



# Migration of DCS/SCADA Graphics to PI ProcessBook

**Robert Norman**  
Vantage Partners/NASA – Glenn Research Center

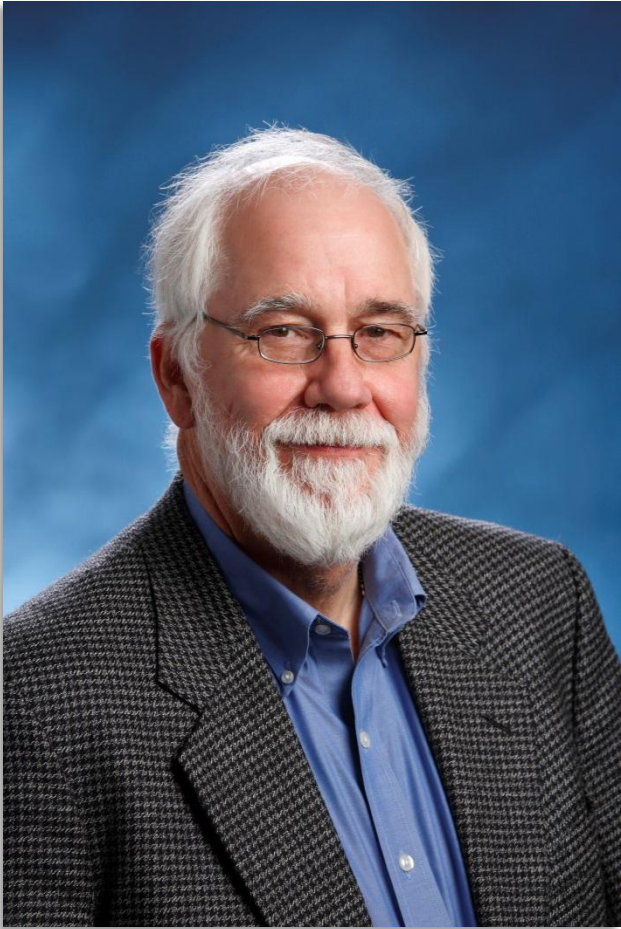
Presented by

**Aaron Brewer**  
Data South Systems, Inc.

# Agenda

- Review of Agenda
- Introductions
- Webinar Series and Partner Solution Showcase
- PI System Overview at NASA
- Uses of DCS, the PI System and PI Processbook
- Need for graphics in PI ProcessBook
- Discovery of GrITS for ProcessBook at 2002 OSIsoft Users Conference
- Demonstration of solution
- Questions
- Conclusions and Thank You!

# Mission



**“Our mission is to maximize the Value our customers get from our product and services”**



# Presenters

- **Robert Norman - Sr. Software Engineer**  
Vantage Partners/NASA Glenn Research Center  
Office: (216) 433-2118  
Email: Robert.L.Norman@grc.nasa.gov
- **Aaron Brewer - Operations Manager**  
Data South Systems  
Office: (912) 369-7350, ext. 105  
Email: aaron@datasouthsystems.com
- **Erika Ferguson - Partner Manager, Americas**  
OSIsoft, LLC  
Mobile: (510) 604- 9053  
Email: eferguson@osisoft.com

# OSIsoft Partner Solution Showcase

- Find software solutions from OSIsoft partners with specific industry and domain expertise.
- <http://partners.osisoft.com/solutions>

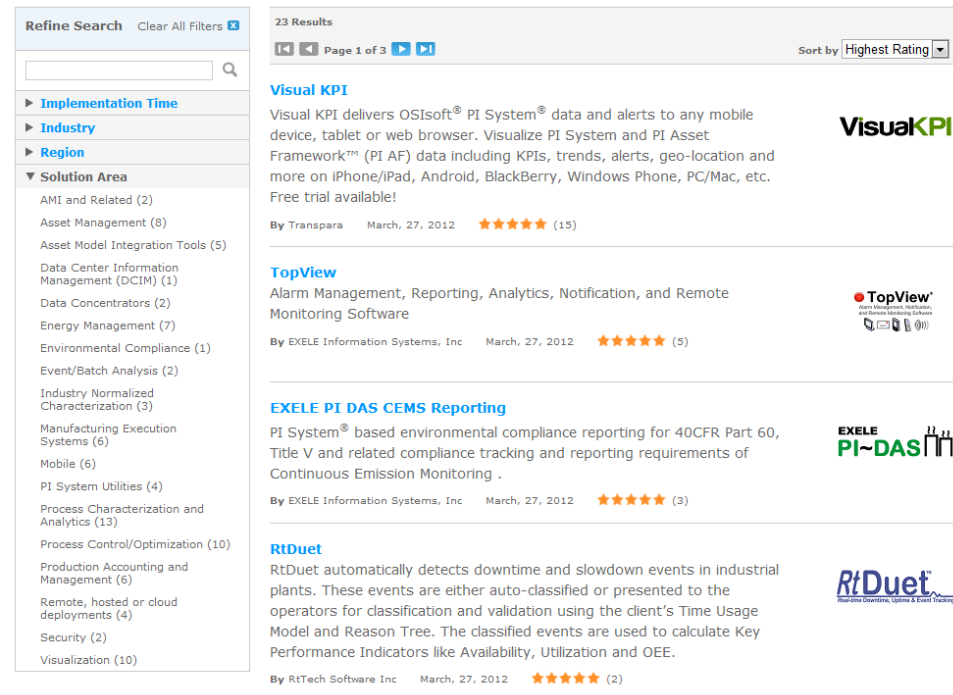


**OSIsoft** | partner  
solution showcase

Connecting our customers with OSIsoft partner solutions

Learn more at [partners.osisoft.com/solutions](http://partners.osisoft.com/solutions)

