



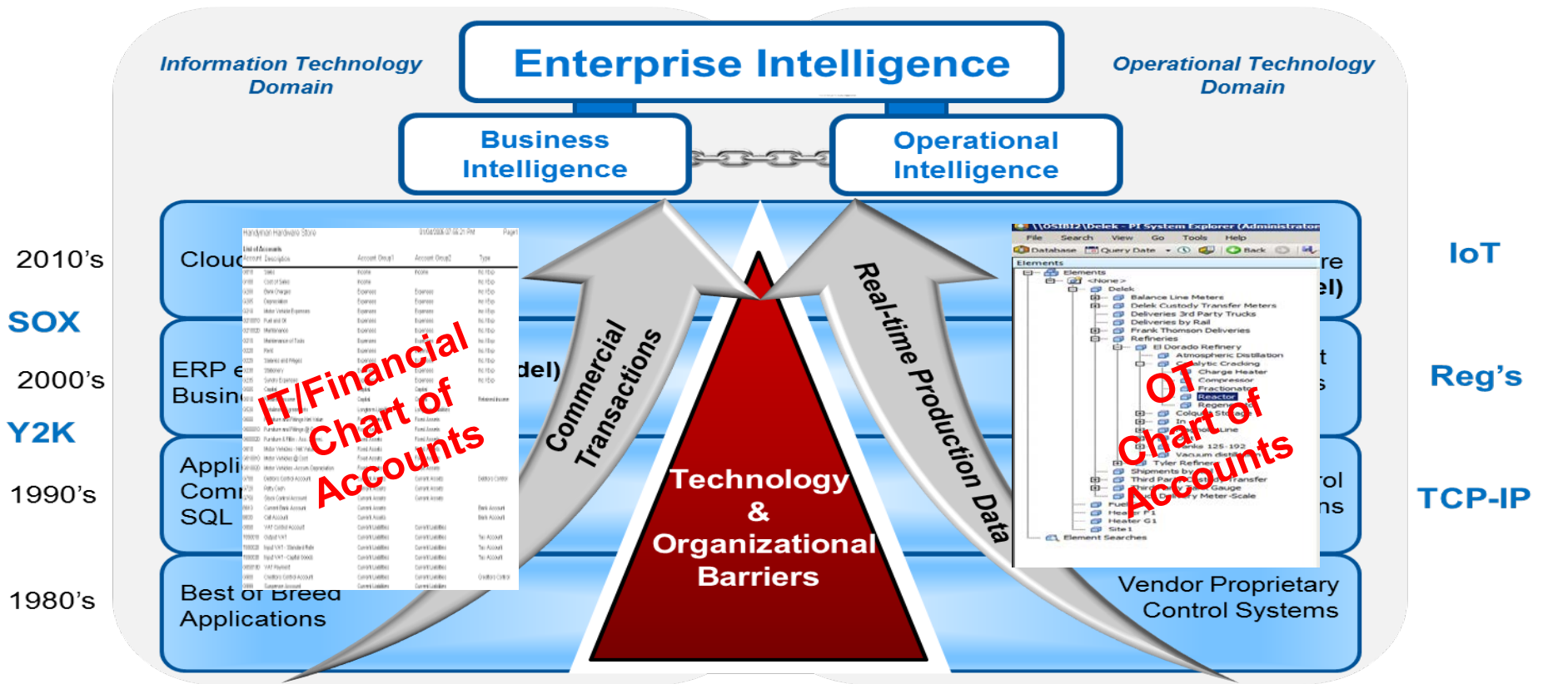
Enabling Analytics and Operational Intelligence with the PI System

Presented by **Curt Hertler - Global Solutions Architect**
Craig Harclerode - Industry Principal – Oil & Gas

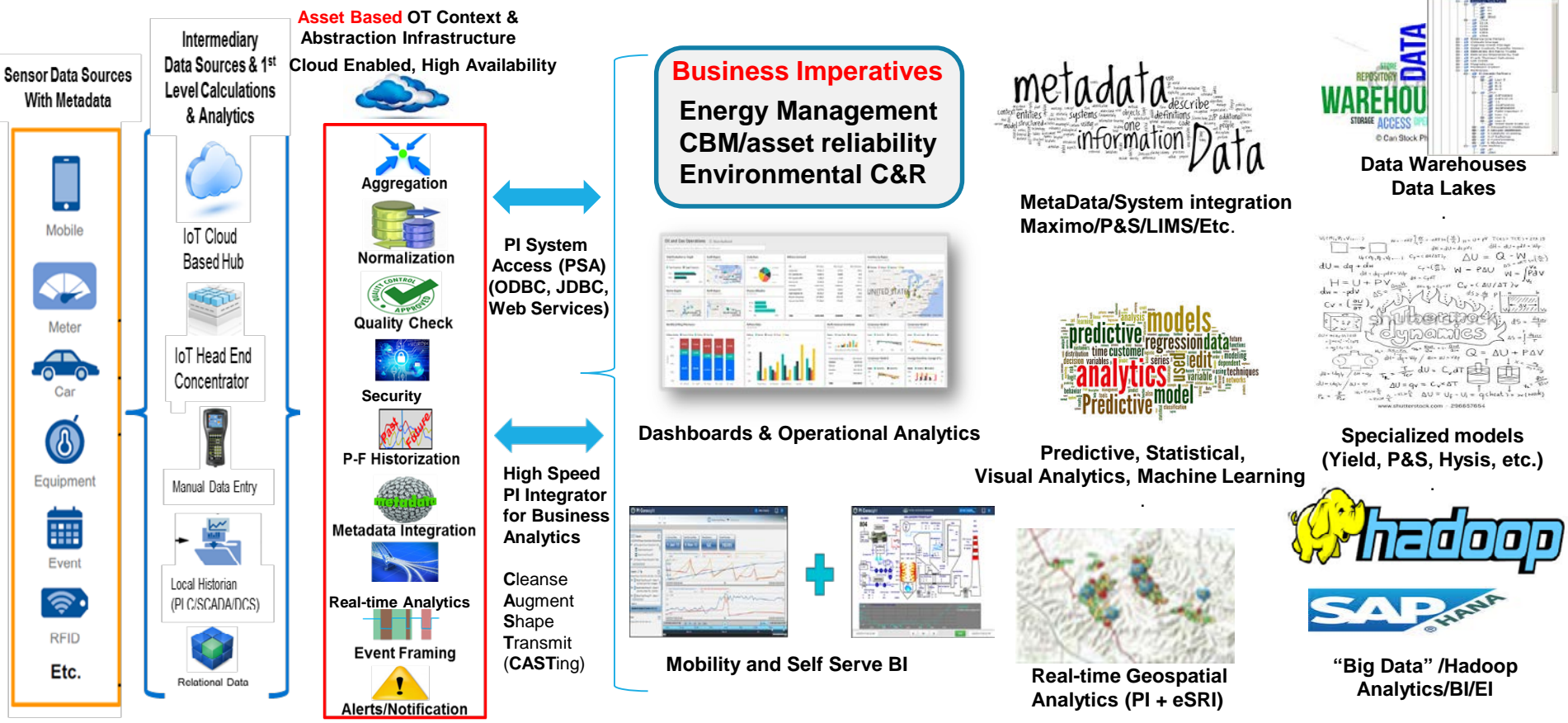
Agenda

- Importance of the Data Model (PI AF) – The Foundation
- Context for Analytics & Operational Intelligence
- Defining Analytics – “The Analysis of Analytics”
- The Role of the PI Integrator for Higher Level Analytics
- Enabling Operational Intelligence and Excellence
- Closing Remarks

