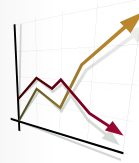


Structural Integrity
Associates, Inc.®



PlantTrack™
Engineering Insight Through Data





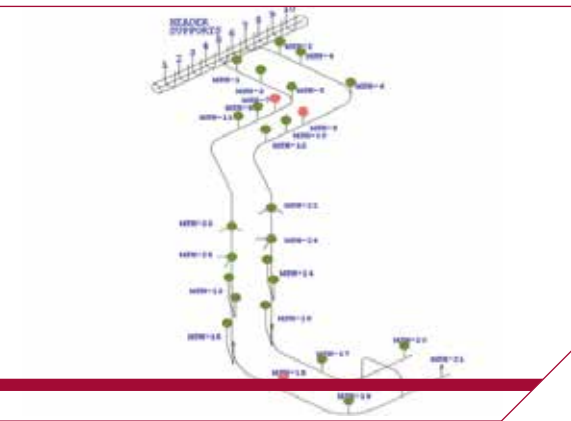
STRUCTURAL INTEGRITY INTRODUCES PLANTTRACK™

Minimizing risk and maximizing reliability are the key goals for an asset management program. An essential part of any program is a system that will warehouse the associated data. However, simply storing the data is not sufficient. The data management system must be capable of mining and analyzing the data to transform that data into information which can be used to make decisions. Through intuitive interaction with this information, knowledge is developed that helps you proactively manage your plant. Structural Integrity (SI) has been the industry leader in the development of programs and methodologies to achieve these goals, and now we introduce our data management program, PlantTrack™.

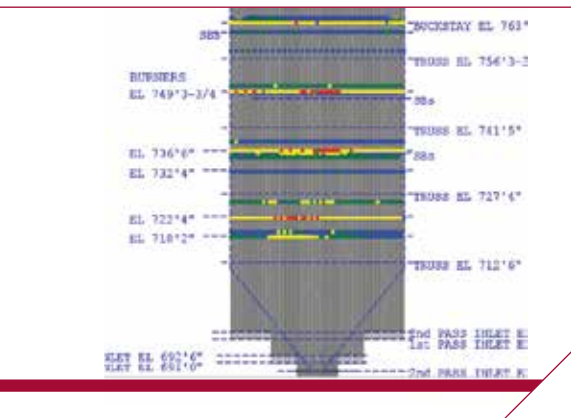
PlantTrack has a solid foundation building on the legacy TubeTrack application which for 30 years has provided an industry best graphical interface for display and analysis of boiler tube information. We augmented this with technology from our own High Energy Piping data management system that was built by HEP engineers for HEP engineers. These two programs have been integrated into our web-based program, currently with Boiler Tubing and HEP modules. Future plans will expand capabilities to include other plant components and systems such as Headers, Turbine Generators, Feedwater Heaters, Condensers, and other balance of plant, (BOP) systems.

Key features of PlantTrack:

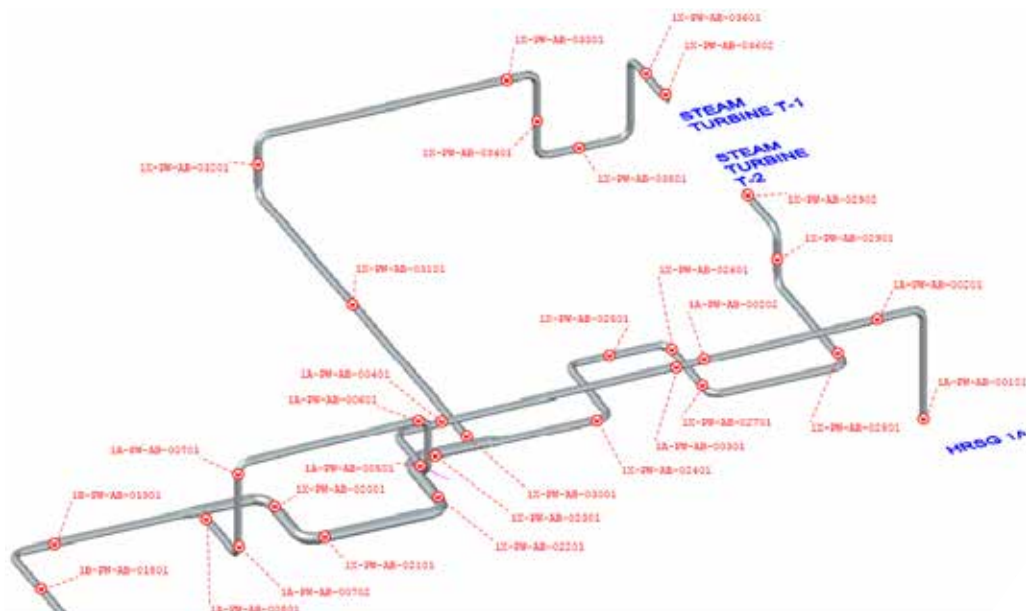
- Easy access from different operating systems and platforms
- Flexible graphics options
- Ability to utilize standard and custom reports and charts
- Powerful database with advanced sorting, filtering, and data mining capabilities



