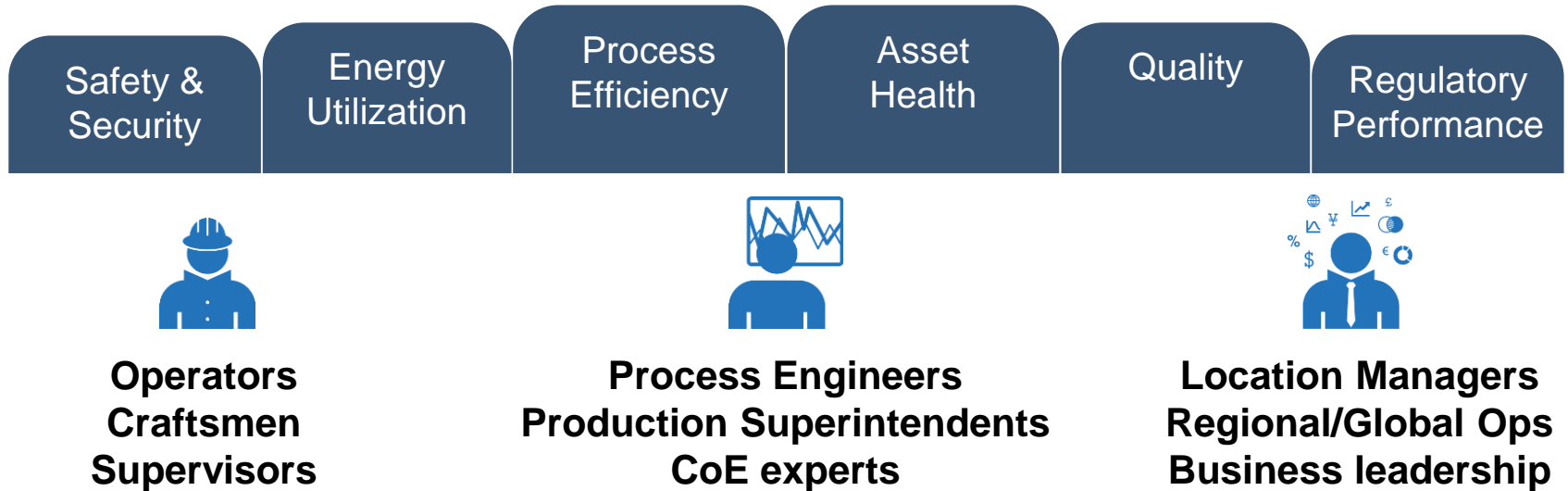
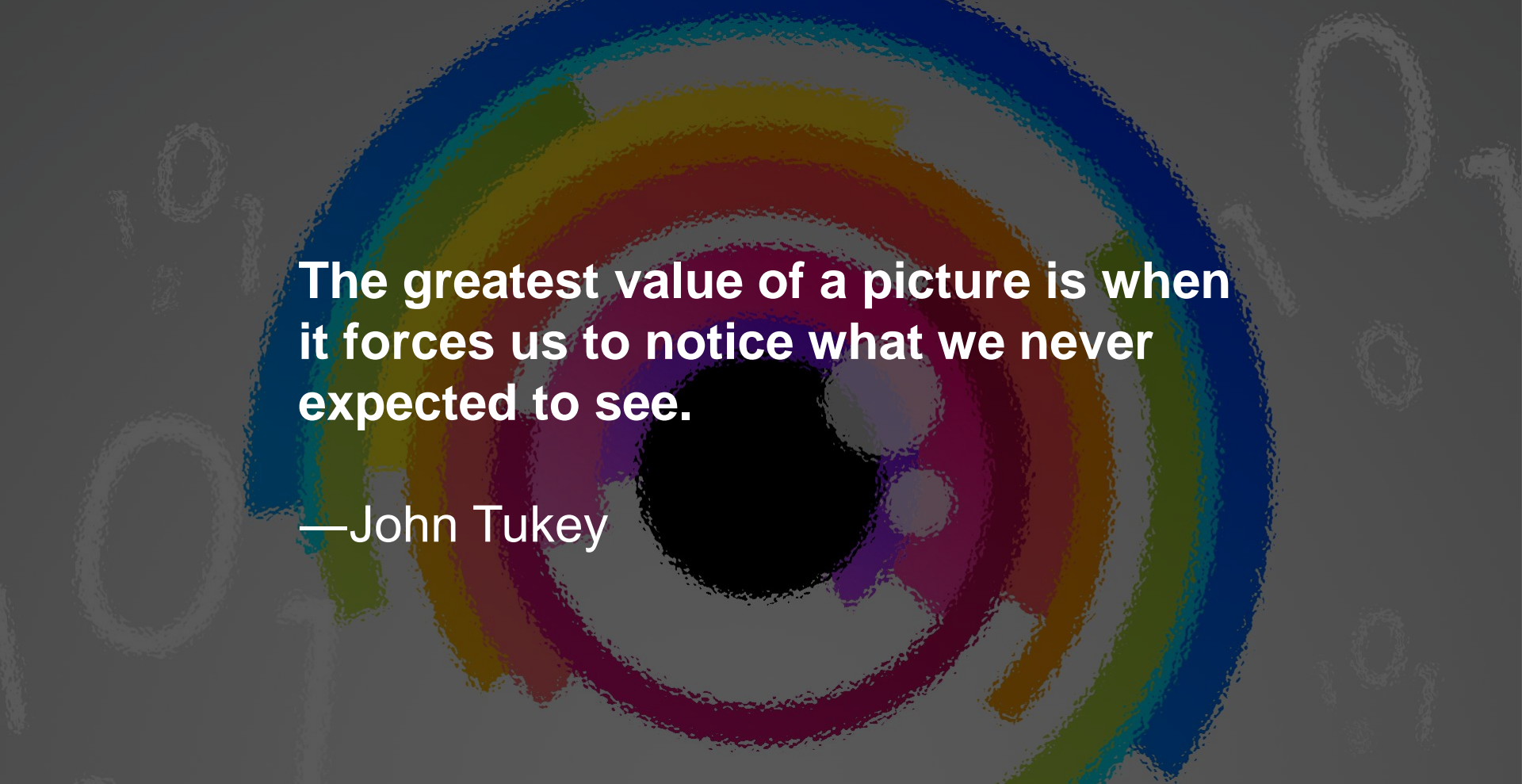