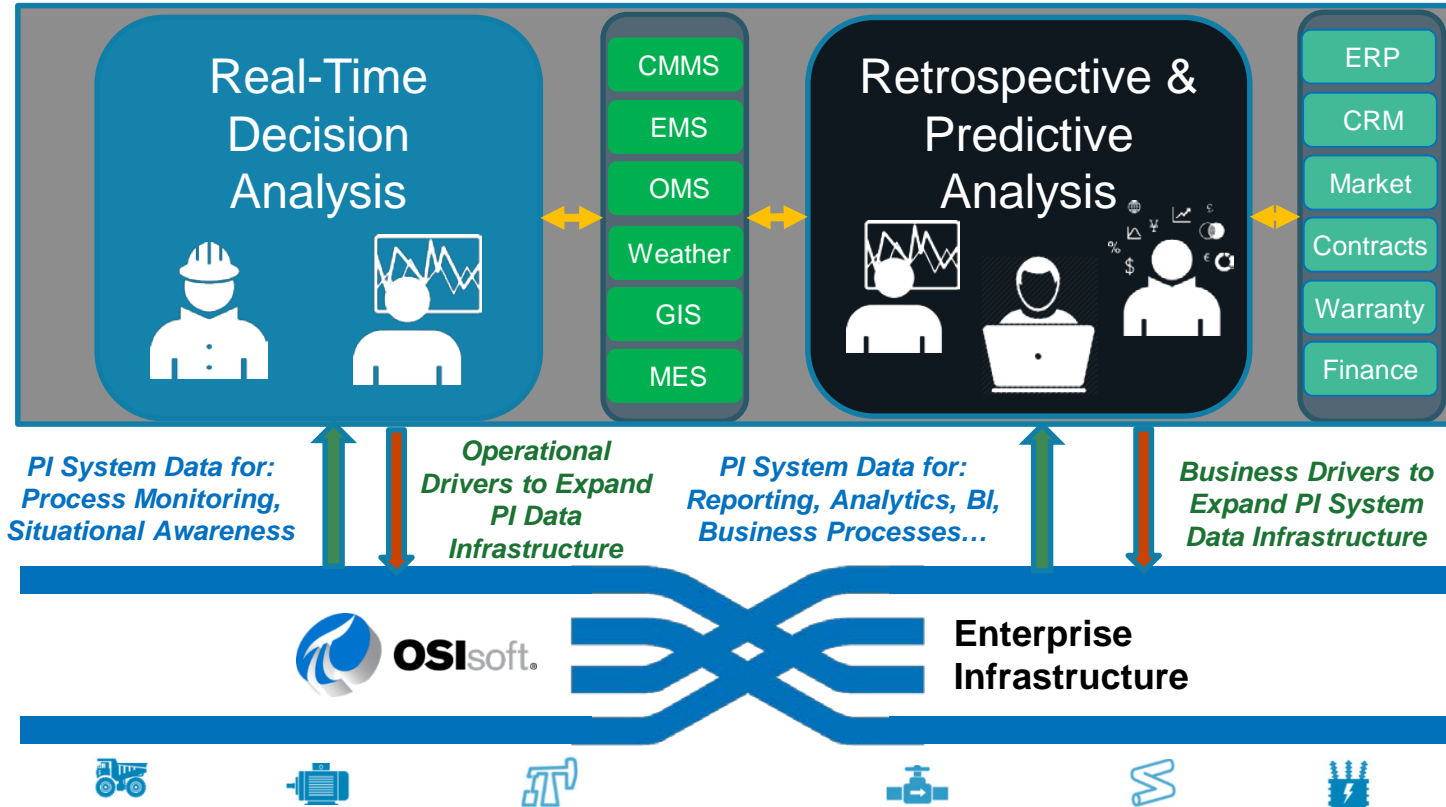
The Journey to Enterprise Intelligence – IT/OT Convergence



The PI System - Foundational for Operational Intelligence & Excellence

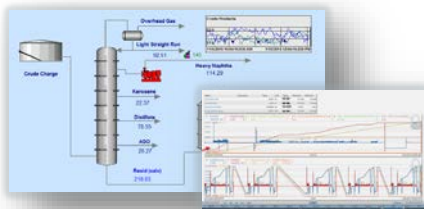


New *Uses* for and *Users* of PI System Data



Enabling Analytics for Operational Intelligence

Real-Time Decision Analysis



Time and Event
Trending & Awareness

Specialized Models
Simulation & Optimization

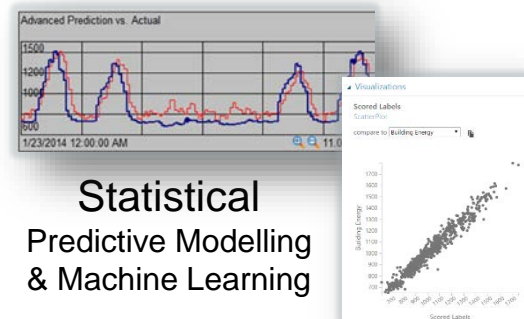
$$Q = \frac{\Delta P_{DD} * kh}{141.2\mu B_0 \left\{ \ln \frac{r_e}{r_w} - \frac{3}{4} + S \right\}}$$

First Principles
Performance
& Condition

Retrospective & Predictive Analysis

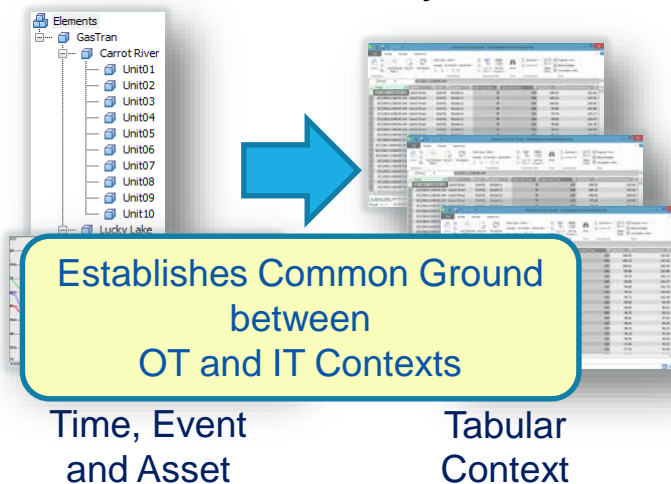


Multidimensional
Business Intelligence
& Dashboards



Statistical
Predictive Modelling
& Machine Learning

PI Integrator for Business Analytics



Time, Event
and Asset
Context

Tabular
Context

First Principles Analytics - *Performance & Condition*

- Relationships ***always*** exists between process measurements
- Requires synchronized observations for meaningful results
- Enables real-time decision making only when visible, i.e. not performed in spreadsheets



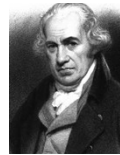
Daniel Bernoulli
(1700 – 1782)

$$H = z + \frac{p}{\rho g} + \frac{v^2}{2g} = h + \frac{v^2}{2g}$$



Benoît Clapeyron
(1799 – 1864)

$$PV = nRT$$
$$Q = \frac{\Delta P_{DD} * kh}{141.2 \mu B_0 \left\{ \ln \frac{r_e}{r_w} - \frac{3}{4} + S \right\}}$$



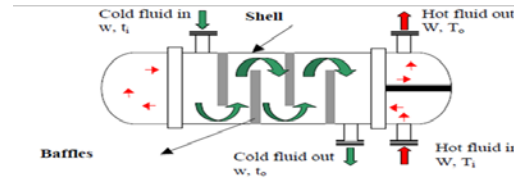
James Watt
(1736–1819)

$$F = \frac{(R+1)^{1/2} \times \ln((1-SR)/(1-S))}{(1-R) \times \ln \left\{ \frac{2-S(R+1-(R+1)^{1/2})}{2-S(R+1+(R+1)^{1/2})} \right\}}$$

$$P = IV = I^2 R = \frac{V^2}{R}$$

First Principles Analytics - PI Asset Analytics

- Configure calculations at scale
- Math, statistical, logical and steam table functions
- Supports simple predictive analytics
- Supports future data for forecasting
- Backfill ! Backfill ! Backfill !



