Sigmafine 4.3

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The issues with data validation

- Too much data
  - Thousands of data points
- Too many sources
  - Lab systems, DCS, manual entry
- Too many interactions
  - Transfers, flows, measurements
- Not much time…

Bad measurement problems

- Poor estimation of key performance indicators
- Unaccounted valuable material loss
- Inconsistent information across the enterprise
- It is easy to make wrong operational decisions

Sigmafine 4.3

- A product that enables data reconciliation and validation for any industrial process
  - Sigmafine key features
  - Using Sigmafine with other OSIsoft tools
  - New functionality to perform energy balance

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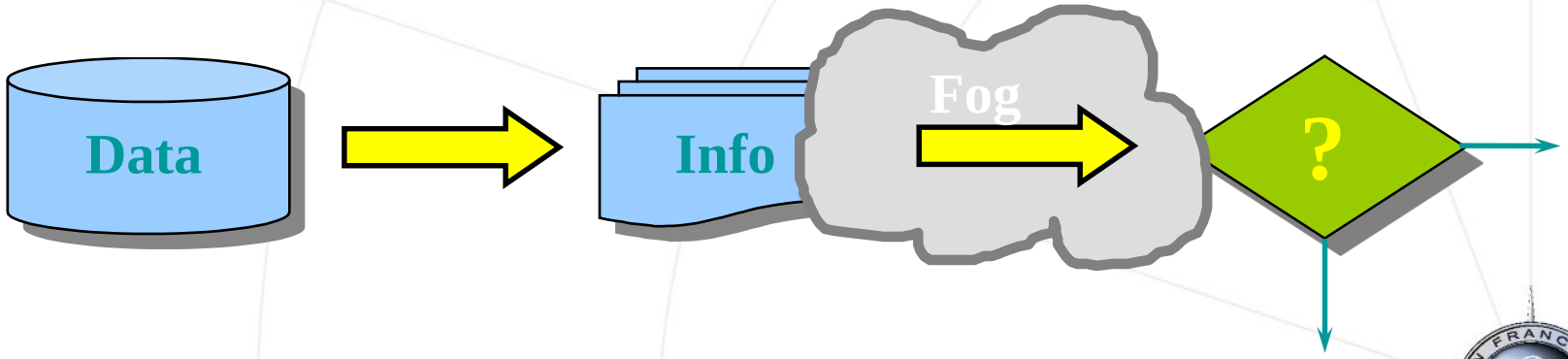
Agenda

- Reconciliation needs by industry
- Data reconciliation using Sigmafine
- Using OSIsoft tools with Sigmafine
- **New** functionality in Sigmafine 4.3
  - **Linear balance**
  - **Non-linear energy balance (mass & energy)**

Typical scenario without validation

- Some sort of local balance
- Some arbitrary and subjective corrections
- No agreement on data
- Difficult to detect measurement errors



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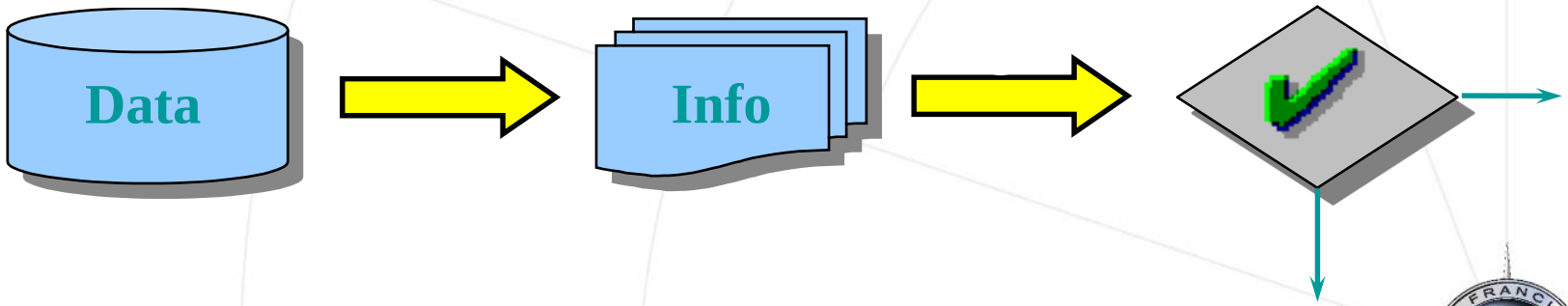
Validation with Sigmafine

- A unique balance, valid for the whole operation
- Systematic and objective corrections
- Agreement on balanced data
- Easier to detect measurement problems



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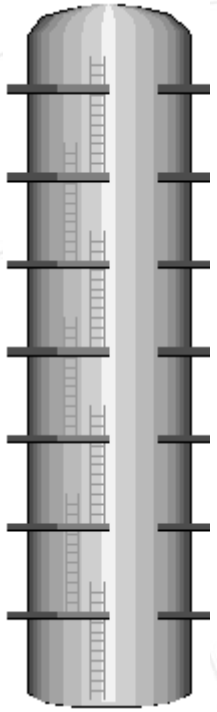
Reconciliation challenges in refining

- Many products
- Topology changes
- Transfers and flows
- Large models (up to 5000 elements)
- Relatively large redundancy



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Reconciliation challenges in metals and mining

- Low redundancy
- Many analyzers
- Complex models
- Piles of materials that cannot be measured
- Material accounting per element

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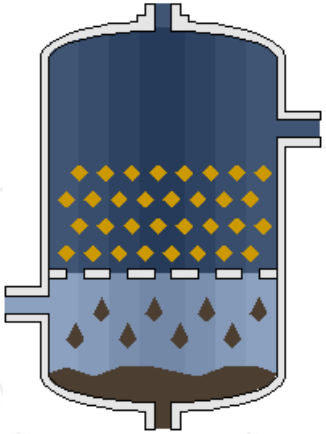
Reconciliation challenges in the chemical industry

- Flows and transfers
- Component balances
- Process is fixed, not much topology change
- Middle size models (1000 elements)
- Component balance requires stoichiometric balance



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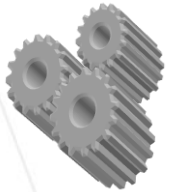
How to solve these problems

Use Sigmafine to…

- Build and configure a model (once)

- Run the model using the appropriate analysis rule (frequently)



- Analyze results (frequently)

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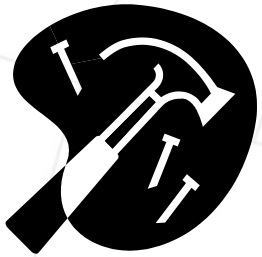
Sigmafine model building (once)

Only during model creation

- AF Explorer to configure elements
- AF Configurator to configure elements using Excel
- ProcessBook to connect elements and model design



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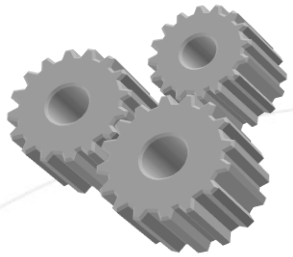
Running the model (frequently)

- ProcessBook
- AF Excel Add-in
- Automatic scheduling using ACE
- AF Explorer during testing
- Create your own application



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Data analysis (frequently)

- AF Excel Add-in
- ProcessBook
- RtReports
- AF Explorer during testing
- Create your own application

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Benefits in refining

- Transfers are used to model receipts, shipments and movements
- Automatic inventory calculations
- Composition tracking of products stored in tanks
- Refining specific calculations, such as gross to net

