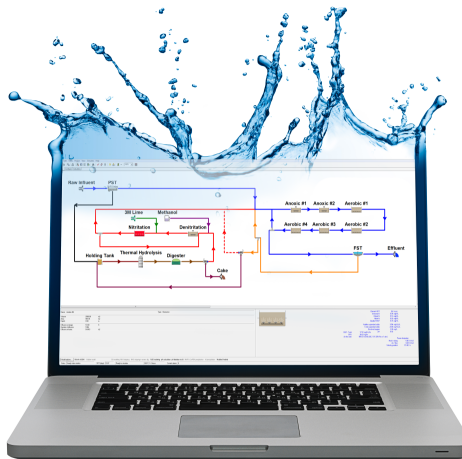


# What's New in BioWin 6.1



**EnviroSim**  
ASSOCIATES LTD.

# Introduction


- **The BioWin Manual is provided in two forms:**

1. As a PDF (default install location is C:\Program Files(x86)\EnviroSim\BioWin 6.1\Manuals)
2. In “Windows Help” format from within BioWin

- **To Use PDF**

- Open it from directory above
- Or copy it to any other location of your choice (*e.g.* Desktop, My Documents)

- **To Use Windows Help**

- Select Help > Contents & Index
- Click Help button 
- Press F1 key on your keyboard (context-sensitive method; will open a relevant topic in the manual)

# Separate Hydrolysis Rate for External Organics

- Degradable external organics state variable (*i.e.* COD<sub>p</sub> – Degradable external organics) now has its own kinetic hydrolysis rate parameter (*c.f.* BioWin 6.0 where hydrolysis rate for slowly degradable particulate COD was used)
- Hydrolysis rate for external organics can be independently adjusted **via Project > Parameters > Kinetic > Common**
- Also can be adjusted locally as per other kinetic parameters

Kinetic parameter editor

Methylophilic | **Phosphorus accumulating** | Propionic acetogenic | Methanogenic | Sulfur oxidizing | Sulfur reducing | pH | Switches |  
Common | Ammonia oxidizing | Nitrite oxidizing | Anaerobic ammonia oxidizing | Ordinary heterotrophic | Heterotrophic on industrial COD

Parameters

Name	Default	Value	Arrhenius
Hydrolysis rate [1/d]	2.1000	2.1000	1.0290
Hydrolysis half sat. [-]	0.0600	0.0600	1.0000
<b>External organics hydrolysis rate [1/d]</b>	<b>2.1000</b>	<b>2.1000</b>	<b>1.0290</b>
<b>External organics hydrolysis half sat. [-]</b>	<b>0.0600</b>	<b>0.0600</b>	<b>1.0000</b>
Anoxic hydrolysis factor [-]	0.2800	0.2800	1.0000
Anaerobic hydrolysis factor (AS) [-]	0.0400	0.0400	1.0000
Anaerobic hydrolysis factor (AD) [-]	0.5000	0.5000	1.0000
Adsorption rate of colloids [L/(mgCOD d)]	0.1500	0.1500	1.0290
Ammonification rate [L/(mgCOD d)]	0.0800	0.0800	1.0290
Assimilative nitrate/nitrite reduction rate [1/d]	0.5000	0.5000	1.0000
Endogenous products decay rate [1/d]	0	0	1.0000


Print all      Set current tab to default values      OK      Cancel

# Additional State Variables in Source Separated Organics Input

- Particulate COD can now consist of both degradable and non-degradable components
- VSS / TSS ratio for SSO stream can now be adjusted through addition of ISS if desired

Input - SSO



 Influent ✕

Edit Influent

Name	Value
Flow	100
CODp - Degradable external organics	80.00000
N - Particulate degradable external organics	0
P - Particulate degradable external organics	0
CODp - Undegradable non-cellulose	20.00000
Influent inorganic suspended solids	10.00

Flow units  
☐ m3/d ☐ m3/hr ☒ L/d ☐ ML/d ☐ mgd ☐ gal/d

Close

# Sulfur in BOD Input

- Sulfur component now available for BOD inputs
- Also displayed in main window summary pane

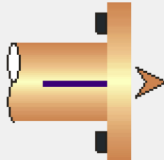
**Influent** [X]

