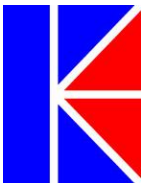


# Template Driven, Web Browser Based Process and Equipment Performance Monitoring Using PI-Module Database and PI-ICE

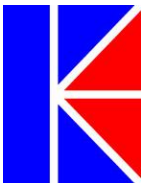
OSI User's Conference  
March 2002

Kesler Engineering, Inc.

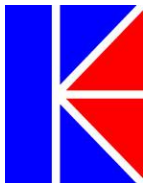
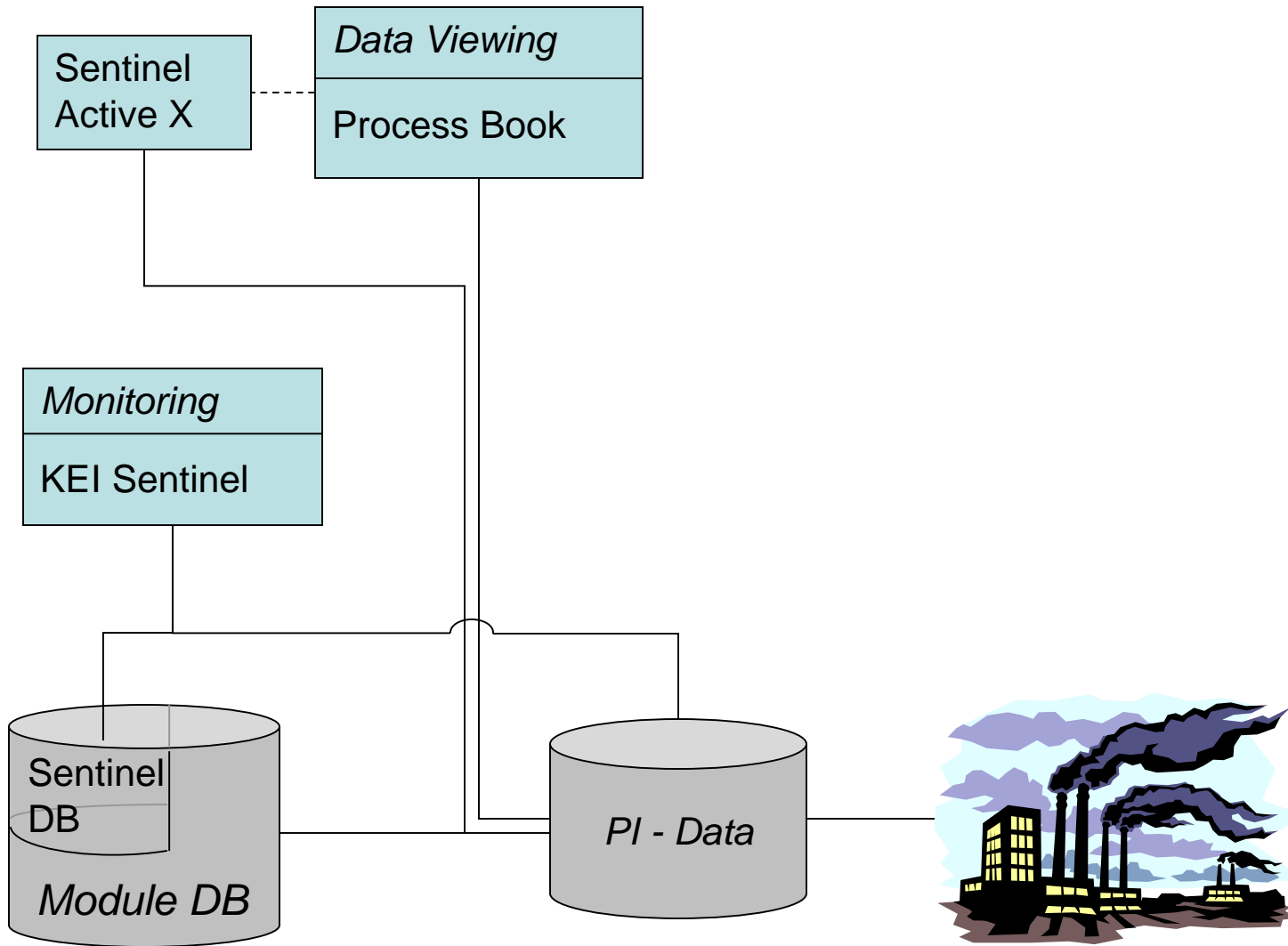