IIOT Data Access with the PI System

Presented by **Nathawan H.**
Systems Engineer

PI System data is utilized across the enterprise to solve various business impacts

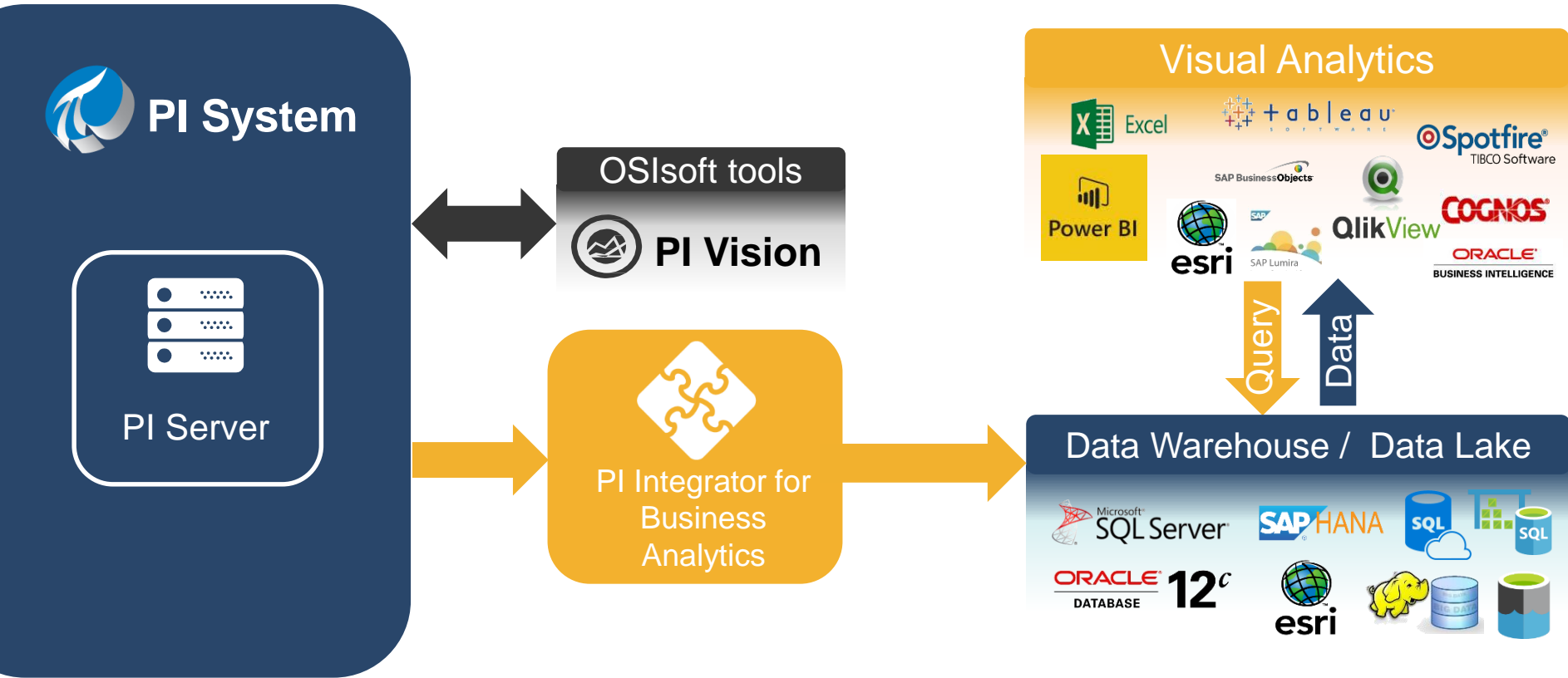




**The greatest value of a picture is when
it forces us to notice what we never
expected to see.**

—John Tukey

Streaming data to the right places



Utilizing PI System data

PI Vision

Unified visualization infrastructure, your window into operational intelligence

Integrators

Blend operational data with business data for complex analyses

PI Vision

We are embarking on a **unified visualization infrastructure** to deliver a seamless, powerful, extensible experience.