Heat Exchanger Key Performance Indicator:

Overall heat transfer coefficient

$$U = \frac{Q}{A \times \text{Corrected LMTD}}$$

RULE: IF the heat transfer coefficient is decreasing,
THEN the **Heat Exchanger FOULING** !!!
Cleaning is required!

Calculation Steps:

1. Heat Duty, $Q = q_h + q_c$
 $q_h = W \times C_{ph} \times (T_i - T_o) / 1000 / 3600$
 $q_c = W \times C_{pc} \times (t_o - t_i) / 1000 / 3600$
2. Hot Fluid Pressure Drop, $\Delta P_h = P_i - P_o$
3. Cold fluid pressure drop, $\Delta P_c = P_i - P_o$
4. Temperature range hot fluid, $\Delta T = T_i - T_o$
5. Temperature range cold fluid, $\Delta t = t_o - t_i$
6. Capacity ratio, $R = W \times C_{ph} / W \times C_{pc}$ (or) $(T_i - T_o) / (t_o - t_i)$
7. Effectiveness, $S = (t_o - t_i) / (T_i - t_i)$
8. LMTD
 LMTD Counter current Flow = $((T_i - t_o) - (T_o - t_i)) / \ln((T_i - t_o) / (T_o - t_i))$
 LMTD Co current Flow = $((T_i - t_i) - (T_o - t_o)) / \ln((T_i - t_i) / (T_o - t_o))$
 Correction factor for LMTD to account for Cross flow

$$F = \frac{(R + 1)^{1/2} \times \ln((1 - SR) / (1 - S))}{(1 - R) \times \ln \left\{ \frac{2 - S(R + 1 - (R + 1)^{1/2})}{2 - S(R + 1 + (R + 1)^{1/2})} \right\}}$$
9. Corrected LMTD = $F \times \text{LMTD}$

Name	Expression	Value	Output Attribute
Qh	//Shell side heat duty "Shell Side Mass Flow" * "Hot Side Temperature Difference" * "Shell Side Heat Capacity" * 3600		Heat Duty Shell Side
Qt	//Tube side heat duty "Tube Side Mass Flow" * "Cold Side Temperature Difference" * "Tube Side Heat Capacity" * 3600		Heat Duty Tube Side
Q	qh + qt		Map
R	("Hot Side Inlet Temperature" - "Hot Side Outlet Temperature") / ("Cold Side Outlet Temperature" - "Cold Side Inlet Temperature")		Map
S	("Cold Side Outlet Temperature" - "Cold Side Inlet Temperature") / ("Hot Side Inlet Temperature" - "Cold Side Outlet Temperature")		Map
LMTD	Roundfrac(((("Hot Side Inlet Temperature" - "Cold Side Outlet Temperature") - ("Hot Side Outlet Temperature" - "Cold Side Inlet Temperature")) / Log(("Hot Side Inlet Temperature" - "Cold Side Outlet Temperature") / ("Hot Side Inlet Temperature" - "Cold Side Inlet Temperature"))), 1)		LMTD
F	((R + 1) * 0.5 * Log((1 - S) / (1 - R))) / ((1 - R) * Log((2 - S * (R + 1) * (R + 1) * 0.5)) / (2 - S * (R + 1) * (R + 1) * 0.5)))		Map
F * LMTD	F * LMTD		Map
U	Max(qs, qt) / ("Area" * LMTDcorr)		Calculated Heat Transfer Coefficient

Advanced Corrosion Analytics - PI Asset Analytics



Elements

- APC
- ARGUS
- Control loops DR
- Crude Units
- Danube Refinery
- Energy Consumption Predictions
- Energy KPI System
- Energy Monitoring
- EztEgyTeszt
- Flare Monitoring
- Interlock Monitoring
- IOW
- DBKS IOW
 - Kémmentesítő reaktor betáp előmelegítő cseppfőgő - HTHA
 - Kémmentesítő reaktor betáp előmelegítő cseppfőgő - Nyomás
 - Kémmentesítő reaktor betápláló hőcserélő - Nyomás
 - Szektív hidrogénző reaktor betáp előmelegítő - Hőmérséklet
- DETBE IOW
- DG3 IOW
- DHDS IOW
- DHG2 IOW
- DKB IOW
- Sófok
- Solomon Szamitások
- Statistical Quality Control
- System
- Tanks
- Technology DataSheet
- Tisza Refinery
- TQI
- Zala Refinery
- Element Searches

Filter

Name	Value
Current	214.10000610351563
Desc	Ide kell a hosszú leírás.
Gasolin flow	82.83045
Density	801.9
Gasolin molar flow kmol/h	0.28879018023142428
Molar weight g/mol	230
H2 flow	11238.164436340332
H2 molar flow kmol/h	1348.57973236084
HTHA limit F	605.81629193204753
Kvencs H2	86.3660355
Make up H2	254.211136
Molar weight g/mol	1
Partial pressure	20.002323679218641
Partial pressure psi	290.03369334867028
Pressure	19.0066071
Rec H2	11070.3193
Suruseg kg/Nm3	0.12
Ht Limit	270
HTHA	318.7866288511375
Is operating	1
LO Limit	-1000000000
Name	DBKSRTI2017.DACA.PV
Naplo_AZON	BKS_TK
Type	
Yesterday Out of limit time	0 h

Properties

Name: HTHA limit F

Description: <None>

Properties: <None>

Categories: <None>

Default UOM: <None>

Value Type: Double

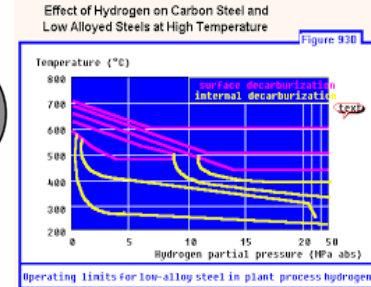
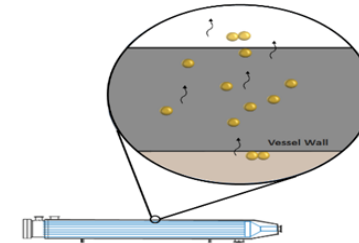
Value: 605.81629193204753

Data Reference: Formula

Settings...

A=Partial pressure psi;(((574.6+(0.03015*A)))+(3351484.9/(A^2)))

- High Temperature Hydrogen Attack (HTHA)
- f^x (metallurgy, temperature, hydrogen partial pressure(PP), length of exposure)
- Developed PI AF template that:
 - Determine partial pressure H2
 - Attribute of pipe class
 - Temperature and length of exposure limits
 - **Total time above Temp and PP**
 - Alerts/notification/event frame
- Tested and rolled out in 6 units < 1 week
- Expanding to all plants in 2015.



Natural Gas Consumption Predictive Analytics



BackGround

- Huge saving possibilities in the decrease of contracted natural gas daily maximum amount

Problem

- High penalty on daily amount exceedance
- Alerting system was needed

Solution

- Consumption prediction calculations in PI Analysis
- Detailed information on PI Coresight display (about consumption, prediction, contacts of decision makers)
- E-mail alerting system in Notifications

The screenshot shows the PI Coresight interface. On the left, a tree view lists various elements under 'MOLHU NatGas Cons', including 'DF C3 compressor stop', 'DF Fuel Oil Burning in BoilerPlant', 'DF GPR PB BlowDown Increase', 'DF PB Own Burning AV2', 'DF PB Own Burning AV3', 'TVK GasTurbine Stop', and 'TVK Oil Burning Increase'. On the right, a table displays consumption data:

Category	Name	Value
Consumption Calculations	Cumulated Daily Consumption	18723164 MJ
	Current Consumption	1991855,5 MJ/h
	Predicted Daily Consumption	49276016 MJ
Exceedance Calculations	Alert State	4
	HI Limit Exceedance	0 MJ
Limits	HI Alert	59500000 MJ
	HHI Alert	61000000 MJ
	LO Alert	0 MJ
	LOLO Alert	0 MJ

The screenshot shows the PI Coresight interface with a table of consumption calculations. The table has columns for Name, Configuration, Schedule, Output(s), and Backfilling. Below the table, there is a section for Name and Expression.

