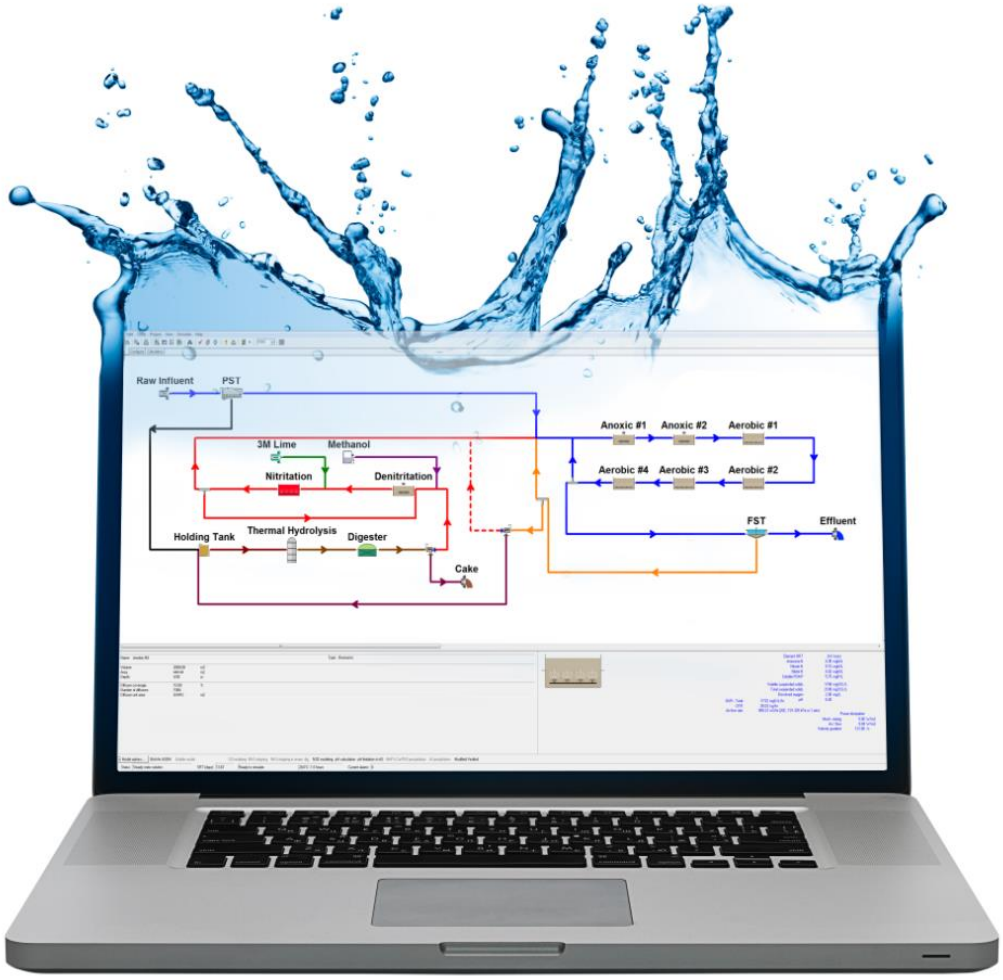
What's New in BioWin 6.3



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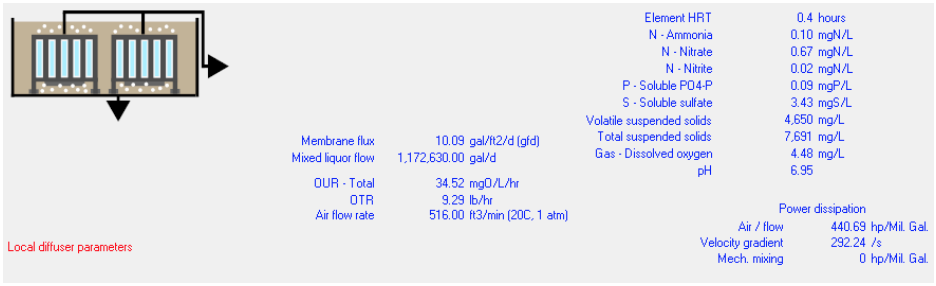
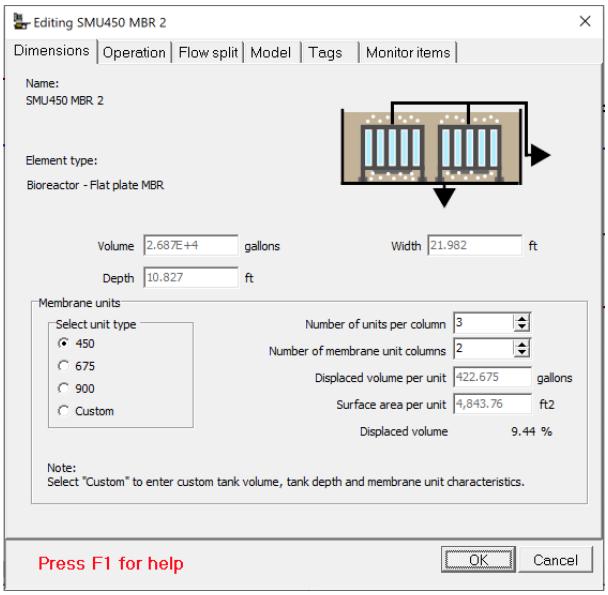
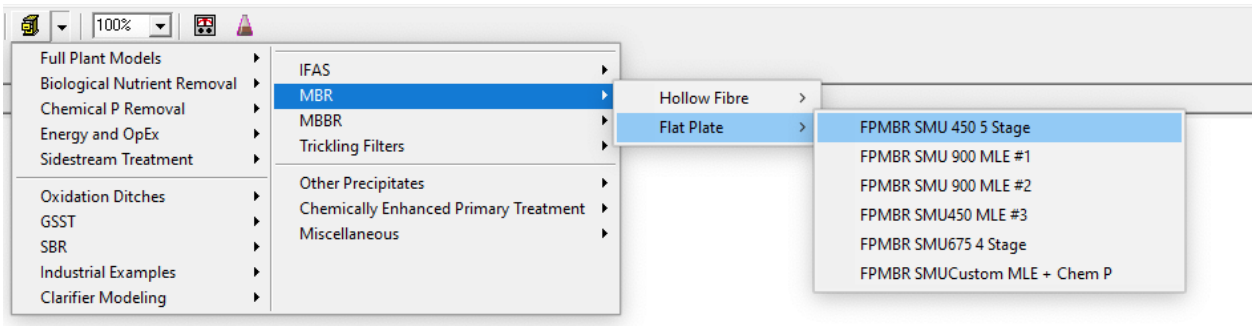
New Element – New Flat Plate Membrane Bioreactor



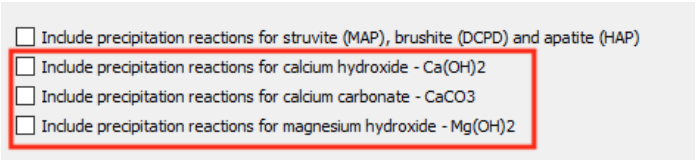


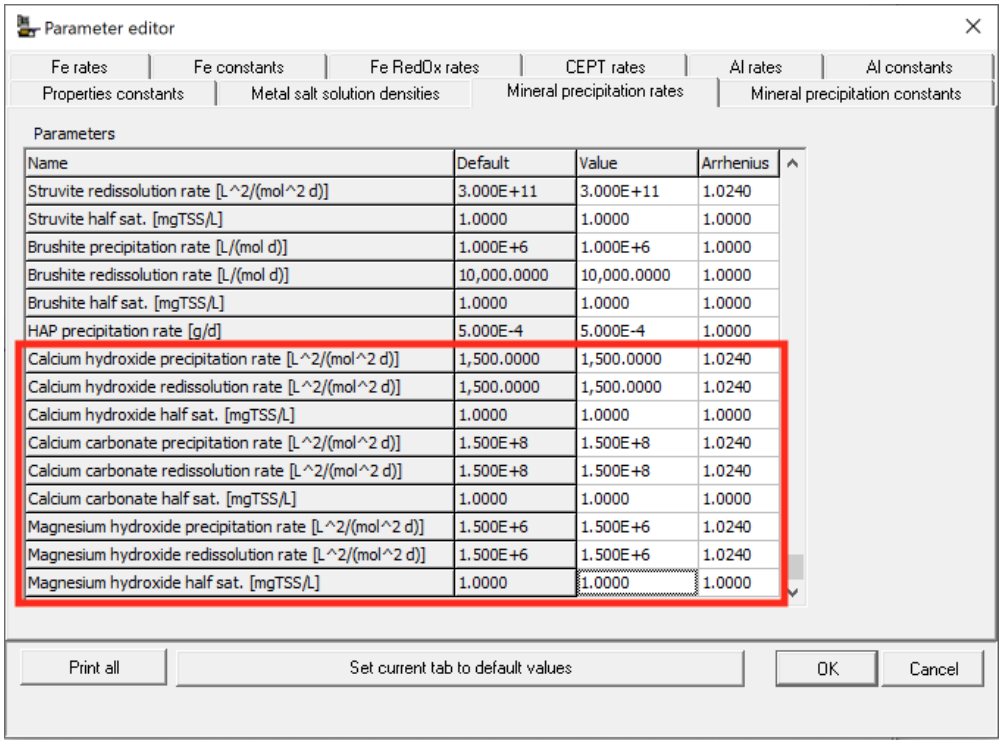
- New element for improved representation of flat plate MBR setup
- Provides pre-configured membrane units which automatically size the tank (a "custom" option is provided for complete flexibility)
- Additional method for specifying aeration (Air flow rate / membrane unit)
- Manufacturer guidelines followed for aeration transfer efficiency
- Several flat plate MBR process flowsheet examples included in BioWin 6.3 installation



