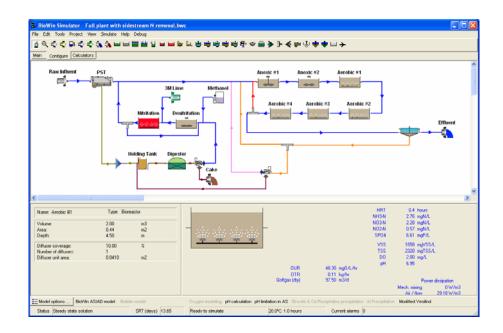
# **BioWin Quick Feature Tour**

## **Quick Feature Tour Overview**

This chapter highlights some of the features available in the latest version of BioWin. These are demonstrated using the "An Example" configuration installed in the **Data** directory. The purpose of this chapter is to provide a brief introduction.

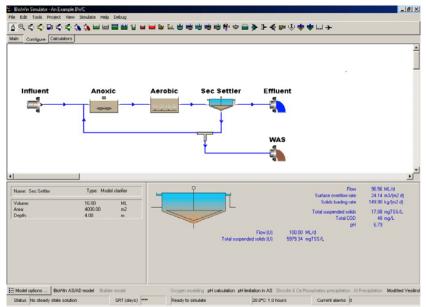
For specific examples on using BioWin, please see "*BioWin Tutorials*". You can find more BioWin examples as follows:

- Select **File|Open** and browse to the **Examples** directory. These systems are discussed in the Help section on BioWin Tutorials and Examples.
- On the BioWin main window toolbar, at the end on the right, click on the arrow next to the icon that looks like a filing cabinet. This brings down a list of pre-configured BioWin process files for a range of system configurations.



### The Interface

The example system shown below is a simple two-reactor activated sludge configuration.



A simple two-reactor activated sludge configuration

The BioWin main simulator window interface consists of:

- Menus
- Toolbars
- Drawing Board
- Summary Panes
- Status Bar

Setting up such a system is easy to do - it's a matter of minutes. Buttons on the toolbar at the top of the main simulator window represent the various unit processes available in BioWin. Simply click on a button, move your mouse cursor over the area on the drawing board where you want to place an element, and click the mouse button.

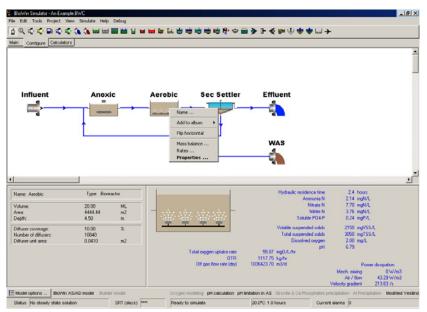
Most types of wastewater treatment systems can be configured in BioWin using the many process modules. These include:

- A range of activated sludge bioreactor modules suspended growth reactors (diffused air or surface aeration), various SBRs, media reactors for IFAS and MBBR systems, variable volume reactors.
- Anaerobic and aerobic digesters.
- Various settling tank modules primary, ideal and 1-D model settlers.
- Different input elements wastewater influent (COD- or BOD-based), user-defined (state variable concentrations), metal addition for chemical phosphorus precipitation (ferric or alum), methanol for denitrification.

• Other process modules – holding tanks, equalization tanks, dewatering units, flow splitters and combiners.

**Note:** A new Sidestream Reactor element can be included in configurations. This is mainly for convenience as it is easily distinguished from other activated sludge reactors on the drawing board. The model applied in a sidestream reactor is no different from the model used in other units. BioWin is based on a single integrated model for all biological and chemical reactions, and the same model is applied to any unit in a BioWin simulation. The only difference for a Sidestream Reactor is that the "seed" values selected by BioWin when a simulation starts differ from those for a standard activated sludge bioreactor.

A quick way to gain access to local menus which contain commands specific to a particular object is through the use of the right mouse button. For example, if you point to the influent element and right-click, you will get a local menu as shown below.



Using the right mouse button gives access to local menus

### **Element Information**

Double-clicking on a drawing board icon for an element in a configuration gives access to all pertinent information for that element. For example, double-clicking on a bioreactor element allows access to physical and operational data, as well as the facility to set up data monitoring.