Name	Configuration	Schedule	Output(s)	Backfilling
Auxiliary Calculations	RemainingDayRatio := In...	Frequency=120...	RemainingDayPart; RefD...	
CumulatedDailyConsumption	CumulatedDailyConsump...	Frequency=120...	Cumulated Daily Consum...	✓
CurrentConsumption	CurrentConsumption := T...	Frequency=120...	Current Consumption	✓
PredictedDailyConsumption	SecondsToNextGasDayTu...	Frequency=120...	Predicted Daily Consum...	✓

Name	Expression
SecondsToNextGasDayTurn	<code>Int(Bod('*-6h')+'+30h'-**)</code>
PredictedDailyConsumption	<code>*Cumulated Daily Consumption'+*Current Consumption'*SecondsToNextGasDayTurn/3600</code>

Energy Demand Forecasting with Future data



Improve energy trading by

Collect real-time data

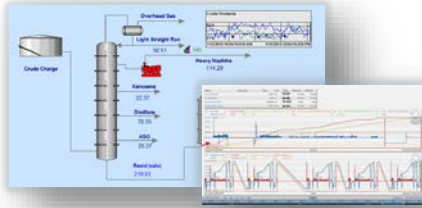
Train energy consumption models

Predict energy consumption based on production plan

Monitor and update models

Enabling Analytics for Operational Intelligence

Real-Time Decision Analysis



Time and Event
Trending & Awareness

Specialized Models
Simulation & Optimization

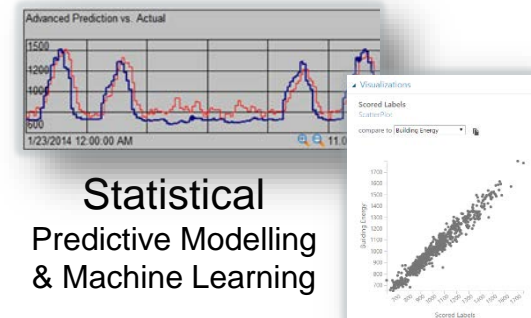
$$Q = \frac{\Delta P_{DD} * kh}{141.2\mu B_0 \left\{ \ln \frac{r_e}{r_w} - \frac{3}{4} + S \right\}}$$

First Principles
Performance
& Condition

Retrospective & Predictive Analysis

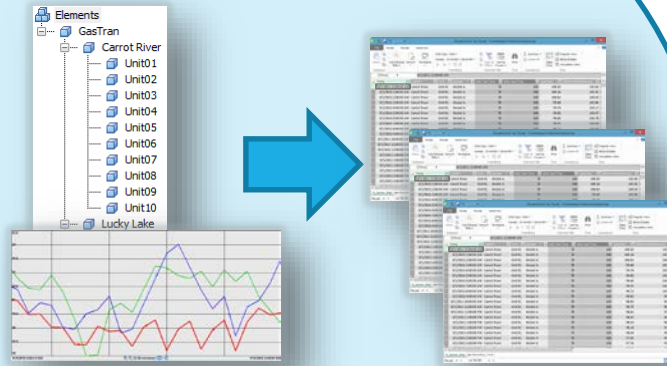


Multidimensional
Business Intelligence
& Dashboards



Statistical
Predictive Modelling
& Machine Learning

PI Integrator for Business Analytics



Time, Event
and Asset
Context

Tabular
Context

PI Integrator for Business Analytics - “Select Data”

- Now available
- Create “PI Views” from AF Hierarchy
- Select AF Elements and Attributes
- Scale up leveraging name, hierarchy, or category

The screenshot displays the 'Select Data' interface for 'Compressor Analysis'. The interface is divided into several sections:

- Source Assets:** Shows the selected server as 'CHERTLER6430S' and the database as 'Compressors'.
- Assets:** A tree view showing the hierarchy: 'GasTran' > 'Brownsville' > 'Compressor-023' (selected). Below the tree is an 'Attributes' filter box and a 'Select All' section listing 'Differential Pressure', 'Gas Flow', 'Model', and 'Station'.
- Asset Shape:** A list of shapes: 'Compressor' (with sub-items 'Differential Pressure', 'Gas Flow', 'Model', 'Station'), 'Model', and 'Station'.
- Matches:** A list of 29 matches, including 'Compressor-023', 'Compressor-304', 'Compressor-340', 'Compressor-356', 'Compressor-432', 'Compressor-567', 'Unit01', 'Unit02', 'Unit03', 'Unit04', 'Unit05', 'Unit06', and 'Unit07'.

PI Integrator for Business Analytics - “Modify View”

- Select any time range and interval
- Add columns for proper aggregating PI System data
- Add columns for common time and date functions

Compressor Analysis

Select Data > **Modify View** > Publish

+ Add Column
6 Columns

Edit Row Filters
0 Row Filters

Edit Value Mode
Interpolated Values
Every 1 minutes

Start Time
Saturday, October 1, 2011

Compressor	LocalTime	Differential Pressure	Gas Flow	Model A
Unit01	2011-10-01 00:00:00	93.3822	100.6735	Model A
Unit01	2011-10-01 00:01:00	93.36484	100.6739	Model A
Unit01	2011-10-01 00:02:00	93.34747	100.6742	Model A
Unit01	2011-10-01 00:03:00	93.33011	100.6746	Model A
Unit01	2011-10-01 00:04:00	93.31274	100.675	Model A
Unit01	2011-10-01 00:05:00	93.29539	100.6754	Model A
Unit01	2011-10-01 00:06:00	93.27802	100.6758	Model A
Unit01	2011-10-01 00:07:00	93.26066	100.6761	Model A
Unit01	2011-10-01 00:08:00	93.24329	100.6765	Model A
Unit01	2011-10-01 00:09:00	93.22593	100.6769	Model A
Unit01	2011-10-01 00:10:00	93.20856	100.6772	Model A
Unit01	2011-10-01 00:11:00	93.1912	100.6776	Model A
Unit01	2011-10-01 00:12:00	93.17384	100.678	Model A
Unit01	2011-10-01 00:13:00	93.15647	100.6784	Model A
Unit01	2011-10-01 00:14:00	93.13911	100.6787	Model A

Column Details

Name
Gas Flow
[Reset Name to Default](#)

Data Content ?

Value

- Name
- Value
- Last Recorded Value
- Total
- Average
- Minimum
- Maximum
- Range
- Standard Deviation
- Population Standard Deviation
- Count
- Percent Good

PI Integrator for Business Analytics - “Publish”

- Select targeted endpoint “PI View”, MS SQL, File, more to come....
- Publish once or on a scheduled bases

The screenshot shows the 'Publish' configuration screen for 'Compressor Analysis'. The breadcrumb navigation is 'Select Data > Modify View > Publish'. A 'Back' button is in the top right. The 'Target Configuration' section has a dropdown menu set to 'PI View'. Below it, 'Run on a Schedule' is selected with a radio button. The 'First Run' section shows a calendar for November 2015 with the 5th selected, and time fields for Hour (00), Minute (00), and Second (00). The 'Summary' section on the right states there are 29 matching instances and provides the start time (Saturday, October 1, 2011 12:00:00 AM), end time (Tuesday, November 1, 2011 12:00:00 AM), and a time interval of 1 minute. A large blue 'Publish' button is at the bottom.

Compressor Analysis OSISoft

Select Data > Modify View > Publish Back

Target Configuration

PI View

☐ Run Once

☒ Run on a Schedule

First Run

*

Nov 2015

Su	Mo	Tu	We	Th	Fr	Sa
25	26	27	28	29	30	31
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5

Hour: 00 Minute: 00 Second: 00

Summary

Shape and Matches

- There are **29 Matching Instances**.