Example displaying hanger inspection results



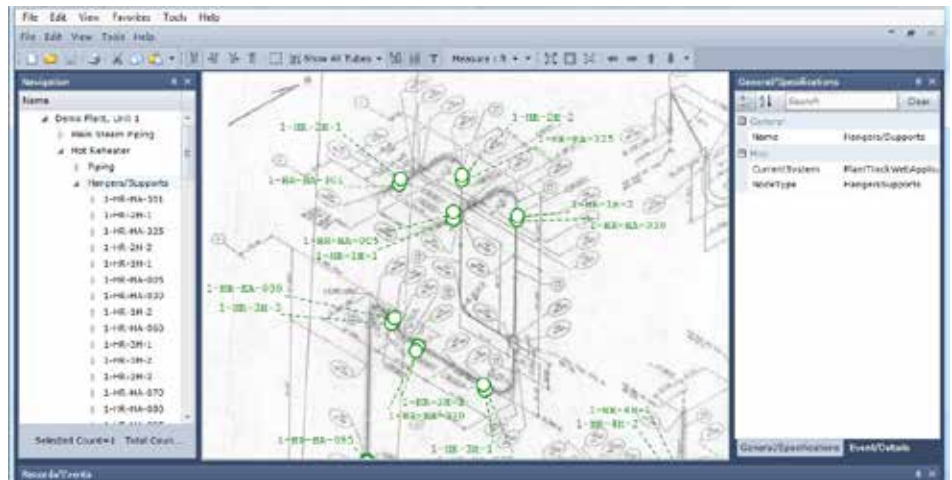
Waterwall displaying over 4,000 color coded NDE readings



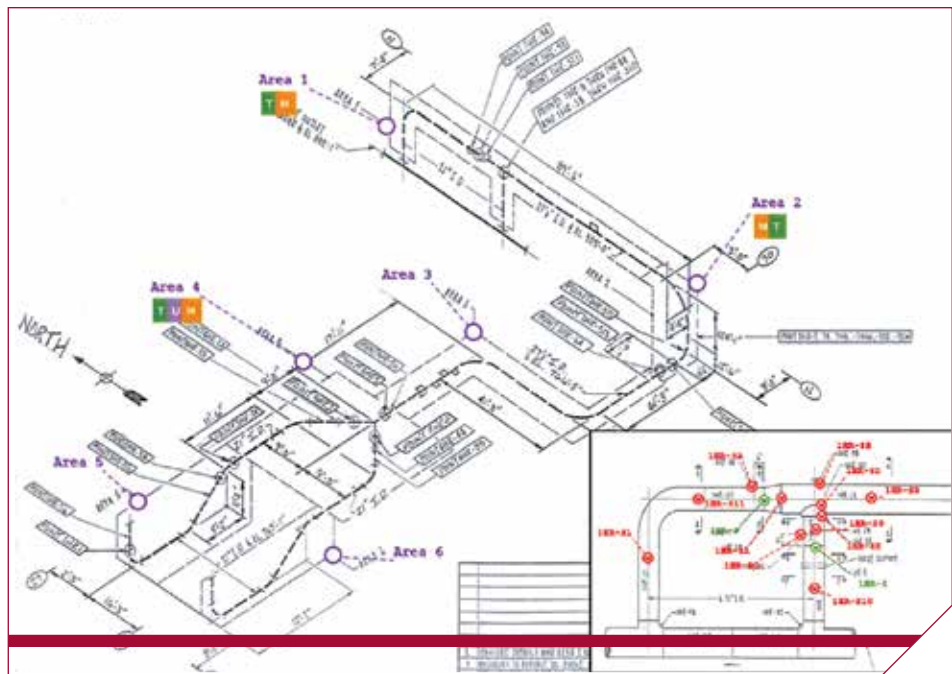
Above is an image of a typical system with the overlaid weld labels.



