# The Power of Analysis Framework

Real-time Analysis and Visualization

All too often, users must create real-time planning and analysis reports with static and inconsistent sources of information. Data is locked in an Excel spreadsheet or a rigidly customized application interface. Imagine if you could unlock the source of that data. Imagine that all the information you need was in a reusable library, that you could create custom formulas on the fly, and create powerful, timely reports and analysis in real time. Imagine that you could reduce the time and money spent developing and supporting vertical applications. Imagine Analysis Framework.

Analysis Framework (AF) integrates the OSIsoft suite of powerful analysis tools with an enterprise-wide infrastructure for analysis, visualization, and reporting. AF is a managed environment for building contextual models, accessing and integrating data, and performing analyses. At the heart of AF are fundamental components: a metadata warehouse, templates, and advanced analytics. Advanced solving capabilities, including a standard reconciliation engine supported through Sigmafine, provides a library of templates, data references, and reporting templates to support yield accounting and data reconciliation.
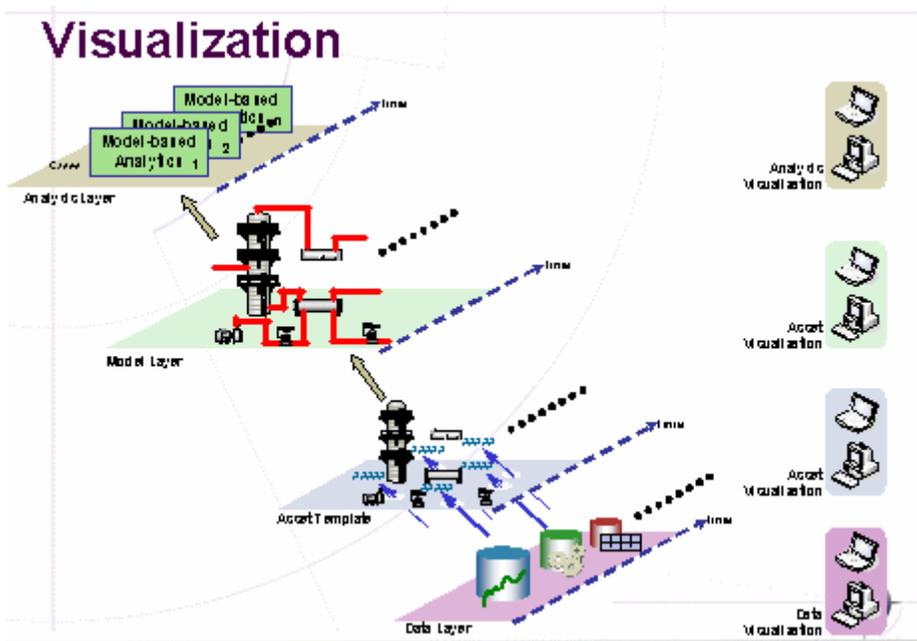
AF seamlessly integrates with many other OSIsoft products to leverage your initial investment. You can use PI System Management Tools (SMT) and RtReports to configure, retrieve, and report information associated with elements and templates. If you prefer to use Excel, the PI Excel Add-in allows you to manipulate AF metadata on a scalable plant or enterprise level. The Excel Add-in expedites the transfer of large database configurations or bulk loads.

The real power of AF is the ability to reuse and visualize information. PI tags, custom formulas, calculations, and templates that contain material and asset definitions and relationships, all become reusable tools as soon as they are created. You can even import and export data from other AF databases and PI applications. All types of knowledge experts and users can create and access all this reusable data without programming expertise.

AF Architectural Overview

AF uses a data abstraction model to create element templates and models. Models are comprised of elements that represent physical or logical entities in a process. Elements are based on element templates. The templates contain all the necessary attributes, data references, and properties for the role of an element in a model.

Think of a template as a bucket that contains a related set of data. For example, a template can define a specific type of measurement device, such as a brand-name instrument, or it can specify a particular role in the model, such as a liquid mass meter. The data configured in the template is immediately referenced in a metadata warehouse.