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Benefits in the chemical industry

- Mass and component balance
- Reaction constraints allowed, a reaction editor allows the user to configure reactions
- Gas and liquid meter compensation
- Inventory calculations

Benefits in metals and mining

- Component balance in inventories that are not typically measured
- Independent solvability of components
- Independent accuracies of measurements
- The common sparsity of the process measurement system is handled efficiently

Sigmafine tools

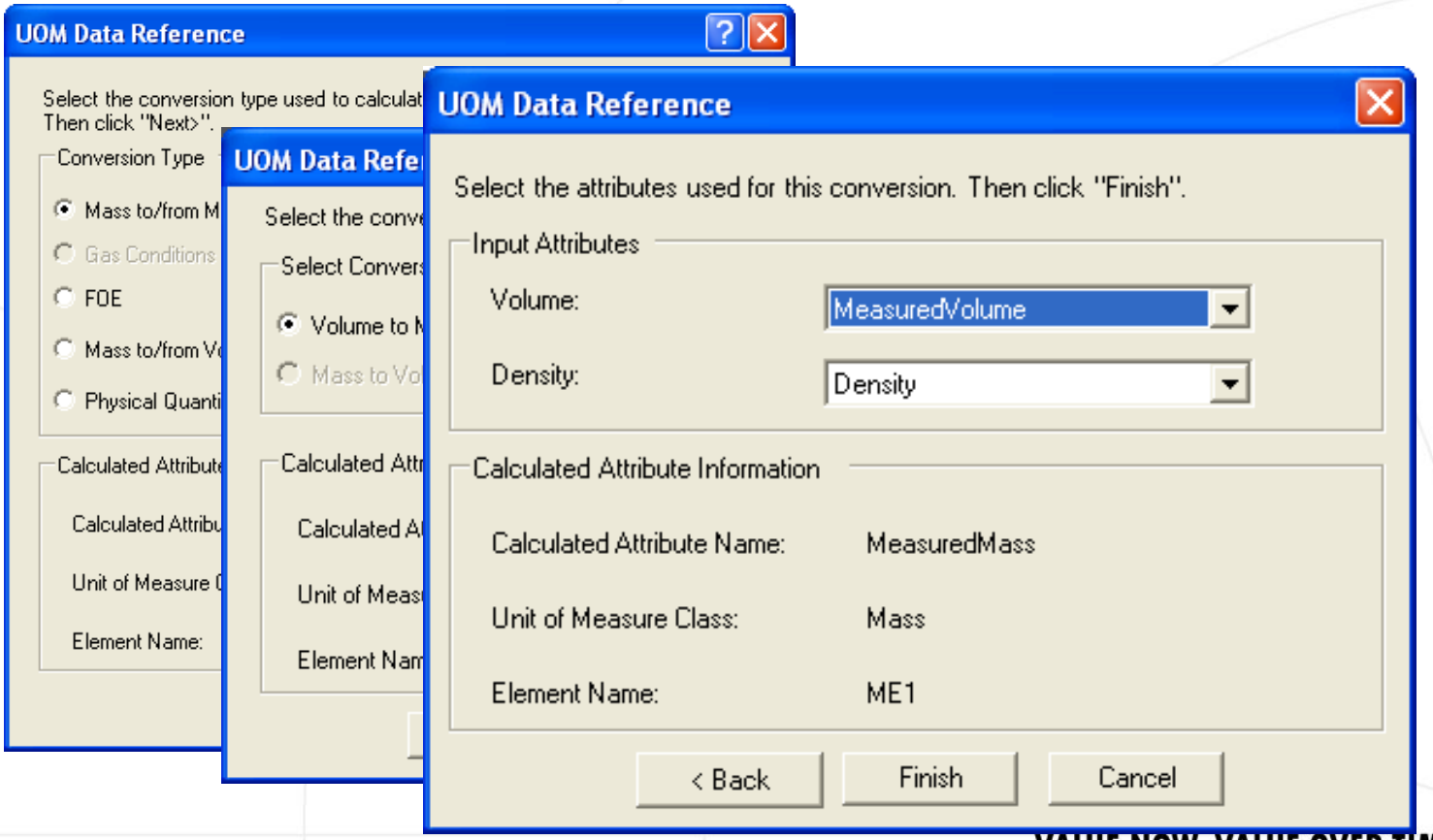
- Data References
- Analysis Rules
- Data Loader
- Other OSIsoft tools
  - ProcessBook
  - AF Excel Add-in
  - RtReports

What is a data reference?

- A component or module of the Analysis Framework that can perform the following tasks:
  - Read data from an external system
  - Write data to an external system
  - Can execute predetermined calculations

Data references

- UOM is a class-to-class converter



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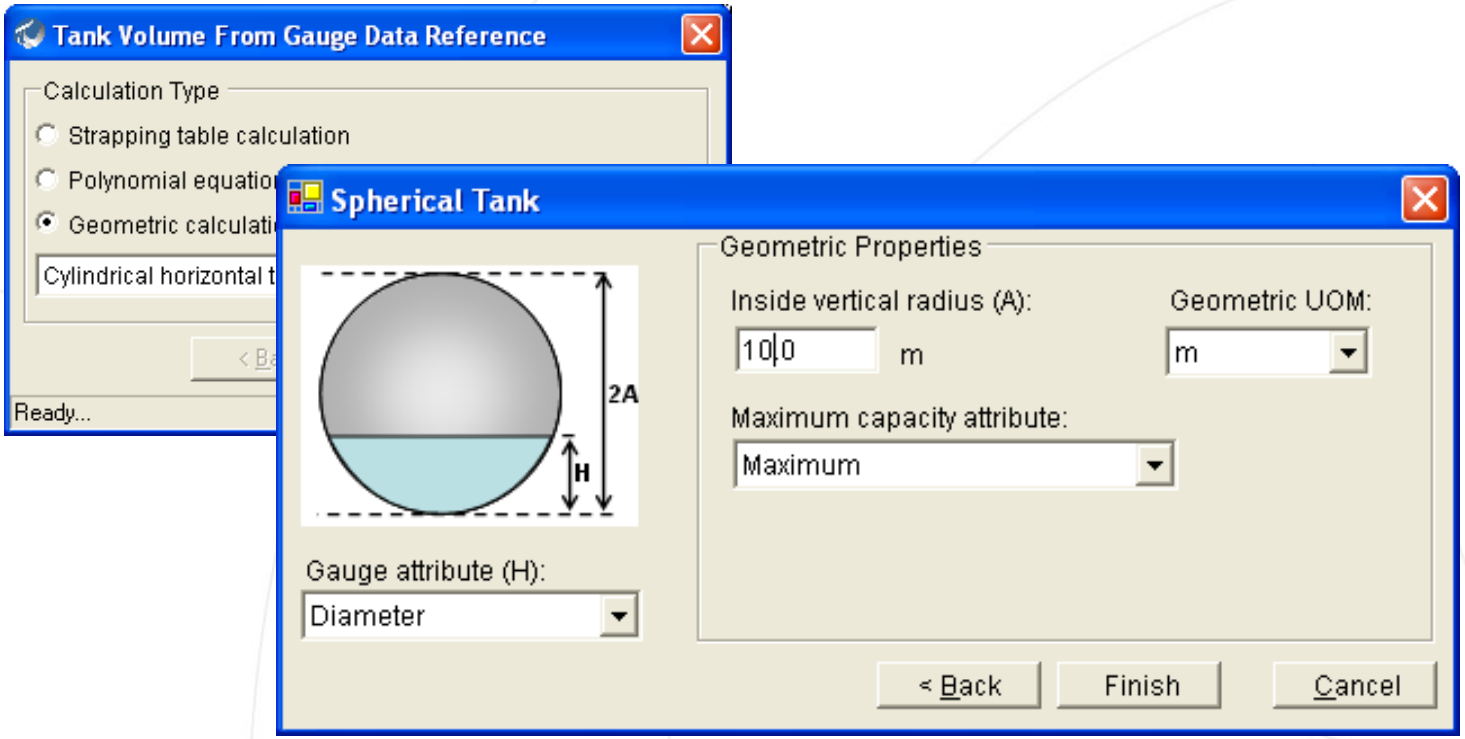
Data references