🔓 Editing Bioreactor0	×
Dimensions Operation Monitor items	
Specify by Area and depth Volume and depth Name: Bioreactor0 Element type: Bioreactor	Volume 20000.0000 m3 Area 4444.4444 m2 Depth 4.5 m Width 4.0 m
Press F1 for help	OK Cancel

Dialog box allows access to all bioreactor information

Once you've double-clicked on an element icon to gain access to this information, it's just a matter of clicking on the tab you are interested in. For example, clicking on the **Operation** tab will allow you to change the bioreactor operating parameters shown below.

🖕 Editing Bioreactor0	×
Dimensions Operation Monitor items	
Specify aeration method D0 setpoint D0 setpoint C Air supply rate Un-aerated Note Oxygen transfer model must be switched on when aeral air flowrate constraint is applicable only in dynamic simu	ion is specified by air supply rate. The specified
on. Mechanical mixing Power input (unaerated reactors Local kinetic parameters	) 5.0000 W/m3
🗌 Local aeration parameters 👘 Local te	emperature
Model parameters Specify te	emperature by
Model gas phase	ant value of 20.0 (deg. C)
C Scher	luled Pattern
Press F1 for help	OK Cancel

### **Influent Data**

Setting up influent data is a quick and easy process. If you double-click on an influent element drawing board icon, you will see the following dialog box.

🗧 Editing COD Influent0					
Input Type   WW Fractions   Monitor	or items				
Specify type © Constant © Variable	Note The user may specify a time-varying flow/composition pattern using one of the methods below.				
	From file				
Edit data	To file				
Check pH and	alkalinity settings				
Last file loaded/saved:					
Press F1 for help	Cancel				

Access the influent properties to set up influent data

Clicking the **Edit data** button as shown will open the **Influent itinerary editor**, as shown below.

🟪 Influent		×
EditInfluent		
-	1	_
Name	Value	
Flow	100.0000	
Total COD mgCOD/L	500.0000	
Total Kjeldahl Nitrogen mgN/L	40.0000	
Total P mgP/L	10.0000	
Nitrate N mgN/L	0	
рH	7.3000	
Alkalinity mmol/L	6.0000	
Inorganic S.S. mgTSS/L	45.0000	
Calcium mg/L	80.0000	
Magnesium mg/L	15.0000	
Dissolved oxygen mg/L	0	
Note : Flow in u	nits of m3/d	
		Close

The variable influent itinerary editor

The **Influent itinerary editor** provides a spreadsheet-like interface for entering data. BioWin even offers several different strategies for filling in blanks in your data! It is very easy to import data into the itinerary editor from files or to copy it in from a spreadsheet – in fact, the data in the example shown above were pasted in from Microsoft Excel<sup>™</sup>!

## **Running A Simulation**

🖉 Steady state balance tool

Dynamic simulation tool

Steady state and dynamic simulations are run from the main simulator window. Once you have taken a few minutes to specify information for the various elements in your configuration, commencing a simulation is simply a matter of clicking the appropriate button on the toolbar!

BioWin uses a powerful itinerary that allows the user to schedule many different operating conditions such as dissolved oxygen setpoints, air flowrates, and temperature. For example, suppose that you were simulating varying temperature conditions. With BioWin, you easily can set up a temperature schedule using the dialog box shown below.

📒 Itine	rary editor		×
Edit itir	nerary		
Enter va	alues		d h m
Time 0	Temperature 20.0000	-	Cycle time 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
			Rows 13
			Time in grid O days ⊙ hours O minutes
		- -	Blank fill style (not time column)
			Close

Scheduling operating conditions is not a problem!

### **Help and Manual**

BioWin comes with an extensive manual which is shipped as a series of Microsoft Word<sup>™</sup> documents each consisting of a chapter so you can easily print out the sections of specific interest.

🗳 Help Contents & Index

**?** Help on using help

You may find this unnecessary as the contents of this manual are available via BioWin's online help. You can access this help system via the toolbar help buttons. Another useful feature that makes BioWin easy to learn is context-sensitive help. To get help that is relevant to a particular dialog box you are working in, simply hit the **F1** key and BioWin will access related topics from the help system and display them to you.