*pss@osisoft.com*



The screenshot displays the 'Refine Search' interface on the OSIsoft Partner Solution Showcase website. The left sidebar lists various solution areas, including 'Implementation Time', 'Industry', 'Region', and 'Solution Area'. The 'Solution Area' section is expanded, showing a list of categories such as 'AMI and Related (2)', 'Asset Management (8)', 'Asset Model Integration Tools (5)', 'Data Center Information Management (DCIM) (1)', 'Data Concentrators (2)', 'Energy Management (7)', 'Environmental Compliance (1)', 'Event/Batch Analysis (2)', 'Industry Normalized Characterization (3)', 'Manufacturing Execution Systems (6)', 'Mobile (6)', 'PI System Utilities (4)', 'Process Characterization and Analytics (13)', 'Process Control/Optimization (10)', 'Production Accounting and Management (6)', 'Remote, hosted or cloud deployments (4)', 'Security (2)', and 'Visualization (10)'. The main content area shows 23 results, sorted by 'Highest Rating'. The first result is 'Visual KPI' by Transpara, dated March 27, 2012, with a 5-star rating (15 reviews). The description states: 'Visual KPI delivers OSIsoft® PI System® data and alerts to any mobile device, tablet or web browser. Visualize PI System and PI Asset Framework™ (PI AF) data including KPIs, trends, alerts, geo-location and more on iPhone/iPad, Android, BlackBerry, Windows Phone, PC/Mac, etc. Free trial available!'. The second result is 'TopView' by EXELE Information Systems, Inc., dated March 27, 2012, with a 5-star rating (5 reviews). The description states: 'Alarm Management, Reporting, Analytics, Notification, and Remote Monitoring Software'. The third result is 'EXELE PI DAS CEMS Reporting' by EXELE Information Systems, Inc., dated March 27, 2012, with a 5-star rating (3 reviews). The description states: 'PI System® based environmental compliance reporting for 40CFR Part 60, Title V and related compliance tracking and reporting requirements of Continuous Emission Monitoring'. The fourth result is 'RtDuet' by RtTech Software Inc., dated March 27, 2012, with a 5-star rating (2 reviews). The description states: 'RtDuet automatically detects downtime and slowdown events in industrial plants. These events are either auto-classified or presented to the operators for classification and validation using the client's Time Usage Model and Reason Tree. The classified events are used to calculate Key Performance Indicators like Availability, Utilization and OEE.'

# PI System at NASA Glenn Research Center

# Central Process Distributed Control System



ED



CAD



CAEB



ERB

# CP-DCS Customers

- Wind Tunnels (10x10, 8x6/9x15, IRT)
- Propulsion Systems Lab
- Icing Research Tunnel
- Engine Components Research Lab
- Rocket Combustion Lab
- Aeroacoustic Propulsion Lab
- Compressor, Turbine and Combustor Test Cells



# Major Systems (ED & CAD)

- ED (Electrical Dispatch)
  - 13 Substations ==> 138,000V to 2400V
  - Max Power Available = 370MW
  - Base (Institutional Load) = 21MW
  - 212,000 MWhr ==> Annual Usage
- CAD (Central Air Dispatch)
  - Over 600+ Remotely Operated Valves
  - Combustion Air Distribution Piping => 16,000 Ft
  - Exhaust Distribution Piping ==> 7,000 Ft

# Major Systems (CAEB)

- CAEB (Central Air Equipment Building)
  - 7 Compressors (107,000Hp)
    - 40, 150, 450 Psig
    - Flow ==> 400 lb/sec @ 150Psig
  - 8 Exhausters (106,000 Hp)
    - Altitude ==> 90,000 Ft.
    - Flow ==> 700 Lb/Sec @ 19,000 Ft.
  - 2 Variable Frequency Mg's (5000 Hp)
  - 1 Static Frequency Converter (7500 Hp)
  - 3 Turboexpanders
    - -90 Deg F

# Major Systems (ERB)

- ERB (Engine Research Building)
  - 9 Compressors (29,100 Hp)
    - 40, 150, 450, 1250 Psig
    - Flow ==> 88 lb/sec @ 40Psig
  - 1 Turboexpander/Compressor
    - -70 Deg F
  - Variable Frequency
    - 9 Rotating Converters
      - 15,000 Hp
      - 10 Hz ==> 120 Hz