- Gauge to Volume



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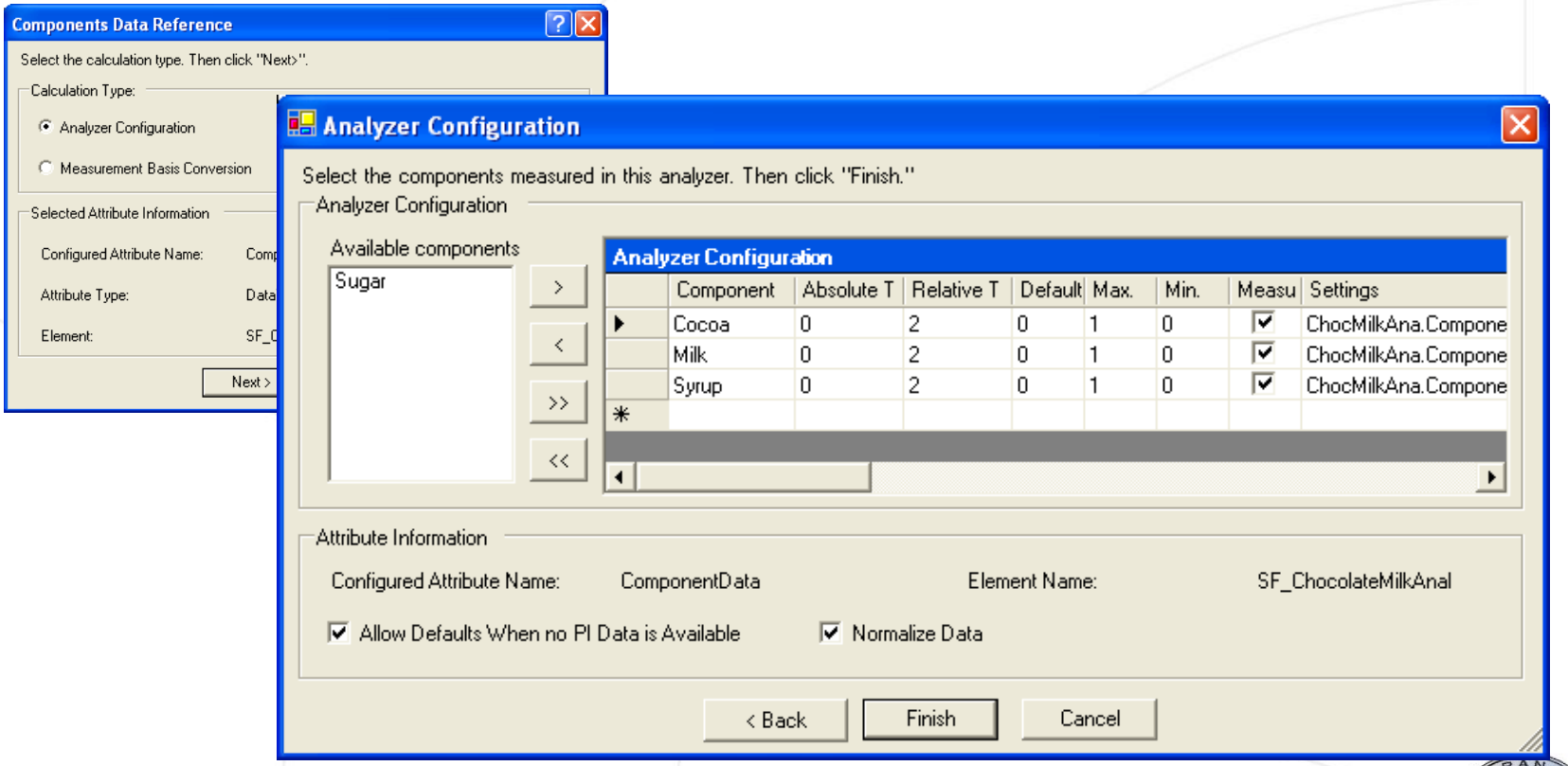
Data references

- Components



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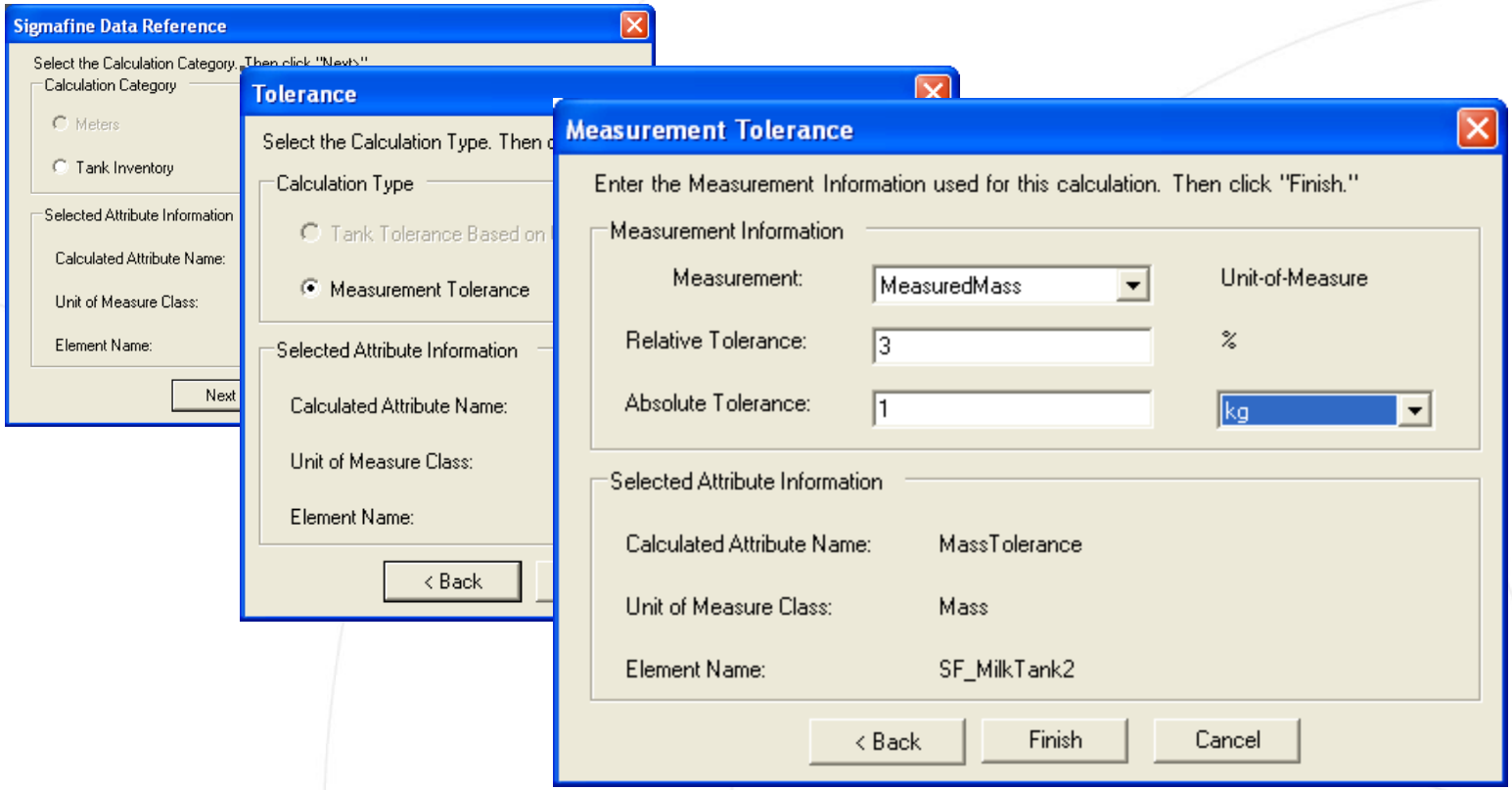
Data references