A screen shot of the help system is shown below.



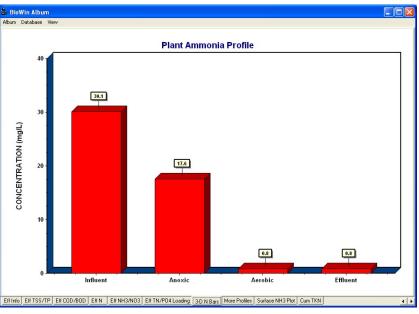
A BioWin help window (Contents tab showing)

# **Viewing Simulation Results**

The BioWin Album provides a fully integrated means to display simulation results. Using the album you can view data in the following formats:

- Tables
- Element-specific information displays
- Charts

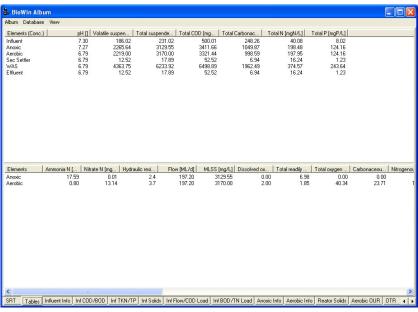
Dens the album Activating the album is as simple as clicking the appropriate button on the main window toolbar. The album consists of a series of tabbed pages which may contain any or a combination of the above data display formats. Shown below is the album with the active page displaying a chart.



The album interface

### Tables

Here is an example of an album page containing two tables.



An album page containing two tables

#### **Element-Specific Information**

Here are two examples of element-specific information displays; one for a bioreactor element and one for a settling tank element.

oum Database View							
Parameters Co	nc. (mg/L)	Mass rate (kg/d)	Notes			Options	
olatile suspend	2219.00	437592.42					
otal suspended	3170.00	625130.11					
articulate COD Itered COD	3287.47	648295.41 6698.70				Element : Aerobic	
otal COD	33.97 3321.44	654994.11					
otar CUD oluble PO4-P	3321.44	105.88				Volume : 30.0000	ML
otal P	124.16	24484.24				Area : 6666.6667	m2
itered TKN	2.06	406.99				Depth: 4.5	m
articulate TKN	182.74	36036.51				Deptri . 4.5	
otal Kieldahl Nit	184.80	36443.50					
tered Carbona	1.31	258.64				Temperature 20.00	deg. (
otal Carbonace	998.59	196923.18				Location : Output	
otal N	197.95	39035.26				Ecoson Compon	
otal inorganic N	13.94	2749.32					
kalinity	3.04	598.52	mmol/L and kmol/d				
4	6.79				3		
olatile fatty acids	0.02	3.56			3		
otal precipitate	0.00	0.00					
otal inorganic s	950.99	187537.70					
mmonia N	0.80	157.56					
itrate N	13.14	2591.76					
	Value		Units	 			
Parameter Ivdraulic residence time	3.7		Units   hours				
ydraulic residence time low	3.7 197.20		nours ML/d				
ILSS	3170.00		ma/L				
issolved oxygen	2.00		mg/L				
otal readily biodegradable .			mg/L				
otal oxvoen uptake rate	40.34		ma0/L/hr				
Carbonaceous OUR	23.71		mg0/L/hr				

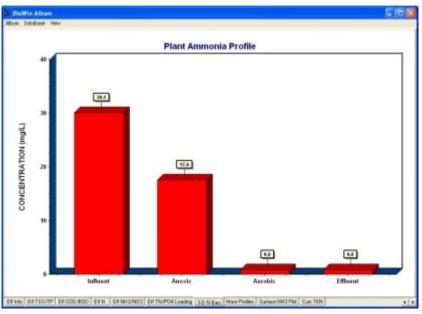
A bioreactor element-specific information display

