



CADSIMulator

CADSIM PLUS PROCESS SIMULATION NEWS

VOLUME 8, ISSUE 1

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Intelligent Energy Solutions Can Save Your Company Money

Aurel has been working on intelligent energy solutions for several years. It is becoming increasingly important to monitor and control energy usage, not only to reduce costs and increase revenues, but also to reduce a plant's environmental footprint.

Plant information systems can provide easy access to live and historical data that can be used as the basis for enhanced decision making at both the operational and managerial levels, leading to more efficient energy utilization.

However, process data is routinely found to be inaccurate or incomplete due to the inherent limitations of measurement instruments, poor accuracy due to maintenance issues, and the lack of installed measurements in key areas. These problems hinder effective evaluation, monitoring and management of energy usage, and can invalidate energy optimization decisions at all levels.

Aurel's Dynamic Data Reconciliation (DDR) is a corner stone technology that can be used to track a process in real time, reduce measurement errors in data, accurately calculate unmeasured variables, report and monitor energy Key Performance Indicators (KPIs) and identify inaccurate

measurements for maintenance. Trusted process data provides improved decision making and better process and KPI monitoring.

In addition, DDR can be used for better data mining

"...turns noisy and erroneous process data into actionable knowledge..."

and future prediction. It can also be used to initialize a simulation model that can be useful for process optimization, rating and selection of process operating strategies, perform intelligent control and for process troubleshooting.

Better tools facilitate better decision making

The CADSIM Plus process simulator and associated tools can be used to evaluate energy saving ideas prior to implementation. They can handle all process complexities and operating strategies plant-wide with verifiable results. They can perform Pinch Analysis. They can turn noisy and erroneous process data into actionable knowledge and improve decision-making by providing reliable energy monitoring and reporting.

Aurel's intelligent energy solutions have been

used to produce overall (as well as process area-specific) real-time energy costs and other operational KPI calculations that are based on reconciled process data. In addition, it is possible to offer real-time monitoring and management of plant natural gas, steam and electrical power meters and to reconcile these with external billing measurements.

One of the more interesting opportunities that can result from advanced energy management is the potential for larger industrial operations (such as pulp mills) to generate some of their own electricity, either for their own use or for sale back to power providers.

One way that this could be done is to route excess steam to a turbo generator. But this can raise many operational issues, such as balancing supply and demand, scheduled and unscheduled equipment shutdowns, compliance with electrical utility generation and supply contracts, load scheduling, optimizing fuel choices (where a choice of fuel is available to the plant) and in multi-tiered electrical rate

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(*Energy Solutions: continued from page 1*) scenarios, deciding when it is most beneficial to make, buy or sell electricity.

When all of the variables are considered, it quickly becomes clear that complex energy management scenarios require advanced tools to augment operational decision making and to optimize financial returns.

Typical operational questions that an intelligent energy solution can help answer include:

- What is the best way to run our boilers and generators?
- Should we buy or sell power?
- What is the best way to load schedule heavy users such as thermo mechanical pulping (TMP)?

- Would it be economically beneficial to burn more natural gas during a specified rate period to produce more electrical power?
- What is the optimum steam supply path at any given time?
- Should we buy power during a specified rate period in order to avoid a peak rate?
- How can we monitor and evaluate energy savings projects?

“...when is it most beneficial to make, buy or sell electricity...”

An on-line Operator Assistant

CADSIM Plus based tools can also be used in real time as an On-line Op-

erator Assistant (OOA) to reduce operator variability, by facilitating live process optimization, future prediction and multivariate data analysis. This requires a simulation model that provides a solid first-principles basis. The model must be initialized with current reconciled data. It can then be run many times while varying a number of parameters, rating the various outcomes to predict future conditions and/or recommend the best choice of operating parameters.

A semi-automated tool like this would run on a separate PC, providing operators with advanced warning of potential process problems and providing more efficient operating parameters.



Aurel Joins BC Hydro Power Smart Alliance

Aurel is pleased to announce that we have recently been accepted as a BC Hydro *Power Smart Alliance* member, in the *Industrial Consultant / Registered Expert* category.

What this means is that Aurel Systems can now offer advanced Dynamic Data Reconciliation (DDR) based tools and energy management services to BC Hydro's industrial customers, who may be eligible for project funding under BC Hydro's *Power Smart* programs and incentives.

BC Hydro has registered Aurel to provide tools and assistance in the following categories: Energy Monitoring, Energy Reporting, Energy Optimization, Mechanical Pulping, Process Control, Heat Recovery Systems and Power Generation.

