WEST

DEMONSTRATION PROGRAM

__W__orld Wide __E__ngine for __S__imulation, __T__raining and Automation

15/09/2004 - Document2

CONTENTS

1. INTRODUCTION

1.1. Welcome

Welcome to WEST-D. This is a limited demonstration program of the WEST modeling and simulation software.

1.2. Installation

From a CD

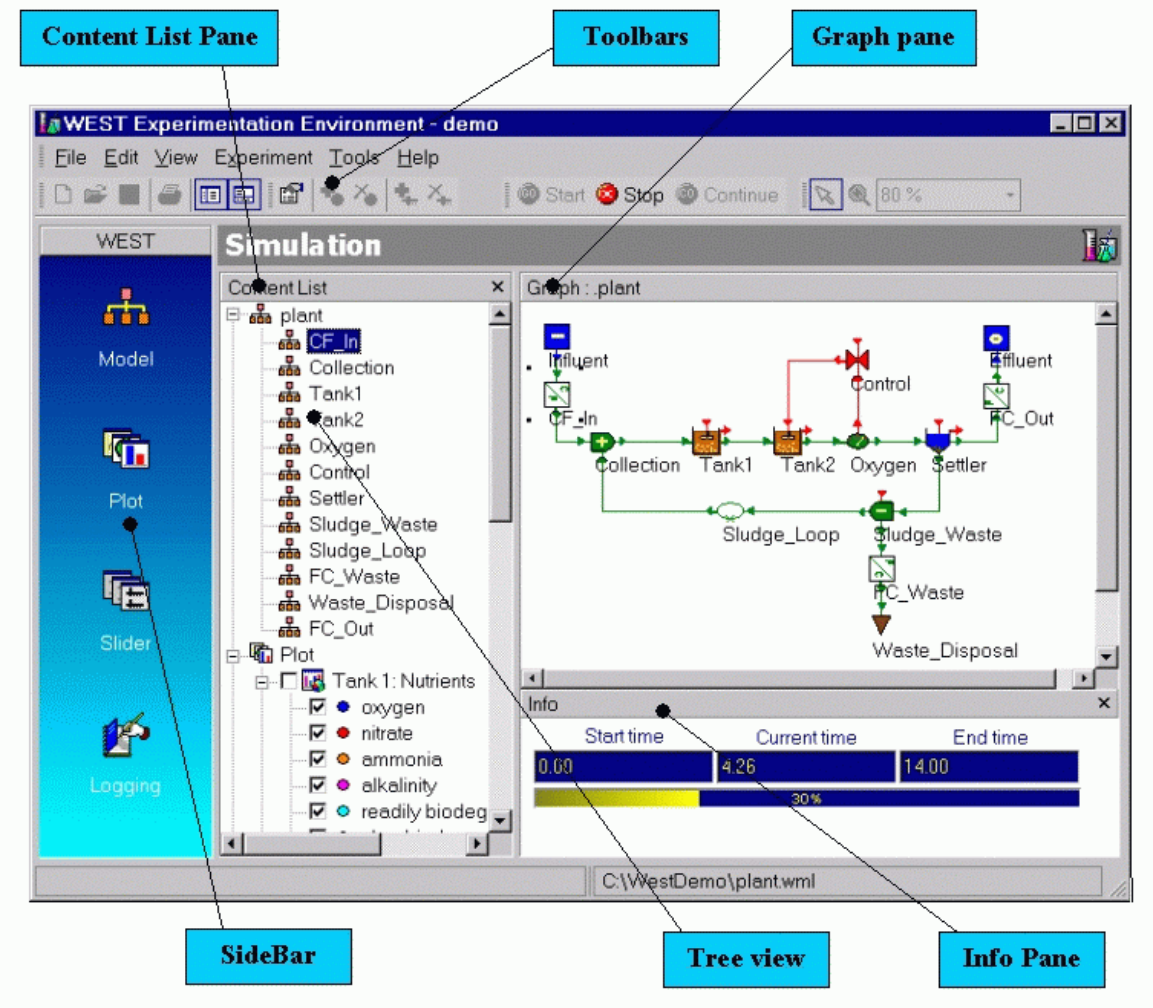
The WEST-D should start-up automatically after inserting the CD in the CD-drive. If not, browse to the CD drive and open the WestExp.exe.

After downloading

In order to use WEST-D you must open the zip file and extract all files in a user-specified directory (E.g. C:\WestDemo).

After extracting all files, WEST-D can be launched by opening the WestExp.exe in the user-specified directory (E.g. C:\WestDemo\WestExp.exe).

1.3. WEST


Content List Pane
Toolbars
Graph pane
WEST Experimentation Environment - demo
File Edit View Experiment Tools Help
Start Stop Continue
80 %
WEST
Simulation
Model
Plot
Slider
Logging
Content List
plant
CF_In
Collection
Tank1
Tank2
Oxygen
Control
Settler
Sludge_Waste
Sludge_Loop
FC_Waste
Waste_Disposal
FC_Out
Plot
Tank 1: Nutrients
oxygen
nitrate
ammonia
alkalinity
readily biodeg
Graph : .plant
Influent
CF_In
Collection
Tank1
Tank2
Oxygen
Control
Settler
Effluent
FC_Out
Sludge_Loop
Sludge_Waste
FC_Waste
Waste_Disposal
Info
Start time
Current time
End time
0.00
4.26
14.00
30%
C:\WestDemo\plant.wml
SideBar
Tree view
Info Pane

2. PLANT LAYOUT

The graphical representation of the plant layout is shown in the **Graph** pane. The tree-view representation of the plant layout is shown in the **Content List** pane.

