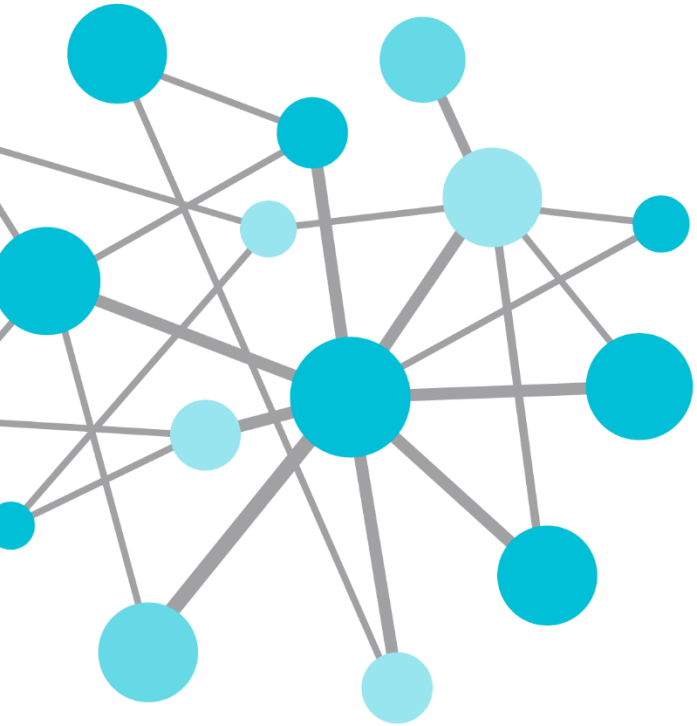
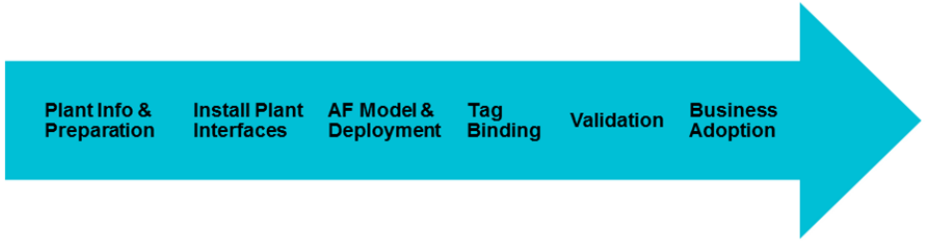


Capturing and Sharing Ethanol Plant Data using PI Asset Framework

Presented by **Mark Sather – Syngenta**
Jason Maxwell – RoviSys
Ron Nicholas – SafeNet Consulting
Jason Prosser – Stone Technologies

Working Together as a Team



- Syngenta and Enogen
- The Consultative Development & Deployment Process
- Illustrative Examples
- Continued Evolution – Future Vision

Enogen® is a registered trademark of a Syngenta Group Company.

Developing a 21st Century Business with the PI System and the Cloud

"Enogen® is bio-tech corn developed to maximize ethanol yield and throughput in dry grind ethanol plants.

The Enogen program needed a 21st century technology to enable us to develop a scalable, highly customer focused 21st century solution.

PI AF, PI Coresight, PI Processbook, PI DataLink and PI Cloud Connect coupled with our consultant based development and deployment has met our needs and expectations."

Mark Sather, PMP, Syngenta® Enogen® Project Lead

Business Challenge

- New business model serving a geographically and process dispersed, tight margin, customer base
- Need to show benefits and services to customers and our internal teams
- Need a scalable, adaptive, cost effective, solution
- Need to capture batch and events with metadata for reporting, visualization, & analytics

Solution

- Selected the PI System as our integration and applications infrastructure
- Leveraged new PI System tools such as PI Coresight, PI Cloud Connect with PI AF as a foundation
- Developed a consultative development and deployment process around the PI System

Results and Benefits

- Flexible, scalable, cost efficient PI System & Cloud based solution
- Repeatable development and deployment process
- Opportunity to continuously improve offering with PI System roadmap items
- Alignment with Syngenta's vision and needs – positioned for the 21st century

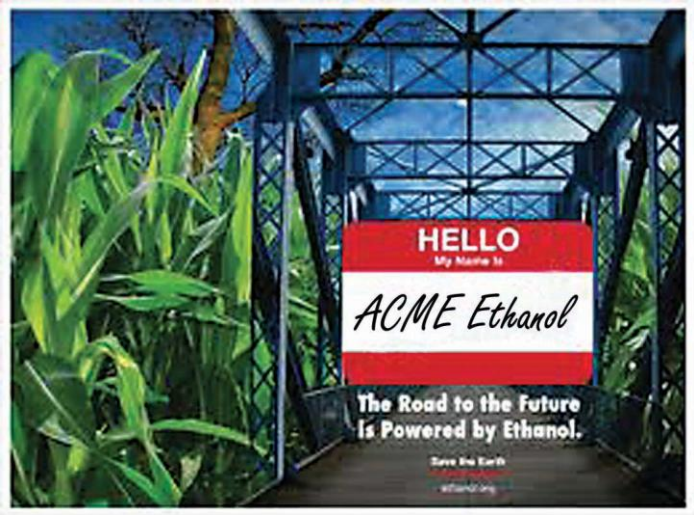
Process Overview

Plant Info & Preparation | **Install Plant Interfaces** | **AF Model & Deployment** | **Tag Binding** | **Validation** | **Business Adoption**

Process Improvement / R&D / Info Sharing / Rapid Response / Knowledge Base

PI AF Event Frames

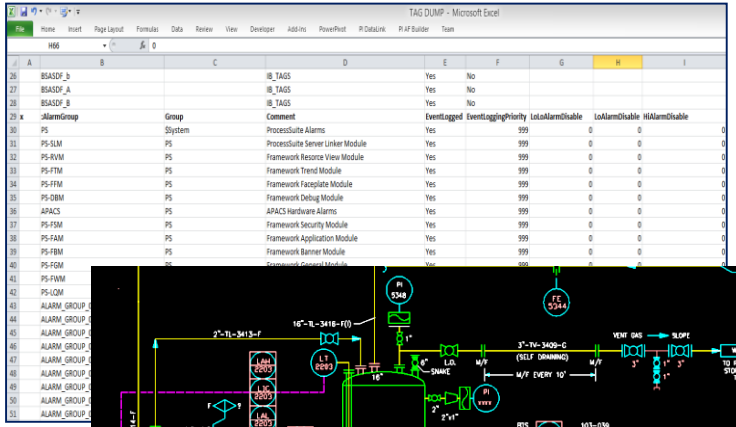
Data Disclaimer



Any resemblance to actual data, living or dead, is purely coincidental.