# Monitoring

- Answers the question: What is going on right now?
- Continuously calculate KPIs
  - Reconcile inconsistent data
  - Normalize to dollars
- Display current raw data and KPIs
  - Used for immediate action
  - Drill-down user interface
  - Periodically update

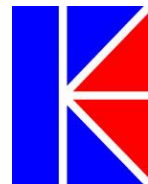


# Template Monitoring and Web-Based Reporting with PI



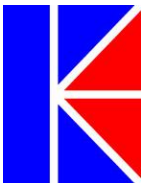
# KEI Sentinel Features

- Tight integration with PI products
- Microsoft Excel integration
- Data reconciliation and limit clamping
- Modeling with algebraic equations, in open-equation format
  - No need for program writing/compiling
- Parsing, partitioning, solving large systems of linear and non-linear equations
- Thermodynamic and physical properties package for hydrocarbon processing industry
- Flexible, personalized reporting
- Modules for selected industrial equipment

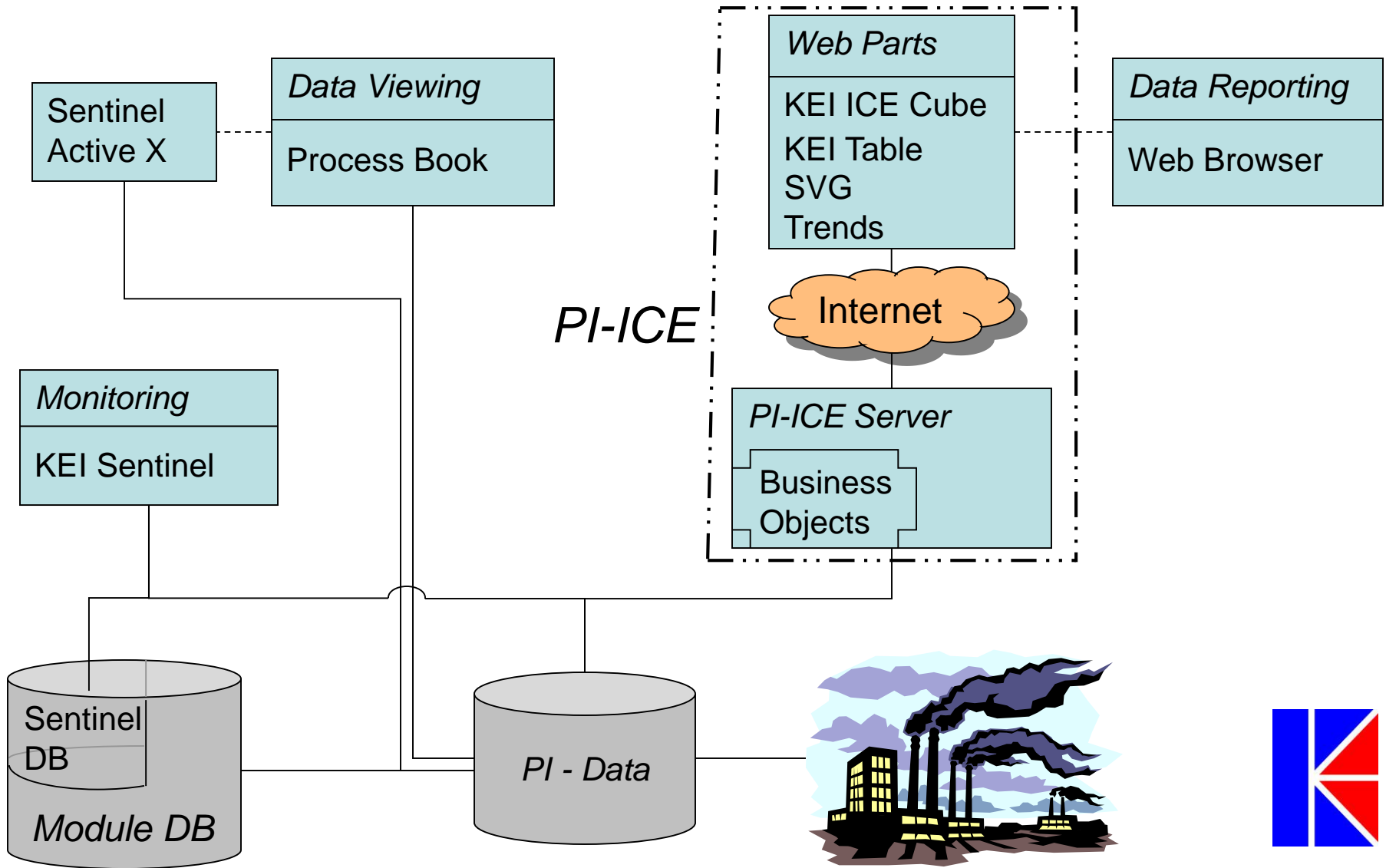


# Reporting

- Answers the questions: What has happened over a period of time?
- Analyze past performance
  - Trend data
  - Perform rollups and weighted aggregates
- Display historical data
  - Used for planning and decision making
  - Tabular user interface
  - Generated on demand