Create
Beautiful
Information
Displays &
Dashboards

Monitor and
Optimize
Complex
Processes

Analyze and
Compare
Important
Events

Input Critical
Data in
Context

Your window into operational intelligence

A single platform for your visualization needs

Today



PI ProcessBook
Display Editor
Process Monitoring



PI Vision
Ad Hoc Analysis
PB Display Viewer



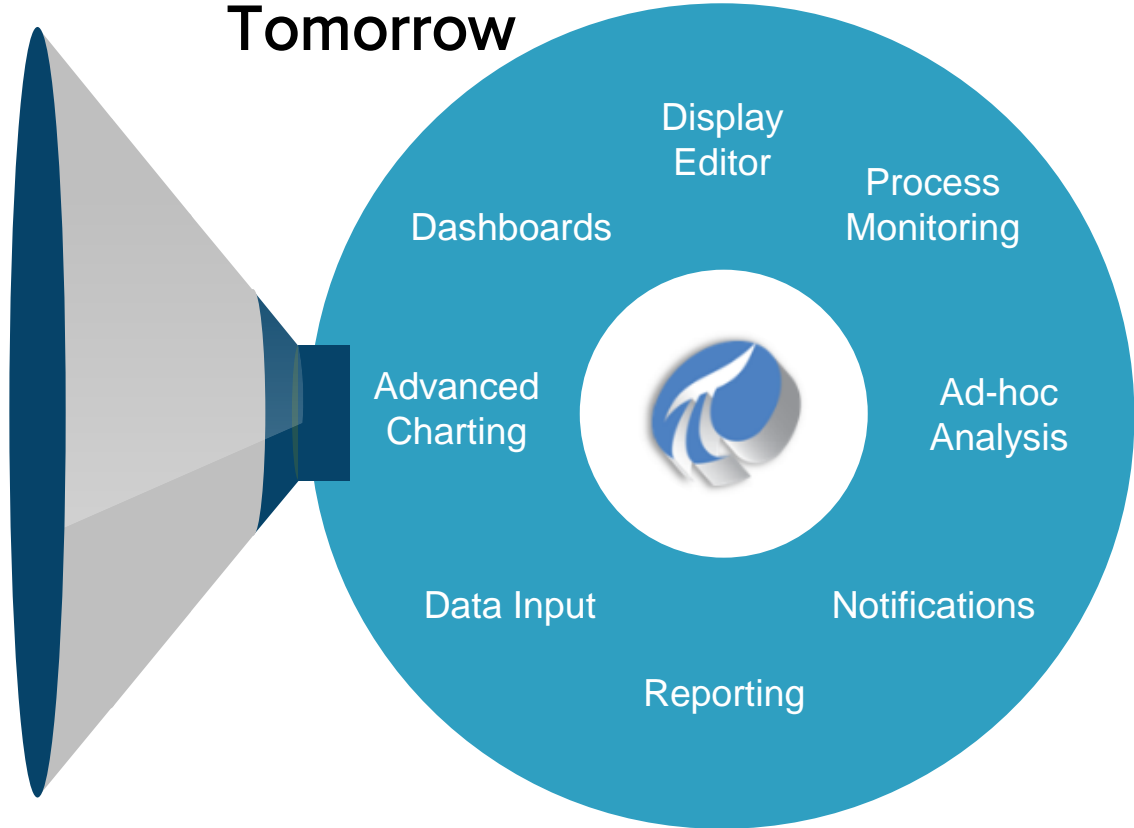
PI WebParts
Dashboards



PI Manual Logger
Manual Data Entry



Tomorrow



A truly extensible visualization infrastructure

Who benefits from extensions?



OSisoft Teams



Partners



Customers

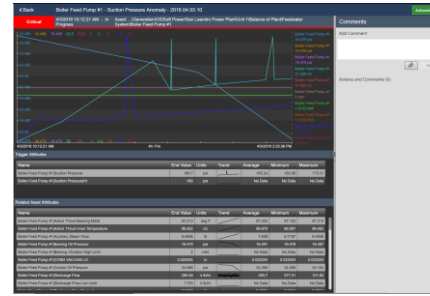
Modern Visualization for the Modern PI System