BC Hydro's *Power Smart* program is a world leader in promoting conservation and efficiency, through increasing public awareness, educating customers on conservation actions, and offering incentives and rebates to promote the use of energy efficient products and technologies.

Power Smart achieves significant energy savings, which reduce the need to develop new energy sources or to purchase energy at market rates from other sources. British Columbia's

Clean Energy Act calls for BC Hydro to meet 66 per cent of future incremental power demand through conservation and energy efficiency by the year 2020.

Funding available for BC companies

Power Smart (bchydro.com/powersmart) offers programs to help businesses realize the benefits of energy saving measures. Whether your business is a small processing plant or a large pulp and paper mill, *Power Smart* can help you save energy and money.

BC Hydro has created a range of funding opportunities and expert resources to help your company increase profitability and take complete control of energy usage.

The *Power Smart Alliance* (Alliance) is a dynamic network of independent professionals who assist BC Hydro customers in finding and implementing energy efficiency solutions.

Started in 2002, the Alliance was originally formed as a resource for BC Hydro customers looking for firms that provided energy efficiency-related services.

Over the last decade, the scope of

the Alliance has expanded to support *Power Smart* initiatives designed for both the commercial and industrial sectors. *Power Smart* staff work closely with industry to develop and implement initiatives that not only support customers' needs, but also make energy efficient solutions an attractive option.

A great opportunity to help clients get more from their energy dollars

“We are really excited about this *Power Smart Alliance* opportunity”, said Mohamad Masudy, Aurel's manager of Industrial Solutions.

“We are now able to offer our expertise to our engineering consulting and our industrial clients by providing expert simulation modeling and process optimization tools and services.”

“Aurel is well positioned to offer any level of assistance. We can help in the creation of a steady-state and advanced dynamic plant-wide process models, configure Dynamic Data Reconciliation to run on top of those models and help to define and create optimization and reporting tools that use these models as their basis.”



Tech Corner: Using the New Compound Editor

The Compound Editor is a new feature in CADSIM Plus v2.6. It allows you to perform two related functions: creating a new user-defined chemical compound for use in CADSIM Plus, or overriding one or more properties of an existing CADSIM Plus compound. The compound editor replaces the previous physical properties override mechanism that was introduced with CADSIM Plus v2.4.

The Compound Editor is invoked from the Stream Definition (SDEF) Wizard, where you can select and edit the properties of an existing compound, or create a new compound. The Compound Editor allows you to name your new compound, specify its molecular formula, (optionally) base its chemical properties on another existing compound and choose which categories the new compound will appear under (such as liquids, gases, etc.) in the SDEF wizard.

Once the basic information for the new compound has been established, you can click on the individual property tabs to enter your own chemical properties data. Or, you can choose to use the specified property of another known compound on a per-property basis. Note that if you decide not to explicitly select data for each of the available properties, those properties that are not set up will use the properties of some default compound (eg. water is the default for liquids in water-based streams, and methane is the default for liquids in HyProc streams).

Some chemical properties may be described by a simple constant value, while others may require a choice of one of several supported equation types. Supported equation types include Shomate, Polynomial, Yaws Antoine and Rational. Note that some properties, such as Vapor Pressure, require data to be in a specific format, such as the three coefficient Antoine equation.

Specific properties may require additional information. For example, much of the available chemical properties data is only valid within a specified (tested) temperature or pres-

sure range. Setting this range on a property page will prevent CADSIM Plus from doing something that is unpredictable, if the compound is used outside of that range. However, you need to be aware that property data that is used outside of its range will produce less accurate simulation results.

It is important to set up test models to insure that the results of your properties customizations meet your expectations. One useful method of inspecting custom properties, is to use the PROPERTIES module in your test drawing, which exposes the current data for each chemical property of the selected compound using current stream conditions. Sometimes recorreleating the data (eg. from polynomial to rational) can allow the range of accuracy to be significantly expanded.

Chemical property data can be obtained from several different sources. You may have assay lab data from your own research or from a university or research organization. Or you may wish to purchase data from an organization such as DECHEMA, which provides online access to thermophysical property data for about 36,500 compounds and 124,000 mixtures. There are many other sources of properties data available on the web and in reference books.

The Compound Editor automatically stores your customized compound data in the current CADSIM drawing file. Compound data is shared between all stream definitions in the drawing, meaning that if you override the boiling point rise of water, it will have the same effect in all of the stream definitions in your current drawing/model.

There is also a report mechanism built into the Compound Editor, that allows you to generate a report of all of the customized compound properties in your model.