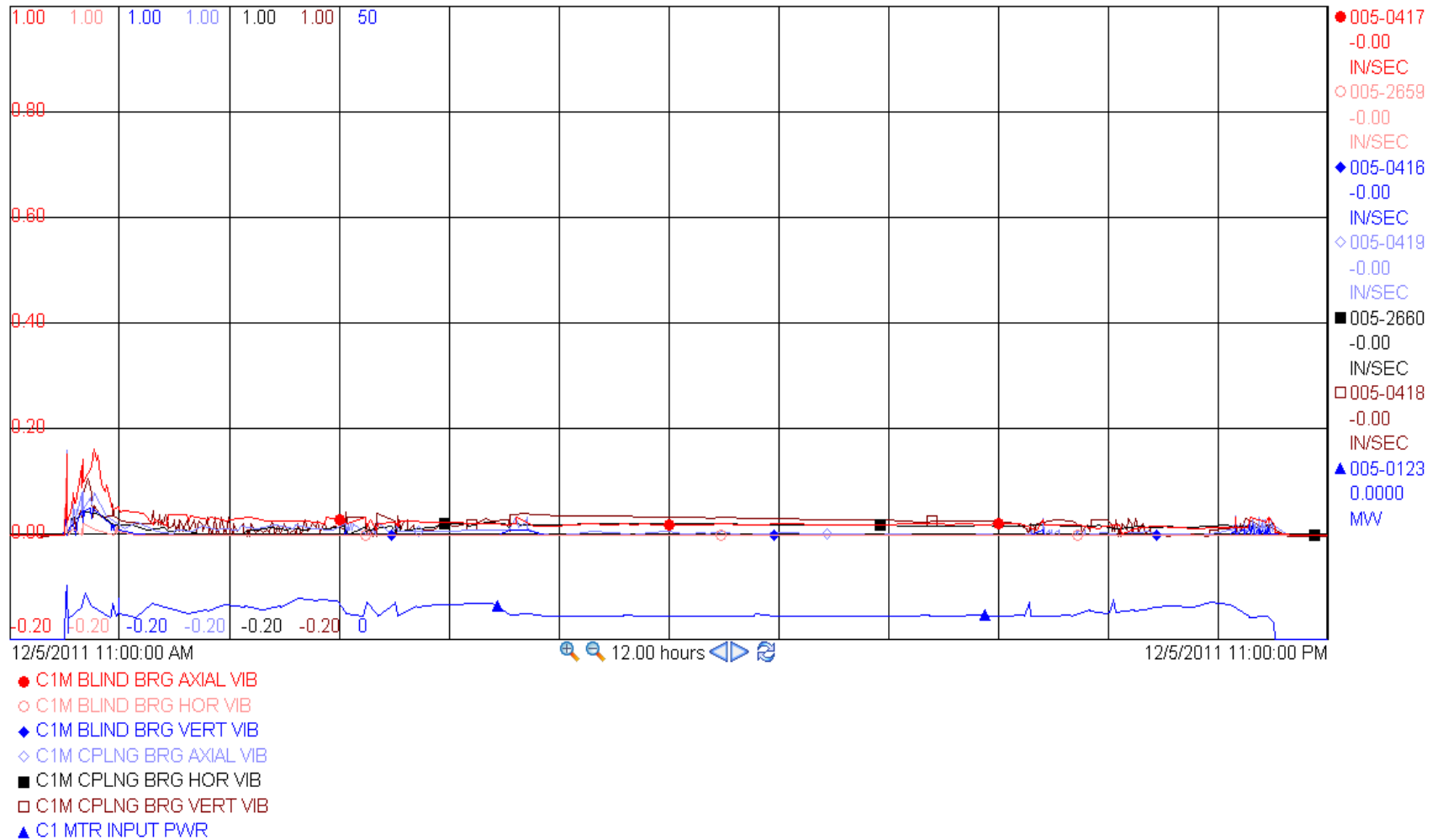
# The OSIsoft PI System at NASA

- Problem existing Bailey Historian was obsolete, not Y2K compliant
- Contacted OSIsoft sale/tech reps on 2/6/99
- Visited the site, did preliminary software load, converted database overnight
- System online since 2/7/99
- Uses trending, data analysis, predictive maintenance, event/upset review using playback

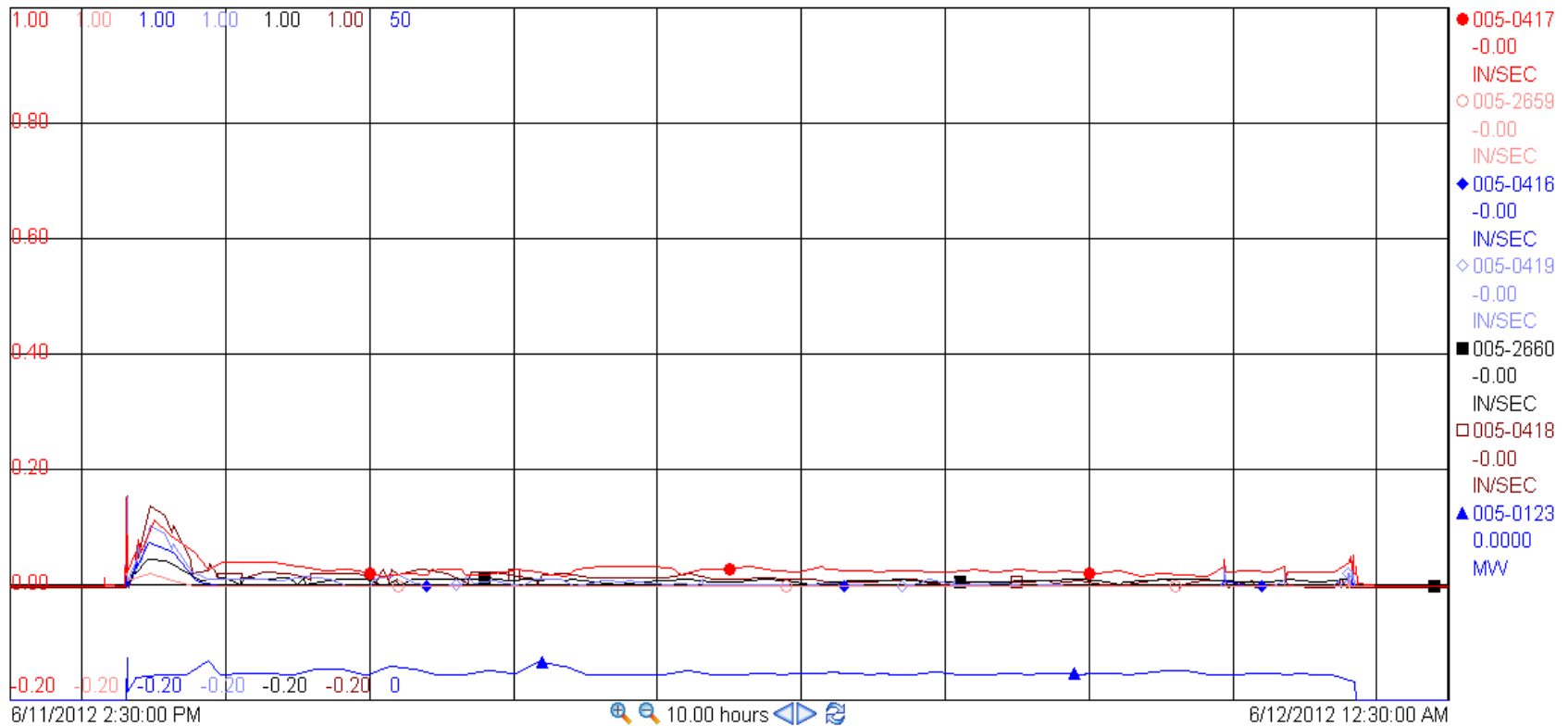
# Predictive Machine Maintenance

- Problem: NASA Online Vibration system obsolete
  - Need to review vibration and temperature readings
    - Predict future problems
  - Funding not available
  - Data already existed in the PI System
  - PI DataLink solution proposed
  - NASA Engineers wanted visual trend displays
  - PI ProcessBook automation used to build baseline and current run trends of a machines, VB app cycles through over 300 trends which are saved as Powerpoint slides