- Digitized Images: The scanned/digitized images of systems and components can be used as backgrounds on which the user can locate various components.



More detailed area/details drawings can be included with the main drawing as shown in the example. The records are propagated from the detail drawings to the higher level drawings.



RECORD TYPES

Similar to TubeTrack, there are three types of records that can be entered graphically:

1. Point records, such as NDE readings
2. Line (length) records, such as pipe insulation
3. Rectangular (Area) records, such as records over multiple components

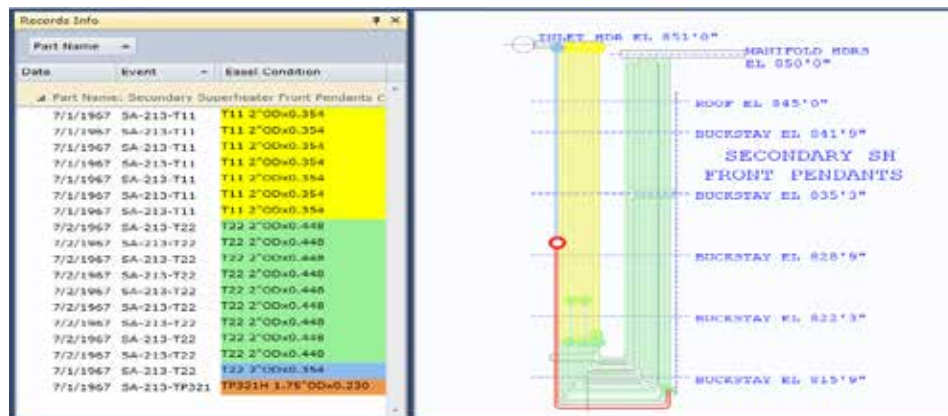
These record types allow a wide range of piping data, from inspection results to specifications, to be easily visualized.

The graphical data entry makes accurate record location a simple task. The user can isolate the pipe or component for which a record is to be entered, and the record entry is one or two clicks away, depending on the record type.

If a record is being entered for a "node" such as a weld or hanger, entering just the node ID will automatically locate the record correctly.

COLOR-CODED DATA DISPLAY, EASELS

In addition to the displaying single or multiple records from the event tree or grid, the user can display multiple records on the graphics color-coded with the user editable filters, called easels. The easels can be saved for future use.



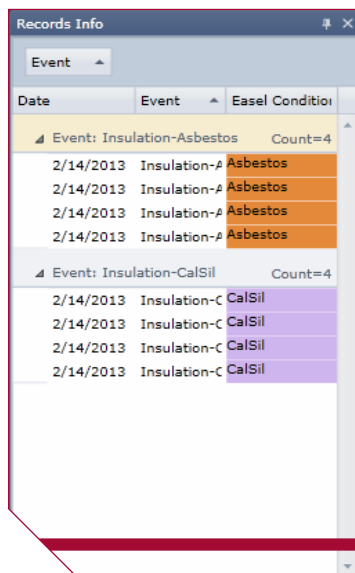
Some typical applications of easels include, with many more options available:

- Piping materials, coating, insulation
- Hanger inspection results
- Weld inspection and analysis results
- Stress analysis results
- NDE readings, etc.

Boiler applications:

- Tube specifications
- Tube failures and repairs
- NDE/UT Thickness readings
- Weld locations, etc.

The easels allow to visually identify where the problem areas are and determine impacts of other physical features on the system and component performances, which would not be possible with a non-visual database.





DATABASE TO GRAPHICS CONNECTIVITY

PlantTrack's graphical data entry feature not only allows accurate record display, but when multiple records are displayed using easels, the details of individual records can be displayed by just right-clicking on the marks.

Using PlantTrack's "Isolate" feature, the user can limit the list of records to the selected component or pipe. This feature is useful to quickly obtain a history of inspection, design data, and repair data on the isolated objects.

ADDITIONAL DATA SELECTION AND SORTING FEATURES

In addition to the "Easels" and component "Isolation" features, the list of records either in the Event Tree or Event Grid can be sorted by just clicking on the column name. In the Event Grid, there are additional filtering capabilities built-in which allow the user to quickly create and apply filters.