Edit Influent

Name	Value
Flow	100
BOD - Total Carbonaceous mgBOD/L	250
Volatile suspended solids mg/L	200
Total suspended solids mg/L	250
N - Total Kjeldahl Nitrogen mgN/L	40.0000
P - Total P mgP/L	6.5000
S - Total S mgS/L	10.0000
N - Nitrate mgN/L	0
pH	7.3000
Alkalinity mmol/L	6.0000
Metal soluble - Calcium mg/L	80.0000

Flow units  
☒ m3/d ☐ m3/hr ☐ L/d ☐ ML/d ☐ mgd ☐ gal/d

Close



Flow	100.00 m3/d
COD - Total	500.00 mg/L
N - Total Kjeldahl Nitrogen	40.00 mgN/L
P - Total P	6.50 mgP/L
ISS Total	45.00 mg/L
<b>S - Total S</b>	<b>10.00 mg/L</b>
Volatile suspended solids	197.71 mg/L
Total suspended solids	242.71 mg/L
BOD - Total Carbonaceous	245.21 mg/L
pH	7.30

# Additional Metal Salt Inputs

- Now seven separate metal salt inputs
- Ferric Chloride; Ferric Sulfate
- Ferrous Chloride; Ferrous Sulfate
- Aluminum Chloride; Aluminum Sulfate; PAC/ACH
- More distinct coloration for flowsheet clarity



Input - Iron (as ferric chloride)



Input - Iron (as ferrous chloride)



Input - Aluminum (as  $AlCl_3$ )



Input - Iron (as ferric sulfate)



Input - Iron (as ferrous sulfate)



Input - Aluminum (as  $Al_2(SO_4)_3$ )



Input - Aluminum (as PAC)



# Metal Salt Pricing Information

- Pricing now input as price per unit weight of **metal**
- Input *via* **Project > Costs/Energy > Fuel/Chemical**
- \$ per kilogram metal for SI units
- \$ per pound metal for US units
- ***Not \$ per unit weight of metal salt or metal salt solution***

Parameter editor

Heating fuel/Chemical Costs | Calorific values of heating fuels | Density of liquid heating fuels

Parameters

Name	Default	Value
Methanol [\$/L]	0.4400	0.4400
Ferric chloride [\$/kg Fe]	1.1700	1.1700
Ferric sulfate [\$/kg Fe]	0.7900	0.7900
Ferrous chloride [\$/kg Fe]	0.6100	0.6100
Ferrous sulfate [\$/kg Fe]	2.3700	2.3700
Aluminum sulfate [\$/kg Al]	1.6900	1.6900
Aluminum chloride [\$/kg Al]	1.9800	1.9800
Poly Aluminum Chloride (PAC) [\$/kg Al]	1.1700	1.1700
Natural gas [\$/GJ]	3.0000	3.0000
Heating oil [\$/L]	0.5000	0.5000
Diesel [\$/L]	0.7000	0.7000
Custom fuel [\$/L]	1.0000	1.0000

Note: If digester gas (Biogas) is not used for CHP it can be sold (if used for heating any excess can be sold) at the price specified above

Print all | Set current tab to default values | OK | Cancel

Parameter editor

Heating fuel/Chemical Costs | Calorific values of heating fuels | Density of liquid heating fuels

Parameters

Name	Default	Value
Methanol [\$/gal]	1.6656	1.6656
Ferric chloride [\$/lb Fe]	0.5307	0.5307
Ferric sulfate [\$/lb Fe]	0.3583	0.3583
Ferrous chloride [\$/lb Fe]	0.2767	0.2767
Ferrous sulfate [\$/lb Fe]	1.0750	1.0750
Aluminum sulfate [\$/lb Al]	0.7666	0.7666
Aluminum chloride [\$/lb Al]	0.8981	0.8981
Poly Aluminum Chloride (PAC) [\$/lb Al]	0.5307	0.5307
Natural gas [\$/MMBTU]	3.1652	3.1652
Heating oil [\$/gal]	1.8927	1.8927
Diesel [\$/gal]	2.6498	2.6498
Custom fuel [\$/gal]	3.7854	3.7854

Note: If digester gas (Biogas) is not used for CHP it can be sold (if used for heating any excess can be sold) at the price specified above