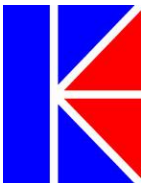
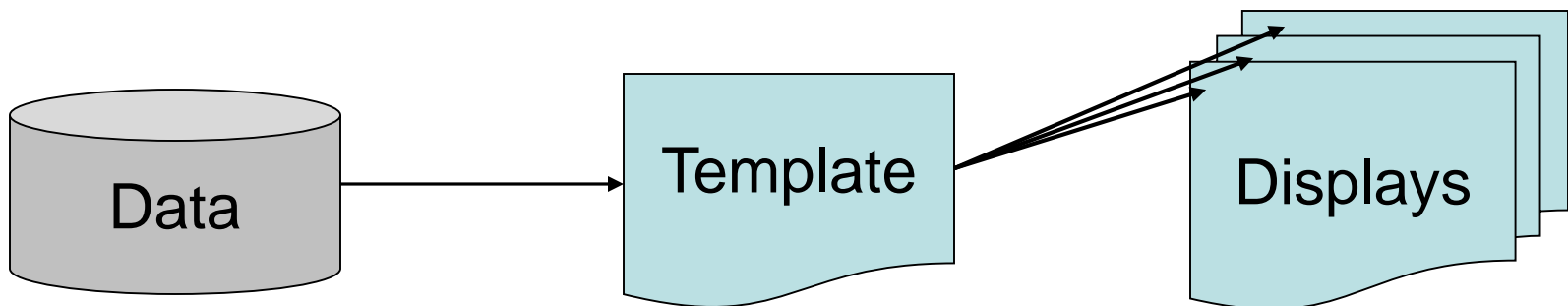


# Template Monitoring and Web-Based Reporting with PI



# Templates

- Reusable “cookie cutters”
  - Data driven
- Reduces number of files
  - Easier to maintain



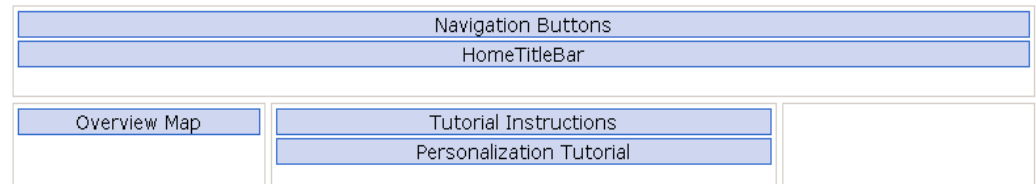
# Overview of ICE

- Web Based
  - Maintain one central server
  - Available to anyone who needs to know
- Allows personalization
  - Content
  - Layout
- 3-tier design
  - Presentation: Web Parts
  - Business: Business objects
  - Data: PI, Module DB

## Web Part Layout

Change the position and order of Web Parts by dragging them around in the different sections. If there are no Web Parts in a section, that section will not be displayed in the dashboard.

To save your layout changes, click the **Save** button at the bottom of the page.



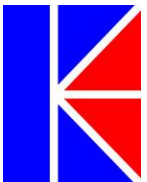
## Content in "KEI ICE Demo"

Web Parts are the blocks of information that are displayed on a dashboard. Use this page to turn Web Parts on and off, to import Web Parts, or to create new Web Parts.

### Web Parts

These Web Parts are currently available to your dashboard. Use the check boxes to turn the parts off and on. To save your changes, click the **Save** button at the bottom of the page.