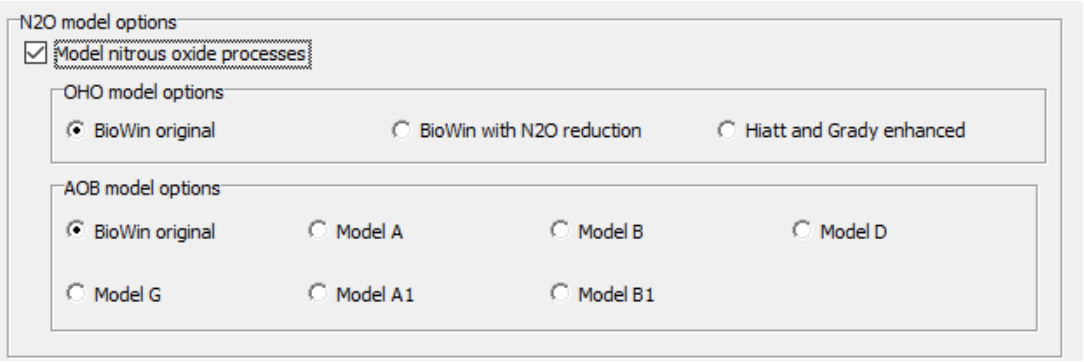
Model Update – New Precipitation Reactions

- Three new precipitate state variables added: calcium carbonate, calcium hydroxide, and magnesium hydroxide
- Twelve additional parameters (*e.g.* solubilities, rates)
- Improves modelling of addition of these compounds as slurries for supplemental alkalinity