- Sigmafine



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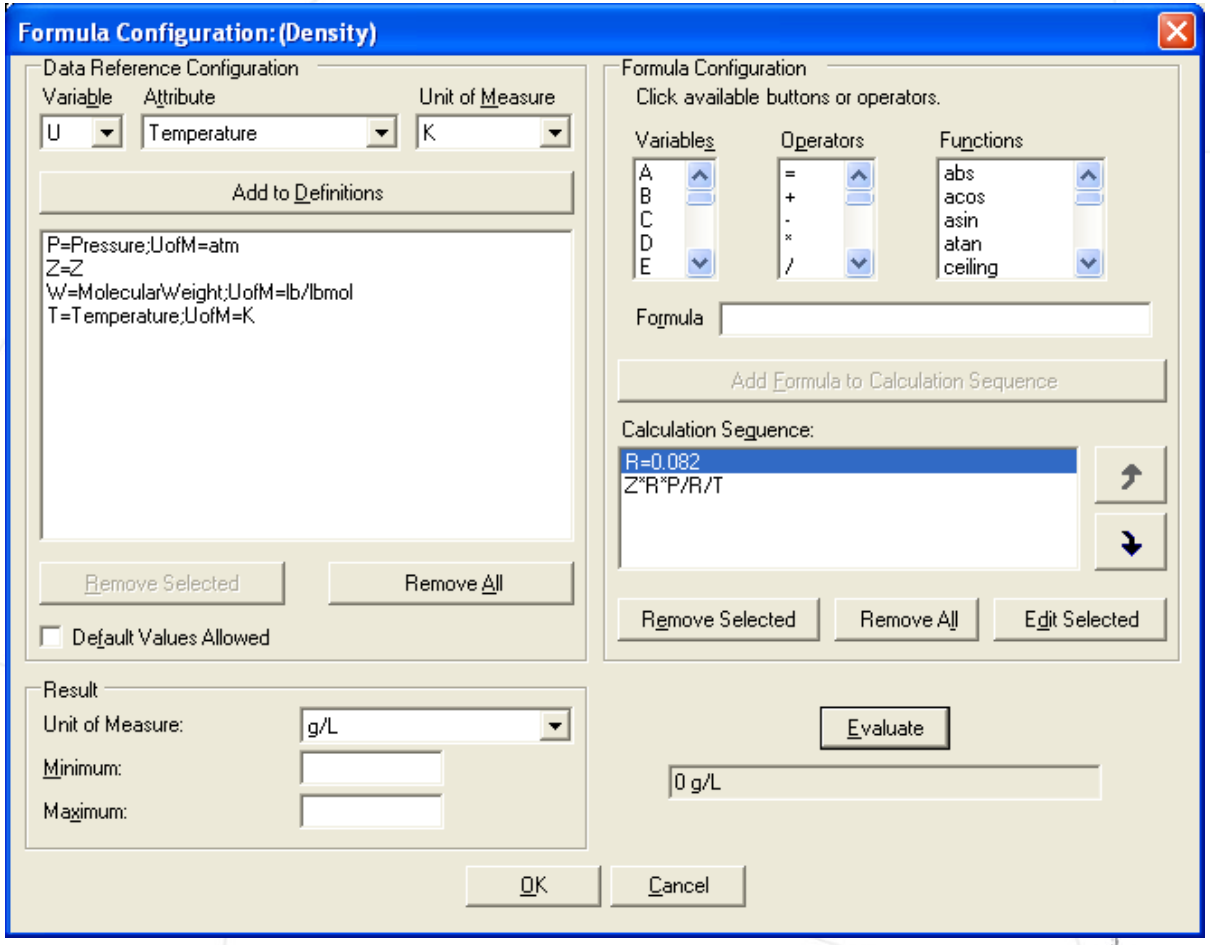
Data references from AF

- Formula DR for add hoc calculations



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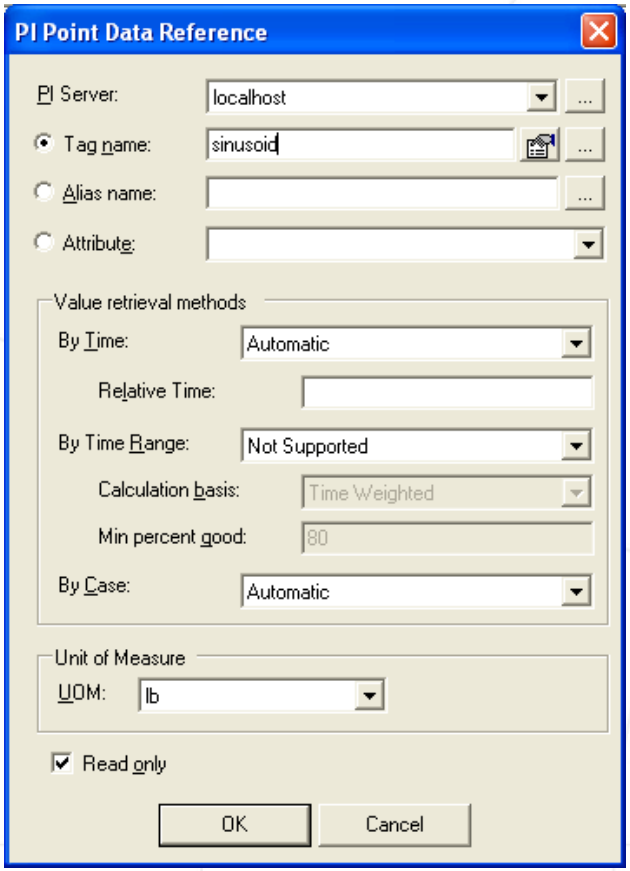
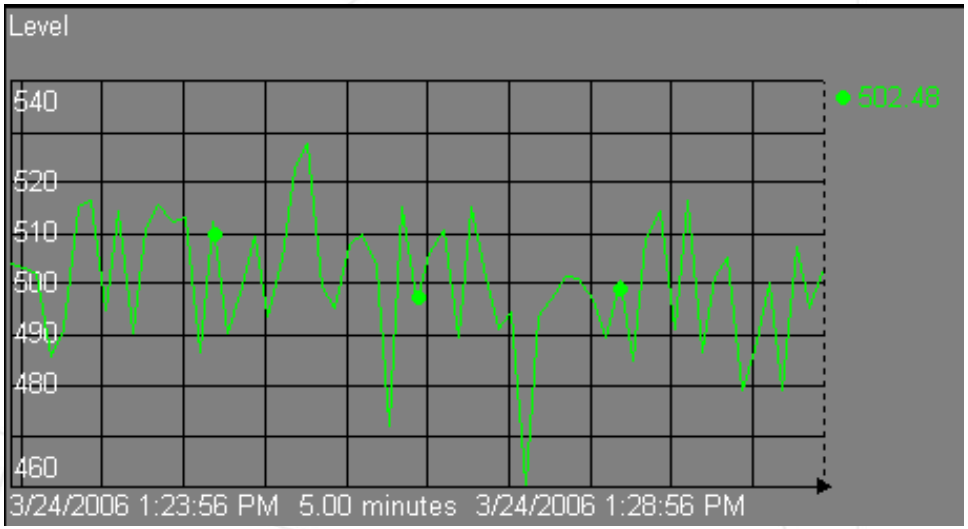
Data references from AF

