

# WEST

## Modelling and simulation of wastewater treatment plants

WEST is a **powerful and user-friendly** software package for **dynamic modelling and simulation of wastewater treatment plants** (WWTP) and other types of water quality related systems. It is designed for operators, engineers and researchers interested in studying **physical, biological or chemical processes** in WWTPs, sewer systems and rivers.

### APPLICATIONS

#### EVALUATION OF DESIGN OPTIONS

When designing or upgrading a WWTP, WEST enables you to compare different design solutions in terms of performance with respect to specific objectives, such as effluent quality, investments and operational costs. The Scenario Analysis tool and the possibility to define custom objective functions in WEST allow you to select the best design for your plant.

You can also take a more conventional approach to plant design by means of the Designer Application. This allows you to design a WWTP according to a template and following a design protocol, such as ATV.

#### PROCESS OPTIMISATION

Improvements to the operations of a WWTP may lead to considerable benefits in terms of process performance, effluent quality as well as operational costs, for example for aeration. The Parameter Estimation tool enables you to identify the combination of operational conditions that optimise a given objective.

#### MODEL CALIBRATION

Model calibration is an essential part of the model development process. The local and global Sensitivity Analysis and Parameter Estimation tools in WEST are invaluable to efficiently calibrate your model.

#### DEVELOPMENT OF ADVANCED CONTROL STRATEGIES

To assess different control strategies by experimenting is typically a cumbersome exercise. WEST provides flexible control models as well as automated conversion of MATLAB fuzzy logic controllers. This makes it the tool of choice for evaluating control strategies prior to their actual implementation.

### APPLICATIONS

#### MONITORING OF PLANT OPERATION AND TROUBLESHOOTING

A calibrated model of a WWTP can be used to predict the dynamic response to different types of variations, for example in the influent composition, in order to identify bottlenecks and the appropriate countermeasures. It can also be used for training operators through the offline simulation of a variety of control actions. The Scenario and Uncertainty Analysis tools in WEST are instrumental to understanding the complex processes in a modern WWTP.

#### RESEARCH AND DEVELOPMENT

When studying novel treatment approaches, you require a software tool that is both sufficiently flexible to capture newly acquired knowledge, such as models and data, and fast enough to evaluate a large number of alternatives within a reasonable timeframe. WEST excels in both areas, demonstrated by its Block Editor and Model Editor applications (for developing custom model libraries) and the availability of the WEST engine on a number of high performance computing (HPC) infrastructures and supercomputers.

#### MODELLING INTEGRATED URBAN WATER SYSTEMS

The water quality in integrated urban water systems (IUWS) is simulated taking into account the catchment, the sewer, the treatment plant(s), and the receiving water body. The integrated IUWS library makes WEST a powerful tool to identify synergies and to globally optimise the wastewater system performance.