Print all | Set current tab to default values | OK | Cancel

# Metal Salt Dialogue Improvements

- Cost per unit volume of actual input solution is displayed in input dialogue
- Based on input price of pure solution under **Project > Costs/Energy > Fuel/Chemical**, pure solution density under **Project > Parameters > Physical/Chemical > Metal salt solution densities**, and strength of input solution
- Additional clarification notes provided (*e.g.* basis for metal salt chemical composition with or without waters of hydration)

Influent

Edit Influent

Name	Value
Flow	250
Ferric [mg Fe/L]	1.50000E+5

Cost of solution : 0.66 \$/gal

Note: Calculations based on anhydrous formula FeCl<sub>3</sub>

Fe concentration as

☒ Ferric Chloride as mg Fe / L

☐ Ferric Chloride as mg FeCl<sub>3</sub> / L

☐ Ferric Chloride as % FeCl<sub>3</sub> by wt.

Flow units

☐ m<sup>3</sup>/d ☐ m<sup>3</sup>/hr ☐ L/d ☐ ML/d ☐ mgd ☒ gal/d

Close

Influent

Edit Influent

Name	Value
Flow	250
Aluminum [mg Al/L]	6.56750E+4

Cost of solution : 0.29 \$/gal

Note: BioWin does not automatically change the Al concentration when switching between PAC and ACH. The user must change the Al concentration accordingly.

Al concentration as

☒ PAC/ACH as mg Al / L

☐ PAC/ACH as mg Al<sub>2</sub>(OH)<sub>n</sub>Cl<sub>(6-n)</sub> / L

where n = 3

For PAC (Al<sub>2</sub>OH<sub>3</sub>Cl<sub>3</sub>), specify n = 3;  
for ACH (Al<sub>2</sub>OH<sub>5</sub>Cl), specify n = 5.

Flow units

☐ m<sup>3</sup>/d ☐ m<sup>3</sup>/hr ☐ L/d ☐ ML/d ☐ mgd ☒ gal/d

Close



# Project Location and Currency Exchange Rates

- Location of project can now be specified *via* **Project > Info**
- Ensures proper currency conversion rates *versus* the US dollar for costing calculations
- Currency exchange rates can now be edited / set directly within BioWin using the **Set exchange rate to** button; editing of external *.ini* files no longer required

Project

Project information

Creation date: Friday, January 24, 2003 12:00:00 AM

Last saved: 4/27/2020 1:59:50 PM

Simulation start date: Friday, February 10, 2017 12:00:00 AM

User name: Remote user

Project name: An Example

Project ref.: Exampleville WWTP

Plant name: Example Plant

Project country setting: Windows Country or Region setting Exchange rate

Windows Country or Region setting

AD=Andorra

AE=United Arab Emirates

AF=Afghanistan

AG=Antigua and Barbuda

AI=Anguilla

AL=Albania

AM=Armenia

Close

Exchange rate

Country setting : US : United States of America

Exchange rate \$ 1.0 = US\$1

CA 1.3999 Canada

CA : Set exchange rate to 1.3999 = US\$1

Close

# Upper / Lower Flow Split Bounds

- Applicable for any flow-splitting element that can be flow-paced based on an influent element
- Splitters, primary and secondary clarifiers, dewatering units, MBRs, grit tanks, cyclones, *etc.*
- Useful for modelling pumping limitations (*e.g.* upper and/or lower limits on RAS flow pacing)

**Editing Sec Settler**

Dimensions | Operation | **Flow split** | Power | Model | Tags | Monitor items

**Conventional**

**Split method**

☒ Ratio [U/O]  m3/d

☒ Fraction [U / (U+O)]

☒ Underflow [U]