These record sorting and filtering features, as well as the graphical filtering features such as "Easels" and component "Isolation", provide capable and flexible methods for data mining, creating information and knowledge on plant systems and components.

Filter Editor

And +

Date Record Is greater than 1/1/

UT Focus Results Is not blank ✖

MT Result Begins with <enter a v

= Equals

≠ Does not equal

> Is greater than

≥ Is greater than or equal to

< Is less than

≤ Is less than or equal to

📏 Is between

📏 Is not between

abc Contains

acb Does not contain

[a]b Begins with

b[c] Ends with

a%c Is like

a%c Is not like

🟢 Is any of

🔴 Is none of

○ Is blank

🟢 Is not blank

UT Focus Results	UT Pel	TOFD In	Replicas T
No	(Blanks)	No	No
No	(Non blanks)	No	No
No	N/A	No	No
No	No	No	No
No	Yes	No	No
No		No	No
No		No	No
No		No	No

OK Cancel Apply

RECORD TYPES

HEP/Piping module typical records are:

- Pipe specifications (size, material, insulation, coating, lagging, etc.)
- Pipe failure and repair
- Piping inspections
- Weld specifications
- Weld inspections
- Hanger/Support specifications
- Hanger/Support inspections
- Valve specifications
- Valve inspections
- Instrument connection information
- Other piping and component related data

Boiler/HRSG module typical records are:

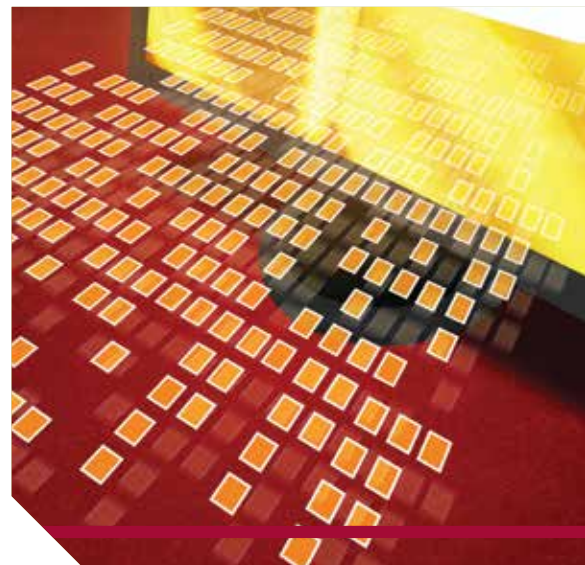
- Tube specifications (size, material, weld procedures, coating, overlays, metallization, etc.)
- Tube failure and repairs
- Tube inspections (NDE, oxide thickness, etc.)
- Analysis results (remaining life, wall thinning rates, wall thickness projections, gas touched length analysis, etc.)
- Tube replacements, etc.

PlantTrack allows editing record types, record details, and menus by authorized users through an easy-to-use database setup feature.

DASHBOARD

The dashboard is the control center of our program. Using the dashboard, you can:

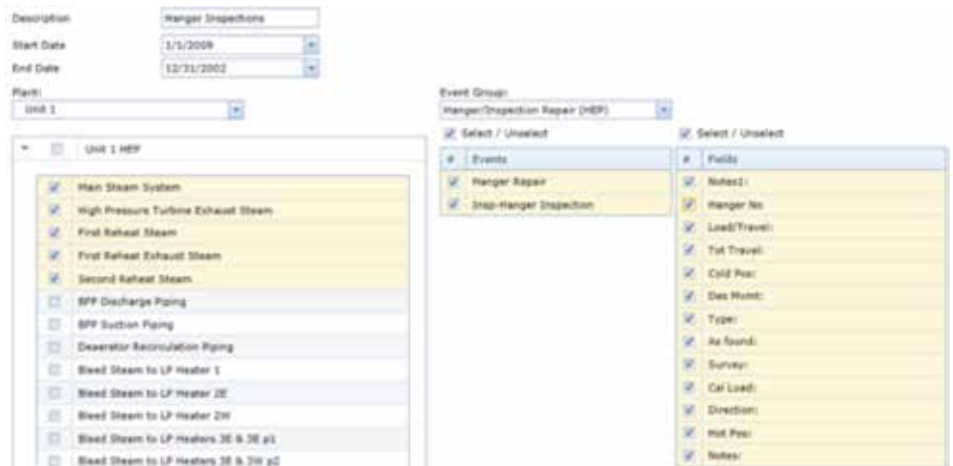
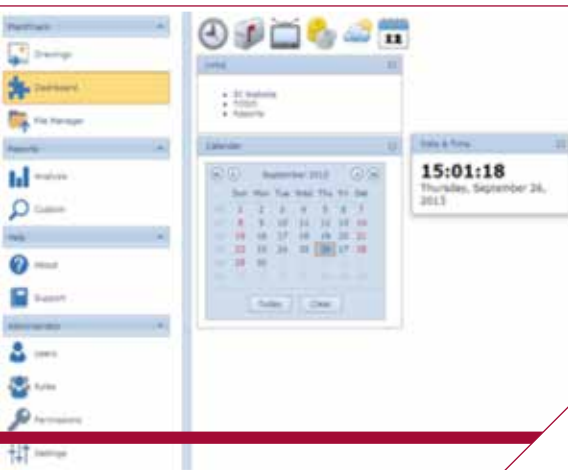
- Proceed to graphical database module
- Create custom reports
- View standard reports
- Create quick lists (transferrable to Microsoft Excel/Word)
- Quick charts (transferrable to Microsoft Excel/Word)
- Add/edit user privileges and roles (administrator)
- Setup database configuration (users with setup privileges)
- Access the online support portal
- Create/view reminders and announcements