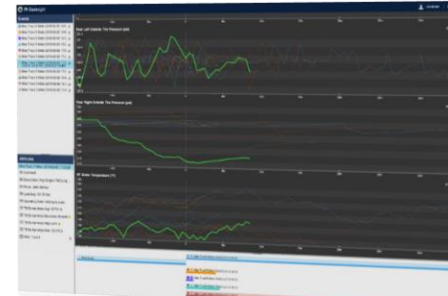
Authoring



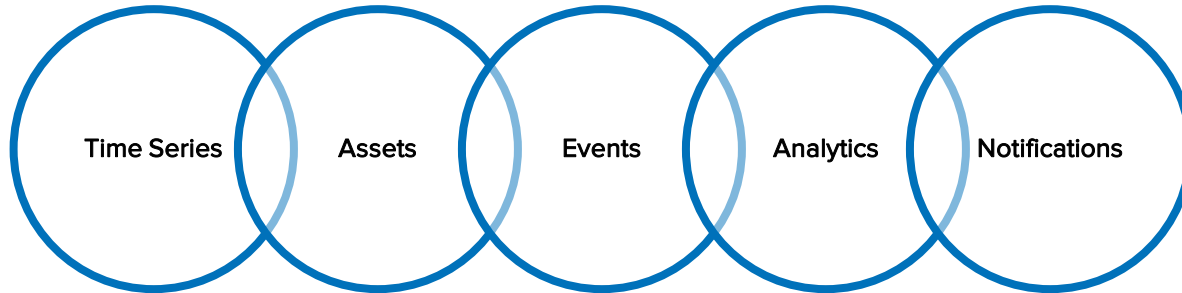
Monitoring



Manual Entry



Ad Hoc Analysis



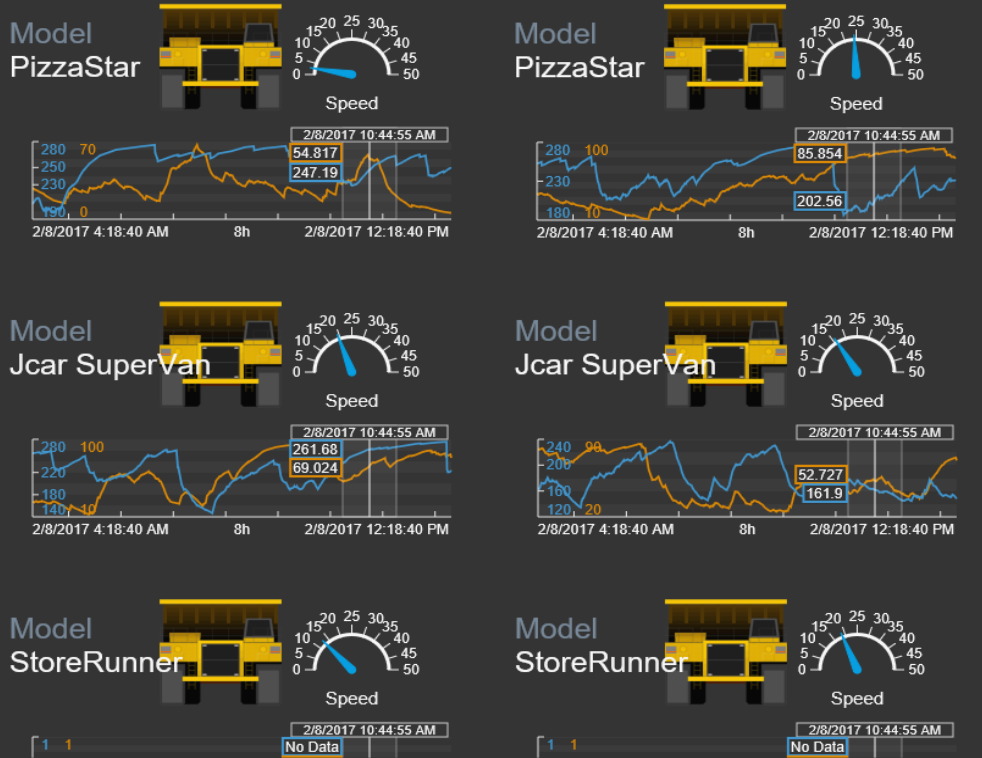
What is PI Vision?

The fastest, easiest way to visualize PI System data

- Access data from any web browser, including **mobile** device browsers
- Collaborate and **share** comments across the company
- Deploy and **roll-out** rapidly



Auto-populate monitoring displays with collections



Group one or more symbols as a “collection”

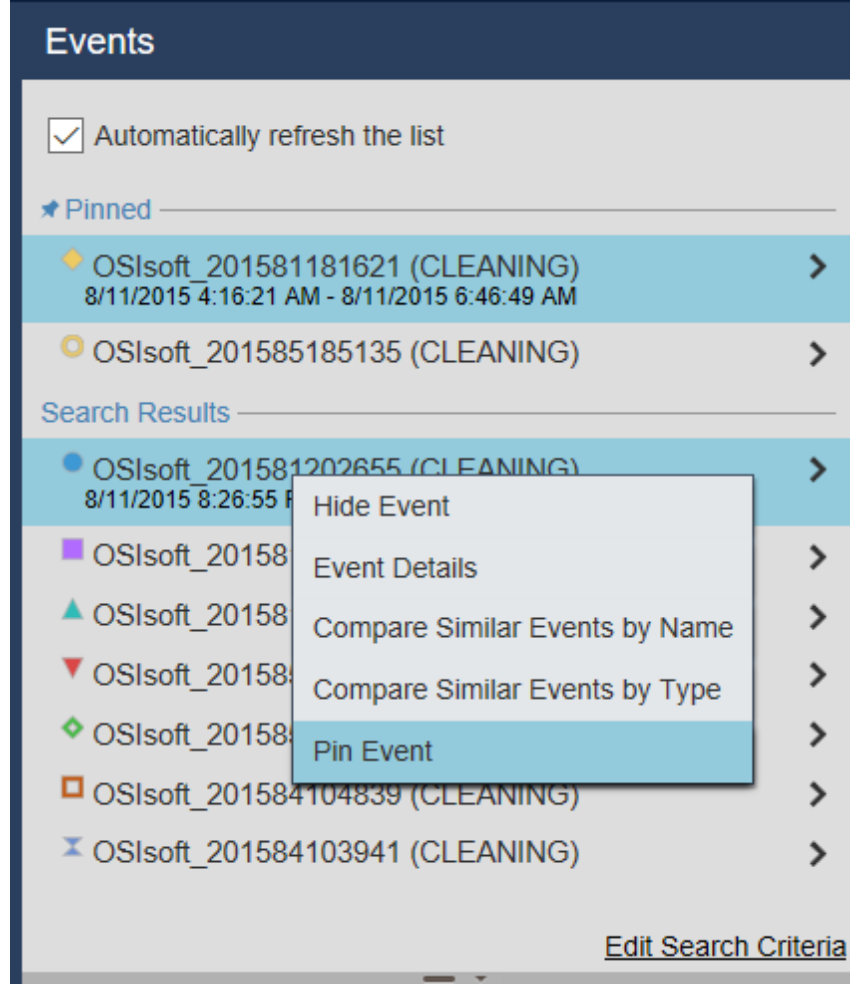


Screen auto-populates that same grouping for **all assets**

- New assets are added **automatically**
- Add **filter criteria** to quickly see troubled assets