# CC01M BRG VIB Baseline

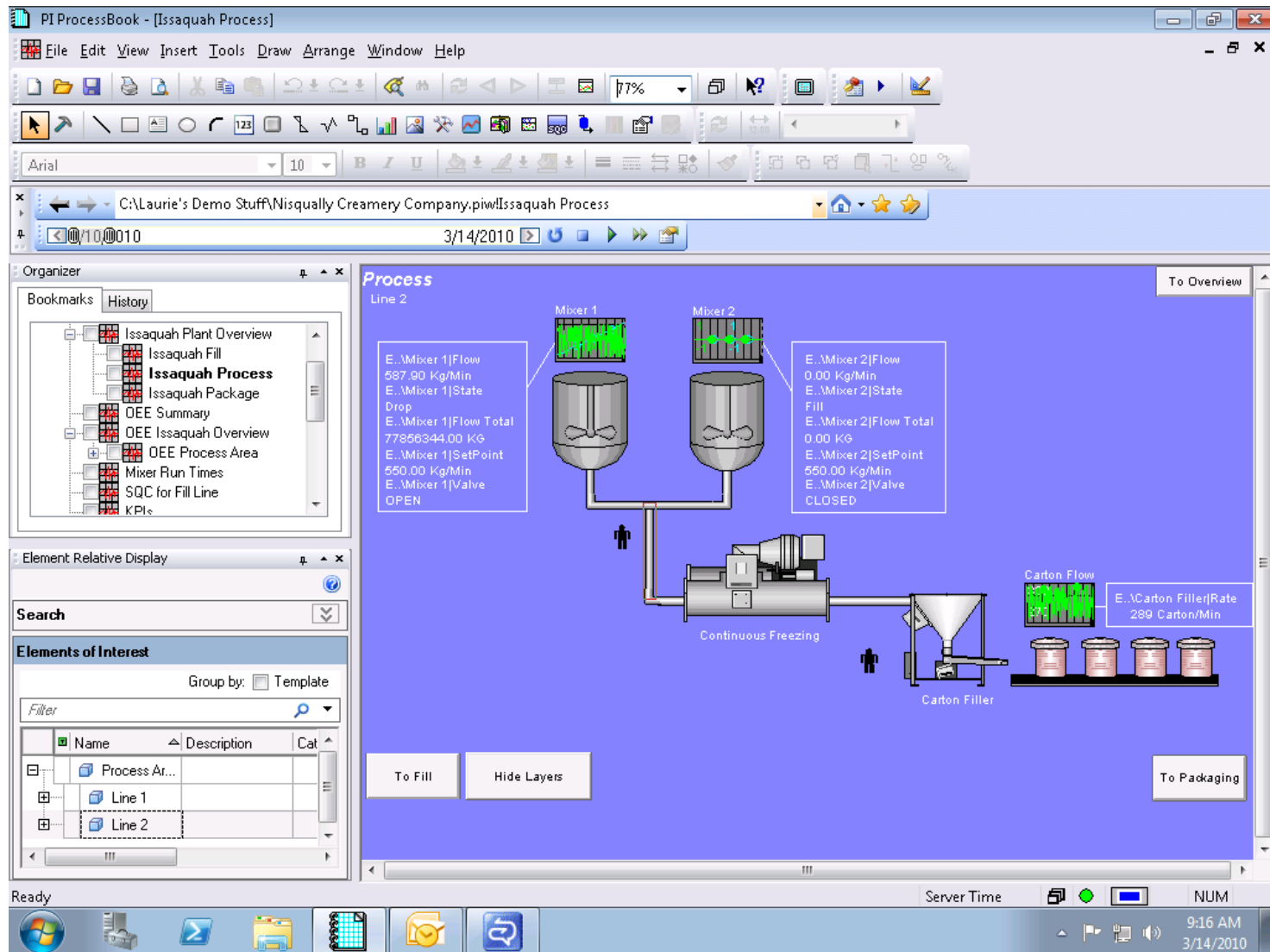


# CC01M BRG VIB Recent



- C1M BLIND BRG AXIAL VIB
- C1M BLIND BRG HOR VIB
- ◆ C1M BLIND BRG VERT VIB
- ◇ C1M CPLNG BRG AXIAL VIB
- C1M CPLNG BRG HOR VIB
- C1M CPLNG BRG VERT VIB
- ▲ C1 MTR INPUT PWR