You can also export customized properties data to an external XML formatted data file, which can then be imported into other CADSIM Plus drawings, allowing you to reuse the data in other CADSIM Plus models.

The Compound Editor allows you to create comprehensive compound properties, or to simply create aliases to existing compounds. The choice is yours.

Compound Properties

FPD | Gf | Hc | Hf | IVC | Ip | kH | NRTL | Pc
 Pv | Tc | Vc | Valence | Viscosity | Wilson
 Overview | Ac | Bp | BPR | Cp | Density | Dielectric Factor

Compound Overview

Name
 Name: MY_COMPOUND

This Compound Uses
 One or more user-defined properties [Change]

Compound Usage
 Use In This Stream (Only) With Default Properties
 Create For All Streams
 Use Stream Default Molecular Weight
 Set Molecular Formula: CH4

Categories
 Gas Aqueous
 Liquid Organic
 Fiber Inorganic
 Suspended Solid HyProc Stream
 Ion

Enter a unique name for your compound. Default properties are used when no user-defined properties are entered. A molecular formula is required for all user created compounds. Choose the categories in which you want your compound to appear in the SDEF wizard.

Finish Reset Properties Cancel Report Help

Editing properties of MY_COMPOUND

Compound Properties

Pv | Tc | Vc | Valence | Viscosity | Wilson
 FPD | Gf | Hc | Hf | IVC | Ip | kH | NRTL | Pc
 Overview | Ac | Bp | BPR | Cp | Density | Dielectric Factor

Heat Capacity - Cp (J/gmol/K)

Property Type
 Use Stream Defaults
 Use Property of []
 Equation: Polynomial

Selected Phase
 Phase: liquid

Polynomial
 property = a + bT + cT² + dT³ + eT⁴ Temperature Range

a: -0.018 Min: 92
 b: 1.1982 Max: 172
 c: -0.0098722
 d: 3.167E-5
 e: 0

Enthalpy/Entropy Offsets
 S_H: 0 S_S: 0

Where T = temperature in Kelvin

Cp is required to calculate Specific Enthalpy (S_H) and Specific Entropy (S_S) which are used in energy and thermodynamic calculations. Cp is used for energy balances and heat of combustion calculation for fuels.

Finish Reset Property Cancel Report Help

Editing properties of MY_COMPOUND



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CADSIM PLUS

Did you know...?

You can troubleshoot changes that you have made to your steady-state model by loading a Startup file that was generated from a previously stable version of the model. Load the Startup file when you enter simulation mode, run the current simulation until it settles into new values and then click on a stream or unit to show those current values. Now click the checkbox beside Show Startup Values. You can now review the old and new values side-by-side in the runtime information dialog box.

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Rollout of New CADSIM Plus Features

CADSIM Plus v2.6 (Available Now)

- New User-created Compound and Chemical Property Editor
- New Kalman & Haar Wavelet filters for data reconciliation
- Improved Tank unit can now perform chemical reactions
- New Recycle and Tracker units
- New Winn-Underwood-Gilliland shortcut distillation column unit for optional HyProc library
- Added 1500 compounds to optional HyProc properties database
- New CADSIM Process Optimization Manager

CADSIM Plus v2.7 (Orders Being Taken)

- Improved chemical reactions mechanism allows multiple reactions to be contained in a single specification icon that is placed on the unit to eliminate specification clutter from drawings. Also, reactions are presented to users as equations that can be edited. Selected process units can now suggest typical reactions based on current stream variables.
- New Cooling Tower unit in Standard Library
- New Boiler module with efficiency calculations in optional Power Library
- New Statistics module can be used to calculate statistics and histogram data
- New Pulper, Dryer, O2 Delignification, D Bleaching Stage, EoP Stage and E Stage units in optional Fiber Library
- New optional Mineral Processing Library - initial modules will include Leaching, Purification and Electrowinning of Zinc (Mineral Library expected to be released in 2013)
- Improvements allow user-configurable variables to track grade change transitions in High Density Storage unit.

Aurel Systems is pleased to announce two new additions to our professional services staff:



Mohamad Masudy has 25 years experience in process optimization with wide-ranging expertise in process design, cost reductions, process and production enhancements. Mohamad is heading up our industrial process solutions and related client services.



Michael Borghardt comes to us with almost 20 years of experience as a senior software developer and is an acknowledged C++ programming expert. While Michael's primary responsibilities will be maintaining the CADSIM Plus platform software, he will also be made available to Aurel clients for the development of specialized on-line adaptations of CADSIM Plus data reconciliation, optimization and training applications.