The Power of Analysis Framework

Real-time Analysis and Visualization

The AF Metadata Warehouse – A Smart Repository

The AF metadata warehouse (AF Database) is the smart repository that defines all AF assets, physical or logical, from the simplest attribute to the most complex template library. Each PI System contains one default metadata warehouse. One PI Server stores the AF metadata warehouse in a designated instance of the Model Framework Subsystem; although you can retrieve the associated process data from PI Points from any number of PI Servers. Most functionality that the modeling framework provides is contained in the AF database object.

A metadata warehouse complements your relational database. While a relational database stores data, a metadata warehouse describes the data and points to its location. In this way, it has embedded relational intelligence. The metadata warehouse can import references from outside sources and provides mechanisms for loading relational tables and other data types. Once a user saves data attributes to a template, the data becomes transformed to metadata and becomes a part of the template wherever it is placed. This transformation from data to metadata enables users to reuse the information in a template. The same metadata is available throughout the enterprise. You can apply it to any context, such as solving financial issues, organizing facilities management, and analyzing problems. For example, you can create views of complex real time operations or solve complex "What if" modeling scenarios. Metadata is especially useful for dynamic calculations, where it can speed time range calculations or other applications with intermediate values that do not need to be stored. Metadata becomes part of an every-growing library of information that the enterprise can reuse to solve new problems.

The AF Template – Configuring Smart Objects

Once, a picture of a tank was a just a picture. However, if you base a template on an asset, tank_template, you can associate data with the asset. If you add another asset-based template and call it tank2_template, you can connect and group assets. Now, drop the tank_template and tank2_template element from AF into ProcessBook for dramatic visualization and analysis. The copied assets contain all the attributes and data references you gave it. The tank has become a smart object.

A template associates data with assets. It defines specific instances or attributes of an object, such as a tank or a stream. The attributes range from simple string values to sophisticated data references, including PI tags, Table Lookups, and Formulas. The AF allows you to configure, rather than program data references and formulas. The extensive group of formula and unit of measurement (UOM) pull-down menus and libraries allow any knowledgeable user to set sophisticated calculations and formulas.

Once you create multiple templates, you can nest templates or create template libraries to reflect the complexity of your operation or enterprise. Through the creation of different templates and different attributes, you can easily create new views and models of your plant and assets. You can even import and export the templates to other AF metadata warehouses. AF relies on xml as its base format for importing and exporting databases, templates, and calculations. The xml format expedites import to and export from other data types.
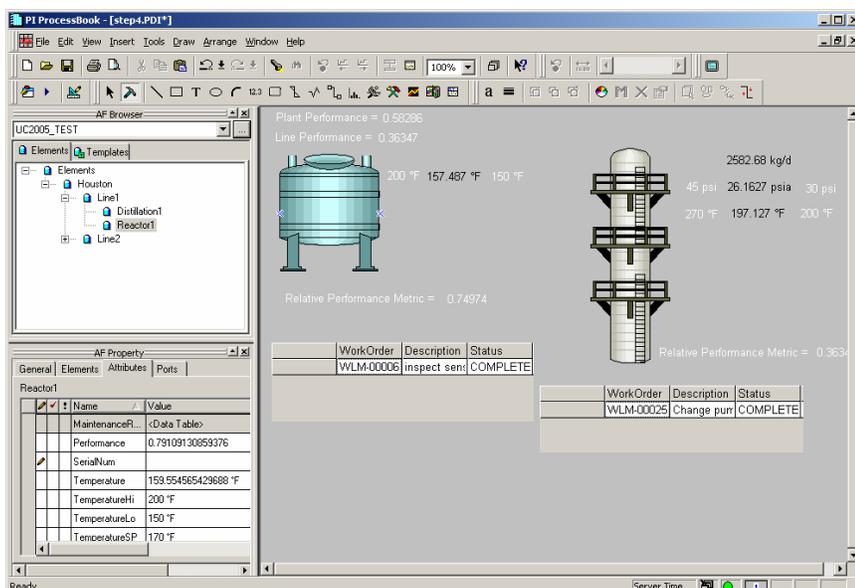
The Power of Analysis Framework

Real-time Analysis and Visualization

Meaningful Organization of Data

The AF helps you to organize of all of your data—1000s of points—in a meaningful way. The templates help you to logically structure data and apply context to the data through models, elements, and objects. You can create unified asset and connectivity-based models to organize, name, and map assets in user-friendly, searchable terms. For example, you can name data objects by a naming convention—the way you might use the data in analysis—by category, or by type. With a central source to organize your data, assets and models become the basis for consistent and faster visualization and analyses.