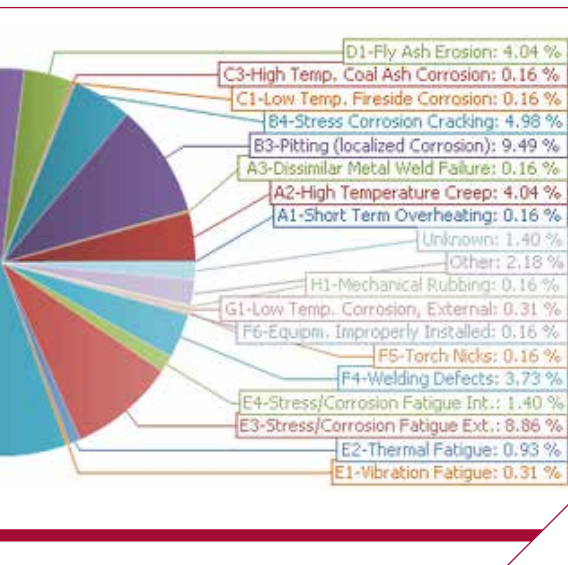
QUICK RECORD LISTS AND CHARTS

The reports section of the dashboard includes a feature to quickly list, sort, and filter records and create trend charts. The listed records and charts then can be copied to spreadsheet and/or word processing programs.

The users create filters for record selection from the database. The filter can be saved for future use. The image below shows the components of filter creation.



Once a filter is created, the user can then list records, add additional filters based on each field, hide selected columns, and sort based on the column values.