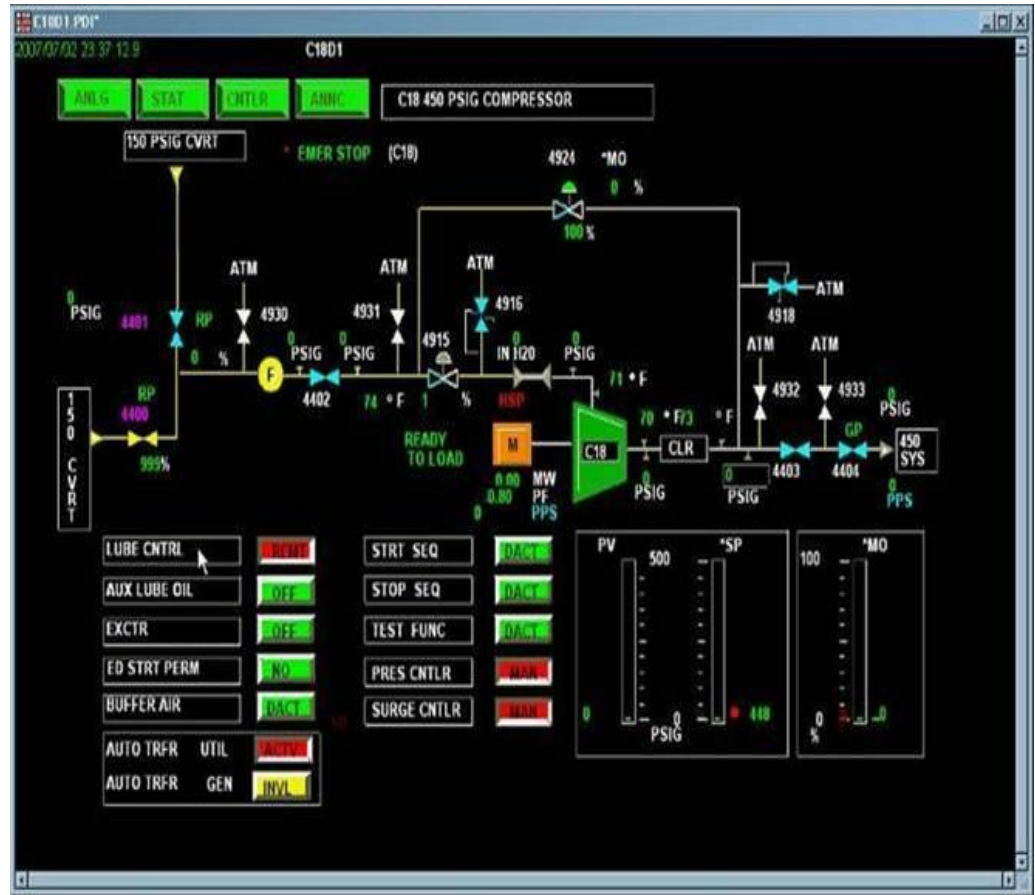
# Graphical Visualization in PI ProcessBook





# Uses for the PI System - Diagnostics

- End users frequently need to review archived DCS screens.
- Site utilizes PI Archive Playback of Process Graphic.
- Originally used a bit map image of the operator console graphic.
- Dynamic symbols had to be built and updated by hand.
- Tags were mapped by hand.
- Time consuming.
- Graphics were frequently out of sync with DCS.



# PI Archive Playback

- Custom tool written by NASA contractor
- Leverages existing technologies
- VCR Playback not necessary
- Event-based replay of process graphics
- Works with any PI ProcessBook display

# PI Archive Playback

ProcessBook Playback.Net

Start Date: 2005/08/04 00:00:00.0 End Date: 2005/08/04 03:00:00.0 Run Query

04-Aug-05 00:00:01  
04-Aug-05 00:00:02  
04-Aug-05 00:00:03  
04-Aug-05 00:00:04  
04-Aug-05 00:00:05  
04-Aug-05 00:00:06  
04-Aug-05 00:00:07  
04-Aug-05 00:00:08  
04-Aug-05 00:00:09  
04-Aug-05 00:00:10

Time	Tagname	Alarm
2005/08/04 00:00:01.4	064-2039	EPSL EL4301 PRES SW PSR1 State OFF
2005/08/04 00:00:01.4	064-2053	EL4315 VENT VLV State OPEN
2005/08/04 00:00:01.4	064-2052	EL4314 VAC PMP VLV State CLSD
2005/08/04 00:00:01.4	064-2056	CADE AS4675 SOL SEAL. VLV State OPEN
2005/08/04 00:00:01.4	064-2039	EPSL EL4301 PRES SW PSR1 State OFF
2005/08/04 00:00:01.4	064-9441	EPSL EL4301 EXH HDR SPLIT VLV State CLSD
2005/08/04 00:00:01.4	064-2053	EL4315 VENT VLV State OPEN
2005/08/04 00:00:01.4	064-2052	EL4314 VAC PMP VLV State CLSD



# Playback

# Code Examples

## Start PI Processbook

```
StatusBar1.Text = "Starting Processbook Application"
Application.DoEvents()
On Error Resume Next
pbApplication = GetObject(, "PIProcessbook.Application")
On Error GoTo errorHandler
If pbApplication Is Nothing Then
    pbApplication = CreateObject("PIProcessbook.Application")
End If
' Bring Processbook to foreground
AppActivate("PI ProcessBook")
doc = pbApplication.ProcBooks.Open(OpenFileDialog1.FileName)
StatusBar1.Text = "Connected to PI Server"
RunQuery()
AppActivate("PI ProcessBook")
```

## Update Display time

```
Private Sub UpdatePI()
    Dim isnamed As Boolean
    Dim DisplayTime As Object
    On Error GoTo CreateSymbol
    DisplayTime = pbApplication.ActiveDisplay.Symbols.Item("PIDisplayTime")
    GoTo SymbolExists
CreateSymbol:
    On Error GoTo errorHandler
    DisplayTime = pbApplication.ActiveDisplay.Symbols.Add(PBObjLib.pbSYMBOLTYPE.pbSymbolText)
SymbolExists:
    isnamed = DisplayTime.SetName("PIDisplayTime")
    DisplayTime.Contents = lstValues.Items(lstValues.SelectedIndex)
    DisplayTime.LineColor = PBSymLib.pbTrendCOLOR.pbLtGreen
    DisplayTime.BackgroundColor = RGB(0, 0, 0)
    DisplayTime.EnableScript = True
Exit Sub
```