Pinned Events

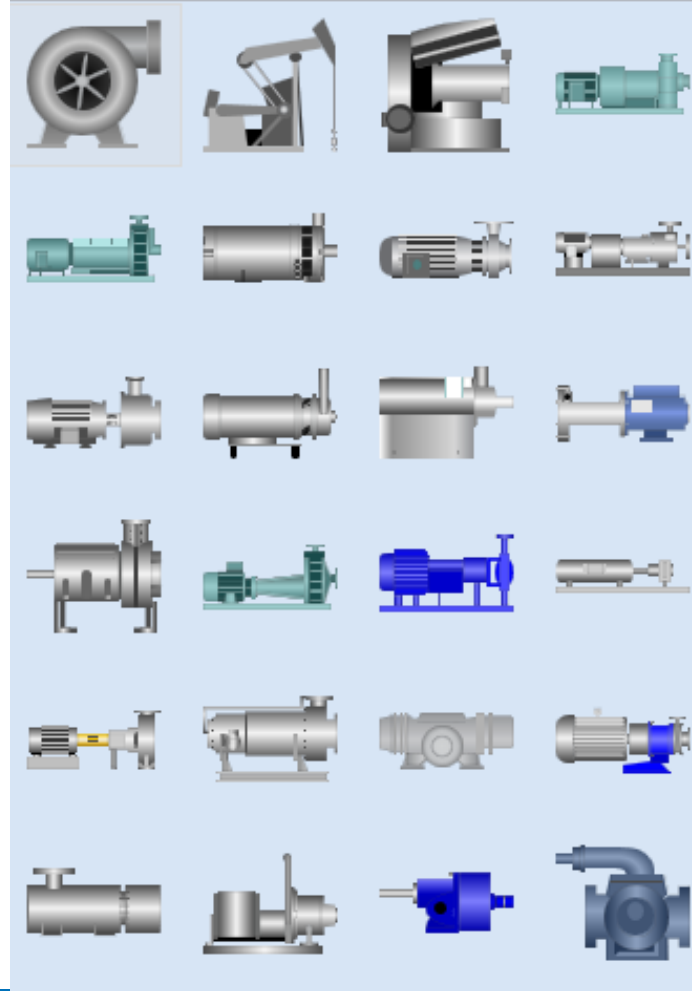
- Identify batch process deviation by comparing to a reference
 - “Pin” one or more events, to be used as a reference
 - Pinned events are saved with the display



The screenshot displays the 'Events' section of a software interface. At the top, there is a checkbox labeled 'Automatically refresh the list' which is checked. Below this, a section titled 'Pinned' is visible, containing two event entries: 'OSISOFT_201581181621 (CLEANING)' and 'OSISOFT_201585185135 (CLEANING)'. A 'Search Results' section follows, listing several events. The first event in the search results, 'OSISOFT_201581202655 (CLEANING)', is selected and highlighted in blue. A context menu is open over this event, offering options: 'Hide Event', 'Event Details', 'Compare Similar Events by Name', 'Compare Similar Events by Type', and 'Pin Event'. The 'Pin Event' option is currently selected and highlighted in blue. At the bottom right of the interface, there is a link labeled 'Edit Search Criteria'.

Graphics Library

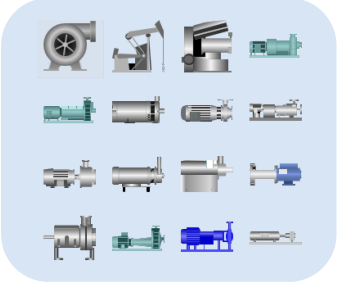
- Easily create **standard views** by using an extensive library of graphics symbols
- Same symbols as available from PI ProcessBook



Drill-in Navigation

Collections

Graphic Library



Pinned Events

Search Results

- OSisoft_201581181621 (CLEANING)
- OSisoft_2015810231135 (CLEANING)
- OSisoft_201581202655 (CLEANING)
- OSisoft_2015810232451 (CLEANING)
- OSisoft_20158519028 (CLEANING)
- OSisoft_201585185135 (CLEANING)
- OSisoft_2015853150 (CLEANING)
- OSisoft_201584104839 (CLEANING)
- OSisoft_201584103941 (CLEANING)

Events Table

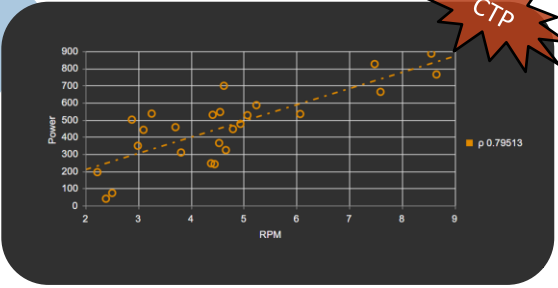
CTP

Start Time	End Time	Acknowledgement
2017-01-26 08:21:43.000	2017-01-26 07:14:43.000	Acknowledge
2017-01-26 07:23:43.000	2017-01-26 07:23:43.000	Acknowledged
2017-01-26 07:34:13.000	2017-01-26 07:34:13.000	Acknowledged
2017-01-26 08:25:13.000	2017-01-26 08:25:13.000	Acknowledged
2017-01-26 08:29:43.000	2017-01-26 08:29:43.000	Acknowledge

Asset Comparison Table

Asset	Manufacturer	Driver	Engine RPM	Load	Status
Mine Truck 1	Caterpillar	Jason Rice	0	0	Running
Mine Truck 2	Volvo	Tommy TooFast	0	0	Running
Mine Truck 3	Komatsu	Edna Thompson	1,682.6	159.87	Running
Mine Truck 4	Caterpillar	Revill Swivel	0	0	Running
Mine Truck 5	Volvo	John Sintias	0	0	Running
Mine Truck 6	Komatsu	Steve Kwan	1,744.9	194.14	Running
Mine Truck 7	Volvo	Brian Bostwick	0	0	Running
Mine Truck 8	Caterpillar	Steve Kia	0	0	Running
Mine Truck 9	Caterpillar	Justin Brown	0	0	Running
Mine Truck 10	Volvo	Bob Bonkers	1,719.7	157.74	Running

XY Plot



Integrators:

Blending data to ask complex questions



Customers want to solve a variety of complex questions

Disparate assets or interacting one-by-one

Interacting with common assets as a fleet

Complexity ↑

Monitoring

Real-time visibility



- HMI

Process Optimization

Real-time & historical view across any plant asset



- PI Vision
- PI Datalink

Benchmarking

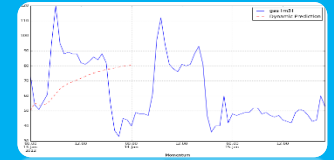
Fleet-wide performance comparison



- BI App (i.e. Tableau, Spotfire, Lumira)
- PI Integrator for Business Analytics
- PI Integrator for SAP HANA

System Optimization

Large scale multi-variate analysis



- Machine Learning (Azure ML, R)
- PI Integrator for Business Analytics
- PI Integrator for SAP HANA

Data Integration can address Big Questions



Mining

- What material is being hauled?
- Was it raining?
- Holes in the road?
- On break?
- What is the grade of the hill?
- Scheduled downtime?
- Shifts—different driving behaviors



Oil & Gas

- When did the geology change?
- Which well was being drilled?
- What angle was the drill bit?
- Is production related to drill conditions?



