Release notes WANDA 4.7

October 2024

Release announcement

Deltares is pleased to announce the availability of WANDA 4.7. This is a feature-release on WANDA version 4.6. In WANDA 4.7, Deltares has made many improvements and added several new features to WANDA.

Downloading

WANDA 4.7 is available via the Deltares software portal, which is available at the following location: https://download.deltares.nl/en/download/wanda/ . You can use the download key you received by email to download the software. If you have not yet received a download key, please contact the sales team via software@deltares.nl .

Installation

Read the separate installation guide to install WANDA 4.7. The installation guide is also available on the download portal, or on the WANDA wiki via https://publicwiki.deltares.nl/display/WANDA/ .

Helpdesk support is provided via software.support@deltares.nl

Organizations with an active service package subscription can use their existing license files to run WANDA 4.7.

What's new in WANDA 4.7

General features and functionalities

- Improved file handling. Reading and writing of files is handled in a neater way. This makes it more robust.
- Released the WANDA API (application programming interface), which enables to possibilities of writing scripts to perform certain task (e.g. creating figures, building of models, etc.). The WANDA API is accessible from Python, C and C# (.Net platform). This gives the user the freedom to choose its own preferred platform to write scripts. The WANDA API is now available for all WANDA 4.7 users. The python bindings for the WANDA API can be installed via PyPI: https://pypi.org/project/pywanda/.

Modeling

- Improved labeling of the unit of Head (). The Head(m) label (WANDA 4.6) is reading now Head (mAD, i.e. meter ad datum) (WANDA 4.7). This to clarify that the hydraulic head is measured above a vertical datum.
- Adjusted default values for the non-newtonian Herschel-Bulkley parameters in the fluid property window. The new default HB parameters are for water: Yield stress *Tau_0* = 0 N/m2, Consistency index *K* = 1e-3, flow behaviour index *n* = 1.0.

WANDA Liquid module

- Added new feature to the Check valve component. The user can set the initial state of the check valve to automatic. WANDA determines the initial (i.e., open or closed) state in the steady-state calculation.
- Fixed the error message for the Pump component when the efficiency is greater than 100%.
- Redesigned the four quadrant Turbine. This model employs the turbine unit curves for the characteristic including varying wicket gate positions. For Francis turbines the characteristic often includes the infamous S-curve, leading in steady state to indeterminate (unstable) behaviour. In unsteady state, for instance at load rejection with turbine runaway, the S-

curve behaviour is solved correctly, and this can be used to predict heavy oscillations at runaway conditions, which can then subsequently be remedied by gate closure scenarios. Next to the absorbed power as loading, the model has been extended with a speed control modus to better model starting-up scenarios.
- Extended Pump model. It has a new drive type: Discharge. This allows for prescribing the discharge of the pump over time by means of an action table or a signal line from a control loop. The pump speed is in this case a dependent variable.
- Added new feature for the Control valve component (): It is possible now to define an initial zero flow. The valve position will be determined on basis of the hydraulic solution, which means that it will be closed if the initial discharge through the valve is zero.
- Added the Flow (Froude) number at time t = 0 as a new output property to the Pipe component.
- Added warning for the Valve component. WANDA gives a warning to the user when the steady state valve position is different from the first value in the action table.
- Fixed the behaviour of the Filling pipe section with airvalve component.
- Fixed crashes Dynamic check valve component due to repeated open and closing of the valve in a time step.
- Fixed that the table values (height - area) for a reservoir no longer allows surface area values of zero.

WANDA Heat module

In the heat domain the core quantities for the heat module has been converted from discharge, (energy) head and temperature to total pressure, mass flow rate and specific internal energy. Consequently, the mathematical implantation of the Heat components were adjusted. This makes solving for the conservation of mass and energy straightforward and enhances the stability. Moreover, the Heat module has been developed further:

- Added new component Heat tank (flow-through). This component represents a simple tank with an area and an infinite height. The Heat tank is an open flow-through tank with two inlets/outlets.
- Improved Solar collector (type of Heat exchanger component). The terminology and mathematical conventions for this component are based now on the ISO 9806:2017.
- Improved Heat Pipe component:
- The user can specify the number of grid cells per pipe for the thermal transport in the pipe a rigid column pipe or in engineering mode, rather than having to specify an advection velocity. The user gets a warning if the criterium of the Courant number is not met.
- The user can specify a wave speed mode in the waterhammer calculation mode.
- The user has new options to fill in the heat transfer coefficient:
    - Value: one value for the complete heat transfer from the fluid to the surroundings.
    - Table diameter: the table should be filled with the outer diameter and heat conductivity coefficient of each layer of the pipeline, starting with the most inner layer.
    - Table thickness: the table should be filled with the thickness and heat conductivity coefficient of each layer of the pipeline, starting with the most inner layer.
- The user has a new option to provide a time series via a time table for heat by tracing.
- Added new initial setting to the Heat valve component. The user can now set an initial downstream temperature for the valve, which makes the design of district heating systems more simple.
- Fixed that the WANDA Heat Pump component outputs the Energy (which remained zero in WANDA 4.6).

WANDA Control module

- Added new sensor property "Meas location" for which the user can set the sensor height.

Manual

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- The documentation has been converted to HTML documentation, which is automatically generated. This has the following benefits:
  - Modern lay-out with clickable references.
  - The manual is now published to ReadtheDocs and is available online (https://deltares-wanda-core.readthedocs-hosted.com/en/latest/).
  - The help-page for each component/feature is still connected to its own page.
  - To avoid the need of an internet connection a local copy of the documentation is installed and accessed when the user opens the documentation.
- The manual has been thoroughly checked. The descriptions on many pages have been extended or clarified, such as but not limited to:
  - Added description of the MINVAL & MAXVAL components.
  - Added description of the Dynamic air valve with water release component
  - Changed T- and Y-junction loss coefficients
  - Clarified that "entrance losses" to the BOUNDH (class) and BOUNDQ (class) need to be specified manually by the user.
  - Clarified that thermal expansion is not taken into account in the Heat Pipe component