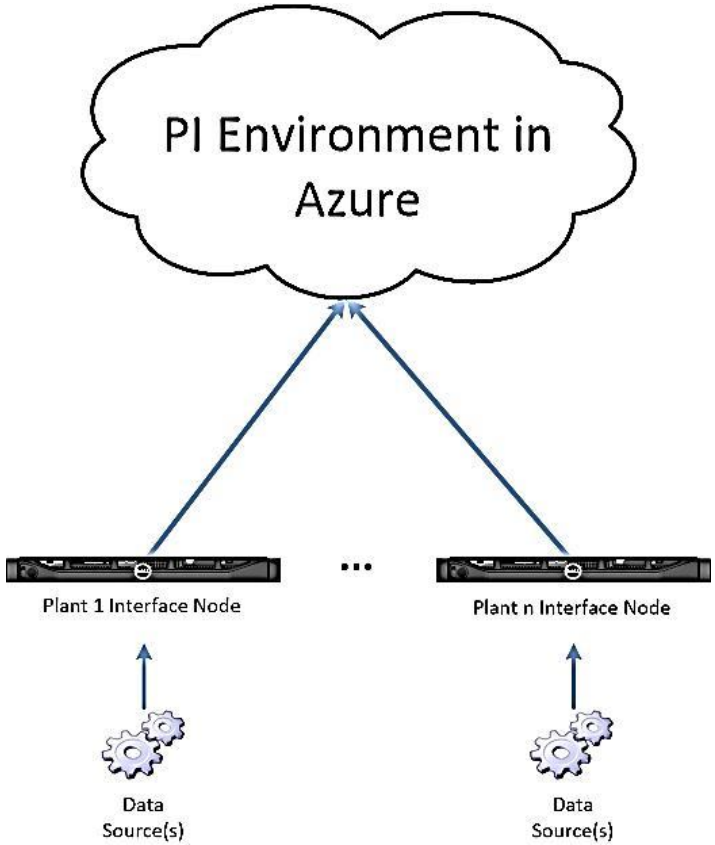
Plant Information & Preparation

- Establish framework for plant information
  - Standardized requests to each plant
    - Key Contacts
    - DCS utilized
    - Network architecture drawings
    - HMI screenshots, DCS Tag List, and P&IDs
  - Outline approach to plant contacts
- Configure interface node in house, ship to site



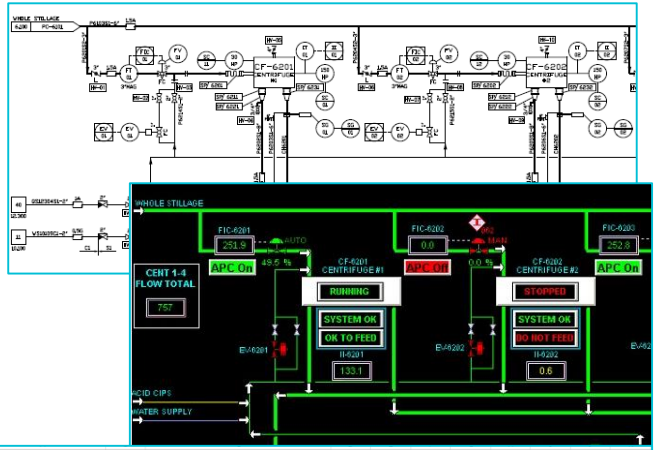
Plant PI Interface Install

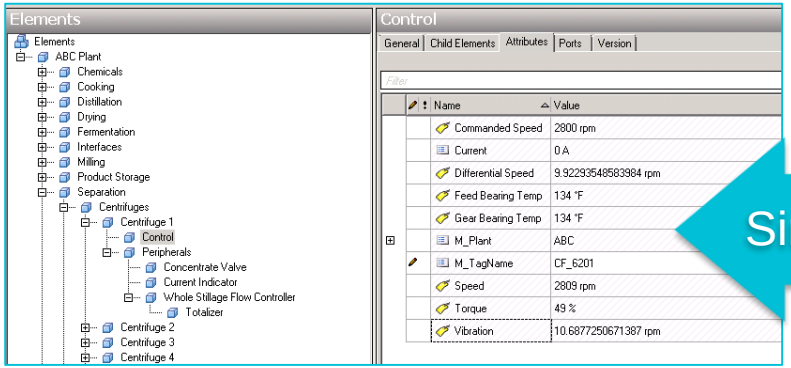
- Minimal time onsite
- Connect to plant business network
  - Provides connectivity to Azure
- Connect to plant control network
  - Configure DCOM
  - Connect to OPC
- Create test tag and ensure data flow from control network to Azure



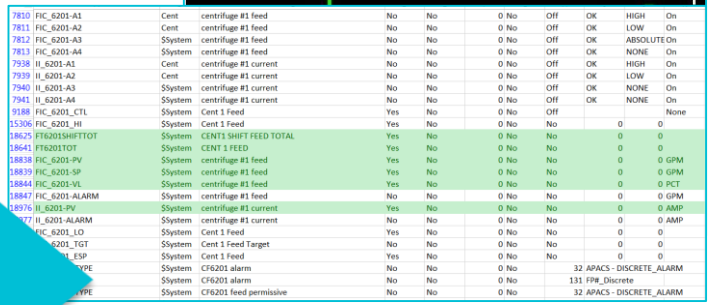
Plant Document Review

- Compare documents to previously modeled plants
  - If possible, identify a similar previously modeled plant