BioWin Album											
Album Database Viev	4										
								120			the second second
Parameters	Conc. (mg/L)	Mass rate (kg/d)	Notes						Options		Sec. 1
Volatile suspend	12.52	1216.99						-	<u></u>		1.2
Total suspended	17.89	1738.56									
Particulate COD	18.55	1802.98							Element : Se	c Settler	
Filtered COD Total COD	33.97 52.52	3301.83									1. 1.
Soluble P04-P	0.54	5104.81 52.19							Volume : 20.	0000	ML
Total P	1.23	52.19 119.99							Area : 50	0000.00	m2
Filtered TKN	2.06	200.61							Depth: 4.0	1200	No. 1
Particulate TKN	1.03	100.22							Depth: 4.U	50× -	m
Total Kjeldahl Nit	3.09	300.83									
Filtered Carbona	1.31	127.48							emperature :	20.00	deg. C.
Total Carbonace	6.94	674.43							Location : I		dog. c.
Total N	16.24	1578.33							Lucauon.	Juipui	1
Total inorganic N	13.94	1355.16									
Alkalinity	3.04	295.01	mmol/L and kmol/d								1. 11
pH	6.79										1. 1
Volatile fatty acids	0.02	1.75									1.1
Total precipitate	0.00	0.00									
Total inorganic s	5.37	521.56									1 1
Ammonia N	0.90	77.66									1
Nitrate N	13.14	1277.49									
											N 14
											1. 1
											1.1.1.1
											1 1
											2.1
											1. 1
											1. 1
	[							\			3
Parameter	Value		Units					_ <u>^</u>			8 8
Hydraulic residence time Effluent flow	e 2.43 97.20		hours ML/d								
			ML/d ML/d								
Return activated sludge Height of specified con			ML/d								No. al
Return activated sludge			mg/L								
Effluent solids	a 6233.92 17.89		mg/L mg/L								A State
Solids loading rate	125.03		kg/(m2 d)								1. 3
Surface overflow rate	19.44		m3/im2 d)					~			1. 1
				1	OTO	Lu print of	2	0.00.00.00	Lució	1.110.0	r. 1
Inf Flow/COD Load Ini	FBUD/TN Load	Anoxic Info Aer	bic Info Reator Solids	Aerobic OUR	OTR	Mass Distribution	Settler Info	Settler Profile	WAS Into	WAS 50	

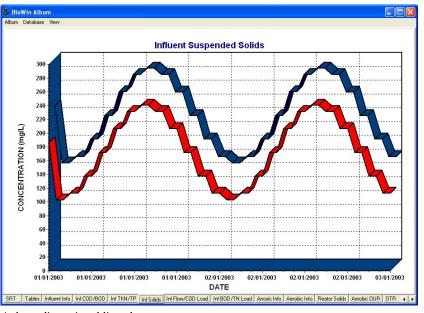
A settling tank element-specific information display

#### Charts

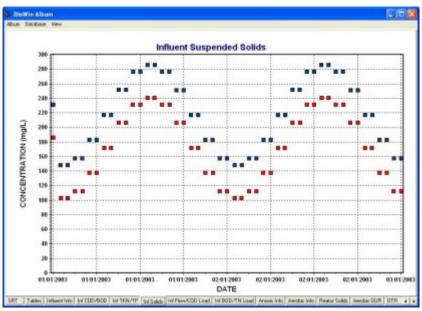
BioWin offers a wide variety of charting options. Here are some examples.



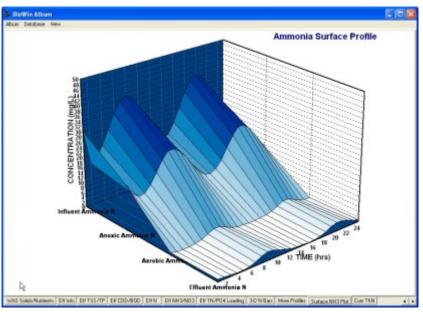




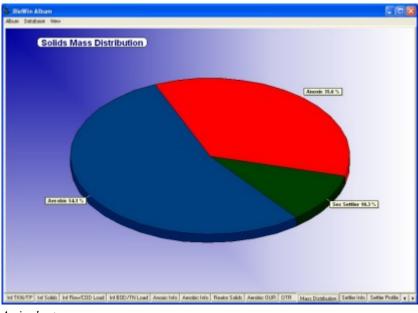
A three-dimensional line plot



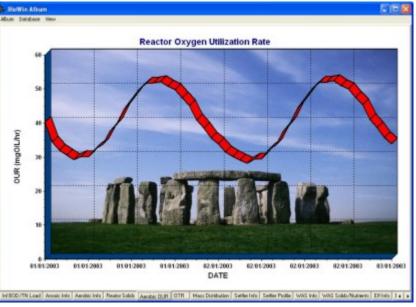
A two-dimensional point plot



A surface plot







Place pictures (or your company's logo!) in the chart background for presentations

# **Creating Reports**

#### **Printing Reports**

BioWin incorporates a powerful automatic report generation feature. With a single click, BioWin can generate a detailed printed report.