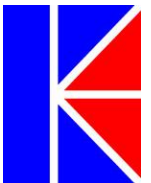
Name	Position	Last Modified
<input checked="" type="checkbox"/> <a href="#">HomeTitleBar</a>	Header	Sunday, March 03, 2002 5:29:12 PM
<input checked="" type="checkbox"/> <a href="#">Navigation Buttons</a>	Header	Sunday, March 03, 2002 5:29:12 PM
<input checked="" type="checkbox"/> <a href="#">Overview Map</a>	Left	Sunday, March 03, 2002 5:29:12 PM
<input checked="" type="checkbox"/> <a href="#">Personalization Tutorial</a>	Middle	Sunday, March 03, 2002 5:29:12 PM
<input checked="" type="checkbox"/> <a href="#">Tutorial Instructions</a>	Middle	Sunday, March 03, 2002 5:29:12 PM





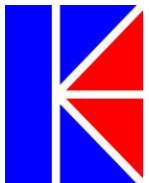
# Extending ICE

- Use Templates
  - Module Database provides data
- Use Dynamic SVG
  - Live graphics
  - Java script in SVG like VBA in Process Book
- Use Navigation Buttons
  - Reduces clutter on dashboard
  - Navigation always synchronized with database



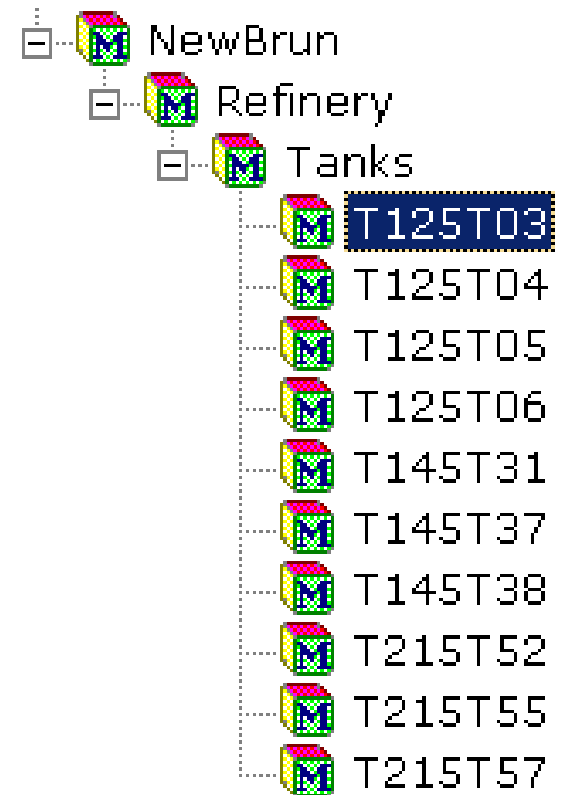
# Why Module Database?

- Hierarchical Data Store
  - Plant topology
  - Easy to navigate
- Allows for Templates
  - New displays automatically available
  - Always synchronized
- Centralized maintenance

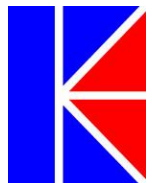


# Integrating ICE and Module DB

- Module DB is queried to create displays and navigation on the fly
- Adding modules to database effectively adds new equipment
- Adding aliases to database effectively adds new KPIs