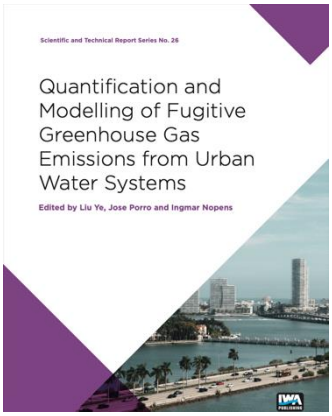


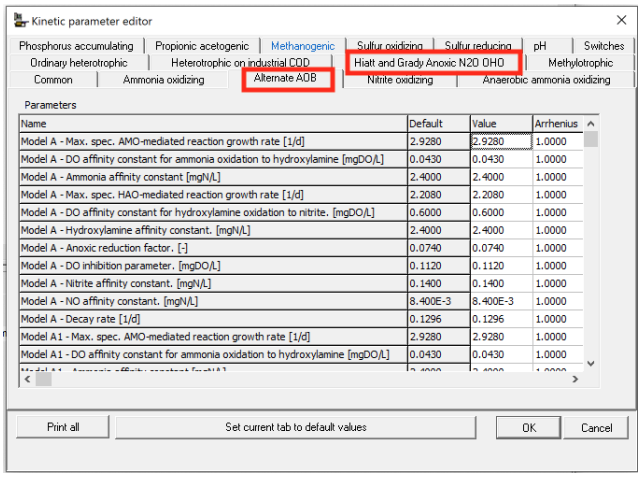


Model Update – Nitrous Oxide Modeling



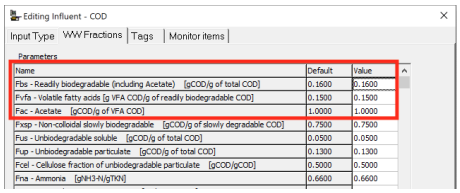
- Several options now available for nitrous oxide modeling
- For heterotrophic nitrous oxide modeling:
  1) Original BioWin model
  2) BioWin model incorporating N_2O reduction to N_2 in anoxic zones, using various substrates (*e.g.* soluble degradable COD, acetate, propionate) as electron donors.
  3) Hiatt and Grady model [Hiatt, W.C. and Grady, C.P.L. (2008). An Updated Process Model for Carbon Oxidation, Nitrification, and Denitrification. *Water Environment Research*; v80; n11; 2145-2156.]
- For autotrophic nitrous oxide modeling:
  1) Original BioWin
  2) Option to choose from several models described in the IWA STR No. 26 ***Quantification and Modelling of Fugitive Greenhouse Gas Emissions from Urban Water Systems***
- New state variables hydroxyl amine and nitric oxide included to accommodate optional nitrous oxide models

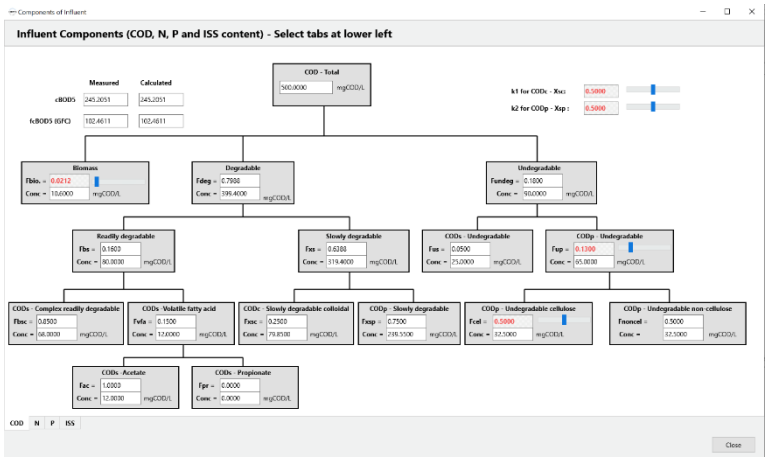




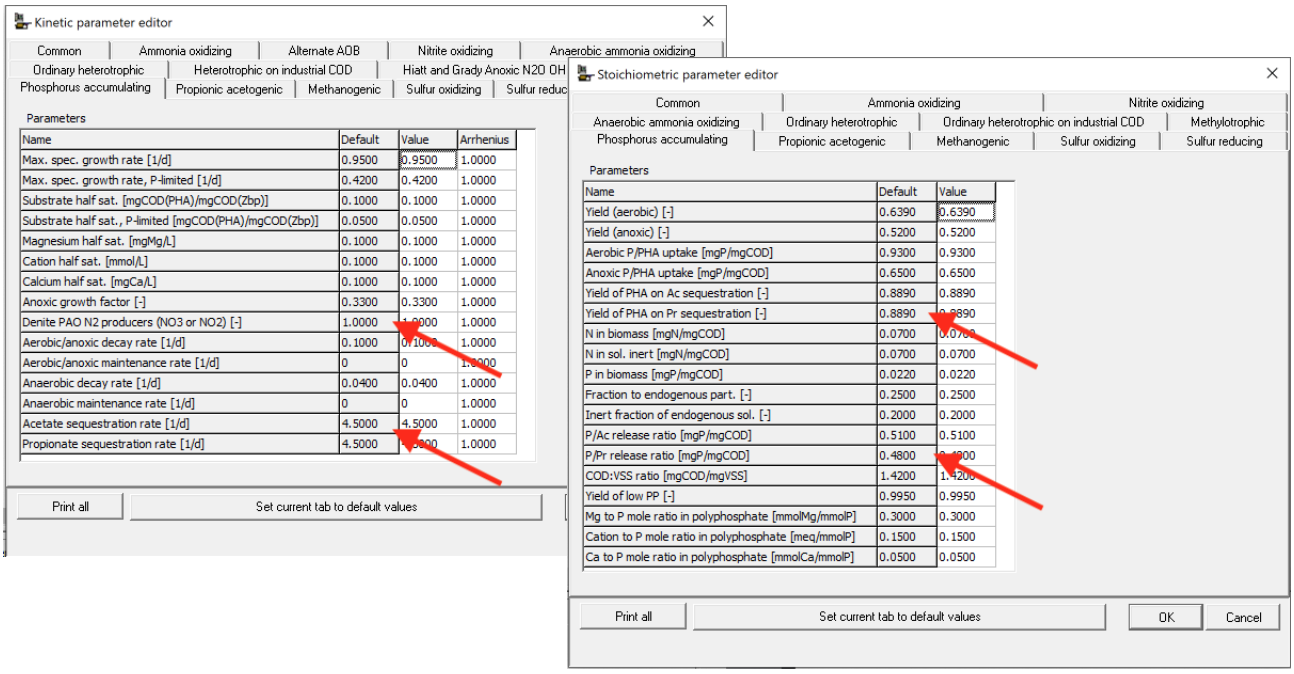
Model Update – Excess Biological Phosphorus Removal