☒ Constant

**Notes**  
If flow paced is selected, a percentage and an influent stream must be specified.

**Flow pacing**

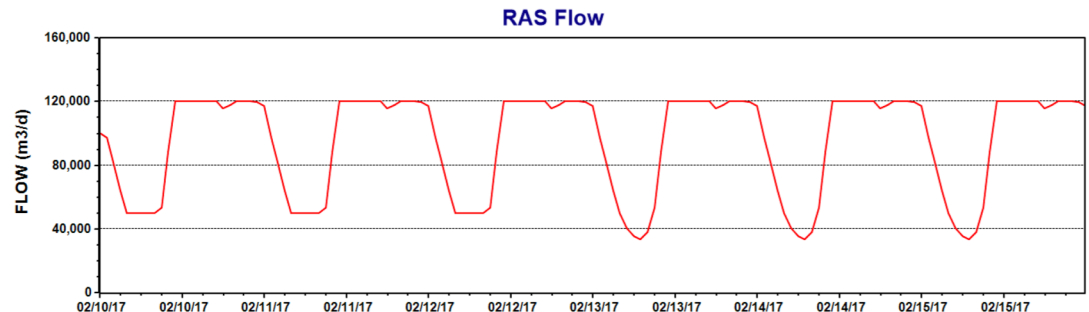
☒ Paced at  % of

**Constrain underflow rate**

☒ Bound flows

Minimum flow rate  Maximum flow rate

**Press F1 for help**



# Swing Zone Setting

- Bioreactor-type elements can be designated as “swing zones” if there is on/off aeration if they are set as *unaerated*
- This setting allows input of diffuser coverage even if zone is set as unaerated (this was not possible in previous BioWin versions)
- The element can display the number of diffusers in tables and this information also is available to BioWin Controller
- Allows for proper implementation of BioWin Controller’s air distribution tool in aeration control strategy simulations involving swing zones

Editing Bioreactor - Model Builder

Dimensions | Operation | Outflow | Initial values | Power | Model | Tags | Monitor items

Specify aeration method

☐ DO setpoint

☐ Air flow rate

☒ Un-aerated ☒ Swing zone

Diffusers

☒ Density (%) 10.00

☐ ATAD

☐ Number of diffusers

Air flow rate constraints

☐ Minimum air flow rate of

☐ Maximum air flow rate of

Note: Constraints only applied for dynamic simulations. For steady state alarms are generated

Local temperature

Temperature

☒ Constant value of 20.0 (deg. C)

☐ Scheduled Pattern...

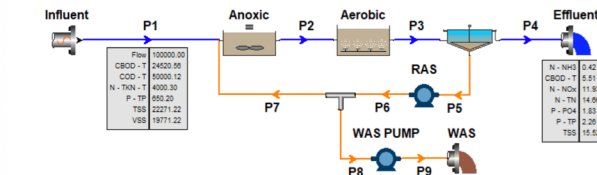
Press F1 for help

OK Cancel

# Report to Excel Refinements

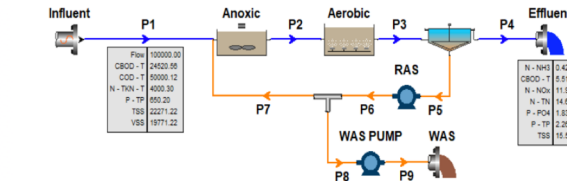
- If multiple unmerged templates are used in report creation, each output report can be saved with unique name/location
- Color has been added to default mass balance tables
- State variable table is now available (default table excludes pipe elements but these can be added through use of filtering)
- AlphaF, Beta, and Diffuser Density now available for bioreactor-type elements

BioWin Mass Balance Summary



PARAMETER	UNITS	P1	P2	P3	P4	P5	P6	P7	P8	P9
FLOW	m3/d	100,000.0	196,570.0	196,570.0	96,570.0	100,000.0	100,000.0	96,570.0	3,430.0	3,430.0
COD	kg/d	50,000	534,401	511,678	4,316	507,362	489,960	17,403	17,403	17,403
BOD	kg/d	345	731	695	6	1,281	1,281	1,281	1,281	1,281
TSS	kg/d	24,521	143,982	128,674	532	128,142	123,747	4,395	4,395	4,395
VSS	kg/d	223	2,334	2,287	16	4,481	4,481	4,481	4,481	4,481
TKN	kg/d	22,271	458,834	449,613	1,496	448,115	448,115	432,744	15,370	15,370
NH <sub>4</sub> -N	kg/d	198	1,842	1,778	12	3,483	3,483	3,483	3,483	3,483
NO <sub>3</sub> -N	kg/d	4,000	29,347	26,422	264	26,159	26,159	25,262	897	897
TP	kg/d	26	15	0	0	0	0	0	0	0
PO <sub>4</sub> -P	kg/d	2,640	3,035	82	40	42	42	1	1	1
Flow	m3/d	0	0	12	12	12	12	12	12	12
Flow	m3/d	0	4	2,345	1,152	1,193	1,152	41	41	41
Flow	m3/d	7	96	65	2	126	126	126	126	126
Flow	m3/d	650	12,803	12,803	219	12,585	12,585	12,153	432	432
Flow	m3/d	3.25	6.34	1.83	1.83	1.83	1.83	1.83	1.83	1.83
Flow	m3/d	325	1,226	360	177	183	177	6	6	6

