest energy consumer in the network they should be operated in a smooth and efficient way. SIWA Optim takes all important parameters such as tank level, energy prices, consumer demands or pump availabilities into consideration and calculates a schedule for the most efficient operation ensuring water supply at all times. Assisting in daily operation by continuously calculating schedules in individually set intervals or supporting in maintenance and operation planning with manual started scenarios and calculations, SIWA Optim.

The network is modeled as a flow based, abstract distribution network. It includes consumer forecast demands, water suppliers feeding fixed quantities of water or providing water in a specific range. Tanks with minimum and maximum level restrictions, pumping stations with limited permissible combinatorics of pumps as well as energy suppliers which calculate the working price for the specific stations and limit power consumption are also part of the model. This data is used to calculate an optimal schedule for the upcoming 24 hours. Some data like pump status and current tank level can be imported from the control system. Reading the current values from the control system is established via a OPC UA connection, which makes it possible to read independently from the control system.

Optimization can be executed in either a manual or a cyclic way. During manual optimization it is possible to change the above-mentioned parameters and have a closer look to the system. This operation is mostly used for operation or maintenance planning. Cyclic calculations are running autonomously in the background in a defined interval. This interval could be anything between 1 hour and 24 hours. Pump status and tank level are updated before every cyclic optimization takes place. Shortening the interval between cyclic optimizations can increase the safety of operation since unexpected events like damaged pumps or low tank levels can be recognized sooner and be taken into consideration for the next pump schedule. The calculated pump schedule can also be sent back to the control system. The block is receiving the schedule and transfers the flow setpoints per station or per pump to the control unit of the pump group. The schedule of SIWA Optim needs to be confirmed by the Operator to release the setpoints to the control unit.

The application is running in Linux dockers within a virtual machine hosted by Hyper-V Manager. The user interface is accessible via Google Chrome. The network engineering for the application is done in a Visio based engineering tool.