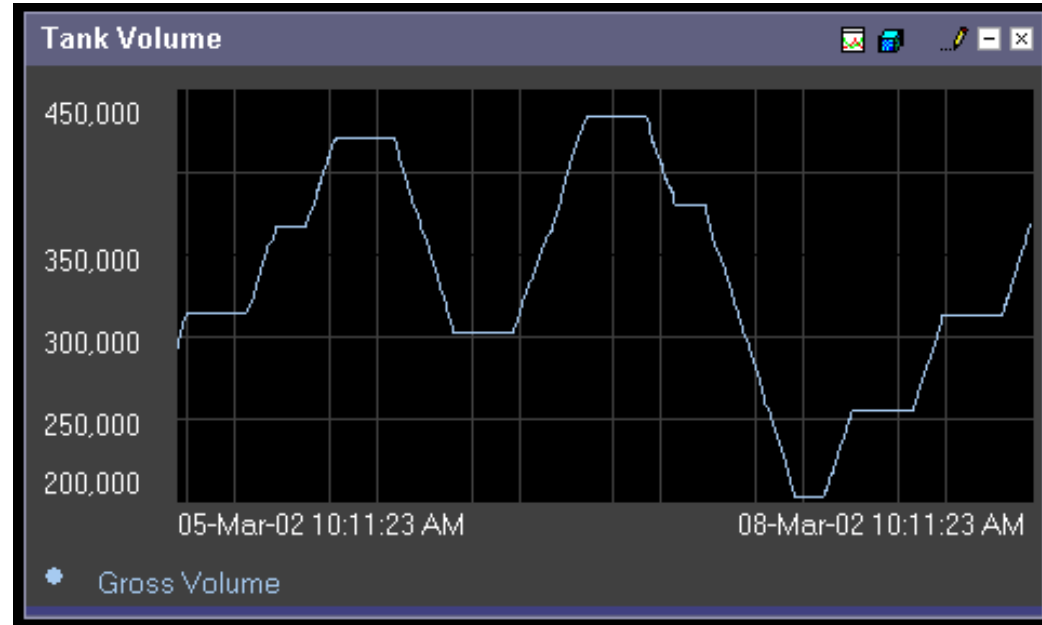


Product Information				
Tank Code	Product	Status	Current Level (ft)	Current Volume (BBL)
<u>125-T03</u>	L. Arabian Crude	ST	<u>37.717 ft</u>	<u>363463 BBL</u>
<u>125-T04</u>	L. Arabian Crude	CH	<u>36.901 ft</u>	<u>355517 BBL</u>
<u>125-T05</u>	L. Arabian Crude	ST	<u>45.000 ft</u>	<u>433646 BBL</u>
<u>125-T06</u>	L. Arabian Crude	ST	<u>15.000 ft</u>	<u>144549 BBL</u>



# Integration Methods

- Web Parts
  - Visual element to accomplish well defined task
  - Stand alone or combined with others to function
- Business Objects
  - Server-side compiled code
  - Process client requests
  - Interact with data stores via queries

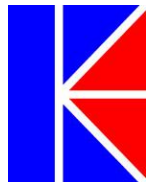


The figure shows two configuration panels for a trend chart. The top panel is titled "Trend Options" and contains the following settings:

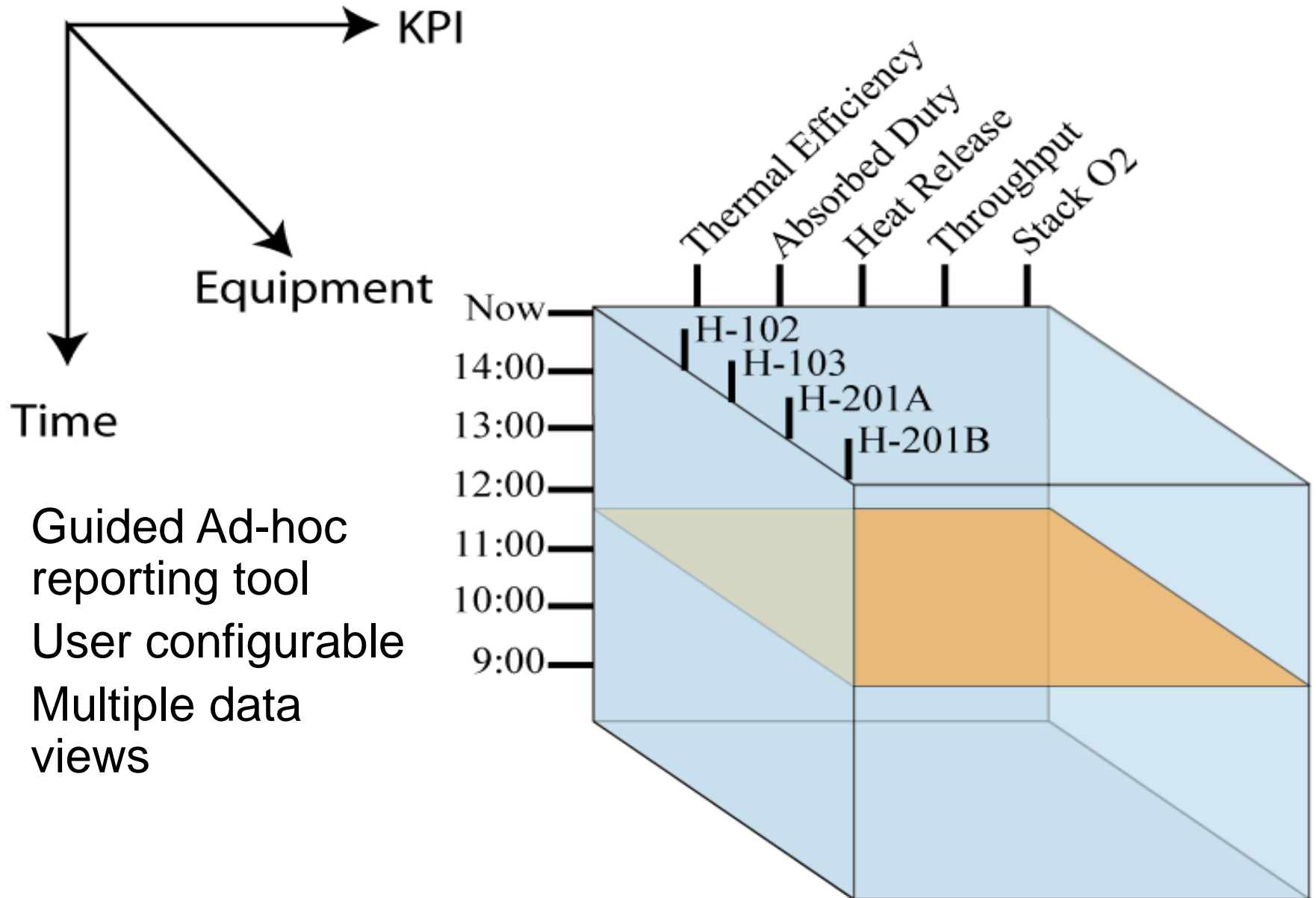
- Vertical Scale: ☒ Single ☐ Multiple
- Title:
- Start Time:  End Time:
- ☐ Auto Update Interval:  secs
- Buttons: Apply, Apply & Return

