

# About Aquadapt Solver

The Derceto® Aquadapt® Solver is at the heart of the Derceto suite. Developed by a team of process engineers and engineering scientists it encapsulates the real-world dynamics of a water distribution system. The starting point is the client’s unique hydraulic network configuration and operational requirements. A dynamic representation of the distribution system is then configured and from this model the optimal operating schedules are derived.

Aquadapt software runs on a standard small office server and even with modest hardware can produce optimal operating schedules in minutes regardless of the size of the distribution system.

The Aquadapt Solver’s impressive speed allows it to be run regularly and interactively. This speed of solution is essential when working with unpredictable future demands and constraints. It updates the operations schedule every half hour to respond to changing demand and operating conditions. It also:

- Uses updated operating constraints for every solution
- Verifies hydraulic solutions using an inbuilt

EPANET model

- Interfaces to electricity data including real-time markets
- Interacts with the client’s SCADA system
- Can be run manually any time to test scenarios and/or incorporate manual settings

The Aquadapt Solver outputs network control schedules for the rest of the day including:

- Schedules pump on and off times
- Variable speed drive pump set points
- Valve flow, pressure or position settings
- Water Treatment Plant raw and final water flow settings

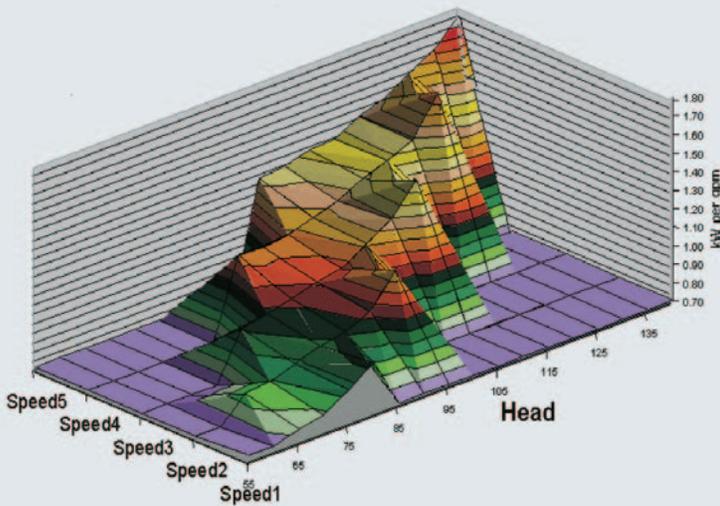
The Aquadapt Solver produces predicted data for the rest of the day, which is updated

every time Aquadapt finds a new solution. Operators therefore have the most up-to-date predictive information to work with throughout the day. The Aquadapt Solver predicts:

- Reservoir and tank levels and volumes
- Water demand by zone plus flow totals
- Pump and valve station flow
- Pump station power and energy use
- Pump station electricity costs
- Water Treatment Plant costs (chemical and electricity)

## Complexity

Water distribution systems are complex and the number of ways pumps could be run to supply demand and replenish storage is virtually infinite. A system with N fixed



Aquadapt Solver calculates optimal set-points for parallel variable speed pumps.

speed pumps, requiring hourly schedules for a single day, has  $(2^N)^{24}$  possible combinations to consider so a system with only 11 pumps has  $2.96 \times 10^{479}$  possible schedules. This is almost the same value as recent estimates of the number of atoms in the entire universe. Most sizeable water utilities have hundreds or even thousands of pumps. Some of these pumps may operate over a range of speeds so that the assumption of only on or off operation is wrong, making the possible schedules virtually infinite. Aquadapt uses a proprietary technique to tame this mathematical conundrum and produce very fast solutions. One system with 300 pumps takes only a few minutes to solve. Aquadapt uses both linear and non-linear techniques to provide speed and accuracy respectively.

### Predict Demand and Adapt

There are many unknown variables in a water distribution system. Of these water demand is the hardest to predict with any accuracy, as it is dependent on weather and human behavior. The Aquadapt Solver has to be able to predict likely future water demand and adapt to unforeseen changes caused by equipment failure or changing weather patterns. This capability to adapt in real time to unpredictable events is a key benefit of the Aquadapt Solver, made possible by its speed of solution which allows regular updates.

### Respond to Electricity Tariffs

Aquadapt can use Standard Offer of Service, Real-Time or Day-Ahead market

prices. Live data feeds are supported via open standard or proprietary interfaces. The Aquadapt Solver uses up-to-date tariff information to find the lowest cost schedules while remaining within hydraulic operating constraints. Electricity peak demand charges are also incorporated in the solution and Auto Demand Response functions can be accommodated.

### Work Within Operating Constraints

The Aquadapt Solver actively manages operational reliability and water quality. Operators can review the predicted data such as storage levels and then, if required, selectively guide Aquadapt to change the desired outcomes. The Aquadapt Solver works within a network's operating constraints such as:

- Reservoir and Tank minimum and maximum operating limits
- Water Treatment Plant available flow rates and rate change requirements
- Distribution system pressure constraints
- Pump Station's operational and electrical restrictions
- Water quality and turn-over requirements
- Bulk transfer into or out of the distribution system for raw and treated water
- Tanks or pumps out of service

The Aquadapt Solver incorporates the client's existing operational strategies aimed at achieving water quality objectives. These strategies include water turnover in storage tanks and pumping fresh water into the outer regions of the distribution system.

### About Derceto

Derceto is the leading provider of energy management software for water utilities worldwide. Our award-winning Aquadapt software integrates with existing management systems to help utilities make operating decisions that reduce energy consumption – typically one of their highest costs after personnel. Aquadapt also contributes to improved water quality and greater consistency of operations. By applying our smart water software, deep industry knowledge and an outstanding commitment to support, Derceto makes it happen – delivering energy savings of 10-20 percent, along with significant gains in operational efficiency and water quality.



For more information please visit:  
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