# Code Examples

## Building Trend from HMI screen

```
Sub ProcessBook()  
Dim appX  
Dim disY  
Dim tndZ  
Dim tag1  
dim success  
    success = getPropertyValue( _  
        "NAME", _  
        "{EC24EFE2-DE1A-11D3-A926-00600829B130}", _  
        "Control Connection", _  
        tag1)  
  
tag1 = "\\PISERVER\" & tag1  
    ' If ProcessBook is not already open, launch it.  
On Error Resume Next  
Set appX = GetObject(, "PIProcessbook.Application")  
  
    If appX Is Nothing Then  
        Set appX = CreateObject("PIProcessbook.Application")  
    End If  
  
    'Add a new display to the displays collection.  
Set disY = appX.Displays.Add(tag1)  
Set tndZ = disY.Symbols.Add(10) ' Adds a trend symbol to the display.  
    'Add a trace to the trend.  
tndZ.addtrace (tag1) ' Add the tag to the trend created above.  
    'Set the display so that the user will not be prompted to save on exit.  
disY.Modified = False  
    'Change the shape and location of the new trend to fit the display.  
appx.maximize  
appx.ActiveDisplay.Zoom = "FitAll"  
appx.ActiveDisplay.Maximize  
appx.ActiveDisplay.Refresh  
disY.Maximize  
tndZ.Maximize True  
End Sub
```

# PI System-For Diagnostics (From 2002 OSIsoft UC)

- PI Archive Playback of Process Graphic used for Diagnostic/troubleshooting of problems/operator errors
- Process graphic uses a bit map image of the operator console graphic
- Dynamic points (Analog & Digital) populate the graphic from the PI Server history file.
- Future enhancement includes a method where two graphics will not have to be maintained (the operator console graphic & the archive bit map image)

# GrITS for ProcessBook

- GrITS: Graphic Import Tool Set
- DCS/SCADA displays converted to PI ProcessBook
- PI Tags substituted for DCS Tags
- Dynamic and Static Elements
- Values
- MultiStates
- Navigation Links
- Supports PI ProcessBook & PI WebParts



# Conversion Process

- Conversion can be run in batch or single screen
- Takes only seconds per screen
- Kick off conversion and walk away
- Refresh graphics whenever you want
- Full diagnostic logging of conversion
- Matched/Unmatched Tags listed in logs

# 100% PI ProcessBook Compatible

- NOT A BITMAP SCREEN SHOT!!
- Polygons
- PolyLines
- Lines
- Ellipses
- Arcs
- Rectangles
- Values
- Bars
- MultiStates
- Navigation Links
- NO CONTROL ELEMENTS ARE REPLICATED!!

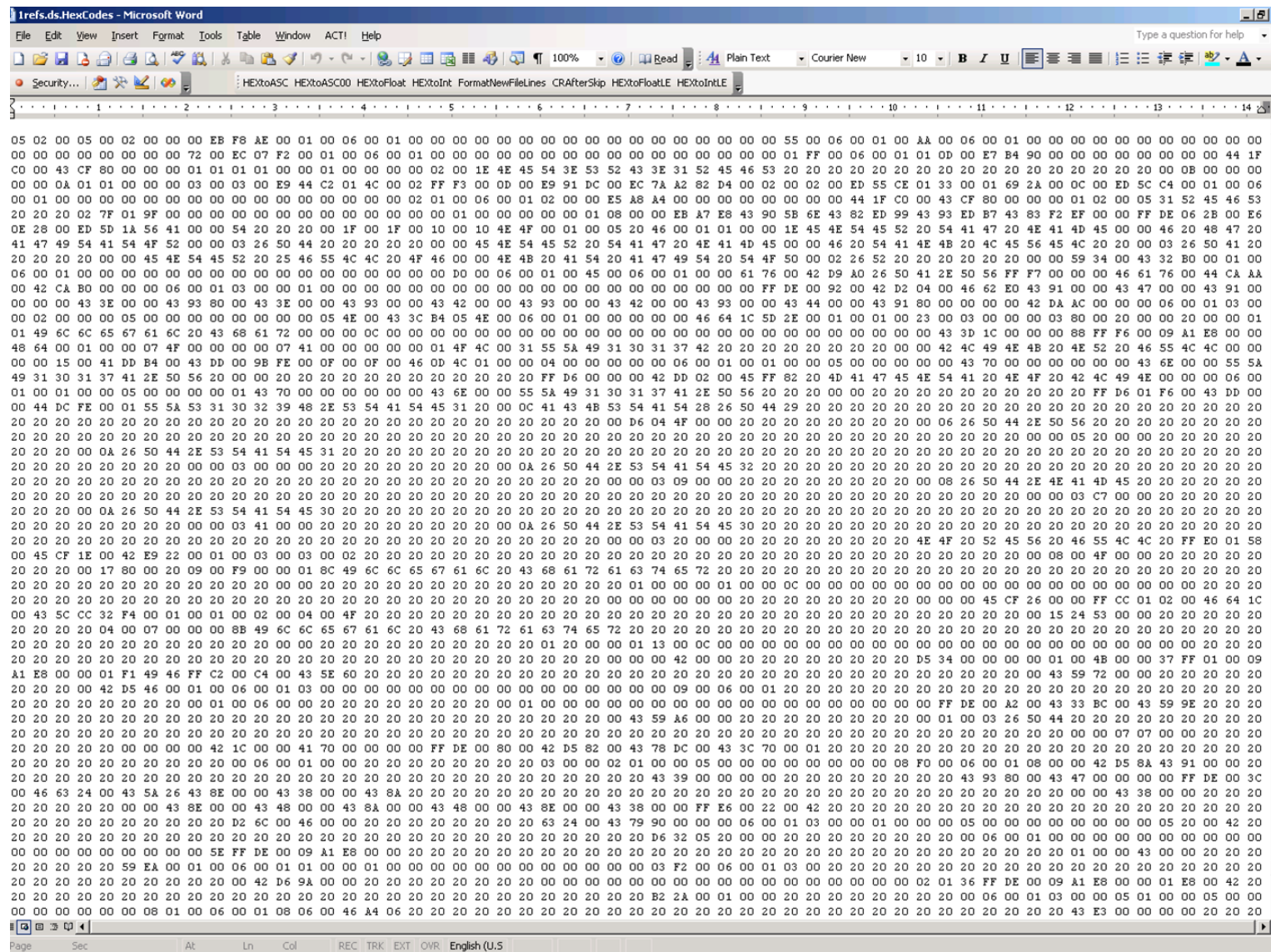
# DEMO

## GrITS for ProcessBook

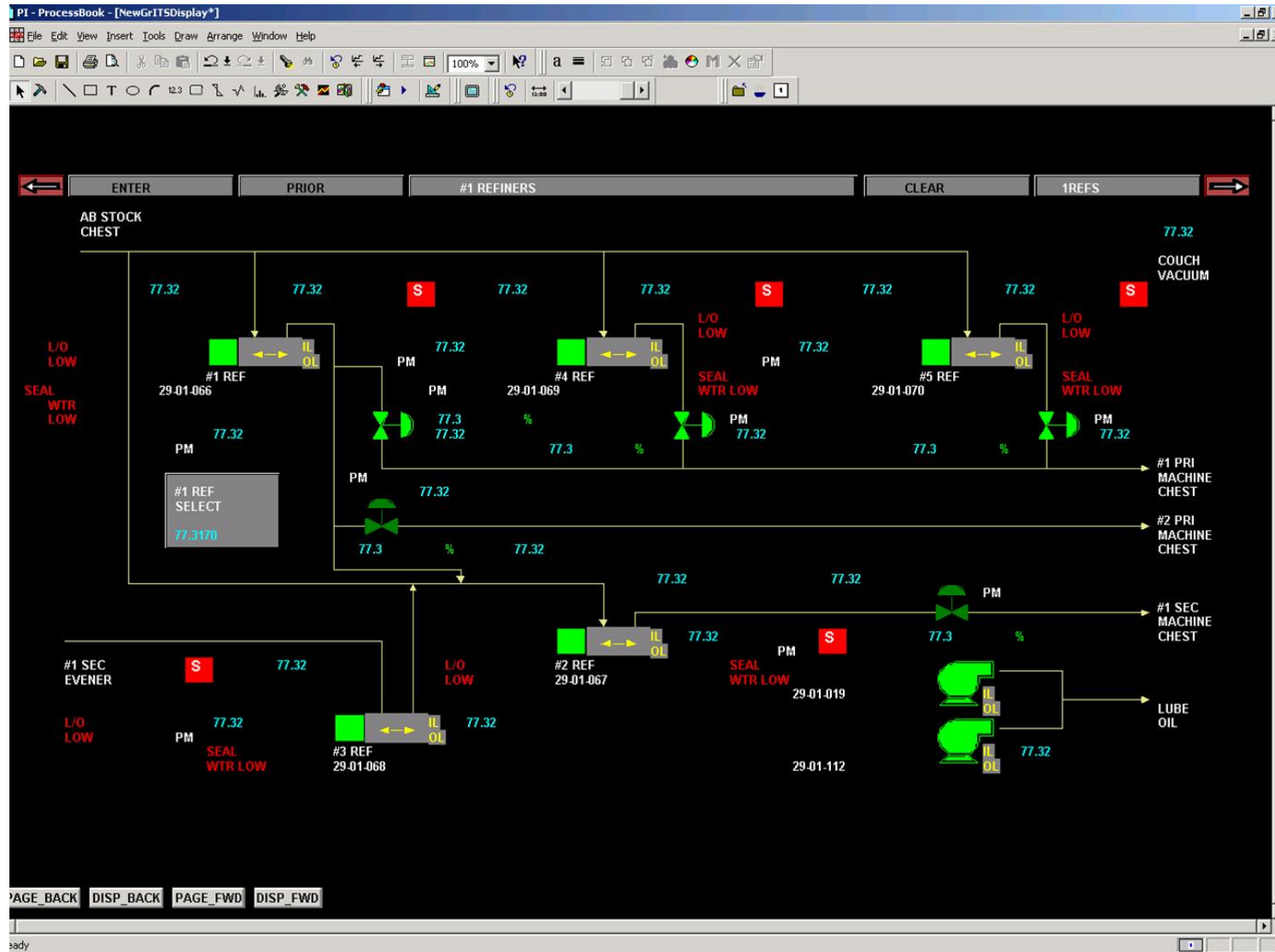
# Conversion Technology

- Graphic file formats
- Pattern recognition
- Rosetta Stone
- “The Matrix”

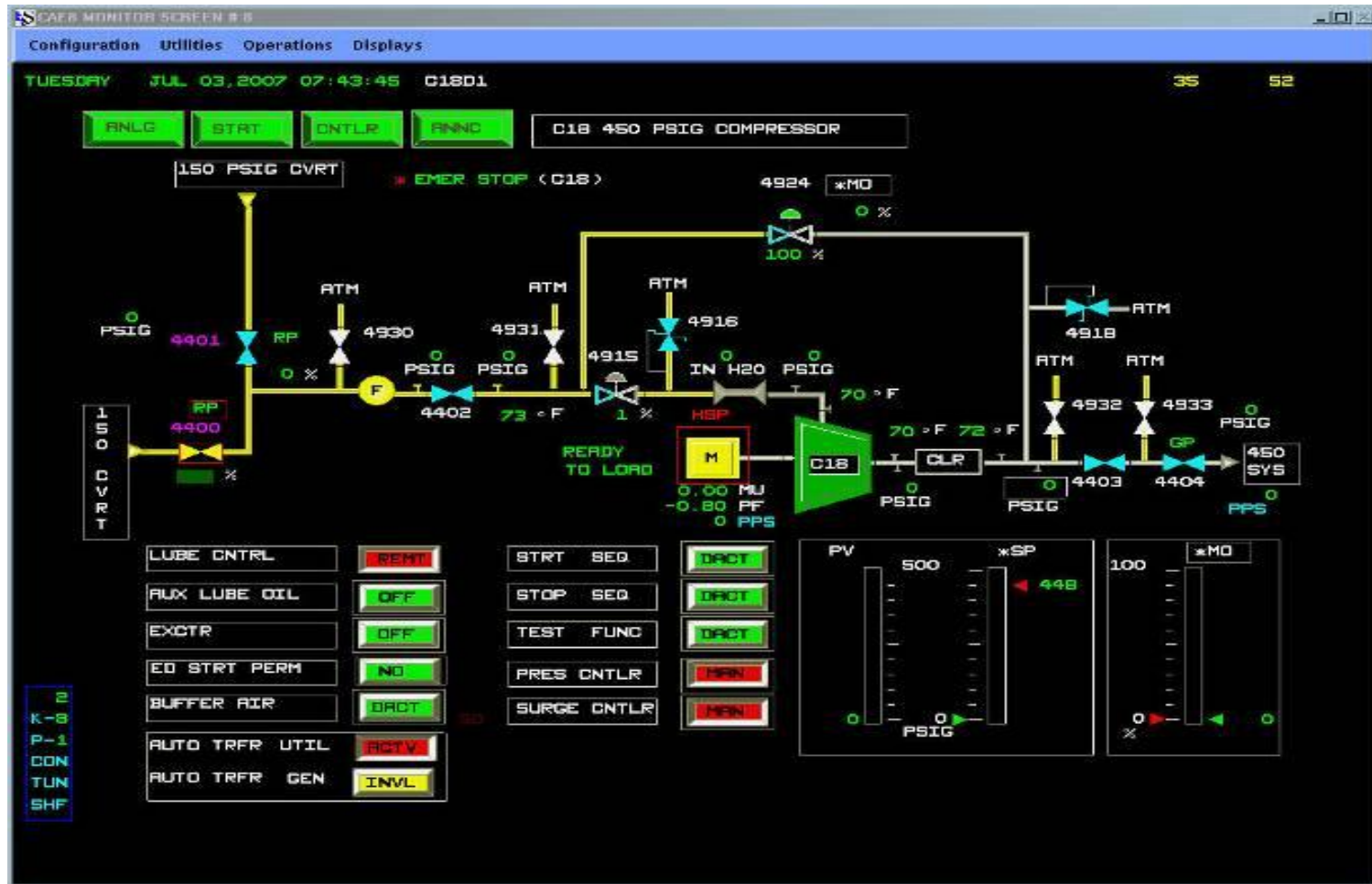
# Graphic Binary File



# The Converted Graphic



# Original Bailey OIS Screen



The screenshot displays the C18D1.PDI process control interface for a C18 450 PSIG COMPRESSOR. The main P&ID diagram shows the flow from a 150 PSIG CVRT through various valves and pumps to the compressor and finally to a 450 PSIG system. Key components include:

- 150 PSIG CVRT**: Feed-effluent separator.
- Valves**: 4915 (H2O), 4916 (IN H2O), 4918 (ATM), 4930 (ATM), 4931 (ATM), 4932 (ATM), 4933 (ATM).
- Pumps**: 4400 (RP), 4402 (PSIG), 4403 (PSIG), 4404 (GP).
- Compressor**: C18, with a MW PF PPS indicator.
- 450 PSIG SYS**: Final destination for the compressed gas.

Three real-time graphs are shown at the bottom right:

- PV**: Process Variable, ranging from 0 to 500 PSIG.
- \*SP**: Setpoint, ranging from 0 to 448 PSIG.
- \*MO**: Motor Output, ranging from 0 to 100%.

A control panel at the bottom left contains the following buttons:

- LUBE CNTRL**: REACT (red)
- AUX LUBE OIL**: OFF (green)
- EXCTR**: OFF (green)
- ED STRT PERM**: NO (green)
- BUFFER AIR**: DACT (green)
- AUTO TRFR**: UTIL (red), GEN (yellow)
- STRT SEQ**: DACT (green)
- STOP SEQ**: DACT (green)
- TEST FUNC**: DACT (green)
- PRES CNTLR**: MAN (red)
- SURGE CNTLR**: MAN (red)



# Summary

- View operator graphics in real-time or historically
- Find objects and data without knowing tag names
- Leverage the PI System and DCS investment
- Bridge the DCS and PI System environments
- Navigate through PI ProcessBook Displays just like in DCS
- Operator Graphic Mimics

# Questions?

# Supported Formats

ABB Conductor NT Graphics  
ABB Process Portal B Graphics  
Bailey OIS SODG Graphics  
Bailey System Six Graphics  
Emerson DeltaV Graphics  
Emerson Ovation/WDPF  
Foxboro IA (FoxDraw/FoxView) Graphics  
Honeywell PHD ProcessTrends  
Honeywell TDC3000 (US Graphics)  
Honeywell Experion HMIWeb  
Intellution iFIX  
Rockwell Automation RSView  
Wonderware InTouch

# Conclusion

By utilizing Data South Systems GrITS technology, PI Processbook displays are created and re-created depicting endlessly changing input files from originating systems thus enabling more efficient use of engineering time while also eliminating errors. Additionally the ability to re-play alarms and events captured in a different system utilizing the PI SDK allows for enhanced Process upset analysis.

# Contacts – Follow up

**What would your display look like after a conversion by Data South Systems?**

## **Aaron Brewer - Operations Manager**

Data South Systems

Office: (912) 369-7350, x105

Email: [aaron@datasouthsystems.com](mailto:aaron@datasouthsystems.com)

## **Charles Campbell - Lead Developer**

Data South Systems

Office: (912) 369-7350, x101

Email: [charles@datasouthsystems.com](mailto:charles@datasouthsystems.com)

**For OSIsoft questions please contact your representative or**

## **Erika Ferguson - Partner Manager, Americas**

OSIsoft, LLC

Mobile: (510) 604- 9053

Email: [eferguson@osisoft.com](mailto:eferguson@osisoft.com)

# Upcoming Webinars

**September 19** - Tag Tuning to Optimize Information Retained in the PI ServerFind objects and data without knowing tag names

**October 3** - One Way PI System Data Transmission from Secure to Business NetworksBridge the DCS and PI System environments

**October 17** - Overall Equipment Effectiveness in the PI System Ecosystem

**November 7** - Process Calculations and Characterization embedded in PI Asset Framework

**December 5** - KPIs, Data and Events On Any Mobile Device



# Thank you

© Copyright 2012 OSIsoft, LLC.  
777 Davis St., San Leandro, CA 94577