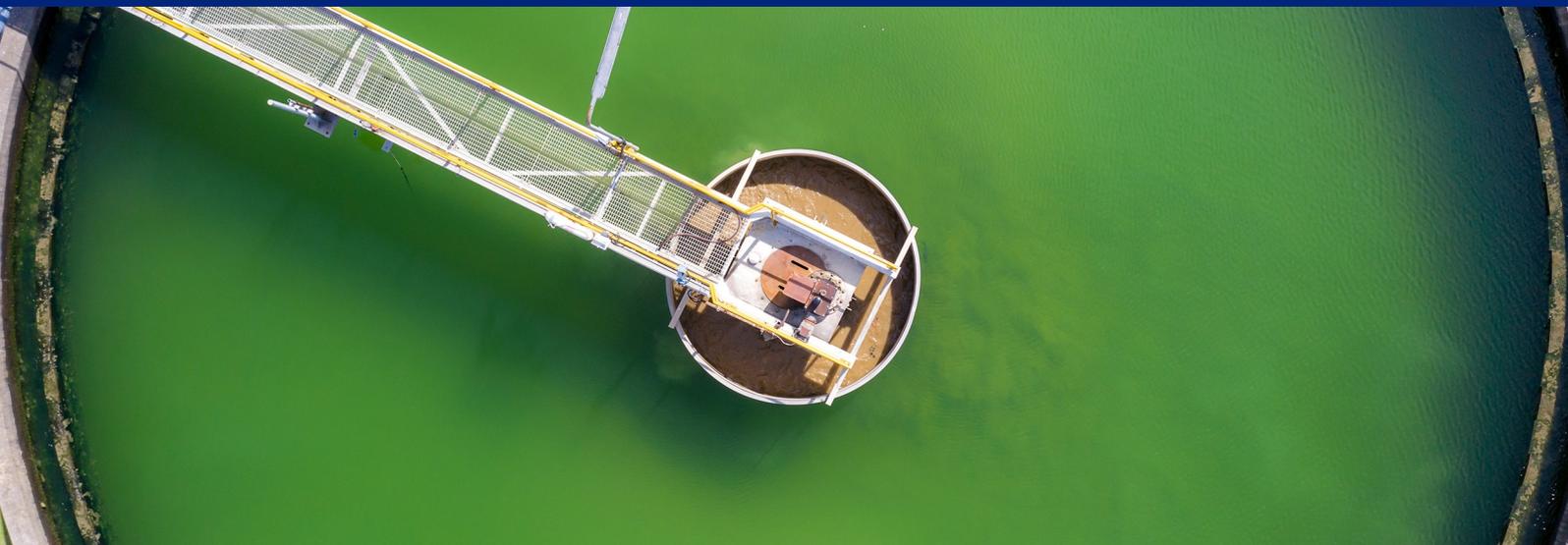
### FEATURES

#### PHYSICAL MODELS

- Screening and grit removal
- Equalisation, storm and settling tanks (with reactions)
- Activated sludge tanks and oxidation ditches (raceway)
- Granular sludge
- Integrated fixed film activated sludge and moving bed bioreactor (IFAS, MBBR)
- Sand and trickling filters
- Sequencing batch reactors (SBR), incl. moving- and fixed bed biofilm
- Membrane- (MBR) and membrane-aerated biofilm reactors (MABR)
- Upflow anaerobic sludge blanket (UASB)
- Sludge treatment (dewatering, aerobic and anaerobic digestion)
- Heat exchanger and gas turbine
- Chemical dosing units
- Disinfection
- Pumps and blowers
- Controllers and timers
- Nutrient recovery
- Heat pumps
- Particle Size Velocity Distribution model

#### BIOCHEMICAL PROCESS MODEL

- Activated sludge model (ASM) no. 1, 2d (with inorganic solids) and 3
- Anaerobic digestion model no. 1 (ADM1) with extension for sulphur
- Anaerobic ammonium oxidation (Anammox) model
- Activated sludge models for greenhouse gases (ASMG)
- Comprehensive C-N-P-S model
- Plant-wide model (PWM\_SA)
- Wastewater Aerobic/Anaerobic Transformation in Sewers (WATS) model
- Integrated urban water systems (IUWS)
- Thermal hydrolysis process model
- PFAS contaminant models



## MODULES

### WEST Basic

This is an entry-level license that allows for the construction of a plant layout and the execution of simulations. The layout is limited in size and only a sub-set of all unit processes can be used. All advanced features (tools and experiment types) are not enabled. It is the ideal starting point to acquire familiarity with the software and get a feeling for its huge potential.

### WEST Player

This module is limited to steady state and dynamic simulation and the computation of custom objective functions. Essentially, it allows you to execute projects that are based on read-only models and plant layouts prepared with higher versions of the software. It is well-suited for training and for evaluation of operational strategies on a fixed or pre-constructed plant model.

### WEST

Based on a read-only model library, this module enables the construction and modification of plant layouts with no limitations in terms of process units. For any plant layout, it allows for the performance of steady state and dynamic simulation as well as computing custom objective functions. In addition, you can exploit powerful tools for model calibration (Global Sensitivity Analysis and Parameter Estimation) and what-if scenario evaluation (Scenario Analysis).

WEST is ideal for projects with limited amount of data, limited time and need to compare scenarios such as different loads, layout configurations or control strategies.

## MODULES

### WEST+

This is the full product that allows you to create both basic projects, which are solely based on steady state or dynamic simulation, as well as more complex projects exploiting powerful tools for model calibration (Global Sensitivity Analysis and Parameter Estimation), reliable predictions of plant performance (Uncertainty Analysis) and process optimisation (Parameter Estimation). In addition, it enables you to create entirely customised model libraries by using the Model Editor and Block Editor applications.

### WEST SDK

This is a software development kit (SDK) that enables you to develop custom applications through integration of WEST engine with other software systems, such as SCADA systems and databases. It is an essential component for developing sophisticated, tailor-made decision support systems.

## BENEFITS

- User-friendly and intuitive graphical tools
- Model library for sewer, treatment processes, river, and nutrient and resource recovery
- Limitless flexibility for developing customised model libraries
- Easy implementation of control strategies
- Customisable project documentation through inclusion of rich text notes and automated report generation
- Fully customisable objective functions
- Wide range of statistical criteria
- Advanced tools for scenario analysis, sensitivity analysis, uncertainty analysis and parameter estimation
- Software development kit (SDK) for integration with other software systems
- Very high simulation speed
- Multi-language support

	WEST Basic	WEST Player	WEST	WEST+	WEST SDK
<b>WEST Application</b>	✓	✓	✓	✓	
<i>Steady-state simulation</i>	✓	✓	✓	✓	
<i>Dynamic simulation</i>	✓	✓	✓	✓	
<i>Objective Evaluation</i>		✓	✓	✓	
<i>Custom Dashboards</i>	✓	✓	✓	✓	
<i>Layout Animation</i>		✓	✓	✓	
<i>Notes, Reports and Workbook</i>	With limitations	✓	✓	✓	
<i>Interactive Layout Editor</i>	✓		✓	✓	
<i>Influent / Effluent Tool</i>	✓		✓	✓	
<i>Executable Model Builder</i>			✓	✓	
<i>Advanced Experiments</i>			✓	✓	
<i>Extensions</i>				✓	
<b>Data Editor Application</b>				✓	
<b>Unit Editor Application</b>				✓	
<b>Designer Application</b>				✓	
<b>Block Editor Application</b>				✓	
<b>Model Editor Application</b>				✓	
<b>Command-line Executor</b>				✓	
<b>MEX Executor for MATLAB</b>				✓	
<b>.NET / COM API</b>					✓