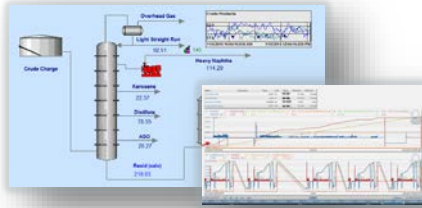
Timeframe and Interval

- Your Start Time is **Saturday, October 1, 2011 12:00:00 AM**
- Your End Time is **Tuesday, November 1, 2011 12:00:00 AM**
- Your Time Interval gets an interpolated measurement every **1 minutes**

Publish

Enabling Analytics for Operational Intelligence

Real-Time Decision Analysis



Time and Event
Trending & Awareness

Specialized Models
Simulation & Optimization

$$Q = \frac{\Delta P_{DD} * kh}{141.2 \mu B_0 \left\{ \ln \frac{r_e}{r_w} - \frac{3}{4} + S \right\}}$$

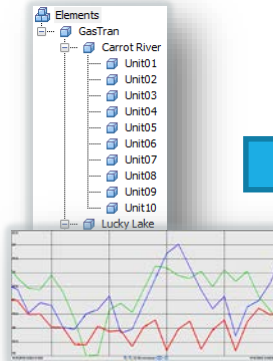
First Principles
Performance
& Condition

Retrospective & Predictive Analysis

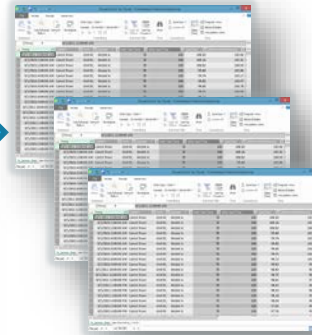


Multidimensional
Business Intelligence
& Dashboards

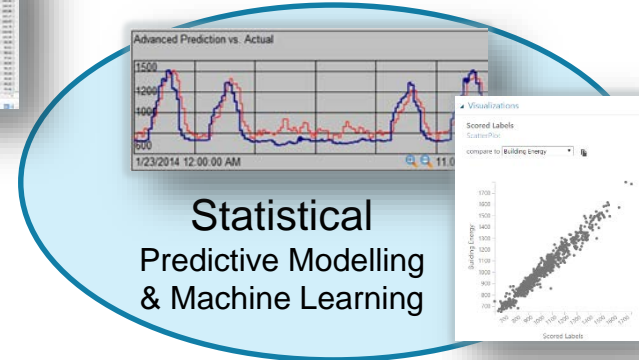
PI Integrator for Business Analytics



Time, Event
and Asset
Context



Tabular
Context

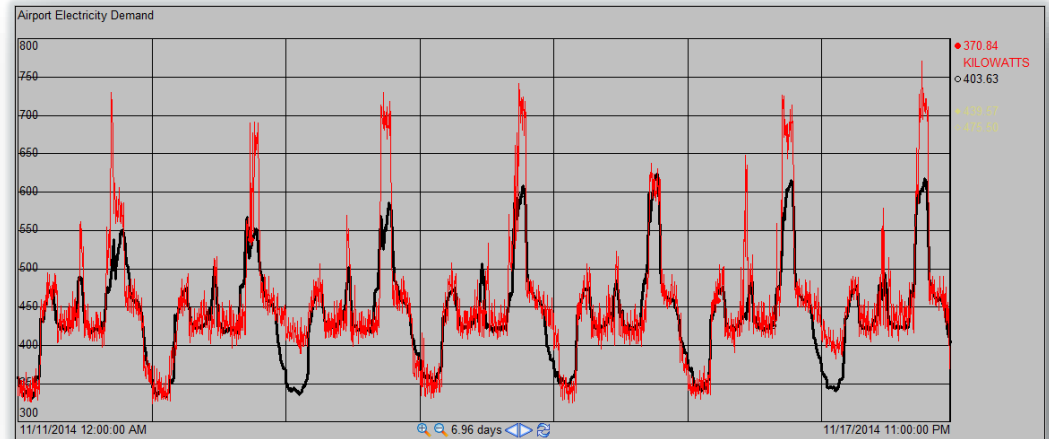


Statistical
Predictive Modelling
& Machine Learning

Statistical Analytics - Example: Power Forecast

Predicted Power = **0.2324** * **Average(Actual Power, 1 day ago, +/- 5 min)** +
0.1421 * **Average(Actual Power, 2 days ago, +/- 5 min)** +
.....(terms for 3-13 days ago).....
0.0435 * **Average(Actual Power, 14 days ago, +/- 5 min)**

- Statistically derived equation with coefficients and time relative averages
- Configurable in PI AF with backfill to assess
- Schedule in PI AF to provide forecast - PI Server future data



Statistical Analytics - Predictive Modelling & Machine Learning

- Complex systems where first principles equations interact or don't exist
- Empirical or “fitted” models generated from time, event and asset data in tabular context
- Predicts outcome, e.g. equipment failure, unmeasured or forecasted quantities
- Model continuously improves or “learns” with additional data

Linear Regression

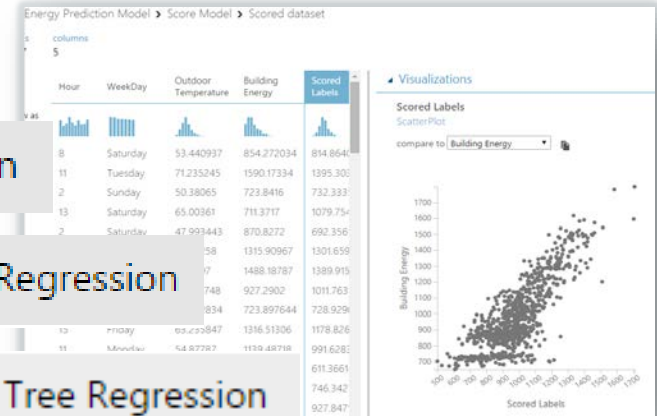
Neural Network Regression

Boosted Decision Tree Regression

Two-Class Decision Forest

Multiclass Decision Jungle

Microsoft Azure Machine Learning

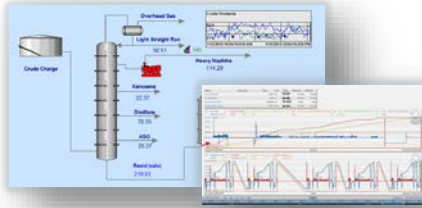


MATLAB



Enabling Analytics for Operational Intelligence

Real-Time Decision Analysis



Time and Event
Trending & Awareness

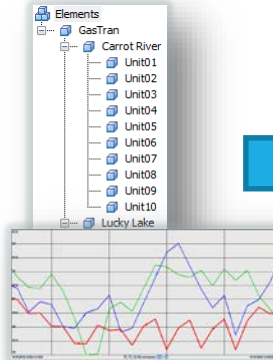
Specialized Models
Simulation & Optimization

$$Q = \frac{\Delta P_{DD} * kh}{141.2 \mu B_0 \left\{ \ln \frac{r_e}{r_w} - \frac{3}{4} + S \right\}}$$

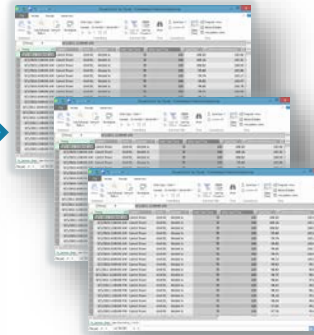
First Principles
Performance
& Condition