For example, you could show different views based on:

- The relevant assets of an operation (tanks, meter, reactors)

- The relationships needed to support advanced calculations, such as yield accounting and data reconciliation
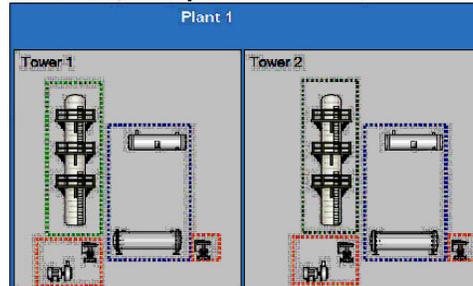
The following diagrams show you three ways that you might group the same template assets by reusing the template:

- The hierarchical relationship groups

- The flow relationship connects
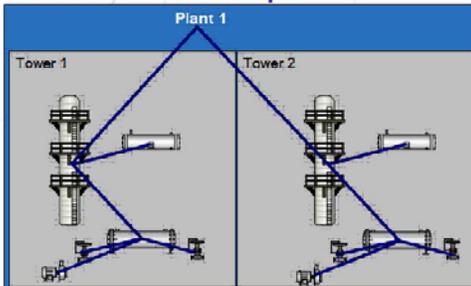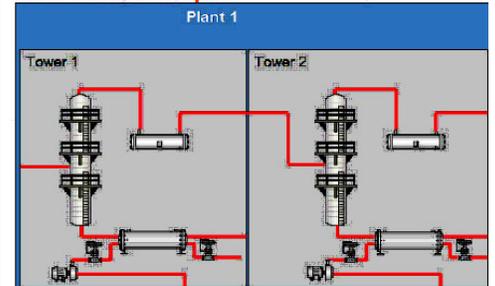
- The role relationship by function

Putting AF to Work for You

AF tools target solutions throughout the enterprise from the developer group to the CEO – all can benefit from the power of AF. While the standard AF features achieve remarkable results, the real power of AF is as an application development framework. Both third-party vendors and customers are developing custom applications that use the resources within AF and maintain the same ease of use. OSI customers are embracing these applications today – to replace legacy applications and to expedite inventory, planning, finance calculations, and analysis. This section describes several of these applications, including:

- Tank Calculation Services

- Movement Management

- KPI Management Framework

- Refinery Yields Management

The Power of Analysis Framework

## Real-time Analysis and Visualization

Tank Calculation Services

The Tank Calculation services provide volume and weight calculations for both operations and finance groups. Tank Calculation Services apply wherever tanks represent major assets – especially within the energy, petrochemicals, and chemical industries.

The beauty of the Tank Calculation Services is that the same infrastructure can support concurrent online and on demand calculation scenarios. The online calculation engine can run periodically or by event. All calculated volumes and weight attributes write back to PI tags. The on-demand scenario is supported by an SOA implementation through web services, which exposes tank calculation services across the enterprise. Tank configurations are stored in one place for the entire company – the PI-AF database.

Several OSIsoft customers recently replaced legacy applications with Tank Calculation Services. Open data access has revolutionized the business at all levels. The CEO appreciates that his managers can derive all calculations in a consistent way. Inventory managers routinely reuse tank calculations templates as they update daily and weekly reports and projects. Planners can now project more accurate futures.

Movement Management

The Movement Management application monitors and tracks material movements for all corporate-wide operations. Movement Tracking applications and engines apply wherever managing the movement of operations is critical to the company, especially in energy, petrochemicals, and chemical industries.
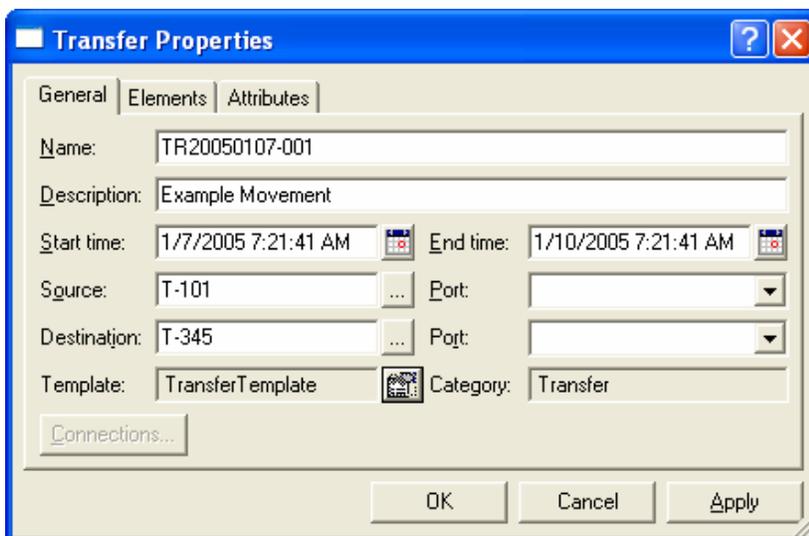
Movement Management far exceeds the quality of tank and movement data for inventory and accounting legacy applications. Movement Manager tracks all movement data in a single graphical view – a view that leverages your OSIsoft preferences. A facilities manager can view and edit the transfers and associated attributes in the AFExplorer, in ProcessBook, in Excel, and in DataLink.

Adding Transfers to the Analysis Framework

Movement Manager is a flexible, time-saving tool that managers can combine with other AF applications to expedite asset tracking and movement. It identifies operations inconsistency by cross-checking tank and movement data. Movement Management also solves complex scenarios to calculate movement quantity.

KPI Management Framework

The KPI Management Framework leverages the AF Framework and RtPortal infrastructures to provide a complete environment to define, aggregate, distribute, and visualize Key Performance Indicators (KPI). The framework allows users to select any information managed by OSIsoft infrastructure, such as PI tags or AF attributes and formulas to be a key performance indicator. Managers can assign specific attributes to define KPI behaviour at calculation and presentation time, such as efficiency, maintenance, possible states and limits, weight factors, and rollup rules.

The Power of Analysis Framework

Real-time Analysis and Visualization
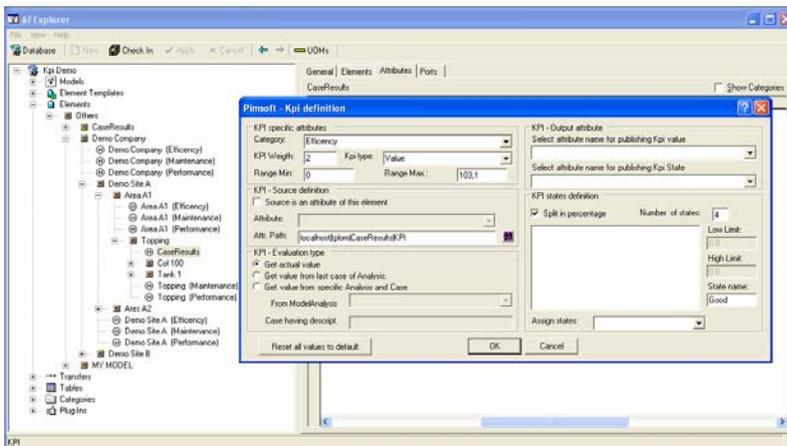
AF data reference allows users to select any attribute of AF databases as KPI

The KPI Framework allows free definition of KPIs starting from existing or derived information. It detects KPIs and organizes them into hierarchical views. It also automatically generates aggregated indicators to support overview and drill-down analysis. The KPI Framework publishing features provide translation of KPI models to structures that can be viewed in RtWebParts in Microsoft Share Point and ProcessBook.