BioWin Overall Element State Variable Summary

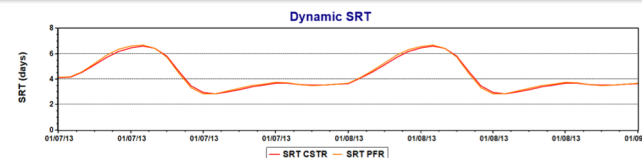
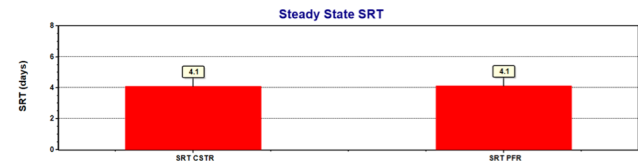
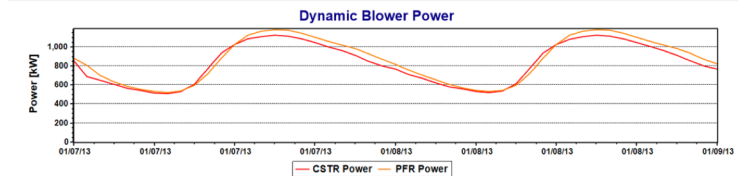
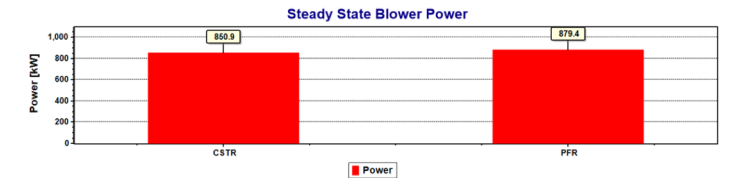
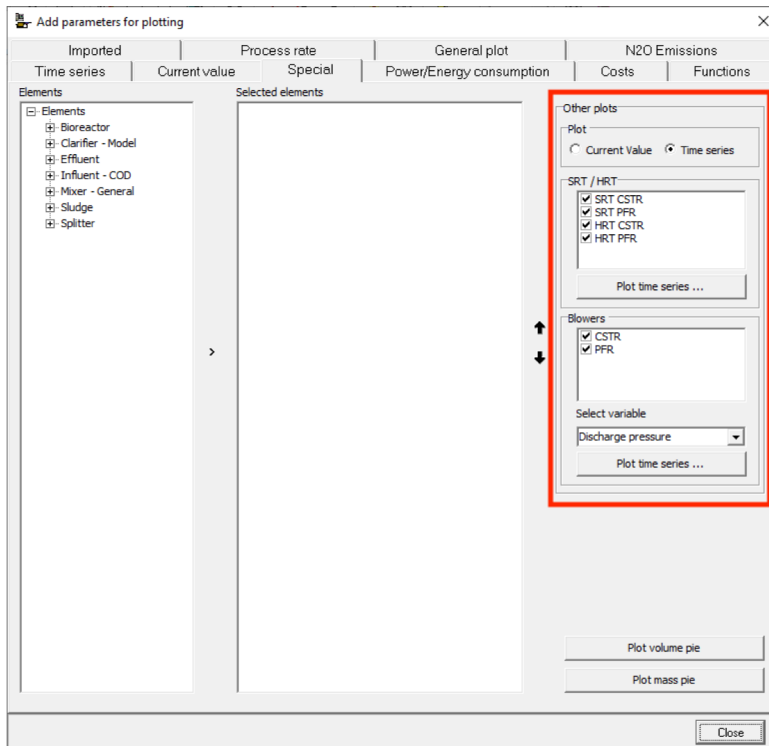


State Variables by Element (O - Overflow; U - Underflow)