Wind Power

- Was wind gusty or steady?
- Was the maintenance planned?
- How long does this issue usually take to fix?



Pharmaceuticals

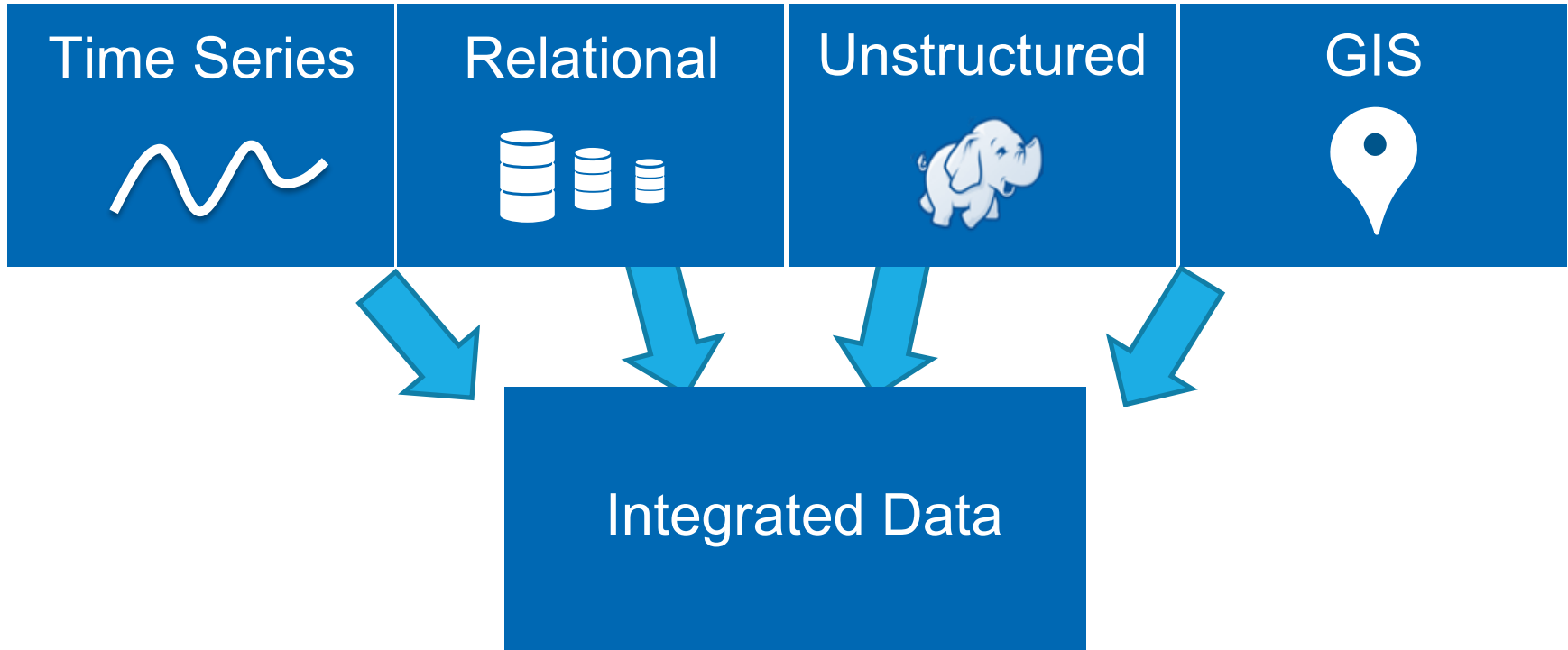
- What product is being made?
- When is the equipment empty?
- Where was the instrument when I took that measurement?



Transmission & Dist

- How are renewables impacting equipment?
- Was there a voltage violation?
- What are the changes in weather?

Data Integration brings together Different Data



Integrate, verb: combine (one thing) with another so that they become a whole

Time Series Data is Complex!



Turbine 1

Speed
Bearing Temp
Oil Temp

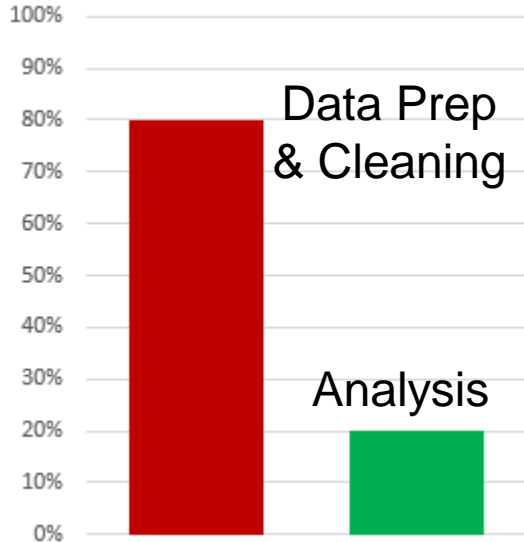


Turbine 2

Speed
Bearing Temp
Oil Temp
Wear Factor

Data Integration Projects are Challenging

Time



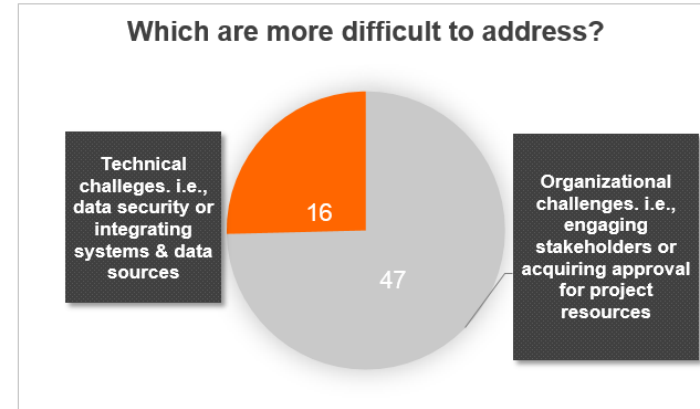
Warning: Currently, data analysts spend 50-80% of their time merely collecting and preparing data¹