Retrospective & Predictive Analysis

PI Integrator for
Business Analytics



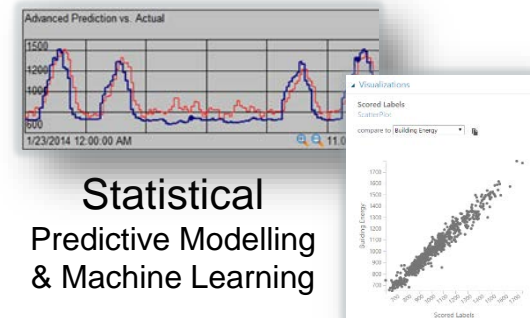
Time, Event
and Asset
Context



Tabular
Context



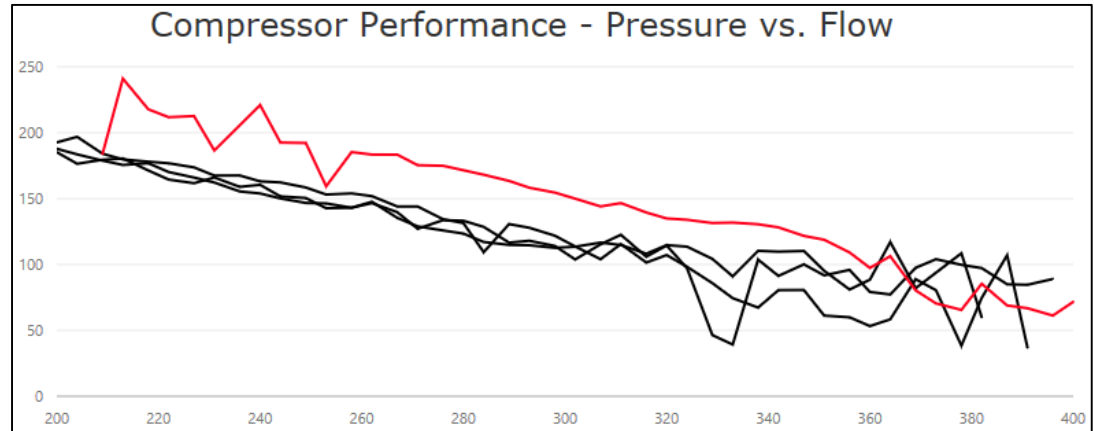
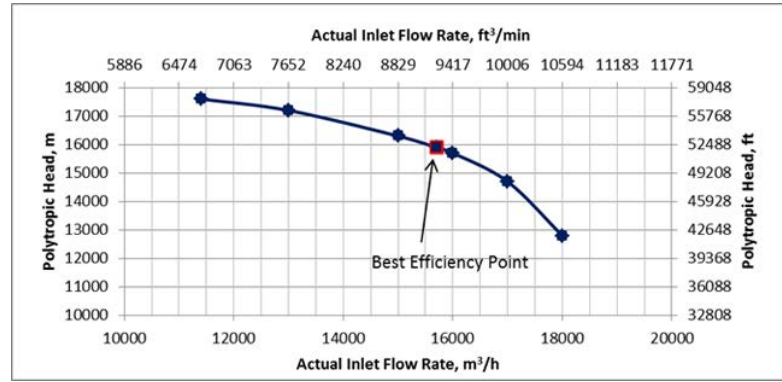
Multidimensional
Business Intelligence
& Dashboards



Statistical
Predictive Modelling
& Machine Learning

Multidimensional Analytics – Business Intelligence

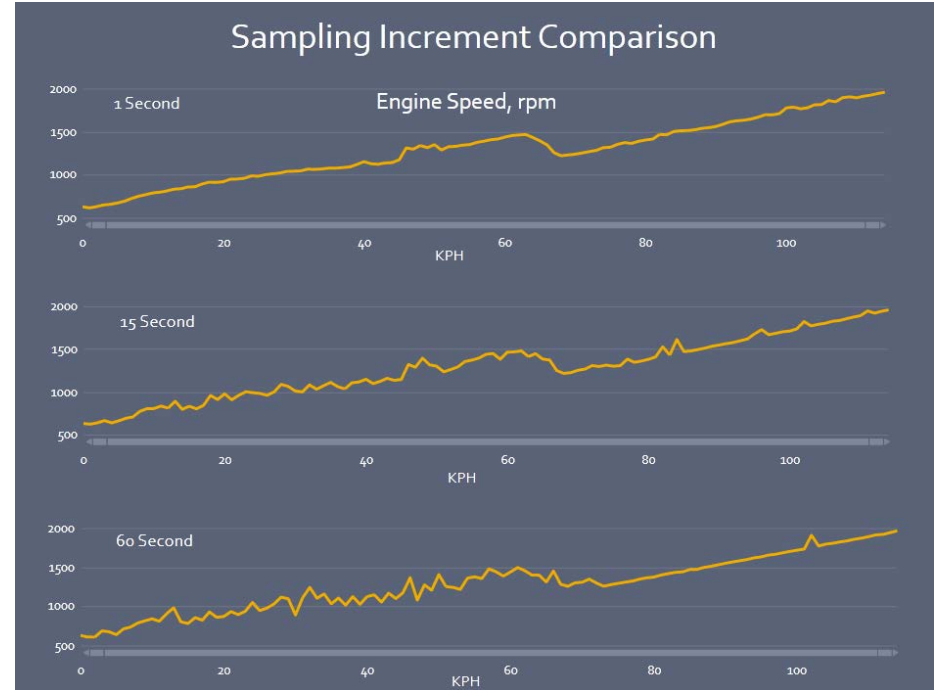
- Ad hoc, visual analysis of a table or related tables of data
- Columns aggregated for selected rows, presenting results in a variety of ways
- Excellent tools for personal analysis and enterprise reporting and dashboards



Multidimensional Analytics – Time Contextualization

Flexible, repeatable access to high fidelity operational data

- Time relative aggregations and statistics at any interval
- Juxtaposition of values - published rows can contain previous row's value.
- Backfill First Principle facts as best practice

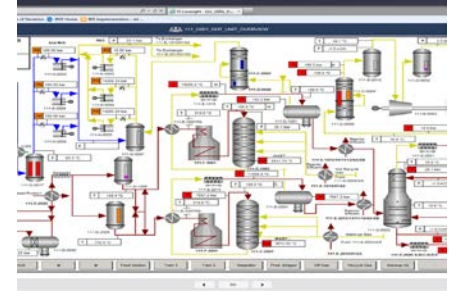


The Most Advanced Refinery in the World by 2020

YASREF (Yanbu Aramco Sinopec refinery JV)

*“Selecting the **PI System and EA early** supported a smooth refinery start up and set the foundation for an integrated, collaborative data based decision making culture that **supports YASREFs vision of being the most advanced refinery in the world by 2020.**”*

Mahmoud M. Madani, IRIS Lead Project Engineer



CHALLENGES

23 separate applications from a variety of vendors including DCS; aggressive grassroots schedule

- Lack of collaborative, data based decision making using standard DCS supplier approach
- Weak data and analytical foundation to enable OpEx and continuous improvement

SOLUTION

YASREF strategically chose the PI System as an integration and applications infrastructure applications