- PI Point data reference





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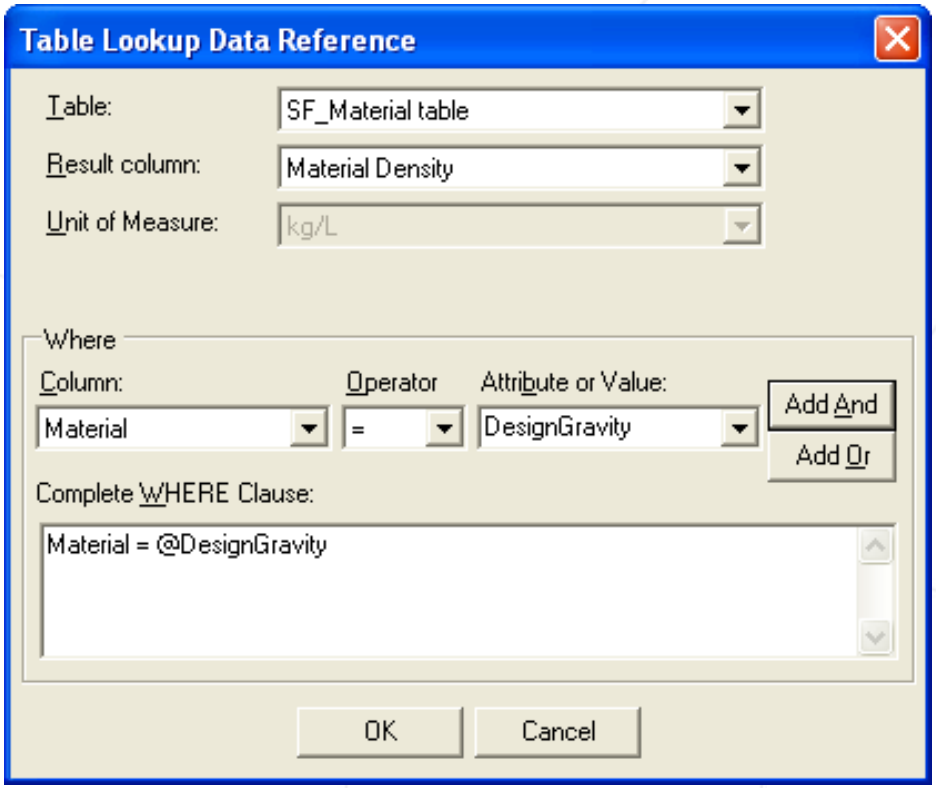
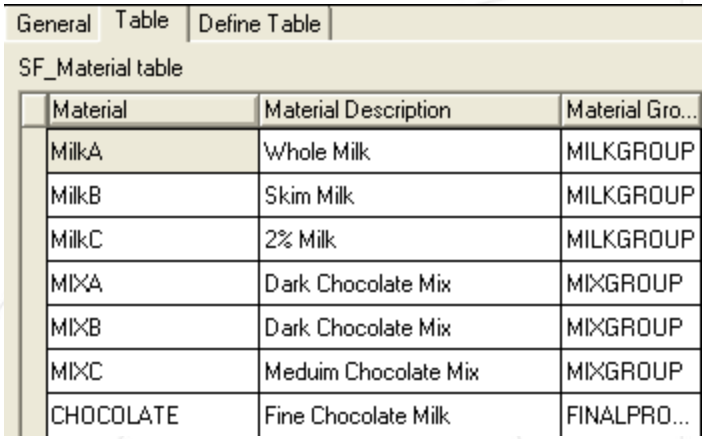
Data References from AF

- Table Lookup





Material	Material Description	Material Gro...
MilkA	Whole Milk	MILKGROUP
MilkB	Skim Milk	MILKGROUP
MilkC	2% Milk	MILKGROUP
MIXA	Dark Chocolate Mix	MIXGROUP
MIXB	Dark Chocolate Mix	MIXGROUP
MIXC	Meduim Chocolate Mix	MIXGROUP
CHOCOLATE	Fine Chocolate Milk	FINALPRO...

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A tank farm example

- Inventory calculations for a tank farm
  - Level is a real time value from PI
  - Tank geometry is known (spheres)
  - Density is stored in a table in AF
  - Material is stored in AF as an attribute
  - Inventory will be calculated in mass

Configuration of data references

- Configuration using AF Explorer

General | Elements | Attributes | Ports

TankC

Name	Value	Value Type	Data Reference
Density	3 kg/L	Double	Table Lookup
Level	0.662982861200968 ft	Double	PI Point
Mass	5.83938132139628 t	Double	UOM
Maximum	10000 US kgal	Double	<None>
Product	MaterialC	String	<None>
Volume	0.514200449391697 US kgal	Double	Tank Volume Fro...

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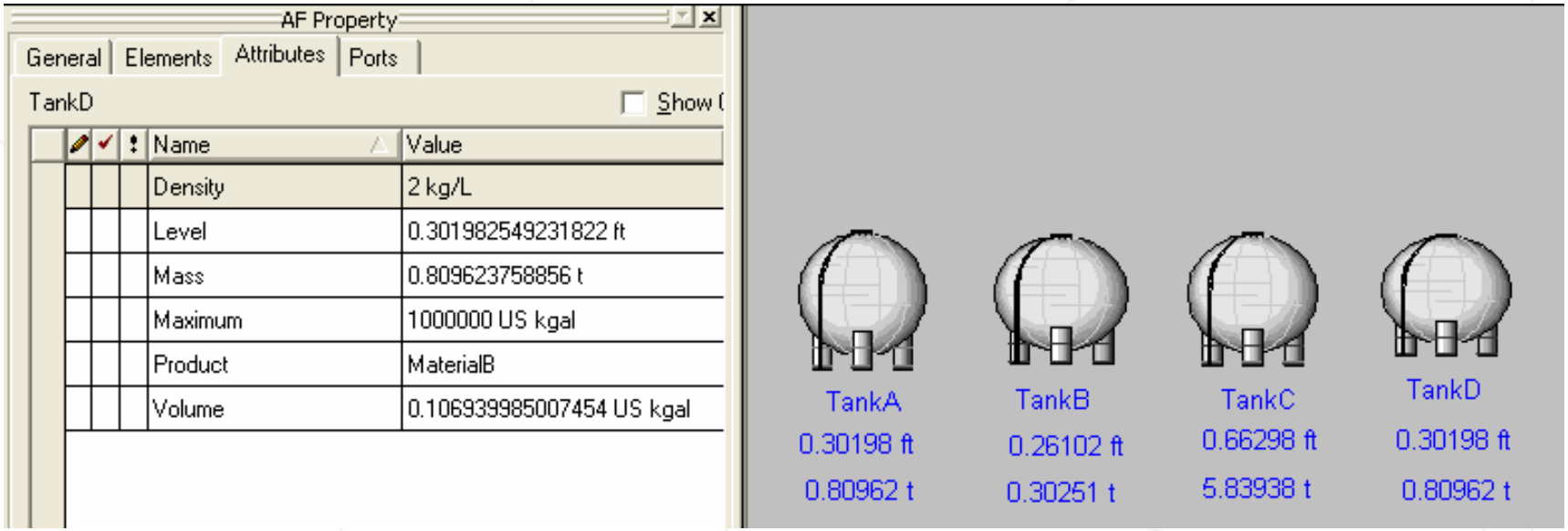
View inventories in ProcessBook

- Attributes from elements can be displayed in ProcessBook in different units of measure



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Summary of data references

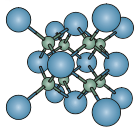
- Configurable
- Chained automatically
  - Sequence is controlled by AF
- UOM conversions are handled automatically
- Some import information, others perform calculations

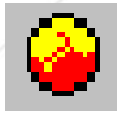
What is an analysis rule?

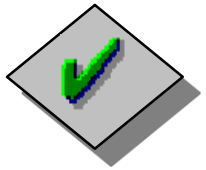
- A component or module of AF that has the ability to analyze a model by using some predetermined logic or algorithm
  - Collect information
  - Validate the model and data
  - Execute logic in the context of a model
  - Write results to a case

Using analysis rules

- Sigmafine Balance
- Components Balance
- Energy Balance
- Composition Tracking
- Gross Error Detection







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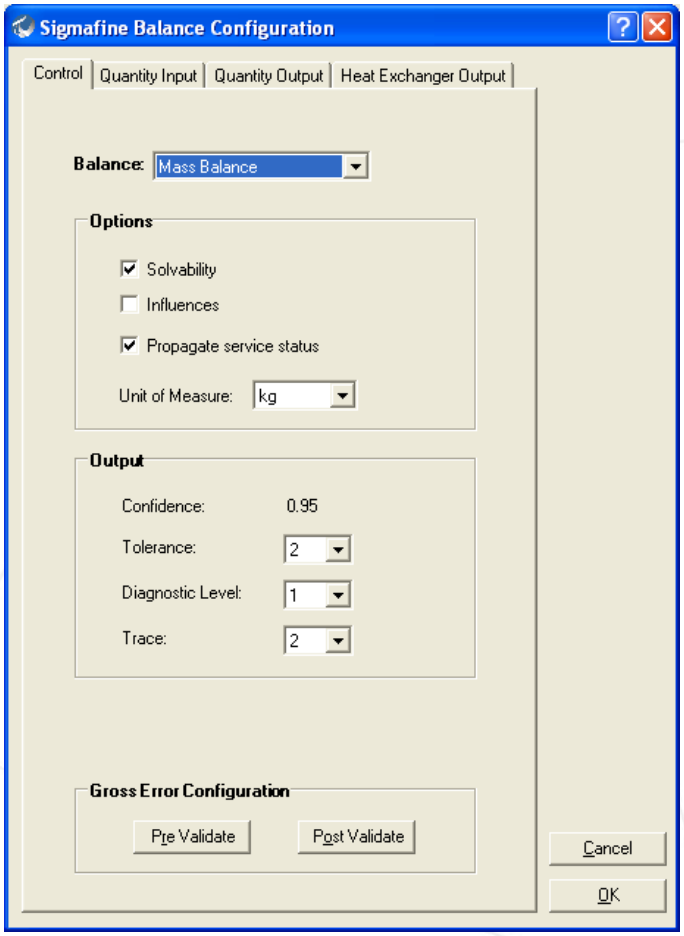
Sigmafine balance analysis rule

- Linear balance of any quantity type:
  - Mass
  - Volume
  - Standard gas volume
  - Normal gas volume
- Easy configuration with minimal definitions of element types (templates)

Sigmafine balance analysis rule

- Any quantity that is conserved in a process can be balanced using this rule



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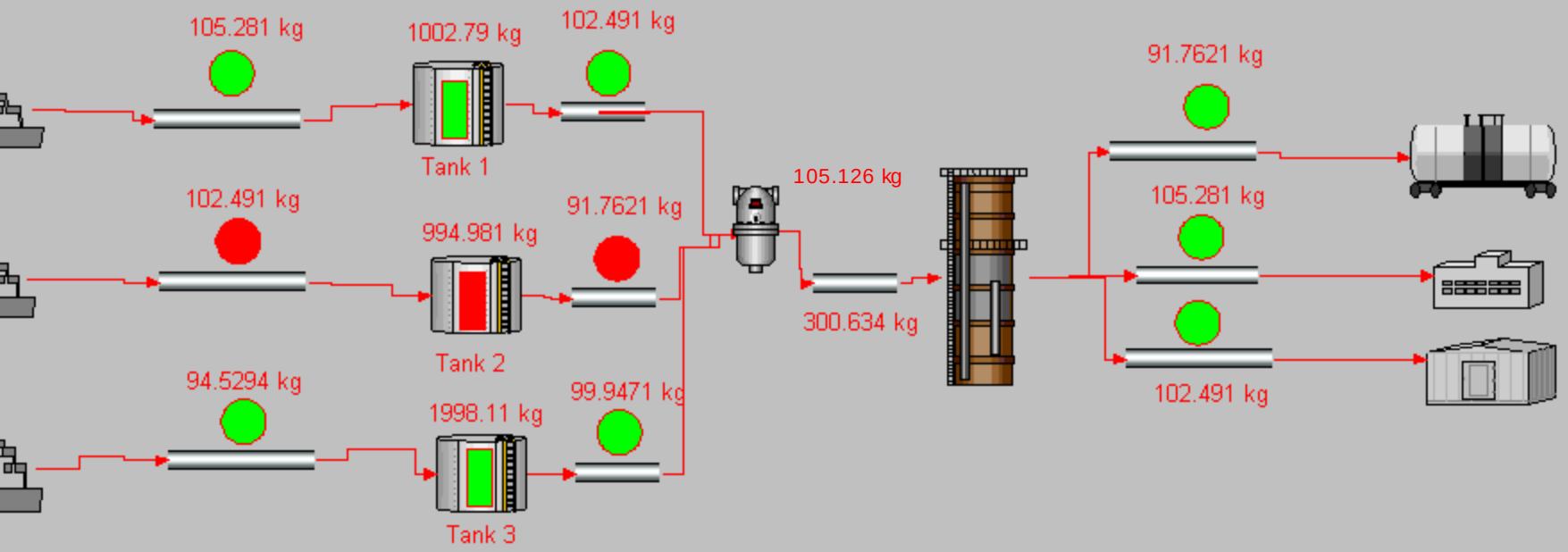
File Edit View Insert Tools Draw Arrange Window Help

Run: Complete: 3/27/2006 1:42:02 PM. 122 Outputs Generated.

Mass Balance | Case 8/29/2005 4:00:00 PM - 8/29/2005 5:00:00 PM



Server Time

Components analysis rule

- Mass and component balance, simultaneously
- Applications of this rule
  - Gas plants
  - Metals and mining
  - Tracing of impurities in refining

Components analysis rule

- Component tracking in inventories
- Analyzers are configurable to handle different component lists
- Normalized constraints in sections of the model
- Independent solvability per component

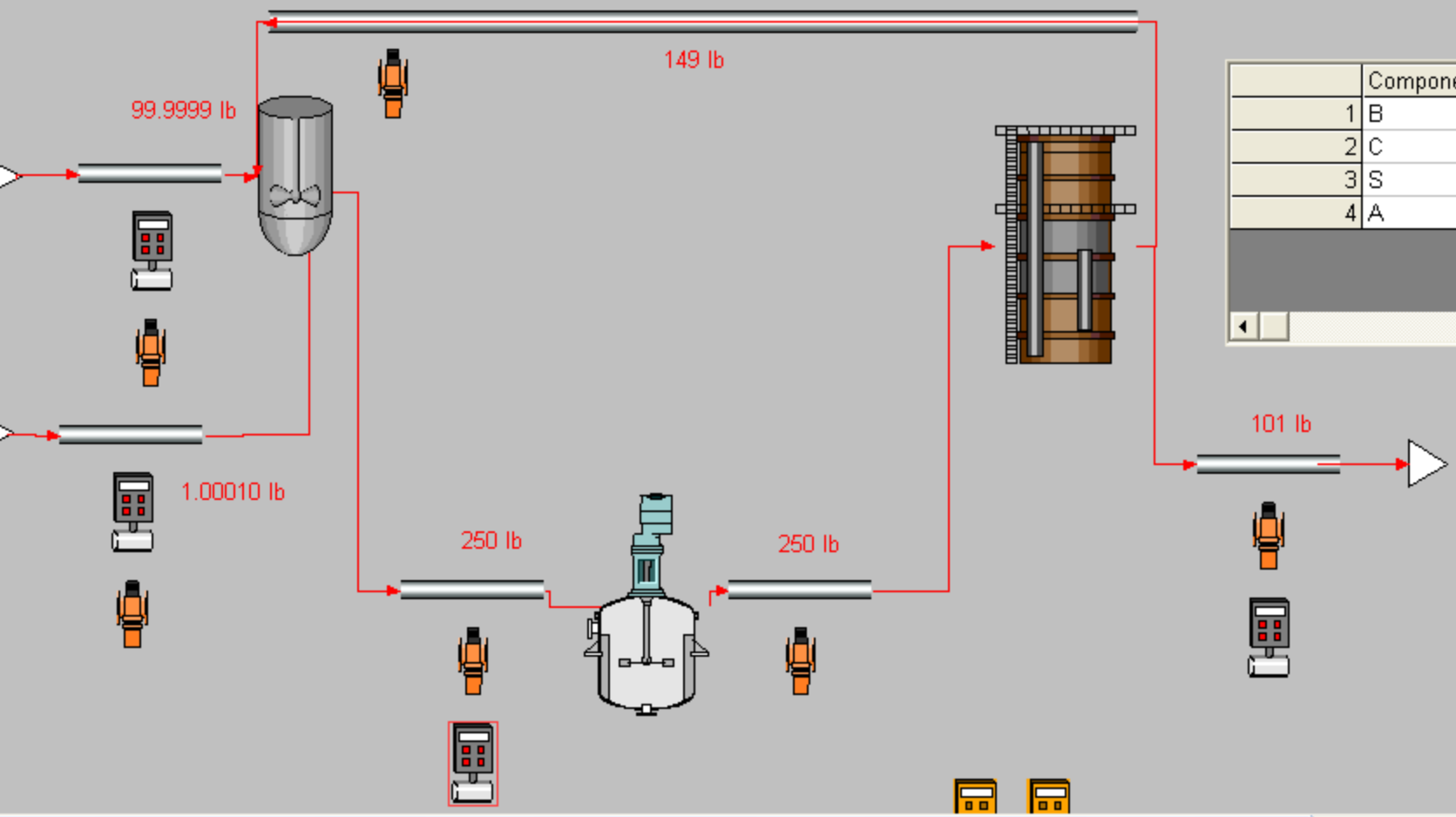
File Edit View Insert Tools Draw Arrange Window Help

Paste Special...

Validate: Pending.

Component and Stoichiometry Balance

Case 5/5/2005 11:00:00 AM - 5/5/2005 12:00:00 PM



	Component	Value	Tole
1	B	0.00	
2	C	0.00	
3	S	0.40	
4	A	0.60	

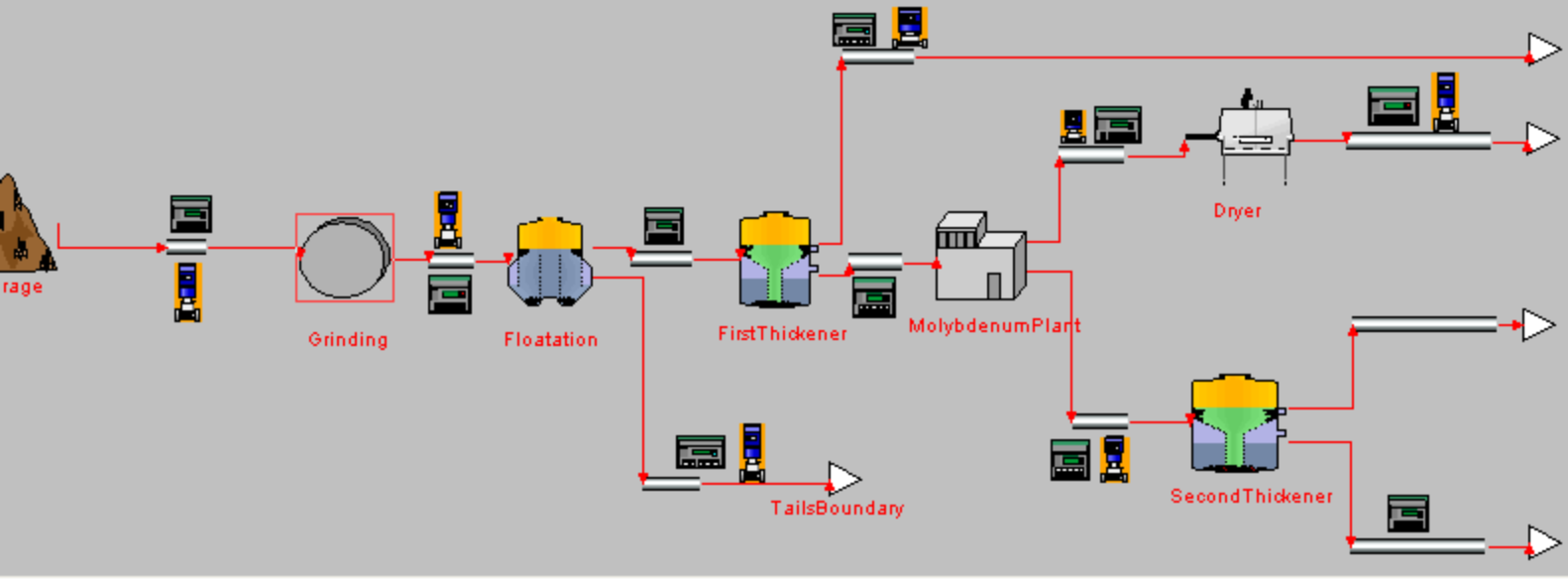
Server Time

CAP

File Edit View Insert Tools Draw Arrange Window Help

Publish: Pending.