The plant flow varies between about 2054 (0.54 Million Gallons per day) and 5600 (1.74 Million Gallons per day) cubic meters per day, with an average of 3789 cubic meters per day (1.0 Million Gallons per day).

The wastewater treatment plant is a two-tank system with sludge recycle. The two tanks each have a capacity of 650 cubic meters (171600 Gallons). The detention time in each aeration basin is about 4 hours.

In the second tank the oxygen level is controlled with an oxygen sensor and a feedback controller. The set point of the controller is 2 mg O_2 per liter.

The underflow rate of the settling tank is 3789 cubic meters per day (1.0 Million Gallons per day).

The waste flow rate is 80 cubic meters per day (21120 Gallons per day) and is wasted from the settler underflow. The part of the underflow that is not wasted is returned to the aeration tank.

3. MODELING ASSUMPTIONS

As overall category the activated sludge model n°1 (ASM1), published by the International Association on Water Quality (IAWQ) Task Group on Mathematical Modelling for Design and Operation of Biological Wastewater treatment Processes (Henze et al. 1987), is chosen. ASM1 takes into account carbon removal, nitrification and de-nitrification.

The influent is specified in an input file.

The models are written in fluxes or loads (grams per day). Therefor it is necessary to convert the influent data, which are specified in concentrations (milligrams per liter or grams per cubic meter), to fluxes or loads (grams per day). This is done in the CF_In node.

Then the recycle flow is added to the influent flow in the Collection tank.

The aeration tank is modeled in two fixed compartments (Tank1 and Tank2), of which the second has a feedback oxygen level control. The oxygen concentration is measured with an Oxygen sensor. The sensor is coupled to a controller, which controls the amount of aeration (Kla or oxygen transfer coefficient).

The settling tank (Settler) is modeled as a point settler. This means that the volume of the settler is neglected. The amount of solids in the effluent is defined by the non-settleable fraction (the fraction of the solids entering the settling tank that does not settle).

The sludge is wasted from the underflow of the settler in Sludge_Waste.

The data from the sludge waste and the data from the effluent are converted from fluxes to concentrations respectively in the CF_Waste node and CF_Out node.

Note: More information about the models and about more detailed models can be found in the WEST Models guide.pdf, which can be received on a simple request (mailto: support@hemmis.be) !

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4. RUNNING INTERACTIVE SIMULATIONS

4.1. Changing system settings

In this demo version a limited set of parameters or system settings (such as flow rates) can be changed during the simulation (in the full version the whole set of parameters can be changed).

The parameters can be changed in the model properties or using a slider.

Compartment	Parameter	Description	Slider
Tank1	Kla	Oxygen transfer coefficient (amount of aeration)	No
Control	K_P	Proportional control factor	No
Control	u0	No error action	No
Control	y_S	Setpoint of the oxygen control in Tank2	Yes
Settler	Q_Under	Settler underflow rate	Yes
Sludge_Waste	Q_Out2	Sludge wasteflow rate	Yes

In this demo version a number of slider windows has been predefined (see the Content List pane).

- Oxygen level control in Tank2 (visible)

  Between 0.5 and 5.5.

  The effect of changing the oxygen level control set point can be seen in the plot element ‘Oxygen’ on the plot window ‘Tank 2: Nutrients’

- Settler underflow rate (hidden)

  Between 0 and 7575 Cubic meters per day (about 2.0 Million Gallons per day), i.e. between 0 and about 200% of the influent flow rate.

  The effect of changing the settler underflow rate can be seen in the plot windows ‘Settler: suspended solids’, ‘Tank 1: Biomass’ and ‘Tank 2: Biomass’.

- Sludge waste flow rate (hidden)

  Between 0 and 200 cubic meters per day (52800 Gallons per day).

  The effect of changing the sludge waste flow rate can be seen in the plot windows ‘Settler: suspended solids’, ‘Tank 1: Biomass’ and ‘Tank 2: Biomass’.

The number of slider windows is not limited to this set. The user can add an own set of slider windows.

Note: More information can be found in the Online Help!

4.2. Starting, ending and continuing simulations

To start an experiment run:

- Click **Start** on the **Controlling** toolbar

To end an experiment run:

- Click **Stop** on the **Controlling** toolbar

To continue a simulation

- Click **Continue** on the **Controlling** toolbar

Note: More information can be found in the Online Help!

4.3. Looking at the results

In this demo version a number of plot windows has been predefined (See the Content List pane).

- Tank 1: Nutrients (hidden)
- Tank 1: Biomass (hidden)
- Tank 1: Nitrogen balance (hidden)
- Tank 2: Nutrients (visible)
- Tank 2: Biomass (hidden)
- Tank 2: Nitrogen balance (visible)
- Settler: Suspended solids (visible)

The number of plot windows is not limited to this set. The user can add an own set of plot windows.

Note: More information can be found in the Online Help!