#### **Customizing Reports**

The type of information that appears in the report is completely customizable. The general information that can be included in a report may be:

- Project information (user name, plant name, project name, etc.);
- A picture of the project flowsheet;
- Global model parameter values;
- Global temperature setting;
- Album pages (charts, tables, etc.);
- The SRT for the system (if one is available);
- Any notes that have been entered in the BioWin Notes editor;

The reporting can be customized to include element-specific information on an element-type basis. Users can choose whether or not they want to include information for element types (e.g. Bioreactor) in the report. The type of information included in the report for each type of element can be different and may include:

- Physical data (volume, area, depth, # of diffusers, etc.);
- Operating data (average or flow-weighted average);
- Local settling parameters (if available);
- Local biological model parameters (if available);
- Aeration parameters (if available);

### Generating Reports in Microsoft Word<sup>™</sup>

If you prefer an electronic version, BioWin also can generate your report as a Microsoft Word<sup>TM</sup> document. Like the printed report, the information contained in the electronic version is completely customizable and may include many different forms. Once BioWin has generated the document for you, you may use it as a basis for an engineering report, or cut and paste its contents into another document.

Related functionality includes the ability to print out all or ranges of the album pages. You can also set the number of album pages per printed page.

Additionally, BioWin has its own internal **Notes** editor (shown below) to help keep track of project details.

_	<b>₿ В</b> ⊿	▼ <u>U</u> ⊐Tr Arial	▼ 14 ▼		E		
- 1		1 1	+ + +		1 1	1 1 1	1 1
Analysis	s of Nitrific	ation Rate					
Runs conduc			pecific growth rate	s:			
	.45/ .55/						
	.65/						
Deremo	er Values						
Parame Name	Default	Value	Arrhenius				
vanne vlu Max	0.50000	0.45000	1.0960				
<s nh4<="" td=""><td>1.00000</td><td>1.00000</td><td>1.0000</td><td></td><td></td><td></td><td></td></s>	1.00000	1.00000	1.0000				
Ba	0.04000	0.04000	1.0290				
Case 1:	MuMax =	0.45/d					
lements	NH3-N	NO3-N	PO4-P	VSS	TSS	CODt	TKNs
nfluent	30.00	0.00	6.64	201.01	246.01	500.00	32.79
Jnaerated	18.44	0.03	17.46	3024.48	4410.27	4483.73	18.88
Aerobic Effluent	2.99 2.99	11.91 11.91	0.25 0.25	2976.58 2.57	4410.71 3.81	4408.74 34.39	3.45 3.45
Lindent	2.55	11.51	0.25	2.57	3.01	34.35	0.40

BioWin's internal simulation notes editor

# Exporting Results to a Word Processor or Spreadsheet

It also is very easy to get results from BioWin into your word processor or spreadsheet. Charts, tables, system configuration layouts, etc. can be copied and pasted from BioWin to your reports. Tables can be exported as tabbed text and then quickly converted to tables, such as the one below which is a section of a Word<sup>™</sup> document.

Т	a	b	le	1

Elements	рН []	Volatile suspended solids [mgVSS/L]	Total suspended solids [mgTSS/L]	Total COD [mg/L]	Total Carbonaceous BOD [mg/L]	Total N [mgN/L]	Total P [mgP/L]
Influent	7.30	186.02	231.02	500.01	248.26	40.08	8.02
Anoxic	7.27	2265.64	3129.55	3411.66	1049.87	198.48	124.16
Aerobic	6.79	2219.00	3170.00	3321.44	998.59	197.95	124.16
Sec Settler	6.79	12.52	17.89	52.52	6.94	16.24	1.23
WAS	6.79	4363.75	6233.92	6498.89	1962.49	374.57	243.64
Effluent	6.79	12.52	17.89	52.52	6.94	16.24	1.23

A BioWin table exported to a word processing application

# Customizing

There are a variety of features that can be customized in BioWin. These are outlined briefly below.