State Variable	Units	Anoxic	Anoxic	Effluent	Influent	RAS	Ses Settler	Ses Settler (U)	WAS
Sample Location		O	O	O	O	O	O	O	O
Flow	m3/d	196,570.00	196,570.00	196,570.00	100,000.00	100,000.00	100,000.00	100,000.00	3,430.00
Biomass - Aerobic methanogenic	mgCOD/L	0.11	0.05	0.05	0.05	0.05	0.05	0.05	0.18
Biomass - Aerobic acidifying	mgCOD/L	21.23	20.25	0.14	0.05	41.59	0.14	41.59	41.59
Biomass - Aerobic anaerobic acidifying	mgCOD/L	0.08	0.08	0.00	1.13	0.00	1.13	1.13	1.13
Biomass - Endogenous products	mgCOD/L	528.74	509.92	3.57	1,031.96	3.57	1,031.96	1,031.96	1,031.96
Biomass - Hydrogenotrophic methanogenic	mgCOD/L	0.02	0.05	0.00	0.04	0.00	0.04	0.04	0.04
Biomass - Methylophilic	mgCOD/L	0.45	0.48	0.00	0.05	0.89	0.00	0.89	0.89
Biomass - Nitrite oxidizing	mgCOD/L	12.89	12.40	0.09	0.09	25.45	0.09	25.45	25.45
Biomass - Ordinary heterotrophic	mgCOD/L	944.29	910.88	6.41	1,850.01	6.41	1,850.01	1,850.01	1,850.01
Biomass - Phosphorus accumulating	mgCOD/L	55.44	53.34	0.38	0.05	108.81	0.38	108.81	108.81
Biomass - Protonic autotrophic	mgCOD/L	0.11	0.13	0.00	0.00	0.21	0.00	0.21	0.21
Biomass - Sulfur oxidizing	mgCOD/L	54.21	54.21	0.38	0.05	115.17	0.38	115.17	115.17
Biomass - Sulfur reducing autotrophic	mgCOD/L	0.52	0.52	0.00	0.00	1.01	0.00	1.01	1.01
Biomass - Sulfur reducing heterotrophic	mgCOD/L	16.08	16.43	0.11	0.05	31.51	0.11	31.51	31.51
Biomass - Sulfur reducing propionic autotrophic	mgCOD/L	0.55	0.55	0.00	0.00	1.07	0.00	1.07	1.07
COD - Adsorbed hydrocarbon	mgCOD/L	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