- Influent VFA fraction of RBCOD with acetate and propionate sub-fractions improves influent characterization for EBPR modeling





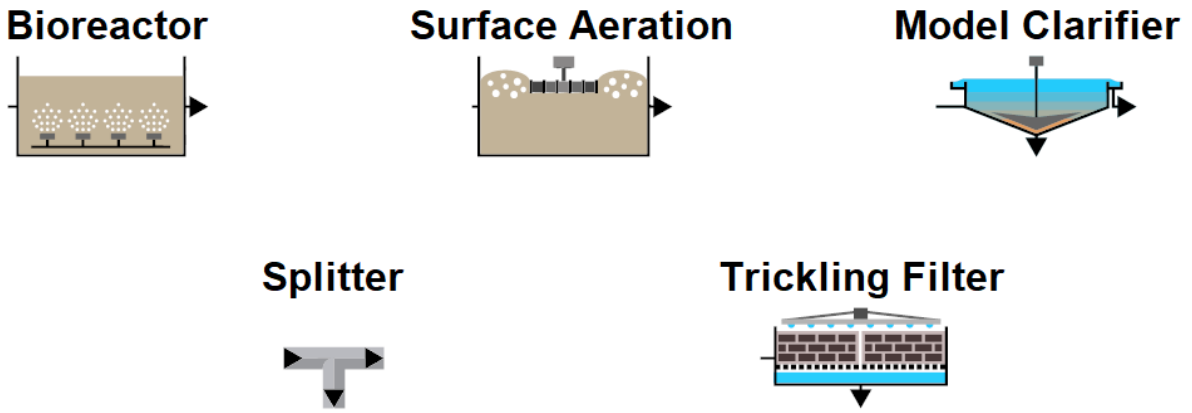
- Several refinements to EBPR model through changes to Phosphorus Accumulating Organism (PAO) kinetics and stoichiometry, including:
  - PAOs now have their own parameter for specifying complete or partial denitrification (previously used the same value as specified for OHOs)
  - Separate acetate and propionate sequestration rates (previously one rate was used for both)
  - Separate PHA yield on PAO propionate sequestration
  - PAOs now have a distinct P release ratio on propionate sequestration