The bottom panel is titled "Time Range" and contains the following settings:

- Start:  End:
- Buttons: Apply, [Zoom In], [Zoom Out], [Reset]



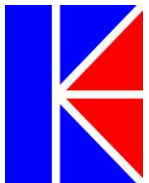
# Example: ICE-Cube



# ICE Cube

- Single Cube used for 3 views of data
  - Equipment Report
  - KPI Report
  - Time Interval Report
- Optional data rollups
  - Time Integral
  - Time Average
  - KPI Average weighted by another KPI
- Unit conversions

KEI ICE Cube Report				
<b>TankCube</b> (KEI ICE Cube for Tanks)		KEI ICE Cube Report		
<b>KPI: CapacityUtilization</b>		Server : localhost		
		3/9/2002 2:40:12 PM		
Period Ending	T125T03	T125T04	T125T05	T125T06
3/9/2002 3:00:00 AM	51.1 %	49.4 %	49.3 %	52.1 %
3/9/2002 6:00:00 AM	48.7 %	44.2 %	47.4 %	44.1 %
3/9/2002 9:00:00 AM	52.3 %	45.2 %	48.1 %	50.0 %
3/9/2002 12:00:00 PM	53.6 %	42.1 %	49.6 %	61.3 %
<b>Summaries</b>	<b>65.2 %</b>	<b>50.5 %</b>	<b>55.7 %</b>	<b>51.1 %</b>
	(AVG)	(AVG)	(AVG)	(AVG)
(Schema Version: 3.0.1)				



# Design of ICE-Cube

- KEI Query Business Object
  - Cube is automatically updated when new equipment or KPIs are added
- User interface built as web parts

Please specify the type of report you want to generate:

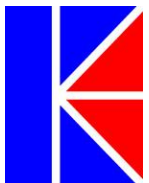
☐ Equipment Report  
☒ KPI Report  
☐ Time Interval Report

Schema version: 3.0.1

Equipment Options

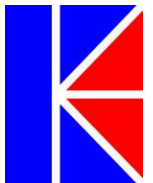
Choose Equipment:

Included ?	Available Equipment
<input checked="" type="checkbox"/>	T125T03
<input checked="" type="checkbox"/>	T125T04
<input checked="" type="checkbox"/>	T125T05
<input checked="" type="checkbox"/>	T125T06
<input type="checkbox"/>	T145T31
<input type="checkbox"/>	T145T37
<input type="checkbox"/>	T145T38
<input type="checkbox"/>	T215T52
<input type="checkbox"/>	T215T55
<input type="checkbox"/>	T215T57



# Applications

- On-line calculation of Pressure-Compensated Temperatures (PCTs)
- Real-time monitoring of internal vapor/liquid traffic in a fractionator
- Spot VLE and material and energy balance calculations
- Calculating and monitoring the heat absorbed or generated in a reactor
- Tracking process unit Key Performance Indices (KPIs)
- Monitoring equipment performance
- Monitoring unit or plant energy use
- Real-time estimation of Profit & Loss of a plant or unit
- Monitoring equipment/tankage inventory and capacity utilization, etc.





# The End



Thank You  
Kesler Engineering, Inc.  
<http://www.KeslerEngineering.com>