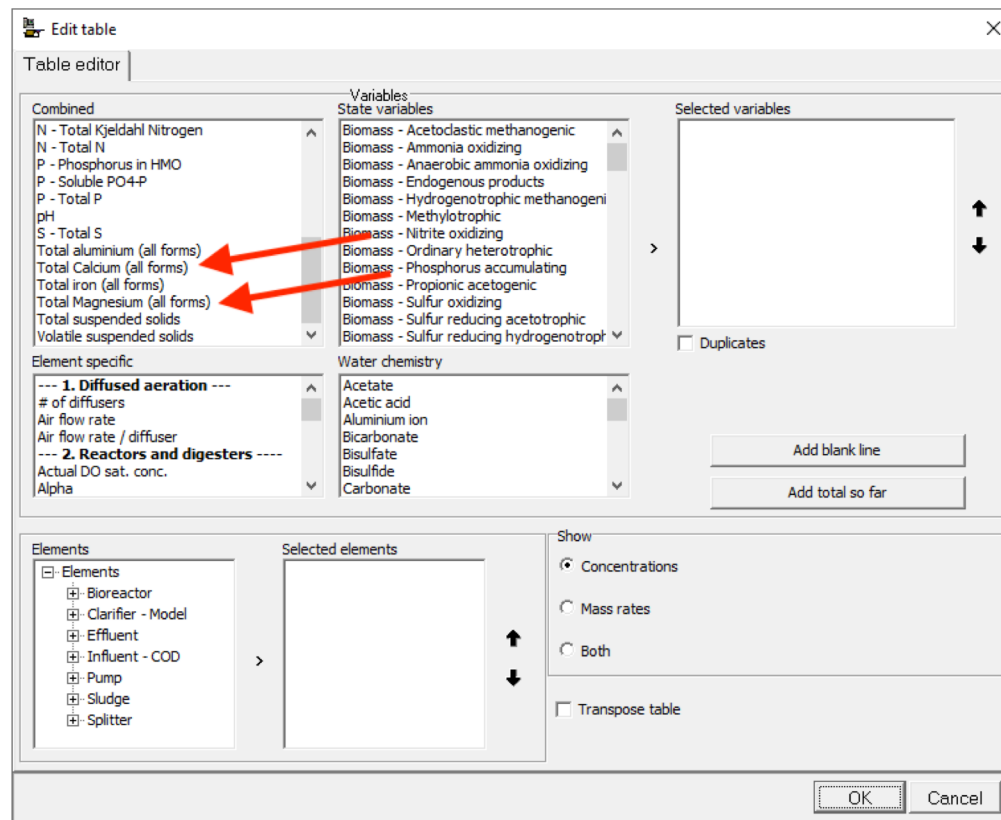
# Plotting Blower Group Information

- Variables of interest for blower groups (e.g. intake airflow, power requirement) can now be plotted in current value or time series charts *via* **Special** tab of **Add Series** dialogue
- Capability of SRT / HRT plotting has been expanded to allow for current value plots (only time series were available in previous versions of BioWin)



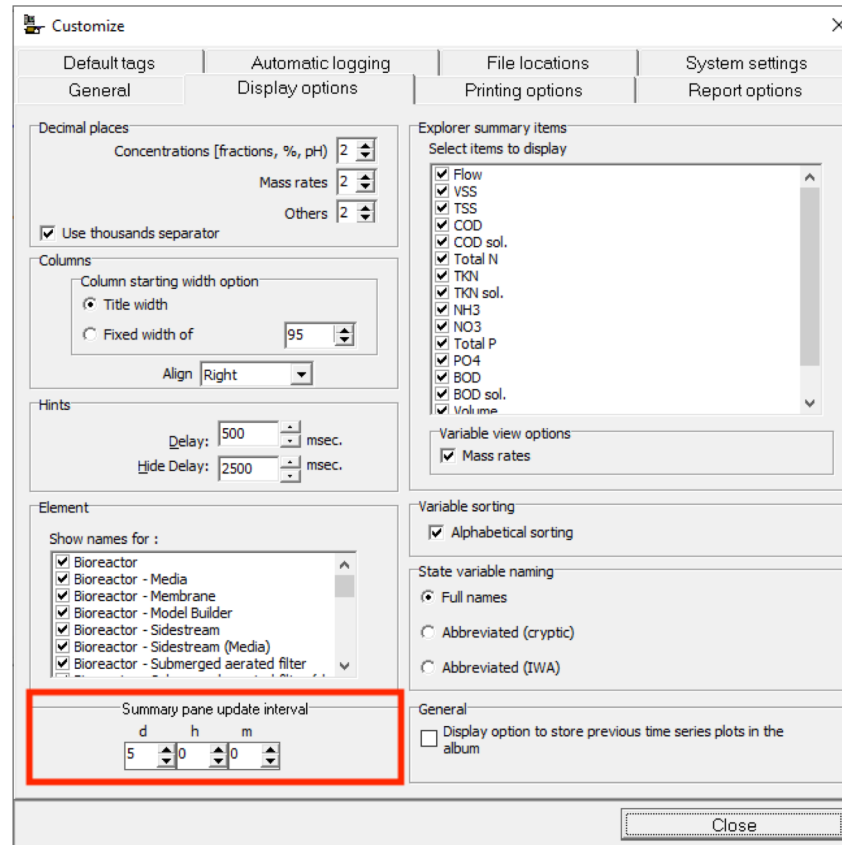
# New Variables

- Total Calcium and Total Magnesium available under Combined variables group for tables and charts
- Aids in overall mass balance-checking for nutrient recovery systems



# Screen Redraw Moved to Customize Settings

- Frequency of screen refresh / summary pane update moved to **Tools > Customize** dialogue
- Reduces screen “flicker” if drawing board tags are used



# Minor Bug Fixes

- User manual additions / corrections
- Spurious generation of pH alarm for variable volume bioreactors
- Error message when switching from DO setpoint to power supply schedule for surface-aerated bioreactors
- Equalization tank outflow is now available to BioWin Controller even if it is set to have constant volume in BioWin
- Fixed typo in process names of some HFO reduction processes in the stoichiometric matrix view
- Addressed an issue where values in cost summary tables were not adding up correctly
- Fixed a rounding issue with time values in flow split patterns



# Enjoy Using BioWin 6.1

[support@envirosim.com](mailto:support@envirosim.com)