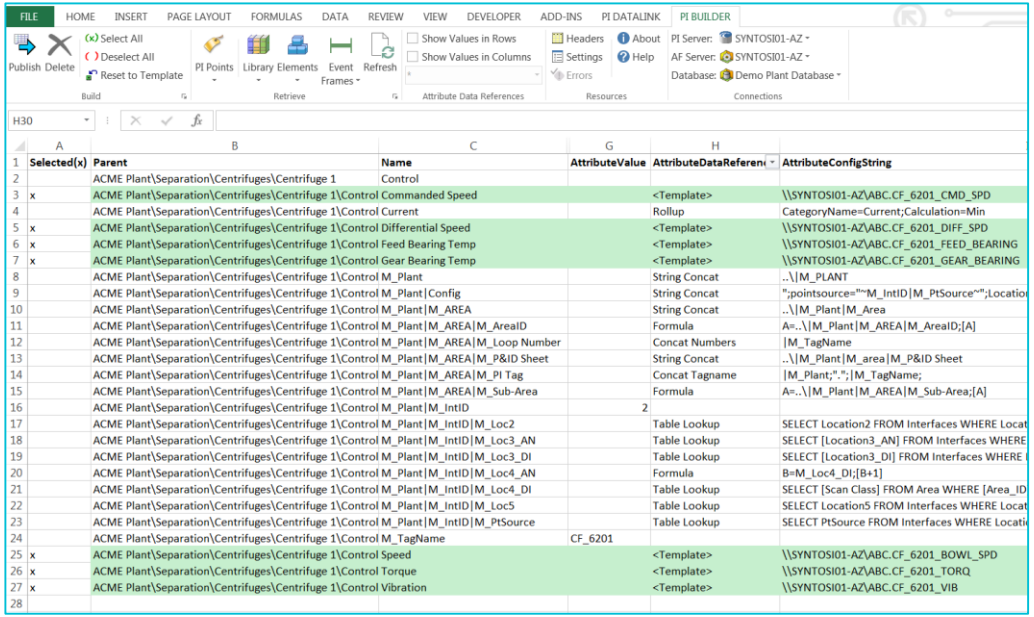


Similar?



Plant PI AF Model Build - Re-use

- Copy existing plant
- Reset all Attributes using PI AFBuilder
- Edit model as necessary



FILE HOME INSERT PAGE LAYOUT FORMULAS DATA REVIEW VIEW DEVELOPER ADD-INS PI DATALINK PI BUILDER

Publish Delete | Select All | Deselect All | Reset to Template | PI Points | Library | Elements | Event Frames | Refresh | Show Values in Rows | Show Values in Columns | Headers | Settings | Errors | About | Help | PI Server: SYNTOSI01-AZ | AF Server: SYNTOSI01-AZ | Database: Demo Plant Database

Build | Retrieve | Attribute Data References | Resources | Connections

H30

	A	B	C	G	H	AttributeConfigString
1	Selected(x)	Parent	Name	AttributeValue	AttributeDataReferen	AttributeConfigString
2		ACME Plant\Separation\Centrifuges\Centrifuge 1	Control			
3	x	ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	Commanded Speed		<Template>	\\SYNTOSI01-AZ\ABC.CF_6201_CMD_SPD
4		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	Current		Rollup	CategoryName=Current;Calculation=Min
5	x	ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	Differential Speed		<Template>	\\SYNTOSI01-AZ\ABC.CF_6201_DIFF_SPD
6	x	ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	Feed Bearing Temp		<Template>	\\SYNTOSI01-AZ\ABC.CF_6201_FEED_BEARING
7	x	ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	Gear Bearing Temp		<Template>	\\SYNTOSI01-AZ\ABC.CF_6201_GEAR_BEARING
8		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant		String Concat	..|M_PLANT
9		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|Config		String Concat	";pointsource="'~M_IntID|M_PtSource~'";Locatio
10		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_AREA		String Concat	..|M_Plant|M_Area
11		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_AREA|M_AreaID		Formula	A=..|M_Plant|M_AREA|M_AreaID;[A]
12		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_AREA|M_Loop Number		Concat Numbers	|M_TagName
13		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_AREA|M_P&ID Sheet		String Concat	..|M_Plant|M_area|M_P&ID Sheet
14		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_AREA|M_PI Tag		Concat Tagname	|M_Plant;".";|M_TagName;
15		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_AREA|M_Sub-Area		Formula	A=..|M_Plant|M_AREA|M_Sub-Area;[A]
16		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_IntID	2		
17		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_IntID|M_Loc2		Table Lookup	SELECT Location2 FROM Interfaces WHERE Locat
18		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_IntID|M_Loc3_AN		Table Lookup	SELECT [Location3_AN] FROM Interfaces WHERE
19		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_IntID|M_Loc3_DI		Table Lookup	SELECT [Location3_DI] FROM Interfaces WHERE
20		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_IntID|M_Loc4_AN		Formula	B=M_Loc4_DI;[B+1]
21		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_IntID|M_Loc4_DI		Table Lookup	SELECT [Scan Class] FROM Area WHERE [Area_ID
22		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_IntID|M_Loc5		Table Lookup	SELECT Location5 FROM Interfaces WHERE Locat
23		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_Plant|M_IntID|M_PtSource		Table Lookup	SELECT PtSource FROM Interfaces WHERE Locati
24		ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	M_TagName	CF_6201		
25	x	ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	Speed		<Template>	\\SYNTOSI01-AZ\ABC.CF_6201_BOWL_SPD
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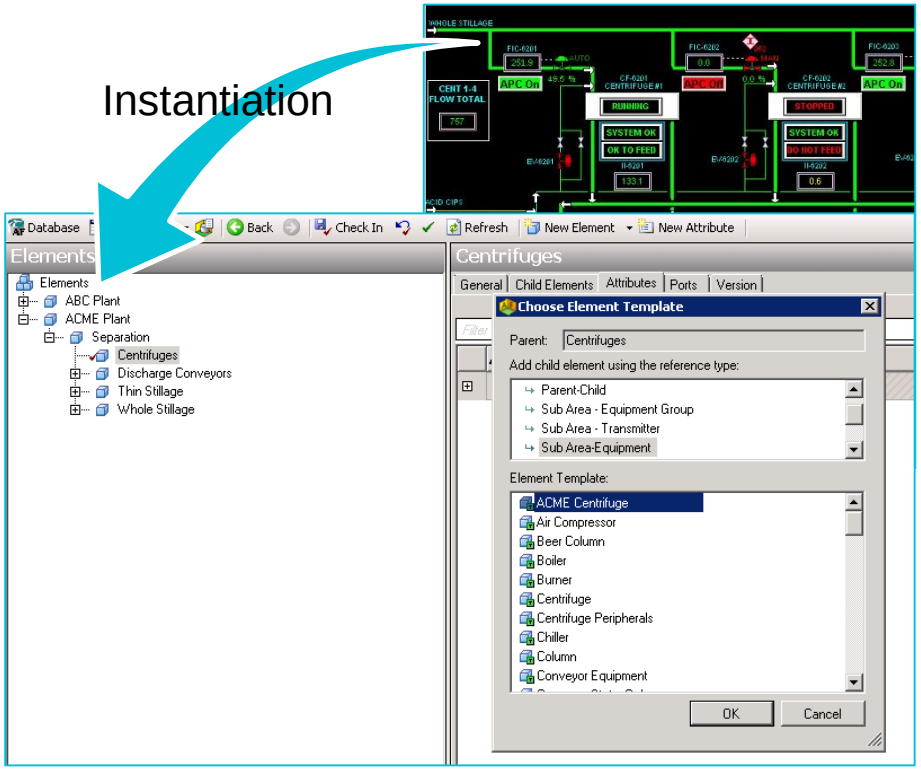
27	x	ACME Plant\Separation\Centrifuges\Centrifuge 1\Control	Vibration		<Template>	\\SYNTOSI01-AZ\ABC.CF_6201_VIB
28						

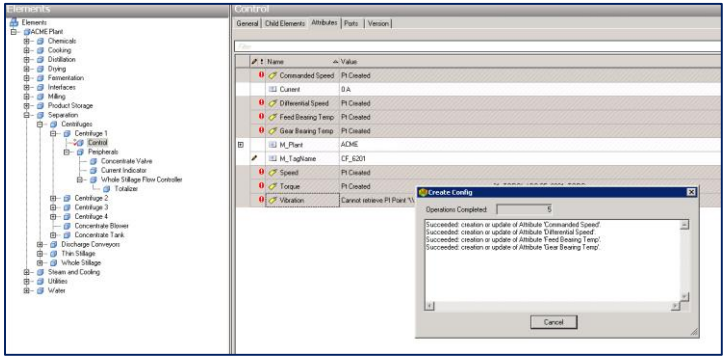
Plant PI AF Model - New Build

- Create New Model using PI System Explorer
- Derive Templates as necessary
- Re-use similar Areas or Elements whenever possible

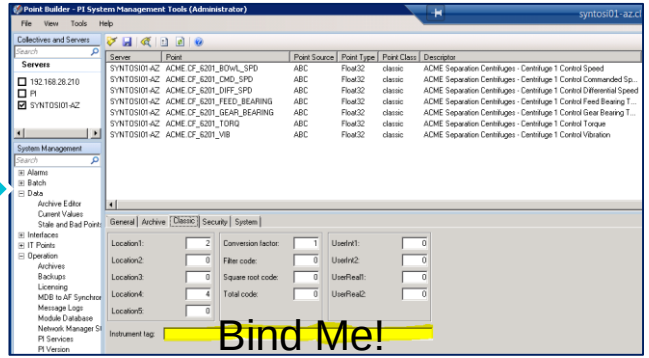


Plant PI AF Model Publishing

- Use PI AF Point Creation functionality to deploy PI Points
- All attributes except for “instrumenttag” are derived from the PI AF context and PI AF Tables

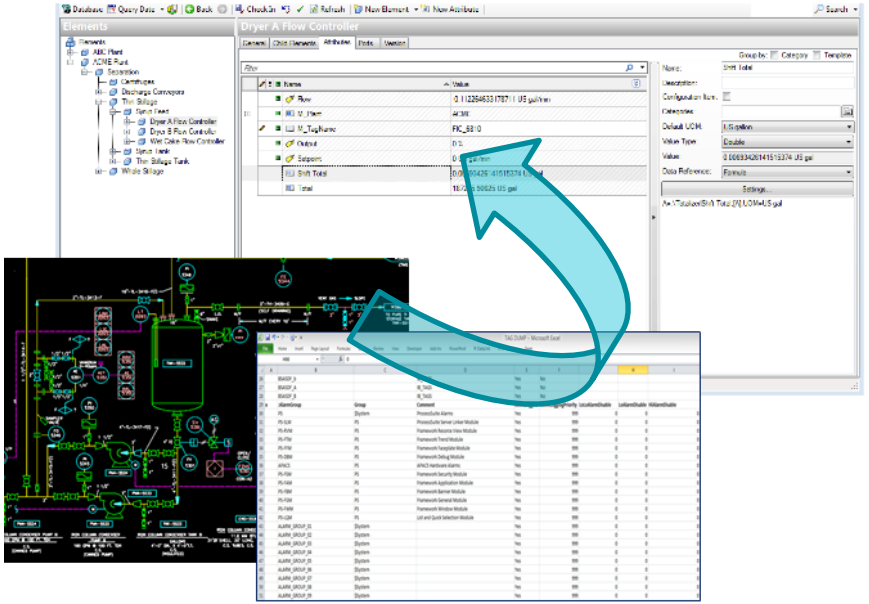


Auto Point Creation



Tag Binding

- Load all PI tags from Model into Excel
- Macros developed to bind ~75% of tags
  - Fine-tuning from site to site
  - Automated bindings double-checked manually
- Remaining tags are bound manually
  - Utilize DCS tag dump, P&ID, and HMIs
- Generate an issue list of unbound tags
  - Do we need more information?
  - Who is responsible to resolve?

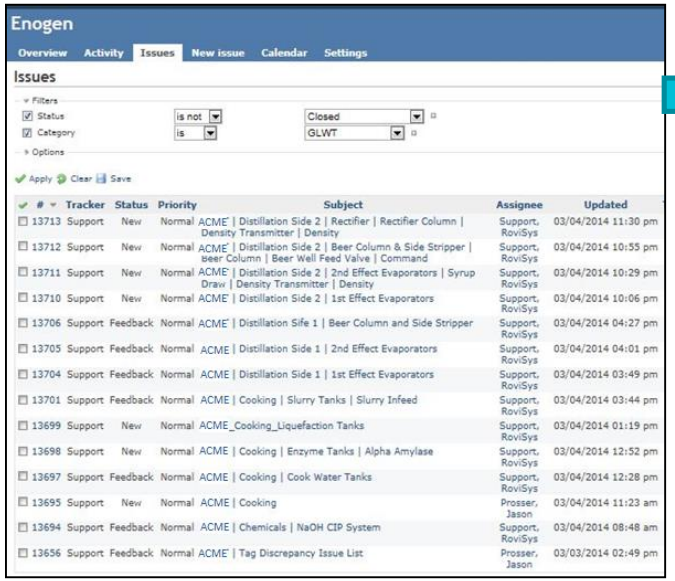


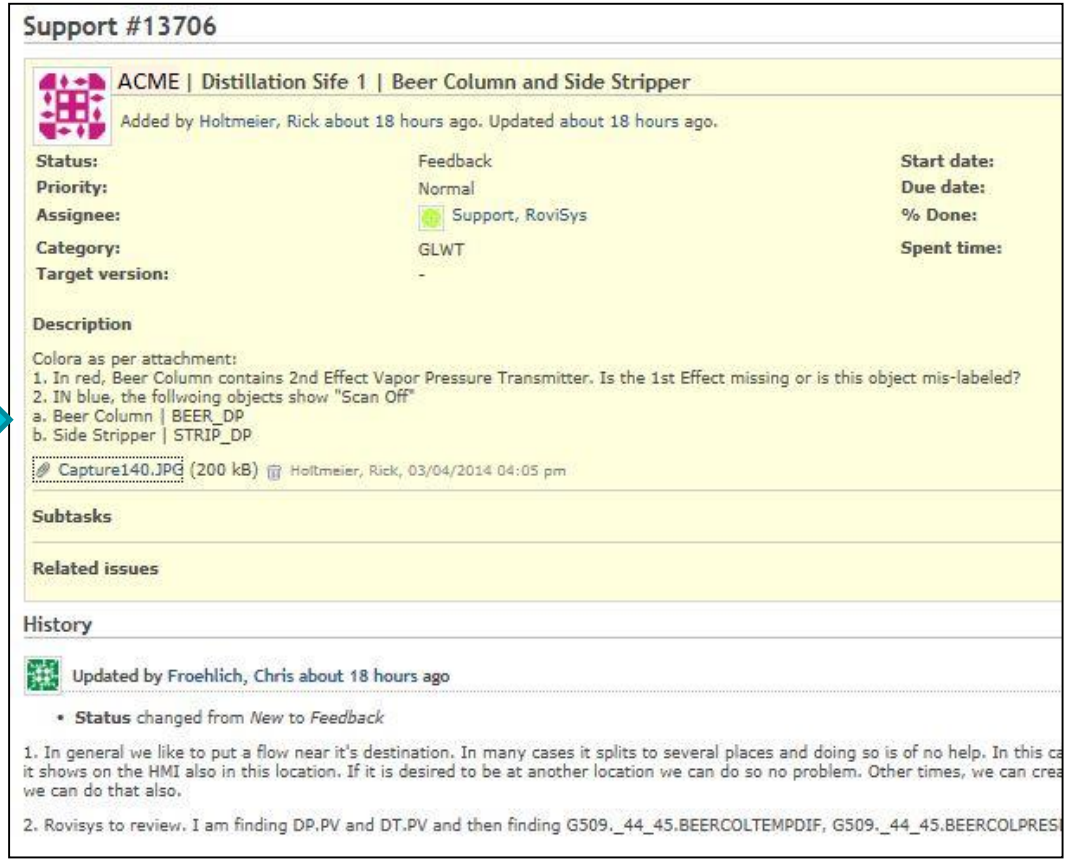
Data Validation

- PI Coresight Visualization

Data Validation

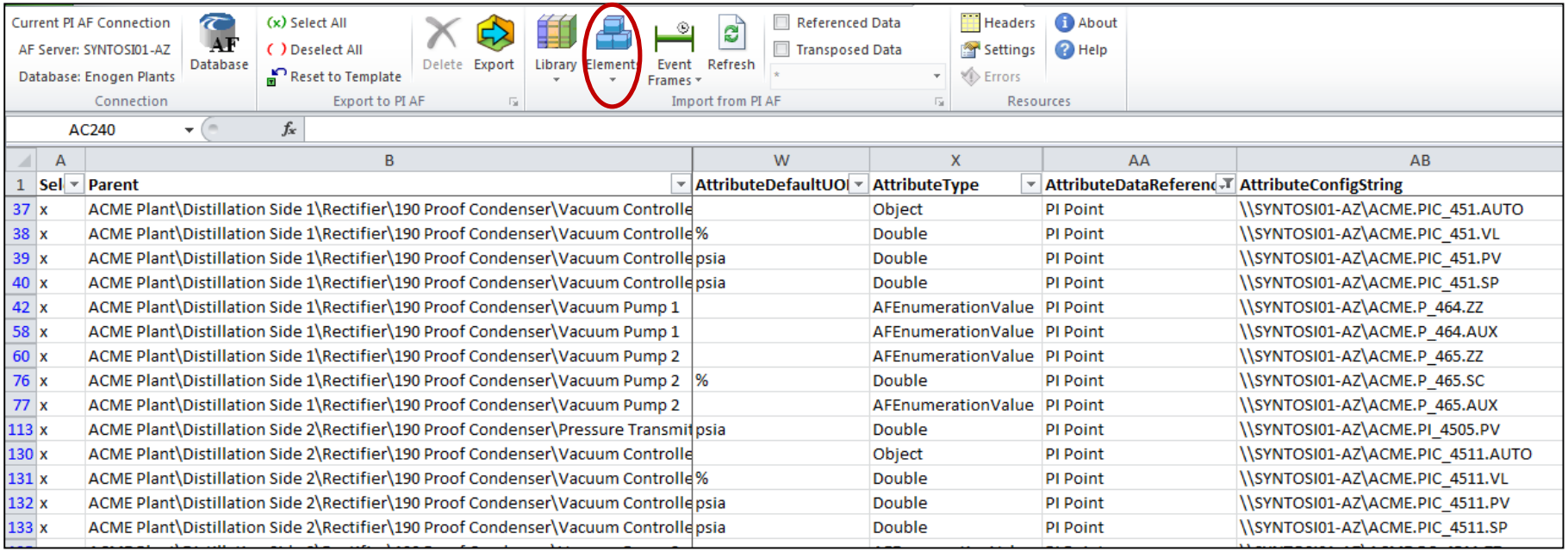
- Issue Logged
  Tracked / Resolved





Data Validation

- PI Data Link / PI AF Builder - Gap Analysis



	A	B	W	X	AA	AB
1	Sel	Parent	AttributeDefaultUO(	AttributeType	AttributeDataReferenc	AttributeConfigString
37	x	ACME Plant\Distillation Side 1\Rectifier\190 Proof Condenser\Vacuum Controlle		Object	PI Point	\\SYNTOSI01-AZ\ACME.PIC_451.AUTO
38	x	ACME Plant\Distillation Side 1\Rectifier\190 Proof Condenser\Vacuum Controlle	%	Double	PI Point	\\SYNTOSI01-AZ\ACME.PIC_451.VL
39	x	ACME Plant\Distillation Side 1\Rectifier\190 Proof Condenser\Vacuum Controlle	psia	Double	PI Point	\\SYNTOSI01-AZ\ACME.PIC_451.PV
40	x	ACME Plant\Distillation Side 1\Rectifier\190 Proof Condenser\Vacuum Controlle	psia	Double	PI Point	\\SYNTOSI01-AZ\ACME.PIC_451.SP
42	x	ACME Plant\Distillation Side 1\Rectifier\190 Proof Condenser\Vacuum Pump 1		AFEnumerationValue	PI Point	\\SYNTOSI01-AZ\ACME.P_464.ZZ
58	x	ACME Plant\Distillation Side 1\Rectifier\190 Proof Condenser\Vacuum Pump 1		AFEnumerationValue	PI Point	\\SYNTOSI01-AZ\ACME.P_464.AUX
60	x	ACME Plant\Distillation Side 1\Rectifier\190 Proof Condenser\Vacuum Pump 2		AFEnumerationValue	PI Point	\\SYNTOSI01-AZ\ACME.P_465.ZZ
76	x	ACME Plant\Distillation Side 1\Rectifier\190 Proof Condenser\Vacuum Pump 2	%	Double	PI Point	\\SYNTOSI01-AZ\ACME.P_465.SC
77	x	ACME Plant\Distillation Side 1\Rectifier\190 Proof Condenser\Vacuum Pump 2		AFEnumerationValue	PI Point	\\SYNTOSI01-AZ\ACME.P_465.AUX
113	x	ACME Plant\Distillation Side 2\Rectifier\190 Proof Condenser\Pressure Transmit	psia	Double	PI Point	\\SYNTOSI01-AZ\ACME.PI_4505.PV
130	x	ACME Plant\Distillation Side 2\Rectifier\190 Proof Condenser\Vacuum Controlle		Object	PI Point	\\SYNTOSI01-AZ\ACME.PIC_4511.AUTO
131	x	ACME Plant\Distillation Side 2\Rectifier\190 Proof Condenser\Vacuum Controlle	%	Double	PI Point	\\SYNTOSI01-AZ\ACME.PIC_4511.VL
132	x	ACME Plant\Distillation Side 2\Rectifier\190 Proof Condenser\Vacuum Controlle	psia	Double	PI Point	\\SYNTOSI01-AZ\ACME.PIC_4511.PV
133	x	ACME Plant\Distillation Side 2\Rectifier\190 Proof Condenser\Vacuum Controlle	psia	Double	PI Point	\\SYNTOSI01-AZ\ACME.PIC_4511.SP

Reporting Needs – Alignment & Use

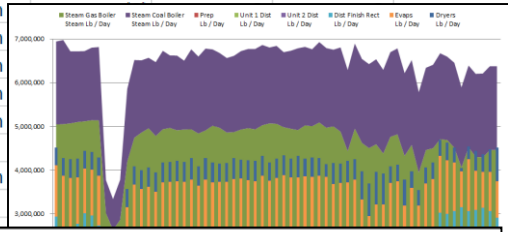
- Must align PI system data and visualizations with in-place plant data, metrics and reporting

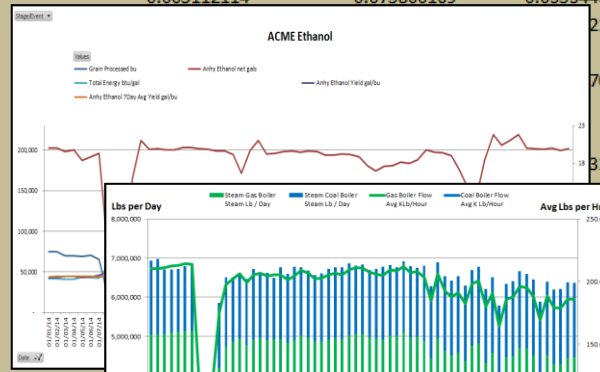
- Data used for many purposes:
  - Monitor
  - Analyze
  - Troubleshoot
  - Evaluate
  - Learn

Reporting Needs – Using PI Coresight

Reporting – Using PI DataLink & ProcessBook

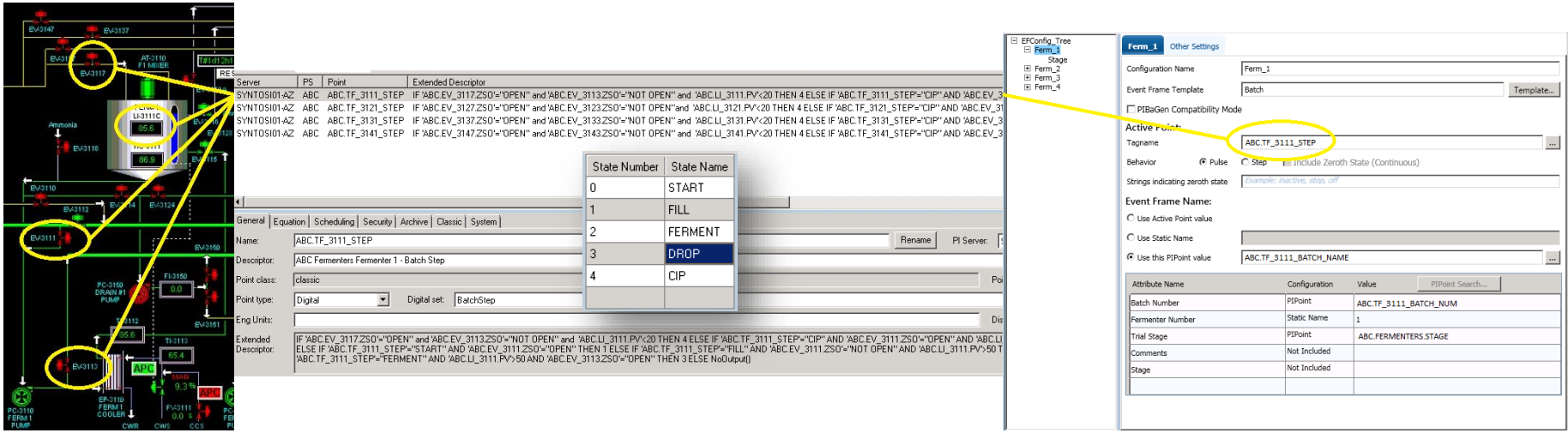
	A	B	C	D	E	F	G	H	I	J	K
1	3/4/2014		Daily Production Report-Rates/Averages					3/4/2014 7:00	3/4/2014 19:00	3/5/2014 7:00	
2			7PM	7AM							
3			Day	Night							
4	Rates/Averages		Shift	Shift	Daily			Tag Name			
5	Grain Handling										
6	Ronan A	lb/min						ACME.FI_RONAN_A.PV	-0.005112114	0.075800169	0.035344027
7	Ronan B	lb/min						ACME.FI_RONAN_B.PV			2183
8	Ronans A&B	lb/min									
9	Ronan C	lb/min						ACME.FI_RONAN_C.PV			7046
10	Total Ronan	lb/min									
11	Prep										
12	Meal Screw	lb/min						ACME.WIC_13001.PV			3102
13	Water to Slurry	gpm						ACME.FIC_13004.PV			07
14	Backset to Slurry							ACME.FIC_13001.PV			66
15	Condensate to Slurry							ACME.FIC_11306.PV			23
16	RS to Slurry							ACME.FIC_4507.PV			58
17	Total Water Flow							ACME.FI_TCW.PV			38
18	Slurry Density							ACME.DI_13003.PV			61
19	Slurry pH							ACME.AI_21301.PV			29
20	Slurry B Recirc Flow							ACME.FIC_31350.PV			23
21	Hydroheater Temp							ACME.TIC_13002.PV			55
22	Hydroheater DP							ACME.PDY_31302.PV			73
23	Unit 1 Conv Flow							ACME.FI_11302.PV			21
24	Unit 2 Conv Flow							ACME.FIC_30309.PV			36
25	Total Conv Flow										





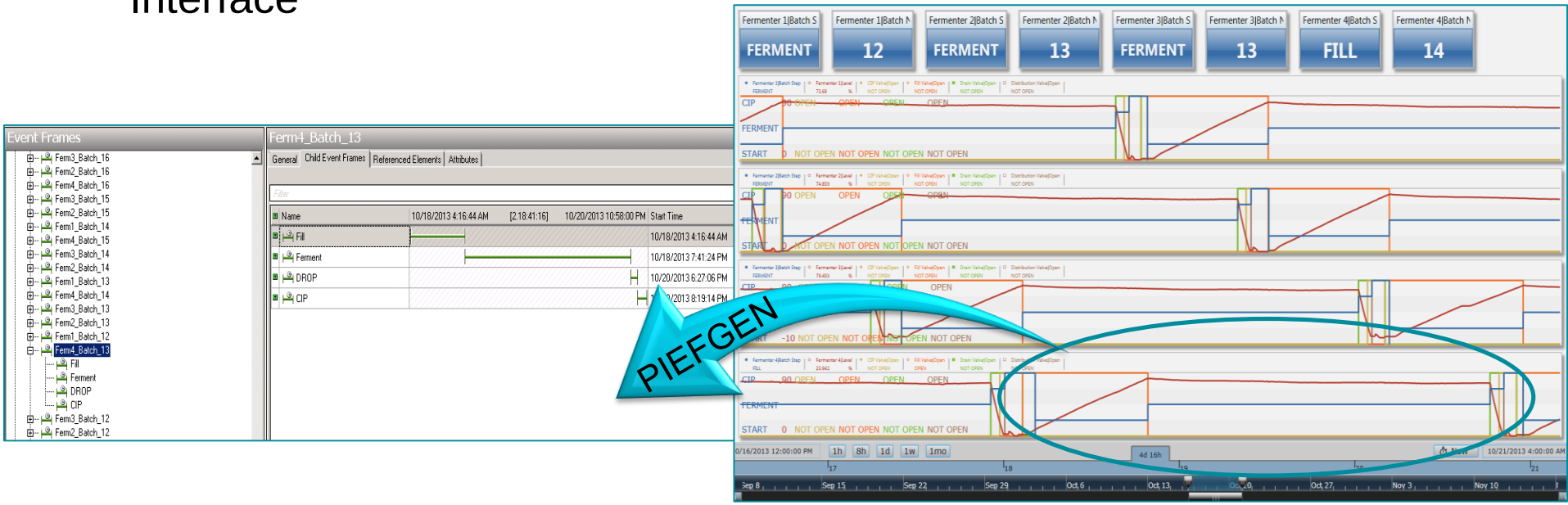
Future World: PI AF Event Frames

- PI AF Event Frames used for Fermentation Batch Tracking
- Custom PI Performance Equation batch trigger defined for each Fermentation Vessel



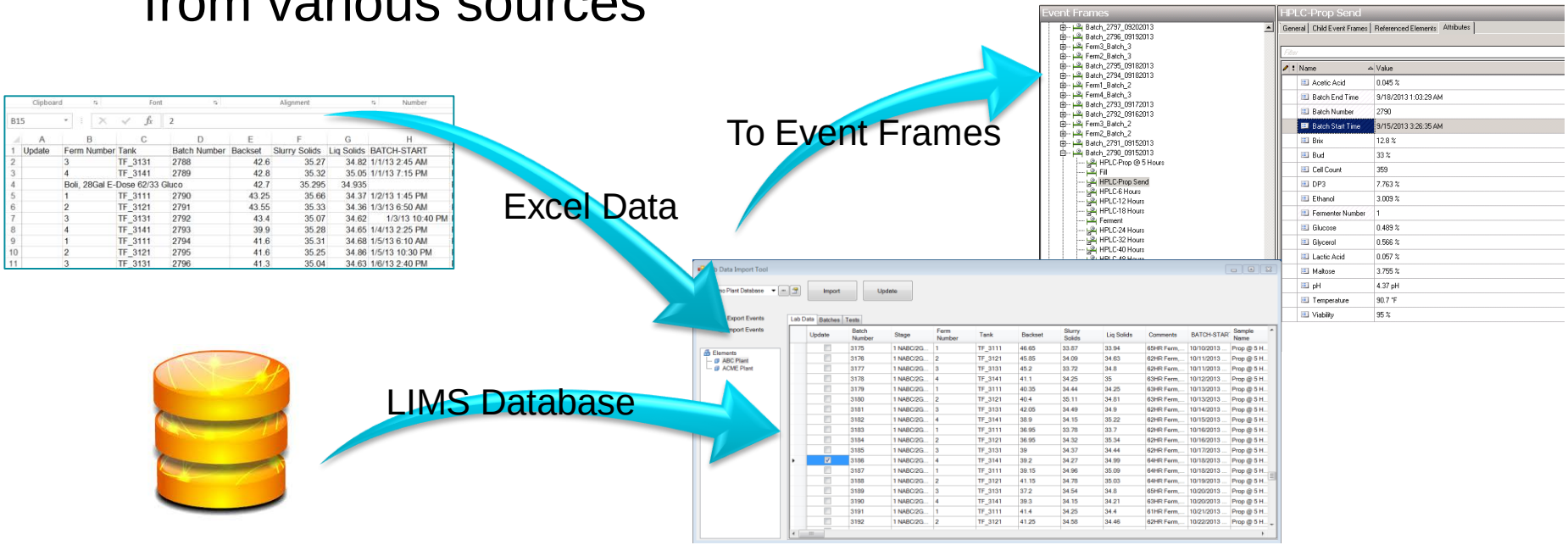
PI AF Event Frames

- Process-triggered Batch Event Frames created using the PIEFGEN Interface



Adding Data To Process PI Event Frames

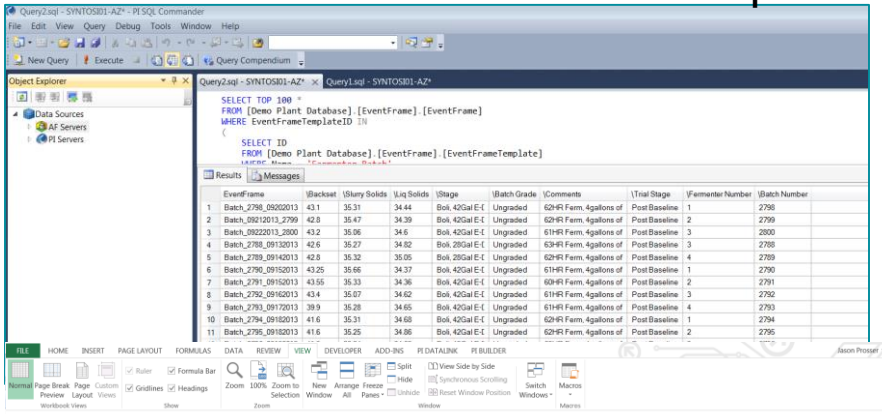
- Reconcile Non-Process Data to Process Event Frames from various sources



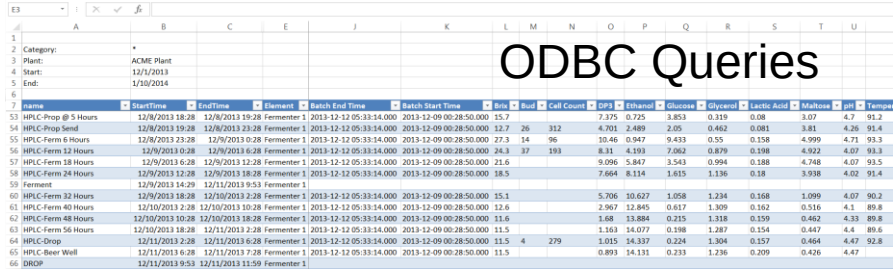
Data Presentation of Events

- Utilize ODBC Queries or PI OLEDB Enterprise to retrieve DataSets
- Standard Presentation tools can be used with the DataSets.
- PI Coresight
- PI ProcessBook
- PI Datalink in the Future

PI OLEDB Enterprise



ODBC Queries

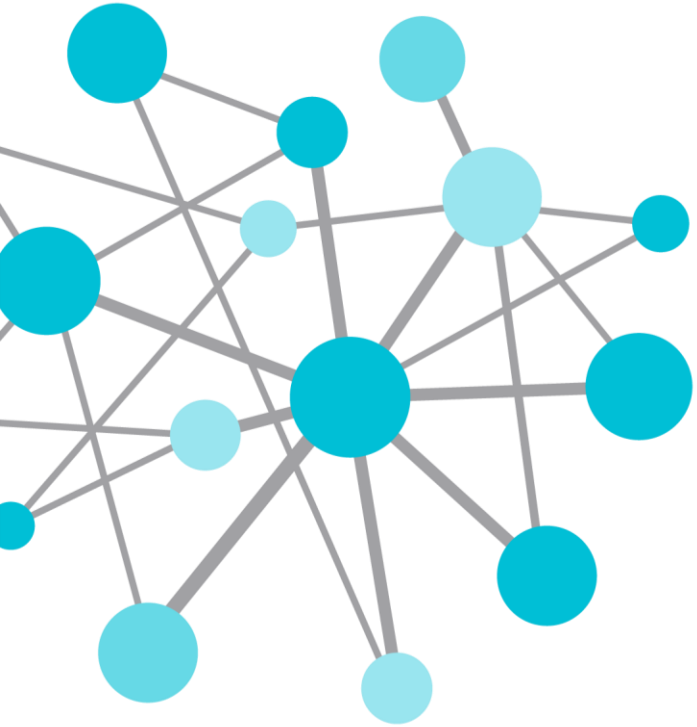


Closing Remarks

Plant Info & Preparation → **Install Plant Interfaces** → **AF Model & Deployment** → **Tag Binding** → **Validation** → **Business Adoption**




Process Improvement / R&D / Info Sharing / Rapid Response / Knowledge Base



THANK YOU

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