Refinery Yields Management

The Refinery Yields Management environment expedites refinery yields reconciliation, aggregation, analysis, and presentation. An AF analysis data reconciliation module calculates yields and yield calculations. With AF, users can aggregate the calculations to show per shift and per types of processed crude and to provide valuable history for future analysis. Performance indicators measure the overall performance of the refinery and provide an indication of the deviation between actual and theoretical yields.
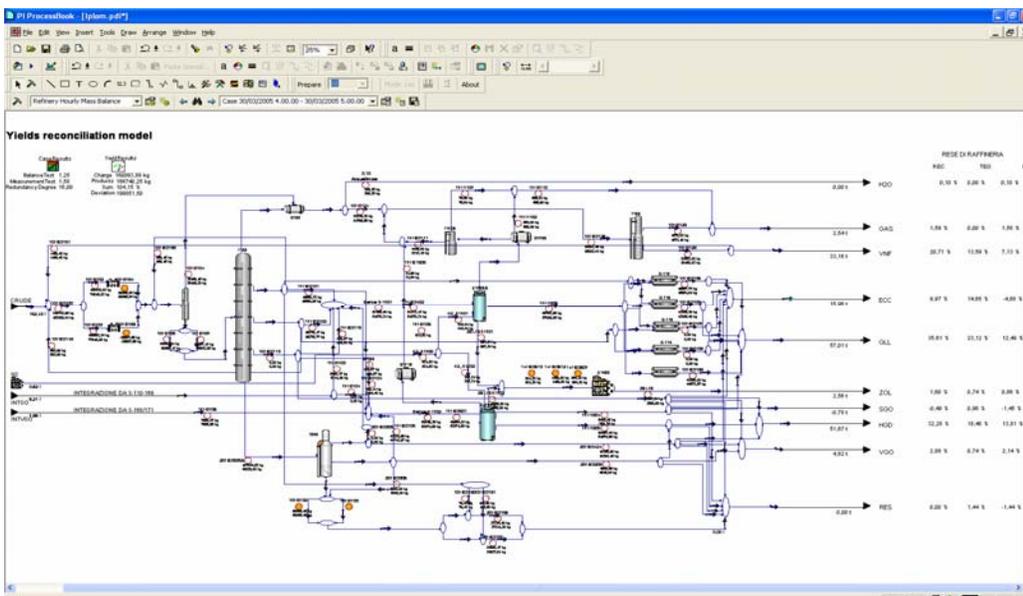
Yield reconciliation model

A recent OSIsoft customer implemented the complete yield scenario from planning to reconciling and aggregation. The company boasts impressive economic savings from increased yield profitability and reduced crude switching time.

- The Operations Manager runs yields automatically on an hourly basis to view online performance indications for the entire refinery. Online performance monitoring allows to rapidly identify yield degradation due to incorrect operating parameters

- Historical analysis allows the Production Manager to redefine better targets starting from the improved performance of the refinery

- The Facilities Manager now enjoys a high degree of control over crude switching operations

The Power of Analysis Framework

Real-time Analysis and Visualization

Return on Investment

AF provides a return on investment in both real cost savings and in facilitating a more productive work environment.

Better Understanding, Communication, and Collaboration

Since AF stores knowledge in a central repository, the metadata warehouse, in a logical way that the entire enterprise can easily access. Any employee, who requires access, can share in the company's knowledge base, thus empowering each worker to perform new types of analysis, to communicate, and to collaborate. For example, without AF, only a planner might have access to the facilities asset data. Now, those who have access to the assets, the facilities managers and site coordinators can use the same asset and model reference to visualize and analyze solutions. Working together, they can provide more timely information and create more accurate asset plans.

Cost Savings

Sites that are using AF have experienced an incremental return on investment throughout the enterprise:

- Cost savings in time and resources due ability to organize data meaningfully and repurpose work, such as the modeling and consistent naming conventions of company assets, application and calculation development, and timely data sharing between departments

- Reduced error and inconsistency due to human input or dispersed calculations due to the reusability metadata

- More streamlined decision making by replacing programming with configuration: employees closest to the information can configure formulas and data references, while programmers returned to system and application development

- Efficient and cost effective way to maintain information due to a central source of data

- Investment in displays, reports, and business logic protected

- Reduces product development lifecycle