Expense



Warning: data integration often requires ongoing upkeep

Risk

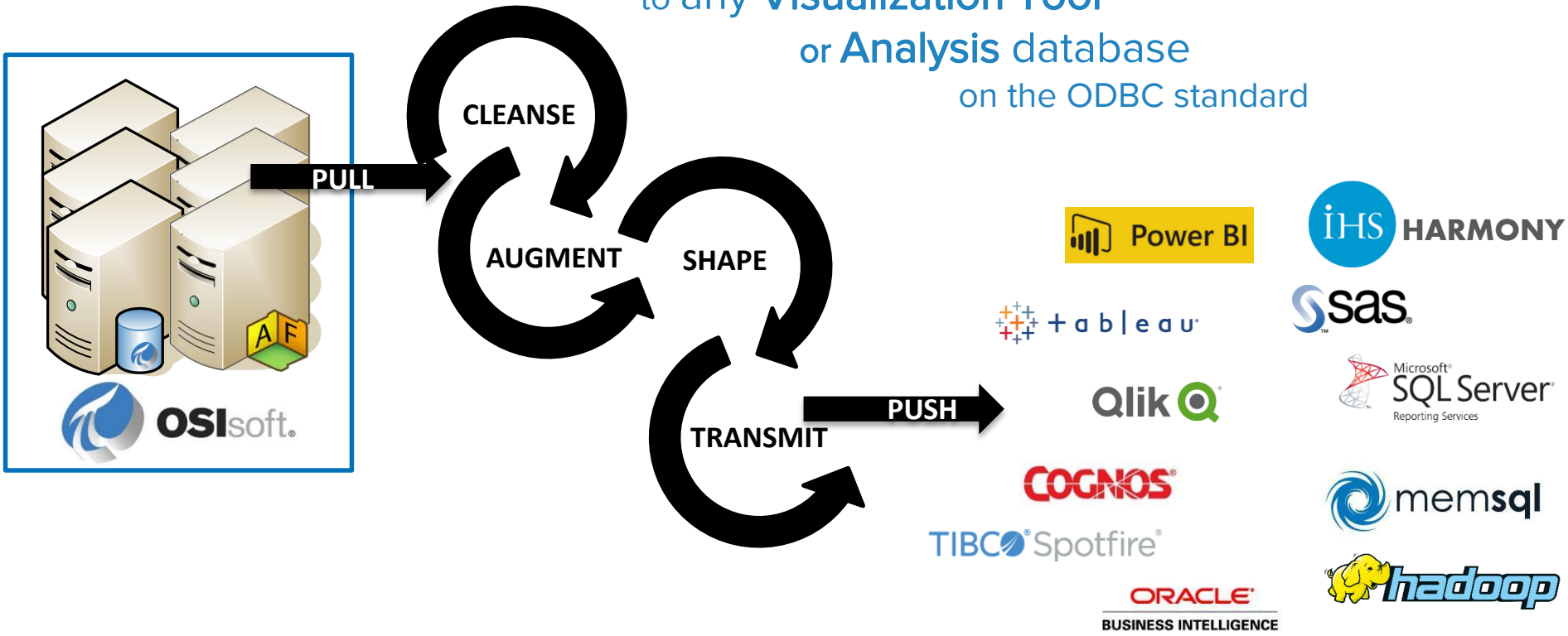


Warning: If “why?” for the project is not clearly communicated, business barriers will delay and risk the project

¹<https://hbr.org/2014/04/the-sexiest-job-of-the-21st-century-is-tedious-and-that-needs-to-change/>

Prepare and Deliver Process Data

to any **Visualization Tool**
or **Analysis database**
on the ODBC standard



Advanced Integrations – Supported Systems

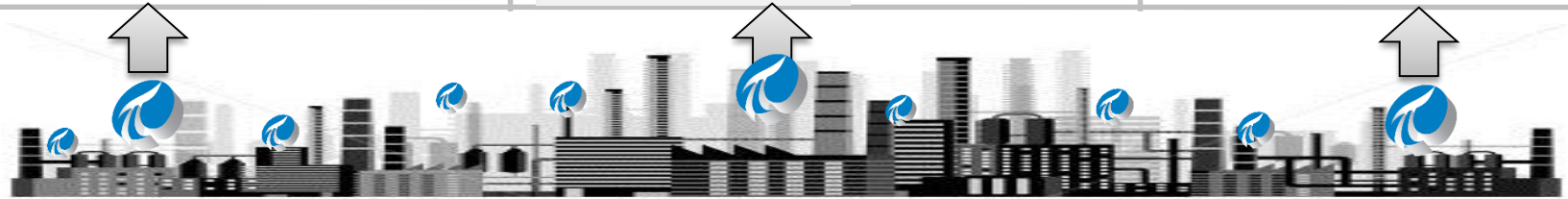
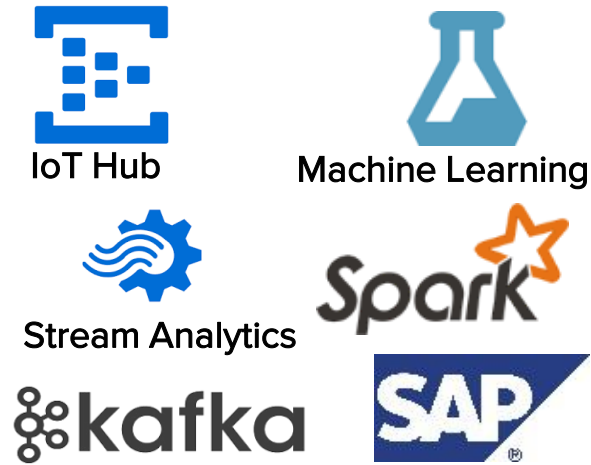
Visual Analytics



