



# Context

The past ten years have witnessed a trend toward improving drinking water production and distribution by optimizing the control of water supply systems. This trend has been reinforced by the following factors:

- Energy consumption and costs are becoming an increasingly important consideration.
- Variations in local demographic conditions are leading to significant increases or decreases in water consumption.
- Increasing attention is being focused on monitoring and reducing water losses, with the objective of achieving sustainable operations.
- Instrumentation and control are rapidly improving and becoming more cost-effective, allowing for fully automated plant operation.

OPIR is an advanced control software product which optimizes the operation of water production and transport facilities, prevents turbidity peaks in the clean water, and reduces energy consumption in water supply systems.

OPIR is the product of decades of experience with control systems in numerous water supply systems, and is based on in-depth knowledge of production and distribution processes. OPIR's adaptive demand forecast allows for constant water production through the optimal use of the available water storage.

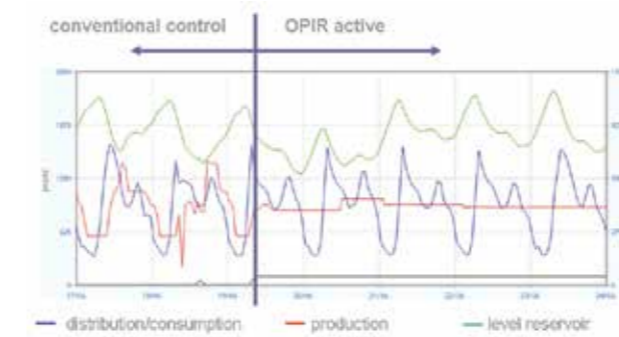
OPIR can optimize the operation of any water supply system: urban or rural, large or small, basic or complicated, with or without SCADA. OPIR provides tailored and plant-based solutions.

OPIR is part of the Aquasuite® product family: intelligent solutions for advanced monitoring and control of water supply systems.

# OPIR Prediction:

improved performance and optimal water quality

OPIR contains an adaptive demand prediction control, which automatically identifies the specific consumption patterns of an area, and uses these to predict the water demand accurately for the upcoming 48 hours. On the basis of the available storage capacity, OPIR determines setpoints for the water production and distribution flow, resulting in a much more constant flow compared to conventional pump control systems.



This water demand prediction significantly boosts process performance because:

- Abnormal situations are rapidly identified as deviations from the prediction and can therefore be responded to automatically.
- constant production rate prevents turbidity peaks caused by flow variations.
- constant production rate reduces energy consumption since the pumping rate is steadier.
- A constant production rate postpones capital investments thanks to the more efficient use of production and transport facilities.
- Energy costs can be further reduced by shifting pump operations to low energy-tariff hours.



## Best Available Technology

- Improved performance, optimal water quality
- Reduced energy consumption
- Reliable, stable, and transparent operation
- Minimal operational effort (self-learning system)
- Reduced equipment wear
- Reduced water losses

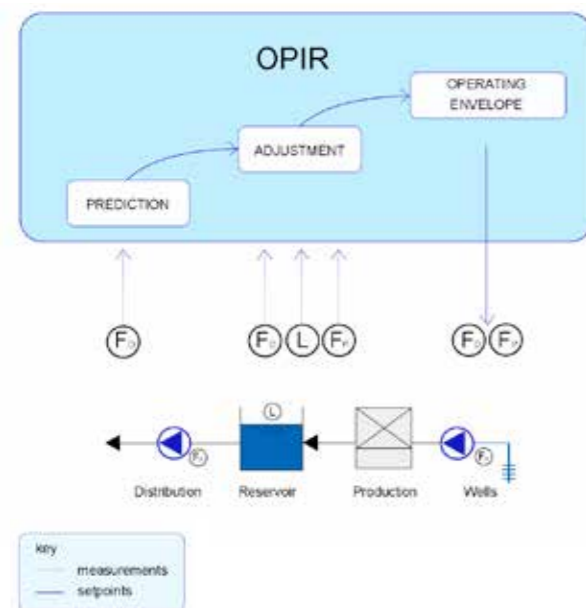


# OPIR Control Algorithm

OPIR's several components together make for a powerful and transparent controller.

**Prediction** - OPIR predicts the consumption of a specific supply area based on historical flow and level data. The prediction also takes into account the different types of days, such as holidays.

**Operating Envelope** - OPIR determines flow setpoints based on the demand prediction and on the optimal use of the available water storage, by taking the local operational boundary conditions into account.



**Adjustment** - OPIR analyses and adjusts its predicted demand trend and defines setpoints by comparing them with real-time data.

**Adaptive** - OPIR is an adaptive or self-learning system, thus saving the operator from having to monitor and adjust parameters.

## OPIR Implementation

OPIR optimizing control is basically an add-on to your plant control system (e.g. PLC/SCADA or DCS). Basic control functions are implemented in the PLC, optimized setpoints are determined by OPIR.

OPIR software can be installed on any type of computer, such as a normal desktop PC, a server or an industrial PC with a Windows operating system. OPIR communicates with the PLC through the control network and generates web-based visualization with settings, trends and extra OPIR functionalities (e.g. dashboard, energy monitor).