Usability Improvements

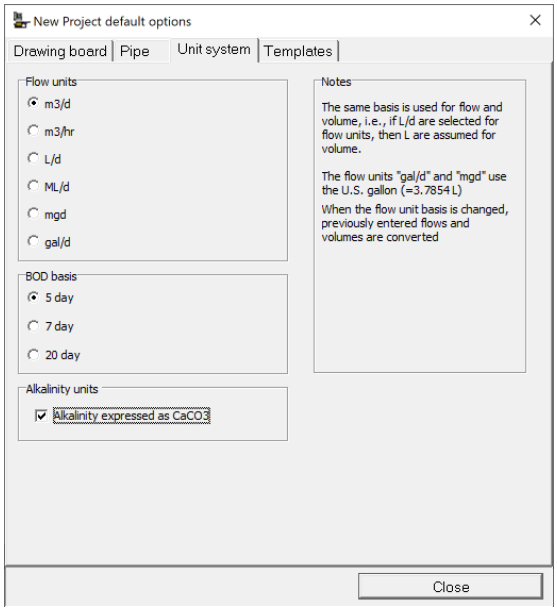
New Flowsheet Images

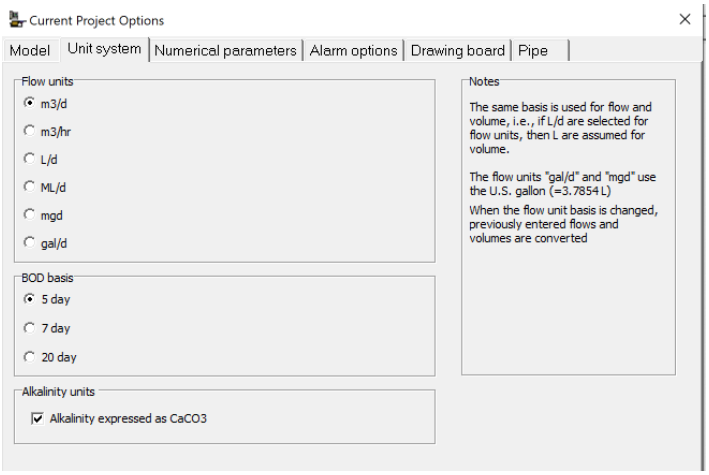
Arrows have been added to all element flowsheet images to help clarify the direction of flow. This will be particularly helpful when constructing new flowsheets, especially for new BioWin users! The element flowsheet images have also been refreshed for a more modern (yet familiar) look and feel.



Input Alkalinity as $CaCO_3$

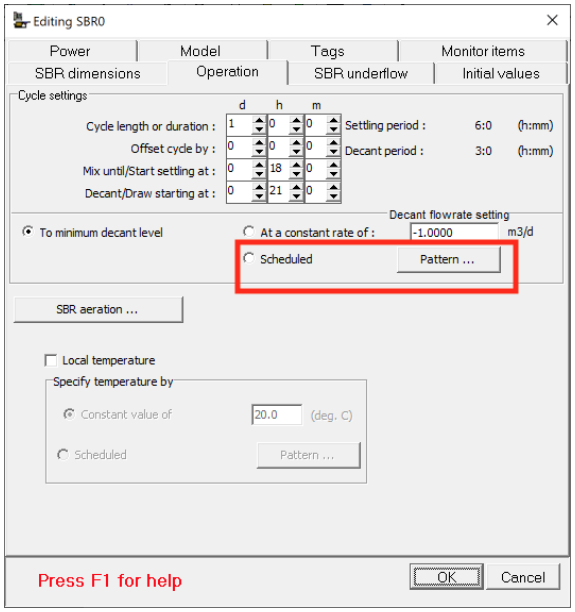
You can now choose between the traditional method of inputting alkalinity to models (*i.e.* in units of mmol ALK/L) or inputting alkalinity in units of mg $CaCO_3$/L. Like other unit basis settings, this can be a new project default and a project-specific setting.





SBR Operation

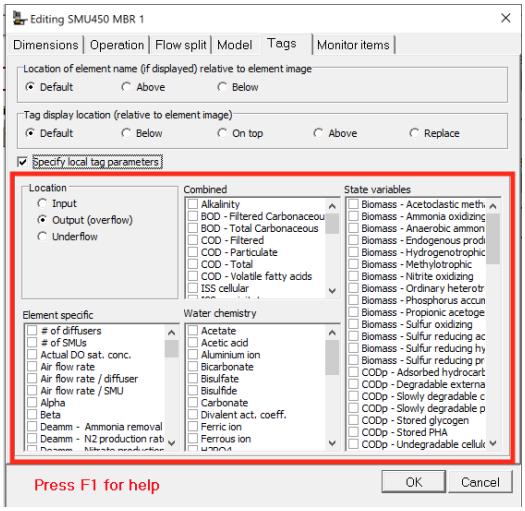
Two changes have been made to further enhance sequencing batch reactor (SBR) simulations. First, it is now possible to have a time-varying decant flow pattern (previously only a constant decant flow rate was possible):



Second, it is now possible to have BioWin Controller (a) manipulate the decant flow rate, and (b) change an SBR's operation mode (*e.g.* mix / settle). Two SBR control examples now ship with BioWin Controller, and the steps for setting up these examples are contained in the BWC manual.