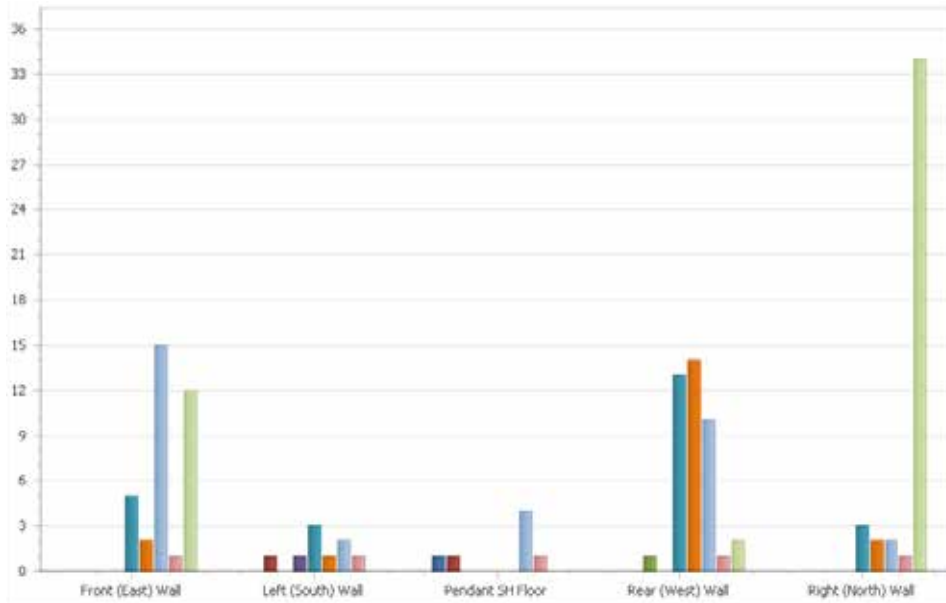


Typical pie chart for various types of failure mechanisms

Drag a column header here to group by that column

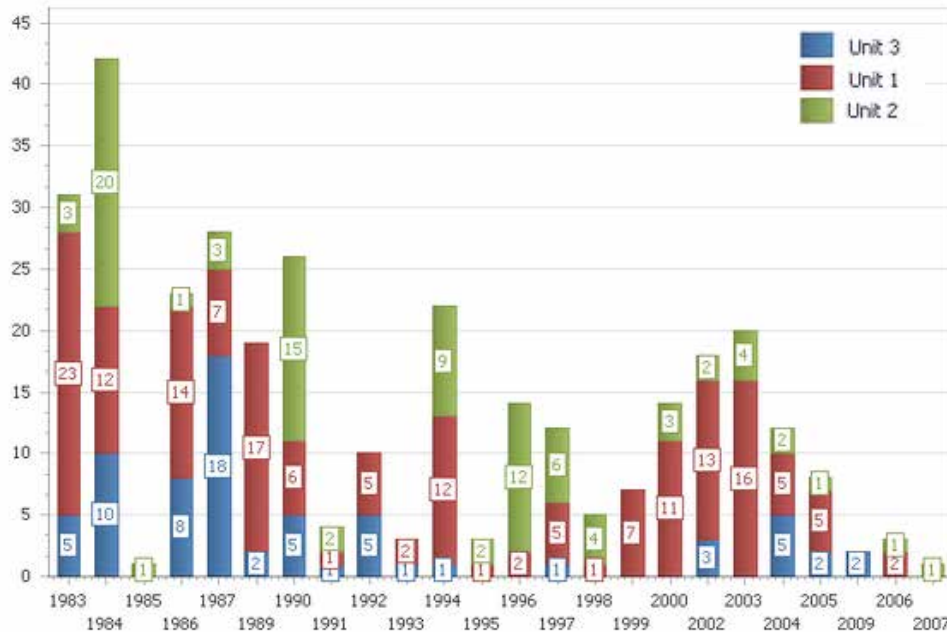
System Name	Date	Event Name	Hanger No	Type	As found	Survey	Notes
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-10	Strut	In Range	Hot	Strut
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-6	Constant Support	In Range	Hot	Hanger
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-12	Strut	In Range	Hot	Strut
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-4	Variable Support	Topped	Hot	Hanger
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-9	Constant Support	In Range	Hot	Hanger
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-7	Constant Support	In Range	Hot	Hanger
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-5	Variable Support	In Range	Hot	Hanger
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-2	Rigid Support	In Range	Hot	Hanger
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-11	Strut	In Range	Hot	Strut
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection		Rigid Support	In Range		
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-8	Constant Support	In Range	Hot	Hanger
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-3	Guide	In Range	Hot	Guide
High Pressure Turbine Exhaust Steam	12/9/2009	Insp-Hanger Inspection	TEH-1	Variable Support	In Range	Hot	Hanger

The user can also create pivot tables and charts:



CUSTOM AND STANDARD REPORTS

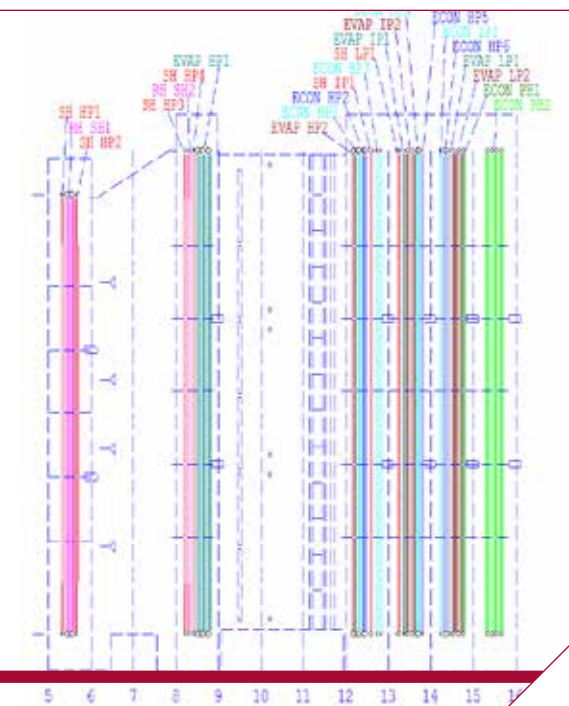
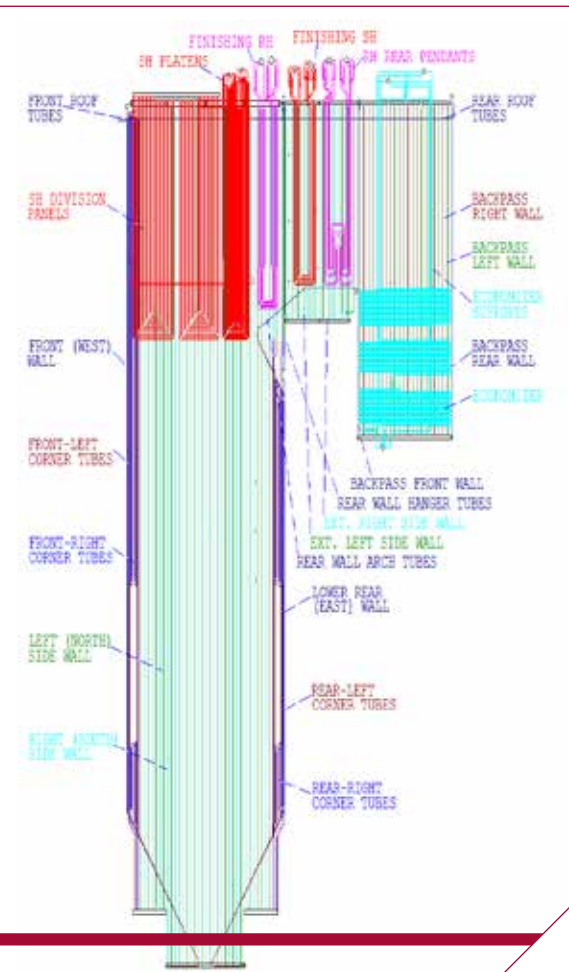
PlantTrack has standard reports based on user inputs for dates, components, and record types. Some report samples are shown below:



Structural Integrity can create additional custom reports based on user specifications.

B3-Pitting (localized Corrosion)
B4-Stress Corrosion Cracking
C1-Low Temp. Fireside Corrosion
C2-Reducing Atmosphere Corrosion
D1-Fly Ash Erosion
D3-Sootblower Erosion
E3-Stress/Corrosion Fatigue Ext.
E4-Stress/Corrosion Fatigue Int.
G1-Low Temp. Corrosion, External

Hanger Inspection Results				
Plant	HEP Demand	Unit	Unit 2 HEP	System: Steam Driven to Generation
Date	Hanger No.	As Found	Notes	
12/14/00	BH-54	Overloaded	OK, inspected by SI OK.	
12/14/00	BH-55	In Range	inspected by SI	
12/14/00	BH-56	In Range	SEE OK, inspected by SI SW OK.	
12/14/00	BH-56W	In Range	inspected by SI	
12/14/00	BH-57	Unloaded	Hanger west side. Raised off ground, inspected by SI OK.	
12/14/00	BH-58	In Range	inspected by SI	
12/14/00	BH-58W	In Range	SW OK, inspected by SI OK.	
12/14/00	BH-59	In Range	inspected by SI	
12/14/00	BH-60	Bottomed	BDN Bottomed out, inspected by SI OK.	
12/14/00	BH-60S	Bottomed	Bottomed out, inspected by SI	
12/14/00	BH-61	Bottomed	Bottomed out, inspected by SI, no other data.	
12/14/00	BH-62	In Range	Hanger OK, inspected by SI	
12/14/00	BH-63	In Range	OK, inspected by SI, no other data OK.	
12/14/00	BH-64	In Range	inspected by SI	
Plant	HEP Demand	Unit	Unit 2 HEP	System: High Pressure Turbine E
Date	Hanger No.	As Found	Notes	
12/09/00		In Range	OK, survey by SI	
12/09/00	TEH-1	In Range	OK, survey by SI (Horizontal strut) shifted slightly to north, survey by SI	
12/09/00	TEH-10	In Range	OK, survey by SI	
12/09/00	TEH-11	In Range	OK, survey by SI	
12/09/00	TEH-12	In Range	Support OK, survey by SI	
12/09/00	TEH-13	In Range	OK, survey by SI	
12/09/00	TEH-2	In Range	OK, survey by SI	
12/09/00	TEH-3	In Range	OK, survey by SI	
12/09/00	TEH-4	Trapped	OK, survey by SI	
12/09/00	TEH-5	In Range	OK, survey by SI	
12/09/00	TEH-6	In Range	OK, survey by SI	
12/09/00	TEH-7	In Range	OK, survey by SI	
12/09/00	TEH-8	In Range	OK, survey by SI	
12/09/00	TEH-9	In Range	OK, survey by SI	