Daily Balance | Case 11/19/2005 4:13:34 PM - 11/20/2005 4:13:34 PM



Case 11/19/2005 4:13:34 PM - 11/20/2005 4:13:34 PM

Name	Value
WetMolybde...	<Data Table>
WetMolybde...	<Data Table>
SecondThic	31456050719.0562 lb

Log | Results | Adjustments | Layers | Elements | Connections | Report

Show Categorie

CAP

Data Table Edit

Component Name	Solvability	Reconciled	Reconciled T
Cu	R	0.0006800	0.00089443
Mo	R	0.5352383	0.00706985

Energy Balance

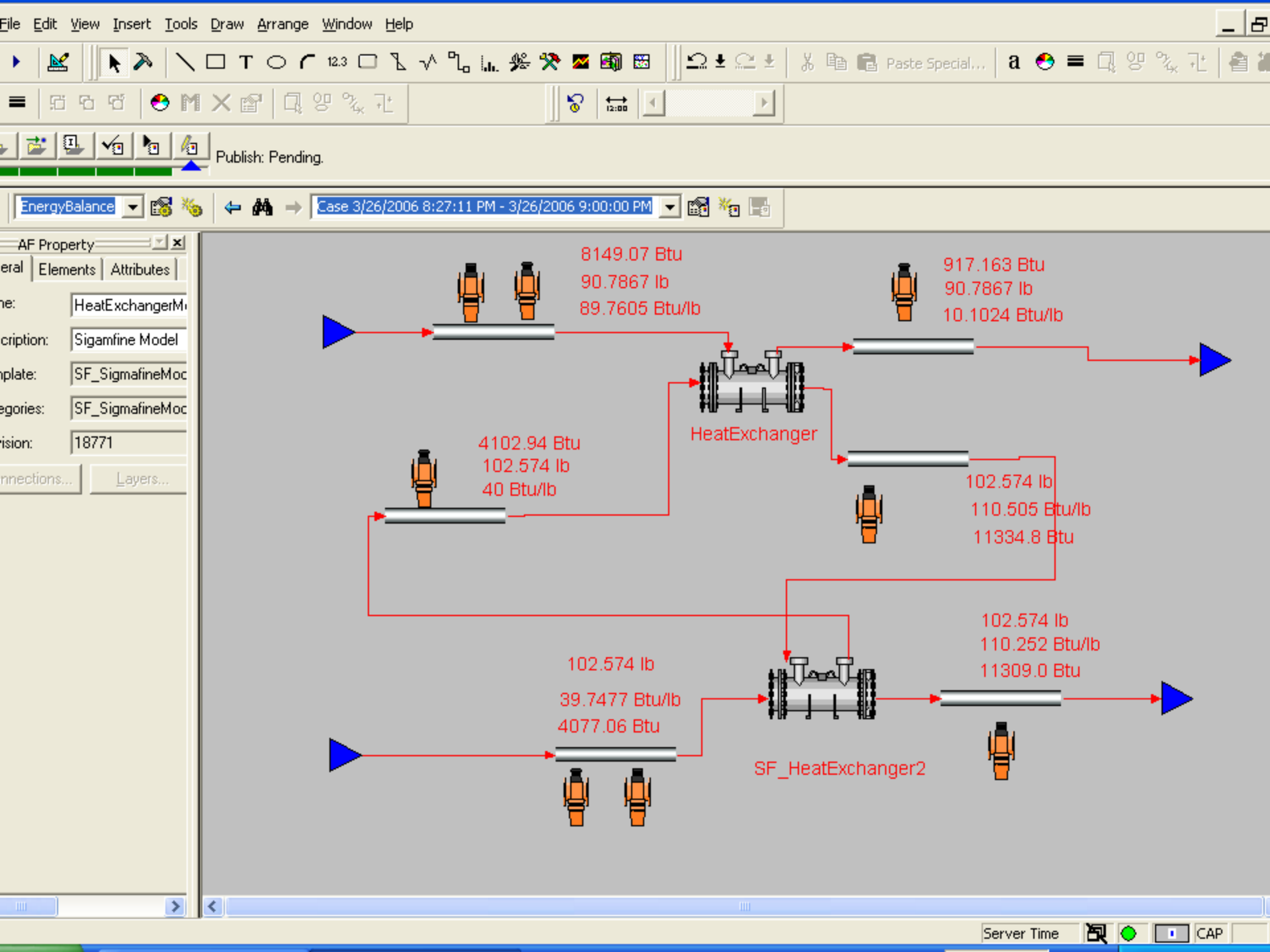
- Due to high energy prices, companies are monitoring closely their energy utilization
- Validation of energy measurements is needed for efficiency calculations
  - Process networks don't have all measurement required to estimate efficiencies
  - The use of reconciliation provide the estimates for further analysis

Energy balance analysis rule

- Physical quantity and energy properties are balanced simultaneously
- Different combinations of extensive and intensive properties are allowed
- Measurements are classified as quantity, specific energy, and total energy

Results of energy balance rule

- Initial imbalances of both quantities and energy properties
- Measurement statistics
- Best estimates of reconciled properties
- A set of data that satisfies both quantity and total energy balance


File Edit View Insert Tools Draw Arrange Window Help
Publish: Pending.
EnergyBalance
Case 3/26/2006 8:27:11 PM - 3/26/2006 9:00:00 PM
AF Property
Elements
Attributes
HeatExchangerM
Sigamfine Model
SF_SigmafineMoc
SF_SigmafineMoc
18771
8149.07 Btu
90.7867 lb
89.7605 Btu/lb
917.163 Btu
90.7867 lb
10.1024 Btu/lb
HeatExchanger
4102.94 Btu
102.574 lb
40 Btu/lb
102.574 lb
110.505 Btu/lb
11334.8 Btu
102.574 lb
39.7477 Btu/lb
4077.06 Btu
102.574 lb
110.252 Btu/lb
11309.0 Btu
SF_HeatExchanger2
Server Time
CAP

Summary of analysis rules

- They contain the logic that understands the model and its data
- They are used for different types of balances: mass, components and energy
- They produce results for the case of analysis

Data Loader Utility

- Allows you to import data for elements:
  - Tanks, meters and analyzers
- Supports different formats:
  - csv and xls file formats
- Can send data to PI or AF cases directly
- Creates transfers

Development Roadmap

- PR 1 “High Availability (HA)” **(7/1/06 – 9/1/06)**
  - Sigmafine 4.3 and AF will benefit from HA and replication support
- PR 2 “Data Directory and PIANO” **(12/1/06 – 2/1/07)**
  - Sigmafine will be recompiled to make use of the new Foundation Data Directory. Sigmafine will take advantage of the Notification support delivered in PR 2.
- PR 3 “Enterprise Platform” **(9/1/07 – 11/1/07)**
  - Sigmafine 5.1 will benefit from a expanded scope of the Data Directory, such as the Scheduler from PIANO

Conclusions

- Sigmafine can be applied to any industry
- Validated data is available to make better business decisions
- No process model required to derive value from Sigmafine
  - The use of data references does not require a model

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Good data for good business decisions

- “You can't manage what you can't control, and you can't control what you don't measure.” – Tom DeMarco
- Sigmafine increases confidence of what you measure and estimates what you don’t measure, which helps you to make better business decisions

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Thank you!

- Please visit the demo session
- Any questions?

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