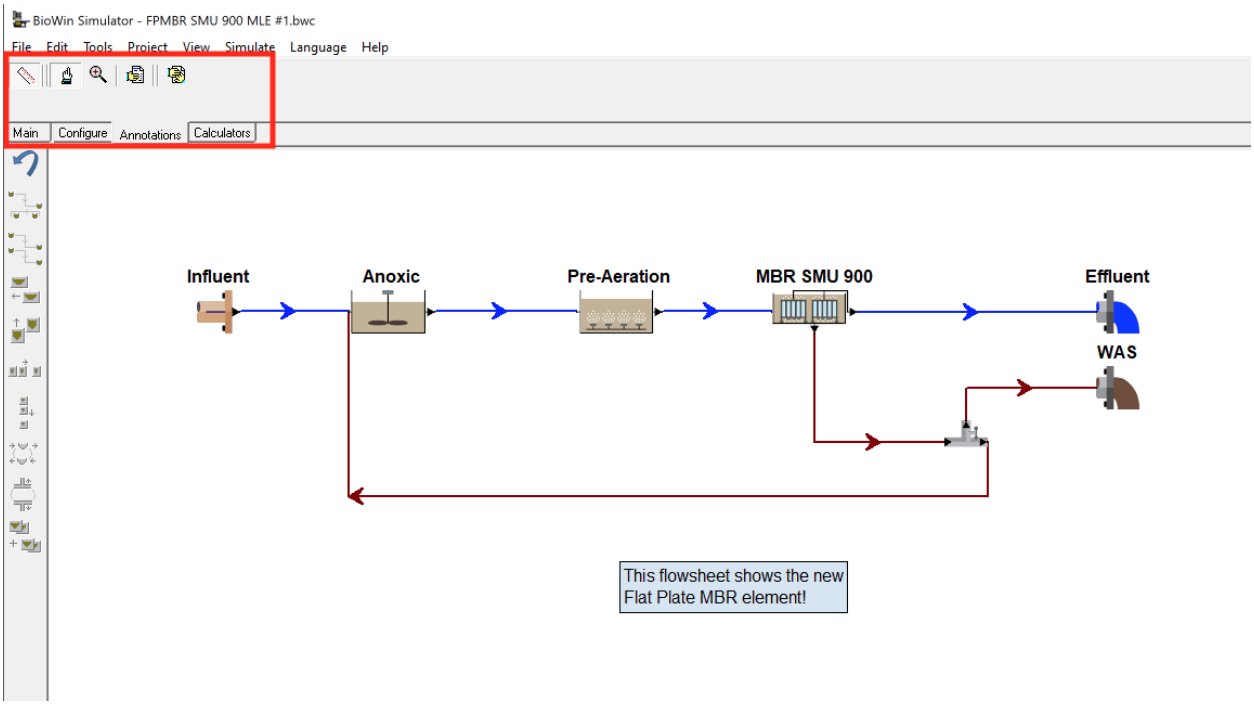
Tag and Initial Values Variable Sorting

All variables available to be added to flowsheet tags are now alphabetically sorted, so the variable lists look like they do elsewhere in BioWin (*e.g.* charting, Explorer, *etc.*). The initial values tab for SBRs, GSSTs, Anaerobic Digesters, Variable Volume Bioreactors, and Model Builders is also now alphabetically sorted for consistency.



Flowsheet Annotations

It is now possible to add text-box annotations to BioWin flowsheets! These are similar to flowsheet tags, but they can (a) contain any text you wish; (b) be located anywhere on a BioWin flowsheet, and; (c) all be toggled on/off using the controls on the Annotations toolbar:



Other Minor Improvements

- Total media area for media-type elements has been added as an element-specific variable so that it can be tabulated / charted and added to reports
- The allowable limits have been greatly expanded for several parameters, including the NOB ammonia inhibition term, anaerobic digester gas-liquid mass transfer parameters, and MABR membrane supply gas concentration ranges
- Improvements have been made to the steady state solver and its seeding algorithm
- Antoine equation parameters have been modified to better suit typical operating temperatures

Minor Bug Fixes

- User manual additions / corrections
- Fixed an issue where a biofilm volume alarm could be triggered in a media bioreactor where the media had been removed
- Fixed an issue where an empty transposed table in the album could cause a crash when adding a pipe to the flowsheet

What's Next....

EnviroSim is continuing to work on a variety of other modelling aspects, including:

- Changes to the hydrolysis formulation to better capture behaviour observed in fermentation zones under certain conditions
- Further refinements to precipitation modelling, *e.g.* allowing a fraction of species such as $CaCO_3$ to be small enough to be considered soluble / colloidal