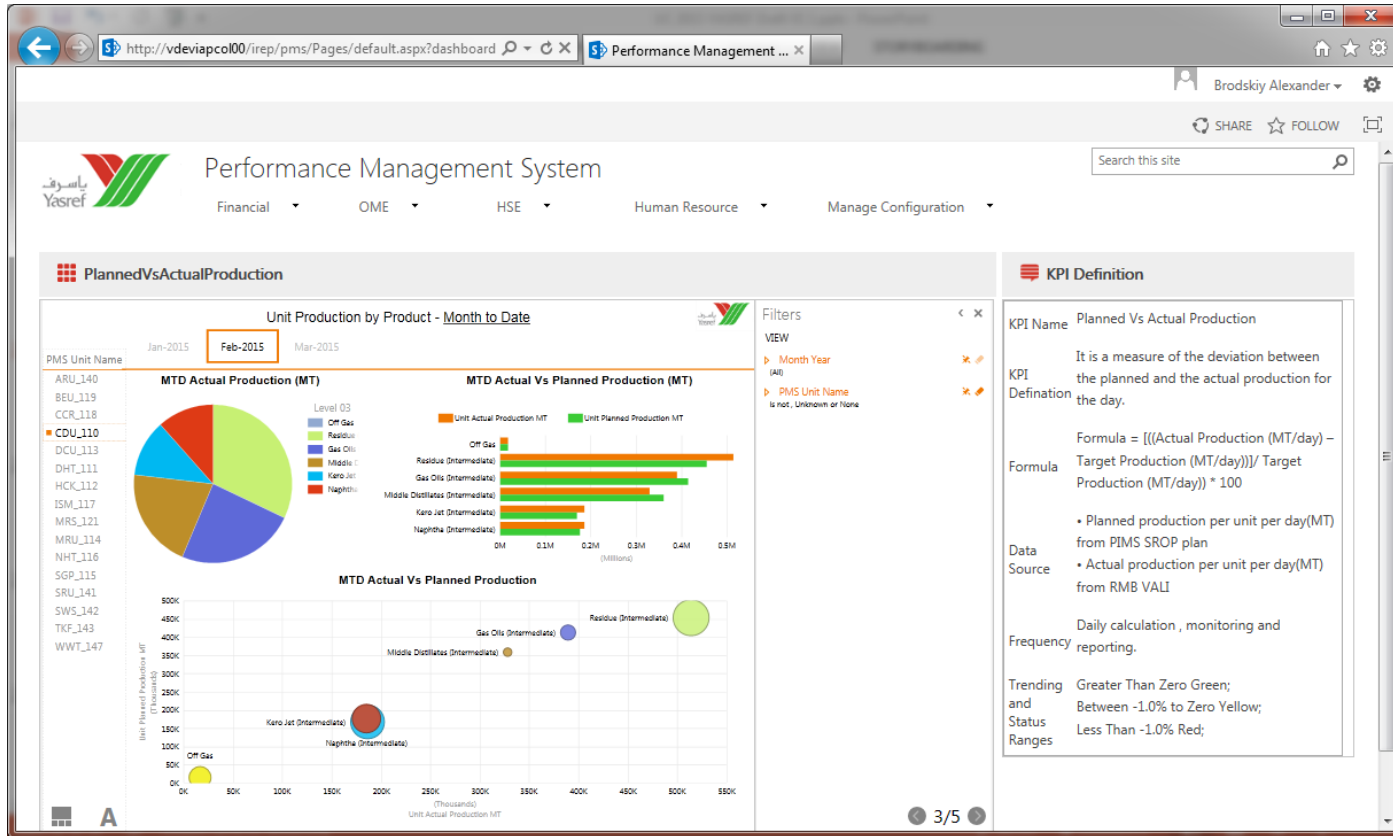
- Migrated standalone applications to the infrastructure with PI AF
- Used Microsoft platform to provide advanced web based reporting and decision support

RESULTS

The market responds to quick ramps of energy production and maintains grid reliability

- Eliminated over 50% of the standalone applications
- Enabled a very smooth refinery startup
- Provided KPIs and performance reporting foundation for OpEx

Performance Management System



Enterprise Performance Summary

Oil and Gas Operations Share Dashboard

Ask a question about the data on this dashboard

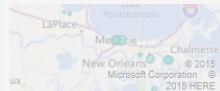
Total Production vs. Target

BY REGION



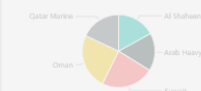
South Region

FIELD PRODUCTION



Crude Runs

BY CRUDE

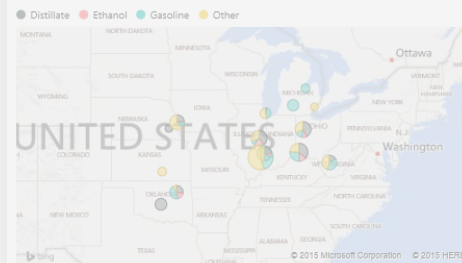


Refinery Scorecard

KPI	KPI Value	Plan Target	Plan Deviation
Conversion	10,651.5	10,752	-100.5
FCC Gasoline (R+...)	14,481.6	14,448	33.6
FCC Gasoline RVP	2,066.4	2,100	-33.6
Feed N+2A	20,008.8	20,160	-151.2
Feedrate	5,663,192.2	5,688,816	-25623.8
Isomerase RONC	14,750.4	14,952	-201.6
Light Naphtha 90...	30,223.2	30,240	-16.8
Reactor Temperatu...	327,906.5	330,120	-2213.5
Vacuum Gas Oil 90...	171,864.0	173,040	-1176.0
Total	6,255,144.6	6,284,628	-29483.4

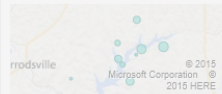
Inventory by Region

BY CITY, COMMODITY GROUP



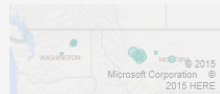
Marine Region

FIELD PRODUCTION



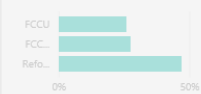
North Region

FIELD PRODUCTION

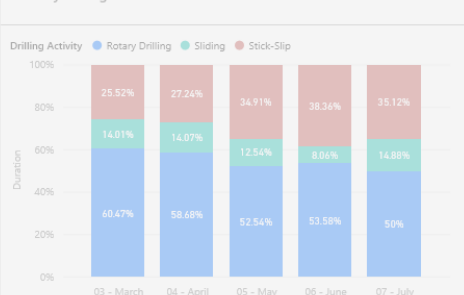


Process Utilization

BY PROCESS

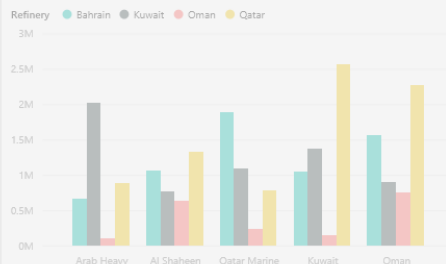


Monthly Drilling Performance



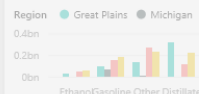
Refinery Rates

CRUDE RUNS



North American Inventories

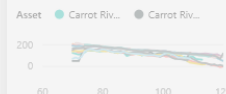
REGIONAL



Commodity Group	Net Volume
Distillate	308,870.20
Ethanol	42,726.94
Gasoline	835,106.18
Other	818,836.93
Total	2,005,540.25

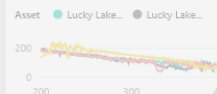
Compressor Model A

REAL TIME DISPLAY



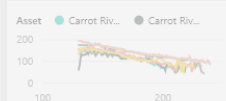
Compressor Model C

UNIT PERFORMANCE



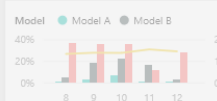
Compressor Model B

UNIT PERFORMANCE



Average Downtime, Average of G...