### **Customizing Environment Settings**

BioWin offers users the ability to customize a number of environment settings to suit their needs. For example, some of the customizable features include:

• Printing options

- Report Options
- Automatic Logging
- File Locations
- Explorer Options
- System Settings

Access to the customizable features is managed through a central location, shown below.

Automatic logging	File locations	System settings
General Explorer option	ns Printing option	s Report options
eneral settings		
ecent file list 🛛 3 🛫 entr	ies	
arm list 25 🛫 entr	ies 🔽 Suppress alarms in dy	namic simulations
Autosave dynamic runs every	50 🚖 days	
Pre-allocate database memory for dynamic	simulations	
Check for updates on exit (if connection exit (if connection exit)	rists)	
ement	State variable naming	
Show names for :	Full names	
Activated primary settling tank     Aerobic Digester     Anaerobic Digester	C Abbreviated (cryptic)	
	Parameter defaults	
✓ Variable volume bioreactor	Falameter derauits	
Variable volume bioreactor     Bioreactor     BOD Influent		meter defaults
Variable volume bioreactor Bioreactor BOD Influent Methanol Model clarifier		neter defaults
Variable volume bioreactor     Bioreactor     BOD Influent     Methanol	Edit parar	neter defaults

All customizable environment settings accessed through one dialog box

#### **Customizing Project Settings**

BioWin offers users the ability to customize a number of new project settings to suit their needs. For example, some of the customizable features include:

- Drawing board appearance
- Pipe Settings
- Unit System Settings
- Template Settings for the Album

Access to the customizable features is managed through a central location, shown below.

Search and the second s	×
Drawing board Pipe Unit system T	emplates
Drawing board appearance	
Font	Sample of current font
Drawing board size	
Width 6000 🚖	Minimum zoom 10 🚖
Height 2000 文	Maximum zoom 1000 🗲
Drawing board snap	
Snap in X direction 10 🚖	Snap in Y direction 10 🚖
	Close

All customizable new project settings accessed through one dialog box

### **Customizing Charts**

Finally, you can customize how BioWin generates new charts using the **Chart Master** and chart templates as shown below.

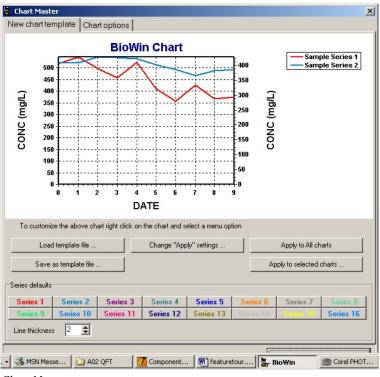


Chart Master

### **Model Information**

BioWin is not only a slick simulator package. The user has ready access to detailed model features for the many operations. Model parameters may be accessed conveniently from a single **Model parameter editor**, shown below.

BioWin offers many utilities to facilitate process analysis. These include:

- Adjusting kinetic parameters and temperature in individual units;
- Simulation of biological activity in secondary clarifiers;
- Scheduling of many different operating parameters such as temperature, dissolved oxygen setpoint, air flowrate, and flow routing/splitting.

Kinetic parameter editor								
DB NOB ANAMMOX OHO:	s Methylotro	phs PAOs	Acetogens	Methanogens	pН	Switches	1	
Parameters								
Name	Default	Value	Arrhenius	_				
Max. spec. growth rate [1/d]	0.90000	0.90000	1.0720					
Substrate (NH4) half sat. [mgN/L]	0.70000	0.70000	1.0000					
Aerobic decay rate [1/d]	0.17000	0.17000	1.0290					
Anoxic/anaerobic decay rate [1/d]	0.08000	0.08000	1.0290					
<ihno2 [mmol="" l]<="" td=""><td>0.00500</td><td>0.00500</td><td>1.0000</td><td></td><td></td><td></td><td></td><td></td></ihno2>	0.00500	0.00500	1.0000					

Model parameters may be changed through a single editor