OPIR control software is built in modular function blocks, which permits flexible implementation. Depending on the drinking water system and available measurements, OPIR control loops can be configured in several ways. The configuration is determined during the design phase of the project.

# Benefits

- Energy costs can be reduced by up to 5-10% compared to conventional control.
- Turbidity can be reduced by up to 20% compared to conventional control.
- After a few weeks of operation, OPIR can predict daily water demand with an accuracy of 98-99%, and hourly demand with an accuracy of 94-96%
- Prediction-based control means smooth control, little variation, little equipment switching (less wear), and better overall process conditions.

## OPIR References

70% of Dutch water companies use OPIR. 40% of the Dutch population drink water controlled by OPIR. OPIR is also being used by water companies in Canada, Portugal, Poland, and Belgium.



# OPIR's Additional Modules

**OPIR Pressure Control:** OPIR calculates an optimal pressure setpoint for the distribution pumps, at which all pressure conditions are satisfied.

**OPIR Performance Dashboard:** allows for ongoing evaluation of daily, weekly, and current performance, and permits quick identification of and response to any abnormalities.

**Energy Monitor:** monitors the effect of OPIR performance on energy consumption.

**Abstraction Permits Monitor:** predicts abstraction amount up to a year. This helps to prevent exceeding the maximal abstraction permit.

## Highly Reliably

OPIR is highly reliable thanks to its predictive nature. OPIR contains several fallback algorithms in the event that sensors malfunction. Even in the absence of any functioning online measurements, the prediction still provides intelligent control for at least 24 hours.

In the event that the OPIR system or communication itself fails, process control is still guaranteed since the back-up plant control in the PLC (or DCS) is automatically activated.

## Project approach

- **System design:** Royal HaskoningDHV and the client consult to determine how OPIR should be implemented in a specific plant. Royal HaskoningDHV then configures and tests OPIR offline, according to the plant's particular circumstances.
- **Realization, testing, and implementation:** Modifications to, and programming of, the PLC and SCADA (or DCS) are carried out by a contractor or the client (not Royal HaskoningDHV). The contractor programs and tests the PLC/SCADA, installs and connects the OPIR computer, and configures and prepares the communication with OPIR. Royal HaskoningDHV writes the specifications for the contractor and, together with the contractor, tests the PLC-OPIR interface and the PLC functionality.
- **Start-up:** To begin with, OPIR runs in the background so that it can begin learning the plant's characteristics. Royal HaskoningDHV consultants closely monitor OPIR's performance in order to guarantee that the controller is well tuned. After this initial period, OPIR is put into operation and the operators can choose to switch to active OPIR control.

## License, Service, and Evaluation

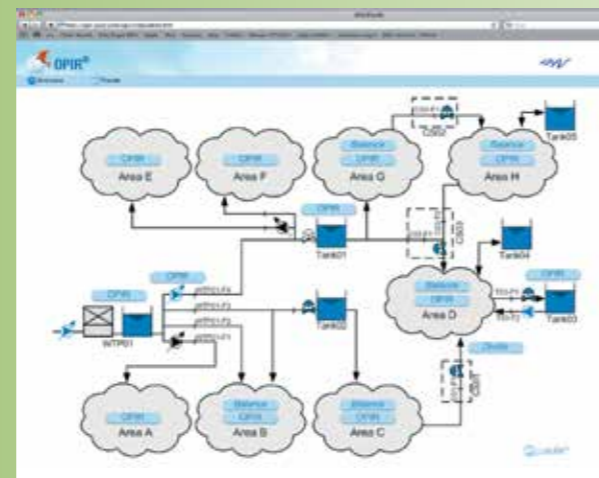
Royal HaskoningDHV offers a service contract in which the OPIR software and license are upgraded every contract year through a remote connection. As part of the standby service, Royal HaskoningDHV engineers are available to answer questions and offer online support and troubleshooting through the remote connection. As an option, Royal HaskoningDHV can also conduct an annual evaluation of OPIR and of the plant's performance, after which a report is prepared including possible recommendations for improvements.

## Operational Excellence

Royal HaskoningDHV process and control experts are available for weekly or bi-weekly pro-active support on running your water supply system with OPIR. Support consists of regularly checking OPIR performance and process conditions through a remote connection, remote data analysis, standby service for answering questions and assisting in troubleshooting. This backs up your staff on their way to operational excellence. Royal HaskoningDHV also offers operator training, including training certificates.

## Aquasuite®

Aquasuite® is a product family of intelligent solutions for advanced monitoring and control of water treatment systems. Through the Aquasuite®, advanced forecasting systems, model-based and decision-support controlling software are made available in a joint effort by Royal HaskoningDHV engineers and our clients. [www.aquasuite.net](http://www.aquasuite.net)



Welcome to the OPIR users community,  
Welcome to innovation!

Decades of experience, knowledge, and best practices have been brought together in OPIR to offer general solutions for water treatment. OPIR has been and will continue to be developed as part of a combined effort of clients, partners, and Royal HaskoningDHV, thus offering a perfect platform for new, innovative control solutions and a quick route to market. This means that every client profits from the experience and the best practices of its peers.