PLANTTRACK DATABASE

The PlantTrack database is based on MS SQL Server. SQL database offers significant technical advantages in terms of reporting, data mining, and sorting. There will be standard database designs for boiler and piping modules. These can be modified to incorporate client's information tracking needs, if necessary.

A typical HEP module will include drawings for:

- Main Steam System
- Hot Reheat System
- Cold Reheat System

An extended Piping module may include the following in addition to the HEP module:

- Feedwater Piping
- Condensate Piping
- Bleed Steam/Feedwater Extraction Steam Piping
- Steam Piping to Deaerator
- Steam Piping to Evaporator
- Deaerator Circulation Piping
- Steam Seal System Piping
- Auxiliary Steam Piping
- Burner Piping
- Sootblower Piping
- Other Piping Systems

A typical Boiler/HRSG module will include drawings for:

- Waterwalls and roof tubes
- Superheater, reheater, economizer assemblies
- Steam cooled walls
- Evaporators
- Spacer tubes, connecting tubes, etc.

DATABASE SETUP

PlantTrack allows users with setup privileges to edit the database configurations. They can add delete or edit:

- Event groups
- Events (record types)
- Templates (field designations for each record type)
- Menus

#	Name	Nickname	Event Group	Template	Symbol	Color	Measurement
1	Material: SA-53		Materials (HEP)	Materials (HEP)	1		2 Outside Diameter,in
2	Material: SA-Other		Materials (HEP)	Materials (HEP)	2		2 Outside Diameter,in
3	Mechanical Stress or Fatigue		Tube Failures	Tube Failures	3		2 O=Failure, 1=Plant
4	NDE-Oxide Thickness		NDE Oxide	Notes-Only	4		3 Oxide Thickness,mils
5	NDE-Tube Thickness		NDE	Notes-Only	5		3 Tube Thickness, in
6	Other		Tube Failures	Tube Failures	6		2 O=Failure, 1=Plant
7	Oxidation Pitting		Tube Failures	Tube Failures	7		2 O=Failure, 1=Plant
8	Remaining Life		NDE RUL	Notes-Only	8		3 Remaining Life, khrs
9	SA-178A		Tube Materials	Tube Materials	9		6 Outside Diameter,in
10	SA-178C		Tube Materials	Tube Materials	10		6 Outside Diameter,in

PlantTrack database setup feature is one of the major improvements over the legacy TubeTrack:

- The Event Groups allow grouping events/records with similar detail configuration together. For example, all the Tube Failure events can be grouped as "Tube Failure" group.
- The user can select the group when creating a report or a filter, instead of specifying each event individually.
- There are no limits to the:
 - number of record types
 - number of fields for each record type
 - the size of text fields
 - number of menus
 - number of items in a menu

FILE MANAGER, DOCUMENT ATTACHMENT

The File Manager feature allows users to create and manage drawing and document resources on the web server. The documents can be any reports, photos, reference drawings, forms, etc. The drawings can also be used as background images for component locations and record displays. A document can be attached to several records or components, and a record or component can have multiple attached documents.

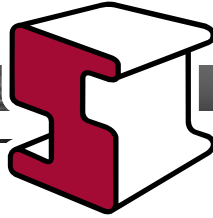
ANALYTICAL TOOLS AND SERVICES

Structural Integrity provides a wide range of support and engineering services to traditional fossil and combined cycle power plants. A detailed list of our Power Plant Services can be found at our web site: www.structint.com.

Some of our engineering services are listed below:

- Economics-based risk assessment method for boiler tube failures
- Customized plant chemistry assessment program
- Full-service Metallurgical Laboratory
- Vindex, a semi-quantitative risk analysis program for HEP systems
- Probabilistic Gas Touch Length Analysis (PGTLA) for Superheater and Reheater Remaining Life Assessments
- Piping Stress Analysis





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