BY MONTH, MODEL

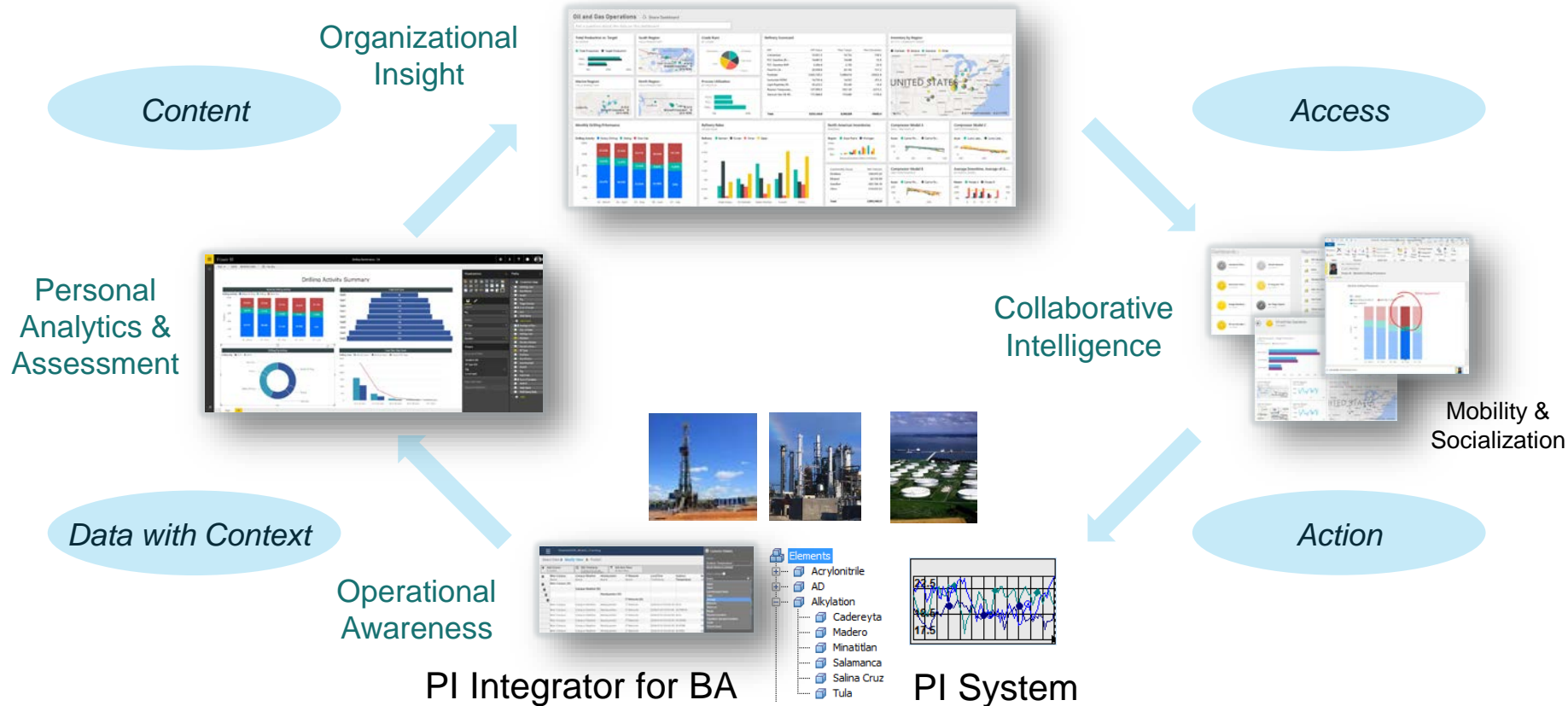


Exploration & Production

Refining

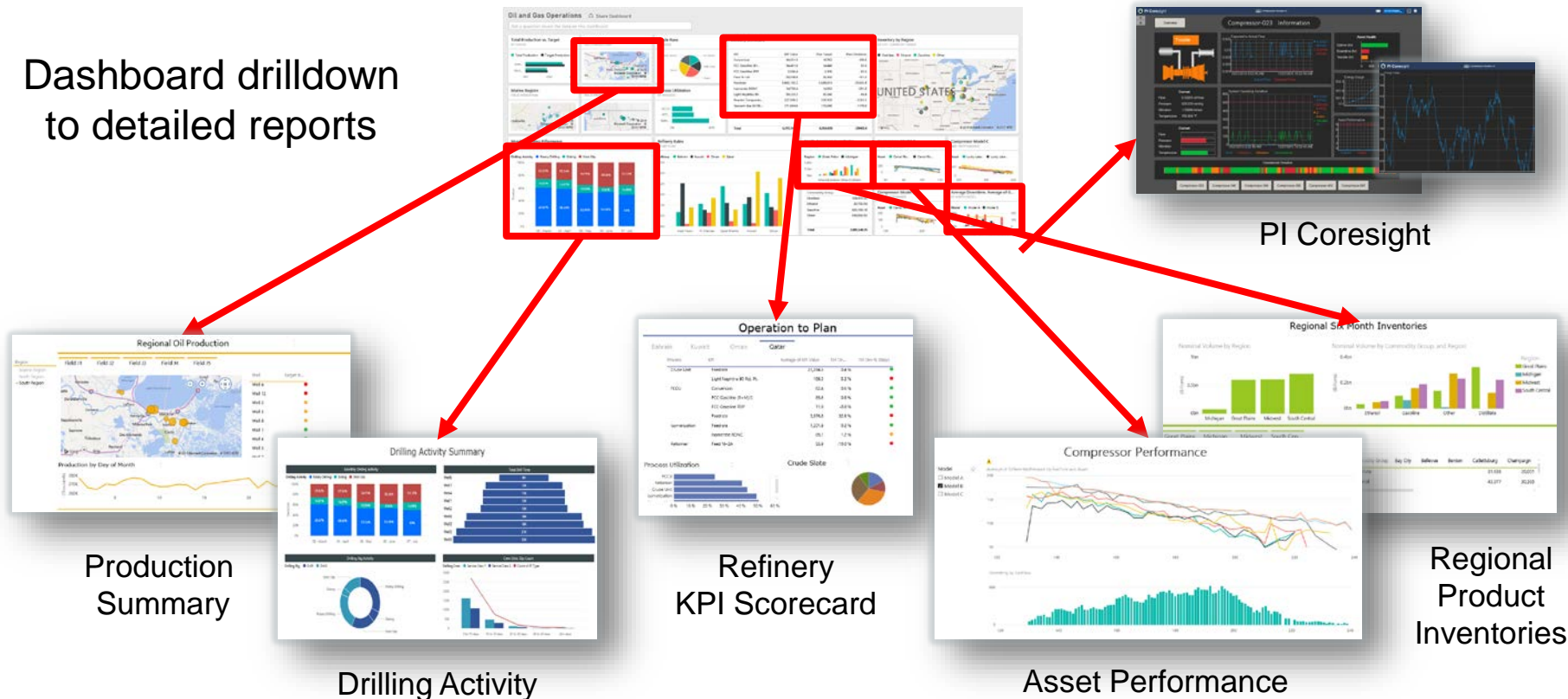
Distribution

Driving Continuous Improvement



Detailed Reporting and Analytics

Dashboard drilldown
to detailed reports



PI Coresight

Production
Summary

Drilling Activity

Refinery
KPI Scorecard

Asset Performance

Regional
Product
Inventories

Summary and Wrap Up

- The PI System enables all types of operational analytics by providing time-related data supported by the essential foundation provided by PI Asset Framework.
- Look holistically when selecting an analytical method or methods. PI Analytics is very capable of performing equation-base analytics for performance and conditions assessment, as well as, certain types of predictive analytics.
- The PI Integrator for BA establishes “Common Ground” between OT and IT contextualization's enabling Operational Intelligence.

Contact Information

Curt Hertler

curt@osisoft.com

Global Solutions Architect

OSIsoft, LLC

Craig Harclerode

charclerode@osisoft.com

Industry Principal – Oil & Gas

OSIsoft, LLC

Questions

Please wait for the
microphone before asking
your questions



State your
name & company

Please don't forget to...

Complete the Survey
for this session



The **Power of Data**
DECISION READY IN REAL-TIME

Evaluation Form (Seminar Location - Date)

Name: _____

Company: _____

Email: _____

Quality and content of the presentations

Poor Good Excellent N/A

Welcome	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Journey To Real-Time Operational Intelligence	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Power of Connection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tank Level Management System	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the PI System to Aid in Troubleshooting Operational Aspects of Oil and Gas Well Drilling and Completion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unleash your Infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Information on the Spot	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wrap-up/Seminar Conclusion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Quality and organization of the seminar

Choice of date	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time allowed for lunch/breaks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Choice of presentations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Break and time allowed for the presentation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



감사합니다

谢谢

Danke

Merci

Gracias

Thank You

ありがとう

Спасибо

Obrigado