Data Warehouse / Data Lake



Streaming Analytics – 2017



2015-2016

2017

Future

Business Intelligence & Data Warehouses

Available Today

PI Integrator for Business Analytics

- Microsoft SQL Server, Oracle
- Hadoop (HDFS/HIVE)

PI Integrator for SAP HANA

Available

Cloud Platforms

- Microsoft Azure
- HANA Cloud Platform (5/2017)

(Planning)

More Platforms

- ESRI ArcGIS GeoAnalytics

Streaming Systems

Available Today

PI Integrator for Esri ArcGIS

- Situational Awareness
- Real-Time Geoprocessing
- Import ESRI features (assets)

Planned (1H 2017)

Stream Systems

- Azure Event Hubs, IoT Hub
- Apache Kafka
- SAP SDS

Planned (1H 2017)

Stream Systems

- Azure Event Hubs, IoT Hub
- Apache Kafka
- SAP SDS (April 2017)

PI Integrator Framework

Planned (1H 2017)

- Process Scale out
- SSL / HTTPS

(Planning)

- All Integrators on common Framework (ESRI)
- Node Scale Out and HA

New Integration Patterns

Research

Enable business process orchestration with PI System data – workflow, asset sync, transaction-like data, MES

Research

Enable partners and customers to build applications and interact programmatically using PI Integrator Framework.

Customer Example: Deschutes Brewery

Leveraging the PI System and Cortana Intelligence to Increase Process Efficiency



COMPANY and GOAL

Deschutes Brewery is the 7th largest craft brewery in US, and wanted to maximize production with its existing infrastructure to fund construction of a 2nd brewery in Roanoke, VA

CHALLENGE

Batch's phase transition happens between manual density measurements occurring every 8-10 hours

- Impact: Losing up to 72 hours in production time

SOLUTION

Use data science to achieve accurate predictive analytics for determining a batch's density measurements

- PI System
- PI Integrator for Microsoft Azure
- SQL Data Warehouse
- Azure Machine Learning
- Azure Data Factory

RESULTS

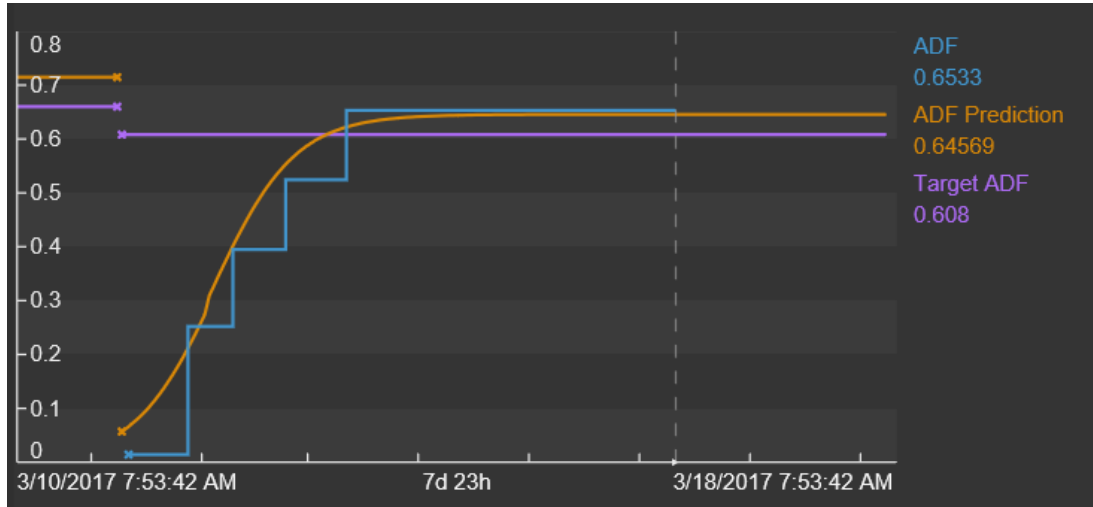
Ability to eliminate production time losses and increase production capacity

- Accurate predictions of when a batch's phase transitions from fermentation to free rise



Detecting Early Deviations and Taking Corrective Action

Black Butte Porter – Vessel 45



Indications:

- Uncharacteristic fermentation

Actions taken:

- Transition to free rise early

Results:

- Production time reduced
- Batch saved
- Quality maintained

Related talks

2:15pm – 2:45pm	Roadmap for the PI System Development	PI Integrator for ArcGIS	PI 101 - Introduction to Process Optimization & Big Data Analytics with the PI System
2:45pm – 3:00pm	Transfer Time	Transfer Time	Transfer Time
3:00pm – 3:30pm	Engaging Product, People and Process for Operational Transformation	PI Server 2017	PI 101 - Introduction to Visualizing Data with the PI System
3:30pm – 3:45pm	Transfer Time	Transfer Time	Transfer Time
3:45pm – 4:15pm	The Business Case for IIoT Panel	PI Visualization 2017	

감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado