

OCTOBER 26, 2023

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# bp: An overview of bp's key real-time products and solutions

Kenneth Guidry

bp

AVEVA



OCTOBER 2023

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# AVEVA World 2023

Presenter, Kenneth Guidry

**AVEVA**

# Agenda



- bp Context and General Updates
- bp Production and Operations Chemical Management Decision Support System
  - Chemical Injection Inventory Management System (CIIMs)
    - Value Statement
    - Capability and Feature Overview
    - Tool Deep Dive
- bp Production and Operations Refinery Management
  - bp AIMS Tool (Asset Intelligence for Monitoring and Surveillance)
    - Value Statement
    - A Product Overview and Deep Dive
    - Good Practices / Findings
- OPAL Program Overview



# bp context and approximate usage of AVEVA PI products

Business areas

4

PI servers

60+

PI interfaces

318+

PI tags

3.9m+

PI AF analyses

187k+

PI Vision analytics

12.5k+



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# How bp leverage AVEVA PI products to Proactively Manage Production Chemicals

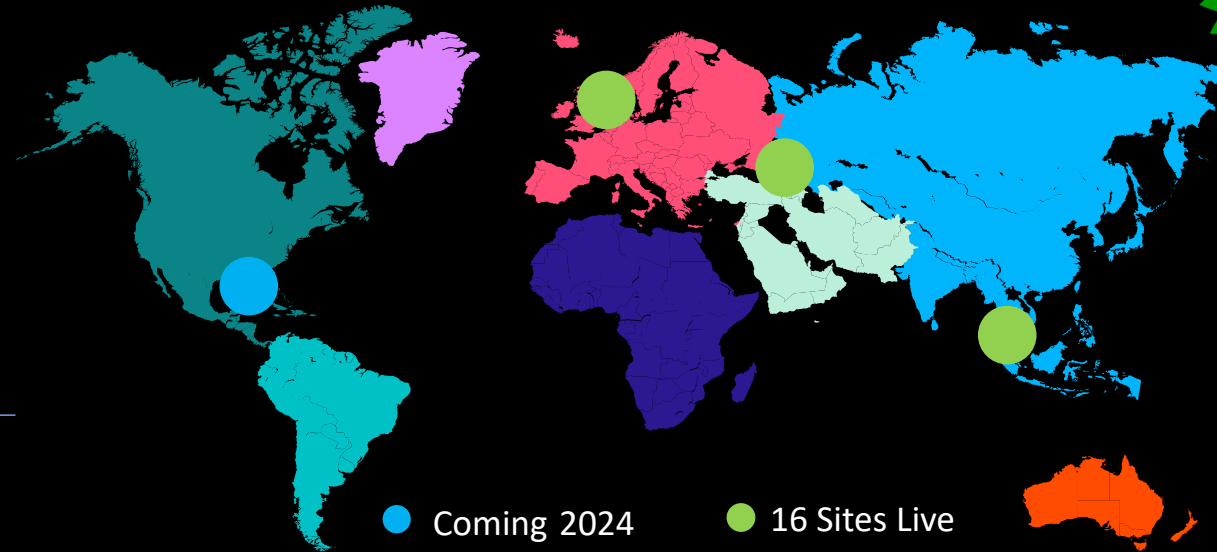
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# CIIMS Value Statement

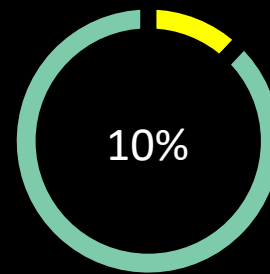


\$7M

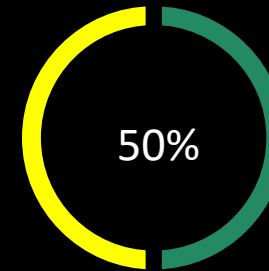
Per Annum Savings through better management of Chemical Spend via the use of the CIIMS decision support system



- Provides Central Management of Production Chemistry Calculations
- Provides timely alerts of excursions
- Provides a decision support system that enhances process performance and reduction of deferrals
- Provides a digital solution to aid Production Chemists in meeting PHCA compliance standards

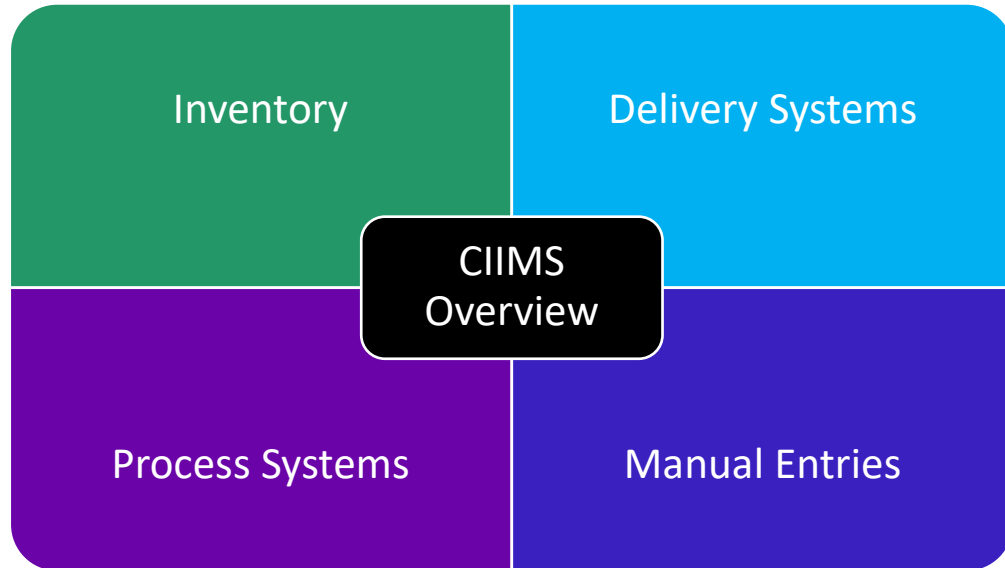


Recognized Overdosing

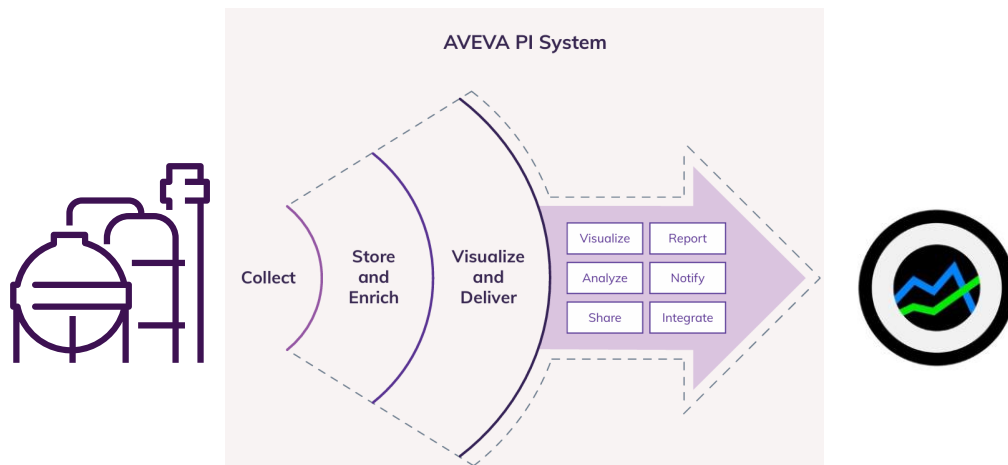


Annual Target Dosing Spend Reduction

# CIIMs Capability and Features



- Level 0 Dashboards allow our Production Chemists to see a manageable overview across all assets so that they can more easily manage chemical products
- Displays Chemical injection points along with chemical and most of the relevant information like Dosage, Corresponding Pumps status, Chemical injection rate, target flow rate in real-time. Other related attributes can be added as required.
- Forecasting remaining inventory to provide lead times for planning and managing replenishments
- Provides a user interface for manually inputting KPI Targets, Limits, Setpoints, Process Variables, and CIIMs Configuration updates

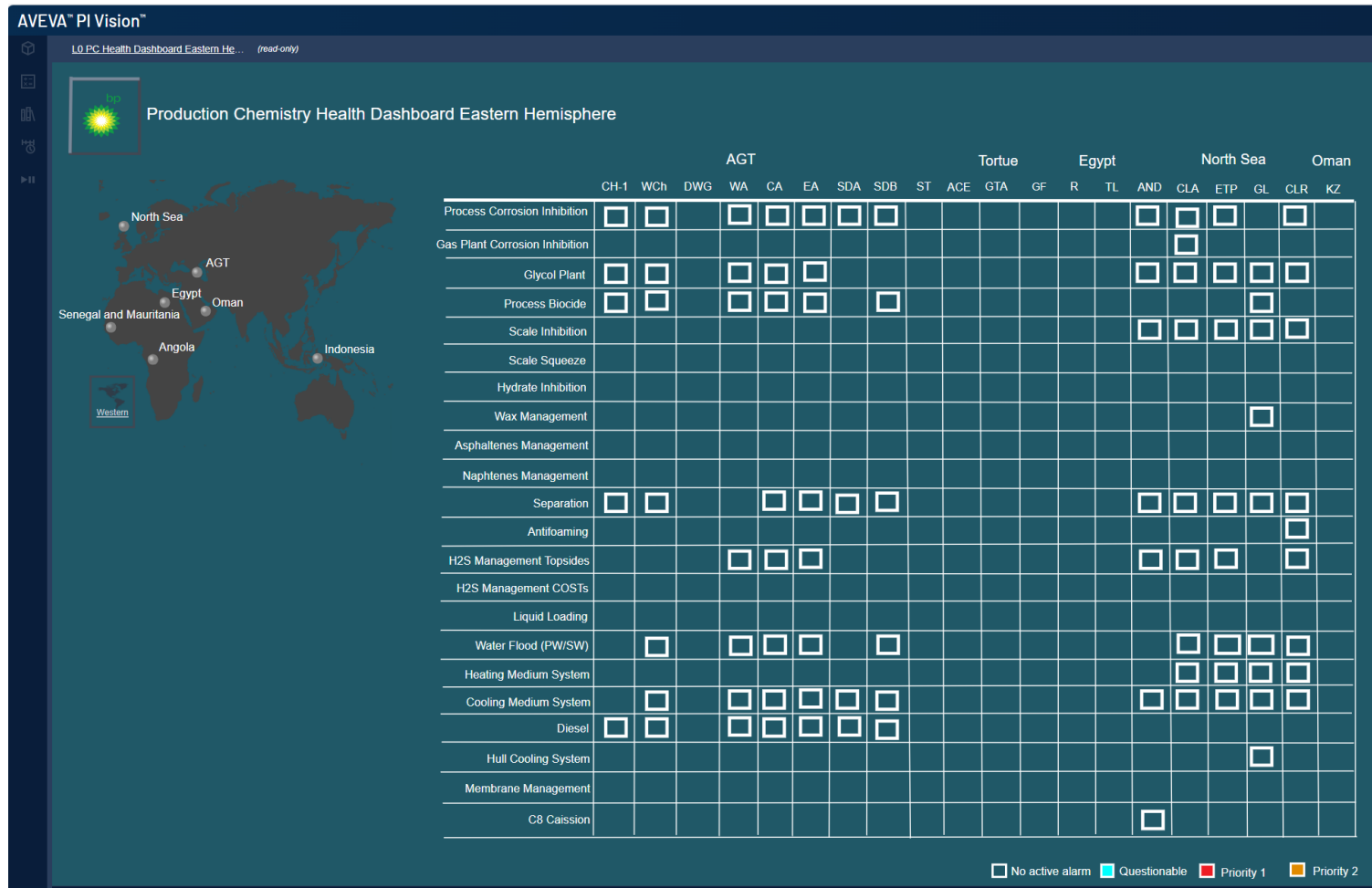




# CIIMs Modules Deep Dive: Dashboards

## The Story

Our production chemists needed a way to better wholistically manage where intervention was required so that they could make informed decisions and better optimize where to employ chemical remediations.







# CIIMs Modules Deep Dive: CIIMS Inventory Overview

## The Story

Our production chemists needed a way to monitor their chemical inventories in real time and to be able to forecast how much time before a given chemical would run out.



### Overview By Chemical

Asset	Chemical Name ▲	Product	Time To Refill	Tank Lowest Level	Mechanical Availability-MTD
T85104	Antifoam-Process	[Redacted]	53 d	36 d	42 %
T86003	Antifoam-Water		Pt Created	Pt Created	0 %
T86004	Biocide		37 d	37 d	28 %
Biocide-Diesel Tanks	Biocide-Diesel				
Biocide-Drains Tanks	Biocide-Drains				
Biocide-LoSal Tanks	Biocide-LoSal				
T86101	Calcium Nitrate		83 d	0 d	100 %
T44402	Chlorine Scavenger-LoSal		0 d	0 d	100 %
T44405	CIP Acid Cleaner-LoSal		31 d	31 d	100 %
T44406	CIP Caustic Cleaner-LoSal		3 d	3 d	100 %
T85106	Corrosion Inhibitor-Export		28 d	28 d	43 %
T85103	Demulsifier		0 d	0 d	42 %
Deoiler-1 Tanks	Deoiler-1				

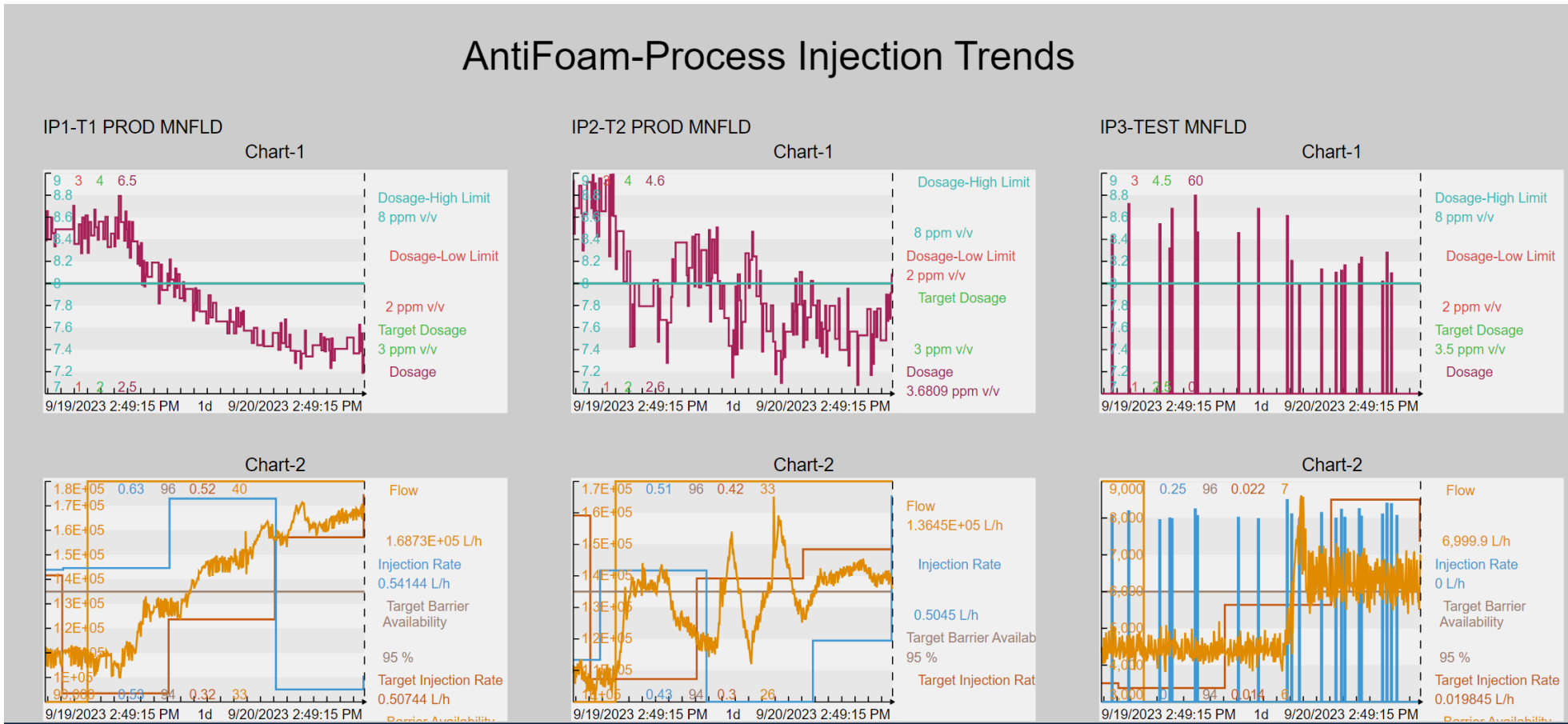
# CIIMs Modules Deep Dive: Delivery Systems Analysis



## The Story

Our production chemists needed a way to take a deeper look at injections against target dosage limits.

### AntiFoam-Process Injection Trends



# CIIMs Modules Deep Dive: Process Systems Overviews



## The Story

Our production chemists needed a way to review the injection points along with relevant information like dosage, pump status, chemical injection rates, and target flow rates in real-time.



### Process & Barrier Overview

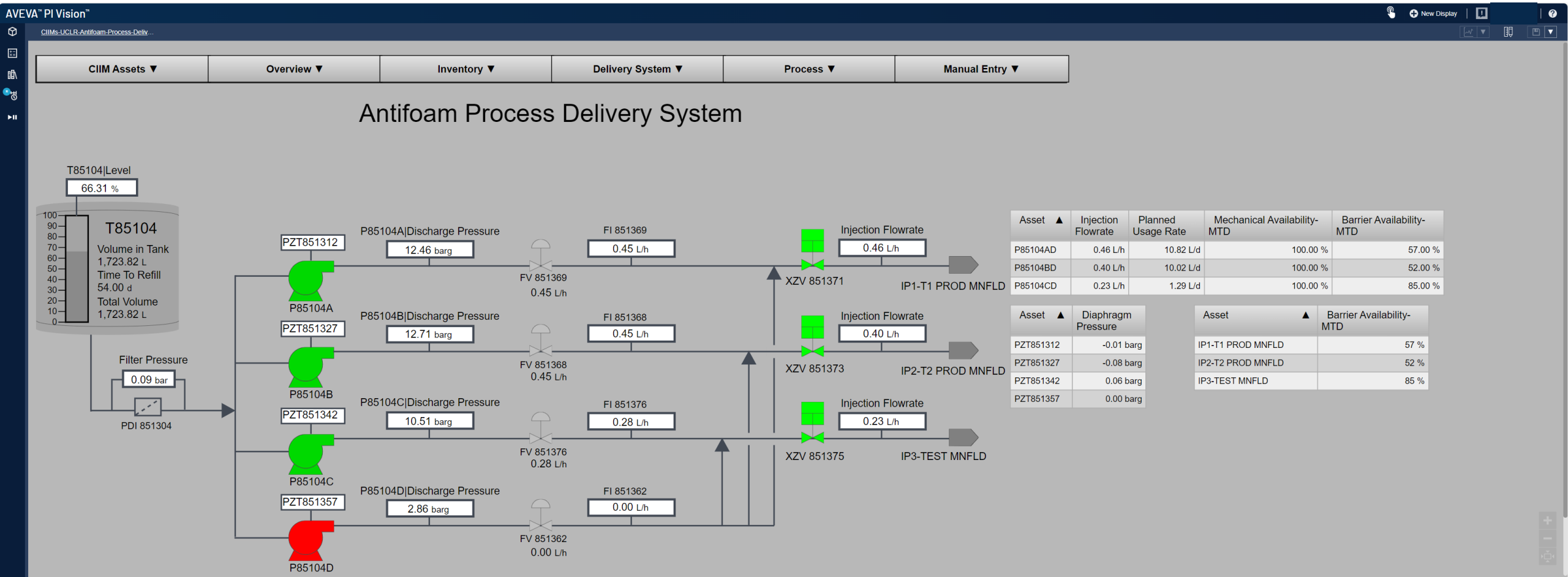
[Print PDF](#) [Export to Excel](#)

Asset	Chemical Name ▲	Product	Pump Status	Delivery System Status	Flow/cubic meter per hour	Injection Rate	Target Injection Rate	Dosage	Target Dosage	Barrier Availability-MTD	PFD URL
IP1-T1 PROD MNFLD	Antifoam-Process		Running	Good	169.62 m3/h	0.61 L/h	0.51 L/h	3.59 ppm v/v	3.00 ppm v/v	40.00 %	<a href="#">🔗</a>
IP2-T2 PROD MNFLD	Antifoam-Process		Running	Good	140.48 m3/h	0.46 L/h	0.42 L/h	3.28 ppm v/v	3.00 ppm v/v	33.00 %	<a href="#">🔗</a>
IP3-TEST MNFLD	Antifoam-Process		Running	Good	6.02 m3/h	0.00 L/h	0.02 L/h	0.00 ppm v/v	3.50 ppm v/v	6.00 %	<a href="#">🔗</a>
IP4-IN DEAERTR	Antifoam-Water		Not Running	Good	306.51 m3/h	0.00 L/h	1.53 L/h	0.00 ppm v/v	5.00 ppm v/v	0.00 %	<a href="#">🔗</a>
IP5-IN DEAERTR	Biocide		Not Running	Good	306.51 m3/h	0.00 L/h	61.37 L/h	0.00 ppm v/v	200.00 ppm v/v	0.00 %	<a href="#">🔗</a>
IP6-OUT DEAERTR	Biocide		Not Running	Good	306.51 m3/h	0.00 L/h	30.69 L/h	0.00 ppm v/v	100.00 ppm v/v	0.00 %	<a href="#">🔗</a>
IP7-SW-CMR EXCHNGR	Biocide		Not Running	Good	0.00 m3/h	0.00 L/h	0.00 L/h	0.00 ppm v/v	200.00 ppm v/v	0.00 %	<a href="#">🔗</a>
IP8-SWUF BUFFR TNK	Biocide		Not Running	Good	897.50 m3/h	0.00 L/h	179.50 L/h	0.00 ppm v/v	200.00 ppm v/v	0.00 %	<a href="#">🔗</a>
IP9-CIP SKID	Biocide		Not Running	Good	0.00 m3/h	0.00 L/h	0.00 L/h	0.00 ppm v/v	200.00 ppm v/v	0.00 %	<a href="#">🔗</a>
IP10-LoSal MNFLD	Calcium Nitrate		Running	Good	0.00 m3/h	59.23 L/h	0.00 L/h	0.00 ppm v/v	220.00 ppm v/v	0.00 %	<a href="#">🔗</a>
IP11-PW MNFLD	Calcium Nitrate		Not Running	Good	105.86 m3/h	0.00 L/h	22.84 L/h	0.00 ppm v/v	220.00 ppm v/v	0.00 %	<a href="#">🔗</a>
IP12-SWUF BUFFR TNK	Chlorine Scavenger-LoSal		Running	Good	897.50 m3/h	10.67 L/h	9.87 L/h	11.88 ppm v/v	11.00 ppm v/v	75.00 %	<a href="#">🔗</a>
IP13-CIP SKID	Chlorine Scavenger-LoSal		Running	Good	0.00 m3/h	0.00 L/h	0.00 L/h	0.00 ppm v/v	8.00 ppm v/v	0.00 %	<a href="#">🔗</a>

### Pumps Status Overview

Asset	Chemical Name ▲	Pump Availability Status	Running Status	Pump Health Status
P85104A	Antifoam-Process	Available	Running	Good
P85104B	Antifoam-Process	Available	Running	Good
P85104C	Antifoam-Process	Available	Running	Good
P85104D	Antifoam-Process	Available	Not Running	Good
P86003A	Antifoam-Water	Not Available	Not Running	Good
P86003B	Antifoam-Water	Not Available	Not Running	Good
P86004A	Biocide	Available	Not Running	Good
P86004B	Biocide	Available	Not Running	Good
P86101A	Calcium Nitrate	Available	Running	Good
P86101B	Calcium Nitrate	Not Available	Not Running	Good
P86101C	Calcium Nitrate	Available	Not Running	Good
P44402A	Chlorine Scavenger-LoSal	Not Available	Not Running	Good
P44402B	Chlorine Scavenger-LoSal	Not Available	Not Running	Good
P44402C	Chlorine Scavenger-LoSal	Available	Running	Good

# CIIMs Modules Deep Dive: Process Systems Overviews Cont.'





### Production Chemistry Health Dashboard Eastern Hemisphere



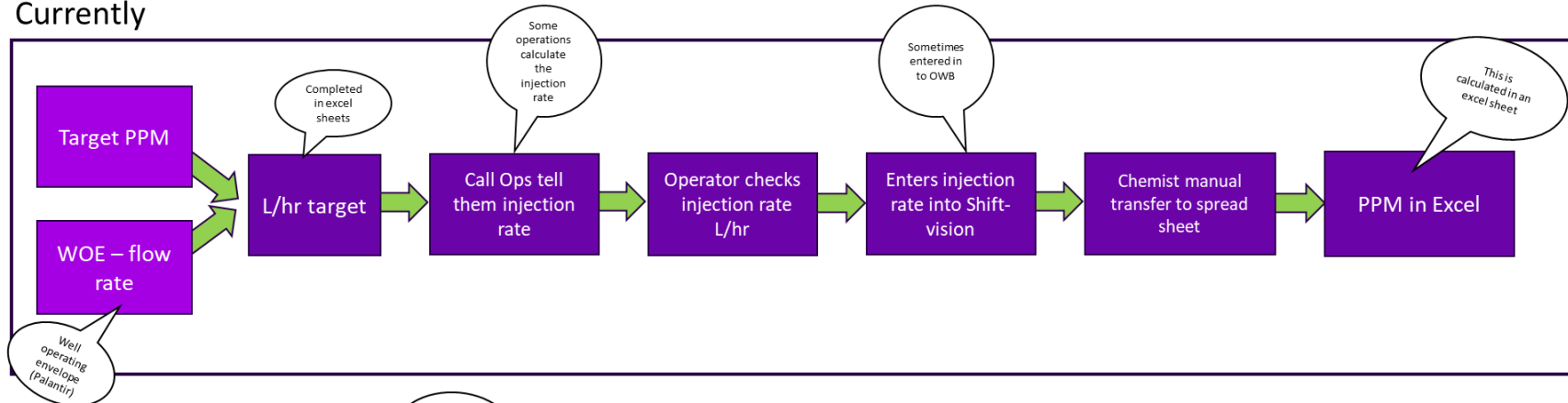
	AGT							Tortue				Egypt		North Sea			Oman			
	CH-1	WCh	DWG	WA	CA	EA	SDA	SOB	ST	ACE	GTA	GF	R	II	ANI	CLA	ETP	CL	CLR	KZ
Process Corrosion Inhibition	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>							<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
Gas Plant Corrosion Inhibition																<input type="checkbox"/>				
Glycol Plant	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Process Biocide	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>										<input checked="" type="checkbox"/>		
Scale Inhibition															<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Scale Squeezo																			<input checked="" type="checkbox"/>	
Hydrate Inhibition																			<input type="checkbox"/>	
Wax Management																			<input type="checkbox"/>	
Asphaltenes Management																				
Naphthenes Management																				
Separation	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>							<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Antifoaming																			<input checked="" type="checkbox"/>	
H2S Management Topsides				<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>									<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
H2S Management COSTs																				
Liquid Loading																				
Water Flood (FW/SW)		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Heating Medium System																<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Cooling Medium System		<input type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>							<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Diesel	<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>												
Hull Cooling System																			<input checked="" type="checkbox"/>	
Membrane Management																				
C8 Cassion															<input checked="" type="checkbox"/>					

No active alarm 
  Questionable 
  Priority 1 
  Priority 2

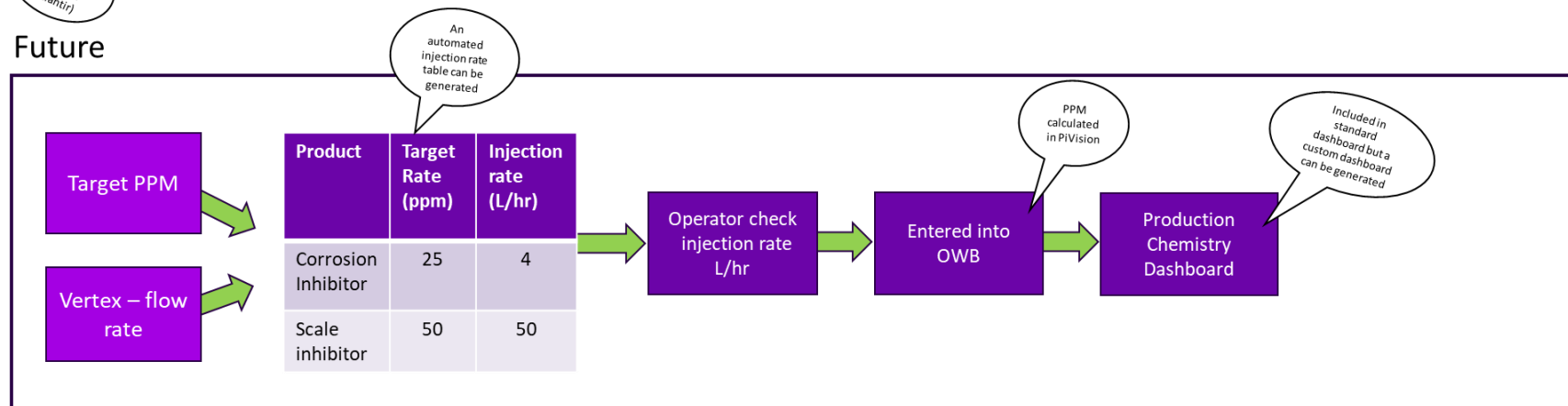
# What's next for CIIMS?

- GOM Rollout (est. 2024)
- Feature Expansion in AGT

## Currently



## Future



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# How bp leverage AVEVA PI products to Proactively Manage Refinery Units

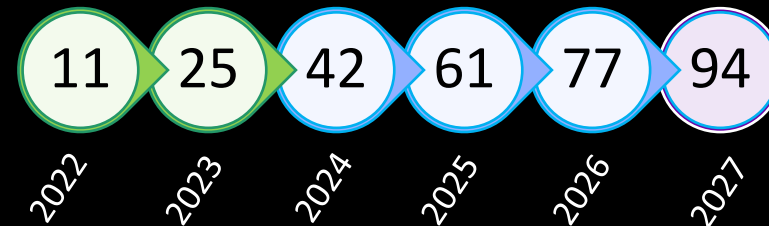
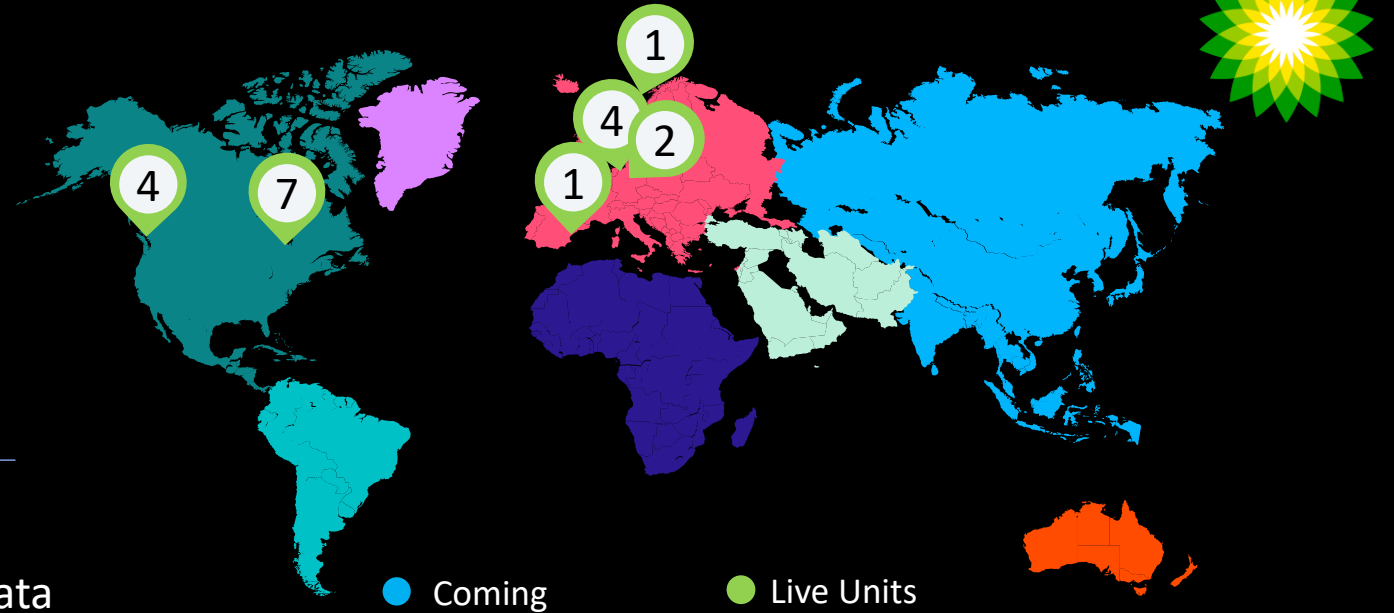
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# AIMS Value Statement

\$5M

YTD Value generated through the reliability improvements, commercial optimization, and digital risk reduction using the AIMS platform

- Provides one version of the truth for process data and calculations
- Enables remote monitoring and collaboration
- Enhances Refinery wide Mass Balancing Capabilities
- UHM Reporting capabilities
- Enables rapid solution rollouts across 6 refineries



Unit Delivery by Year



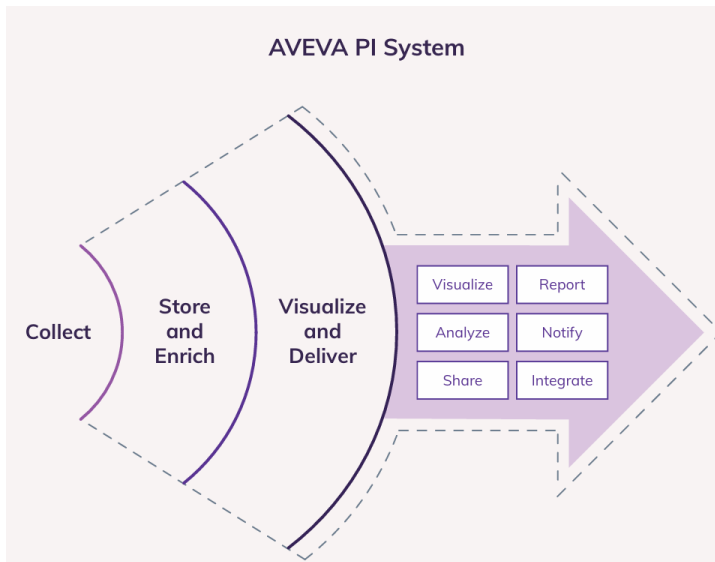


# AIMS Journey

## *The Story*

AIMS' genesis was rooted in the recognized need to provide our process engineers with a more optimized way of performing unit health monitoring and mass balance reconciliation across all refineries. Their legacy platform struggled to scale and proved to be a complex and difficult system to sustain.

## The Backbone



## Key Challenges

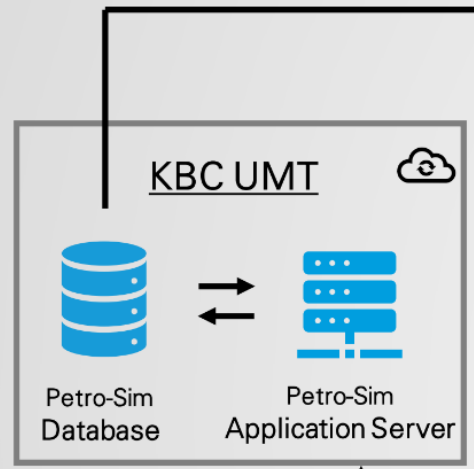
- Tuning Calculation Frequency
- Managing Template Versions
- Prioritizing Analyses Calcs
- Handling varying UOMs
- Tuning the End to End Critical Data Pipeline

## The path to standardization

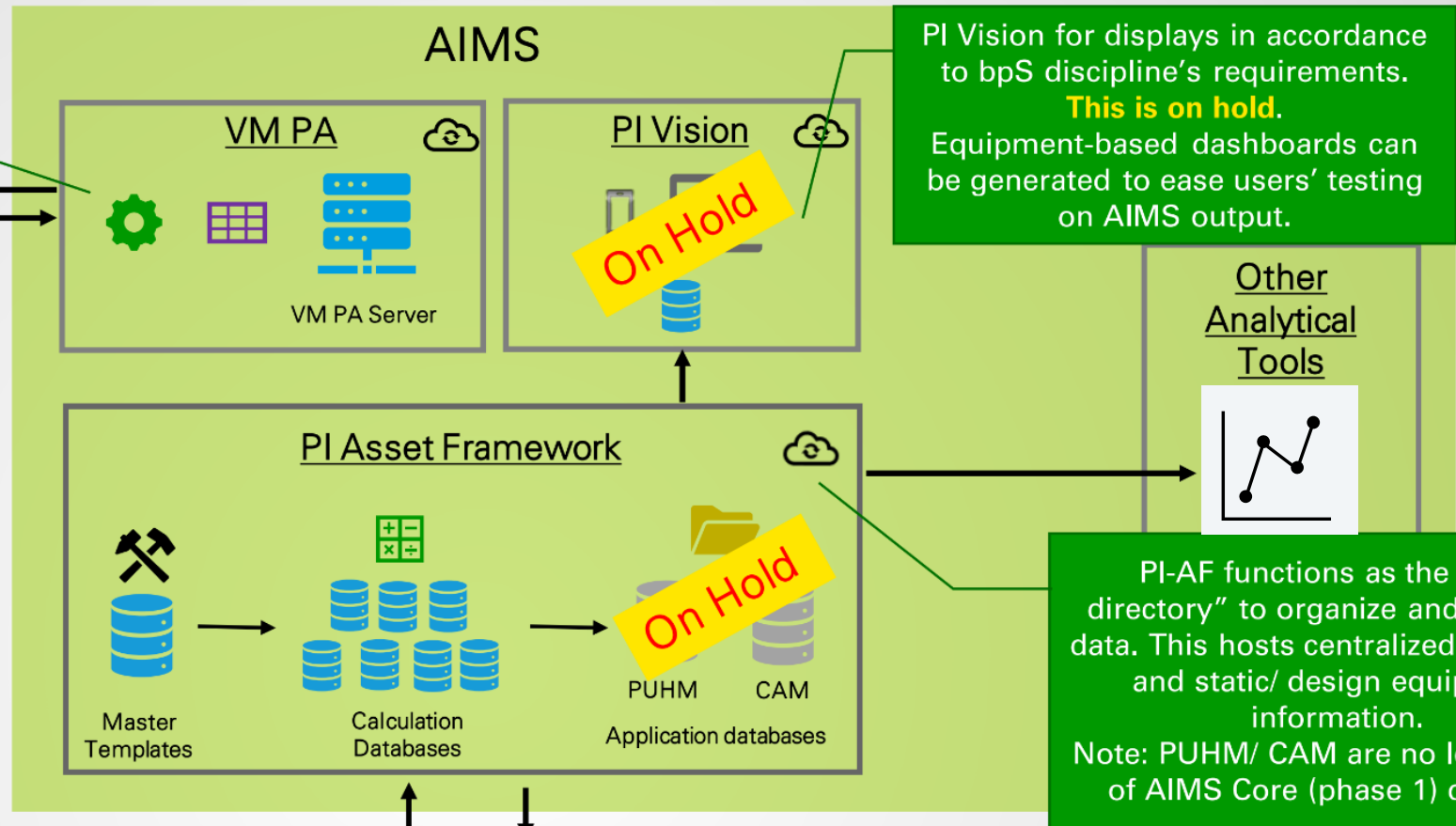
- AF drove Immediate benefits toward scaling and standardization
- AF provides the platform we needed to overcome new and pre-existing challenges
- Process Engineers are a Part of the Team helping drive best practices

# AIMS Components

Visual Mesa for unit MBR and enabling efficient and effective refinery wide MBR.

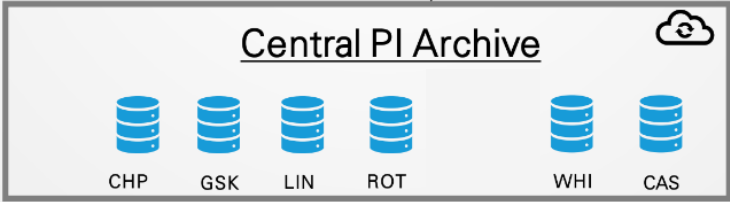


UMT – Unit Monitoring Tool. KBC’s Petro-SIM module for model automation  
 VM PA – Visual Mesa Production Accounting for mass balance reconciliation.

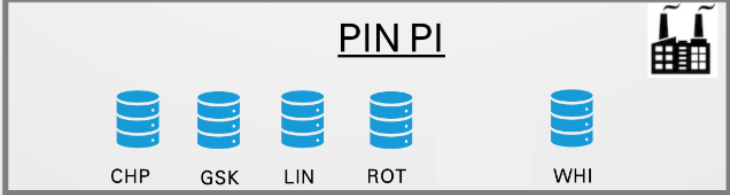


PI Vision for displays in accordance to bpS discipline’s requirements. **This is on hold.** Equipment-based dashboards can be generated to ease users’ testing on AIMS output.

PI-AF functions as the “data directory” to organize and enhance data. This hosts centralized standards and static/ design equipment information. Note: PUHM/ CAM are no longer part of AIMS Core (phase 1) delivery.



Palantir for monthly UHM reports and other analytics, as needed.



Lab data integration: LIMS → Central PI





# AIMS Overview of Good Practices

## *Context*

AIMS is on a 7-year journey, and the team have faced varying challenges along the way. The team have identified the following best practices that have helped keep the program from hitting roadblocks that could compromise delivery.

### Leverage PI AF Tables

- Use of tables to manage template versions across units
- Use of tables to map inputs required for composite formulas

### Deployment Automation

- Unique ways identified to handle the heavy lifting data validations
- Unique ways found to assist in migration packages

### Standardize through Templates

- Leverage AF to clean up unit attribution and make them more complete in a way that scales
- Ensure you have governance support to manage the onboarding of new UOMs
- Ensure you have governance support to be stewards or process calculations

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# How bp leverage AVEVA PI products to drive our OPAL Initiative

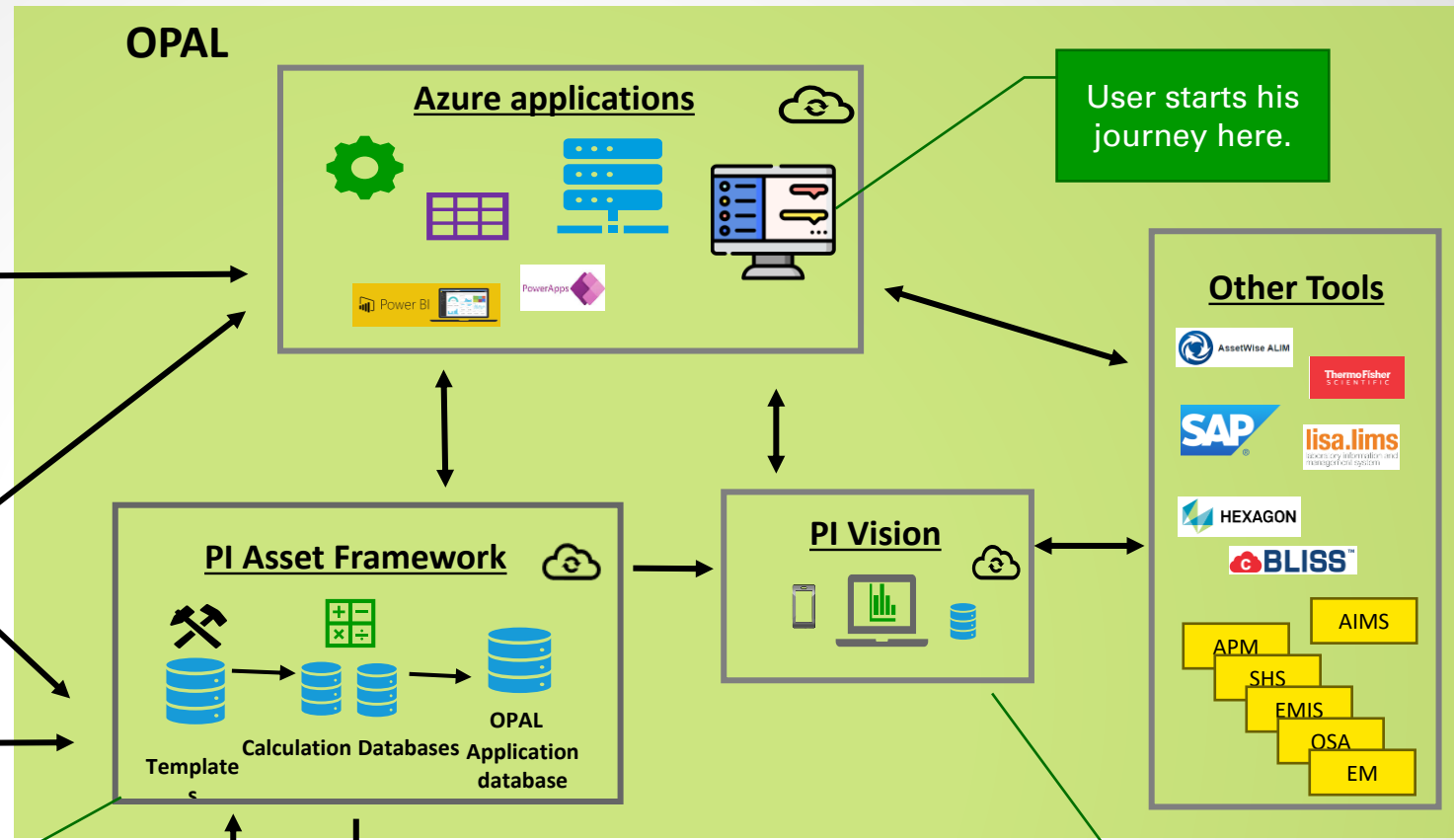
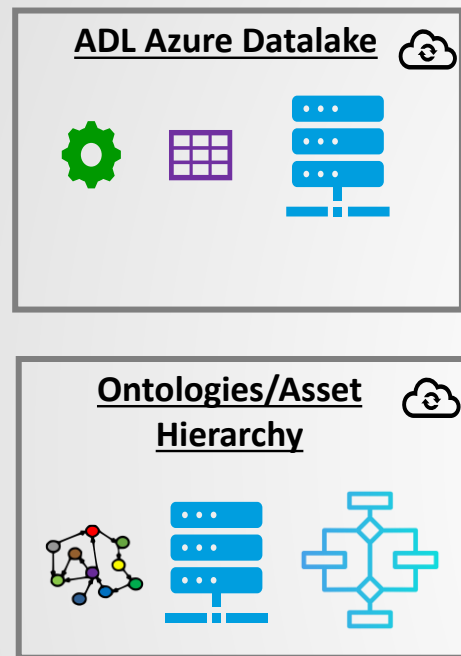
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# OPAL: Optimized Process & Analytics Launchpad

- P&O **strategic** Refining information system
  - Designed for efficient and effective information access by all Personas and disciplines at refineries and support organizations worldwide
  - Providing user centric information presentation based on use cases across the organization
- Home for **centrally managed** process unit **calculations, reports, dashboards, events, and displays**
  - Standardized graphic displays for Refining/unit/asset monitoring
- **Integrated** platform approach to maximize user efficiency in daily information work enabled by the cloud-based PI Asset Framework, PI Advance Analytics and PI Archive
  - Visualization in PI Vision
  - Contextualization and linking of spread information to form a launchpad for users
  - Standardization of best practice approaches
  - Supporting possible advanced visualization and analysis in Power BI
  - Supporting possible application/workflow solutions in Power Apps

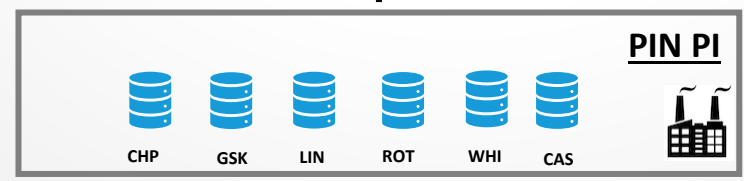
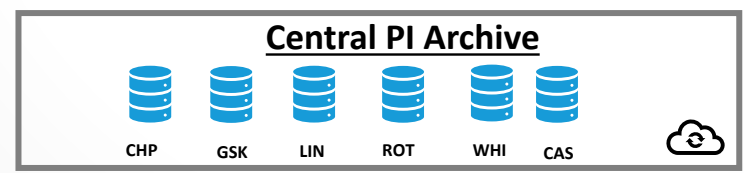
# OPAL Components



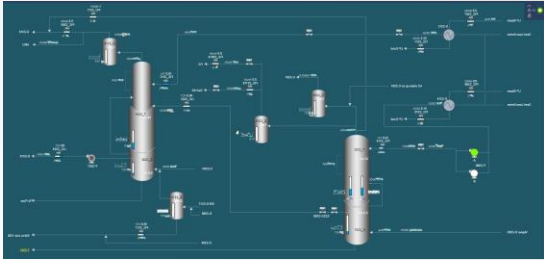
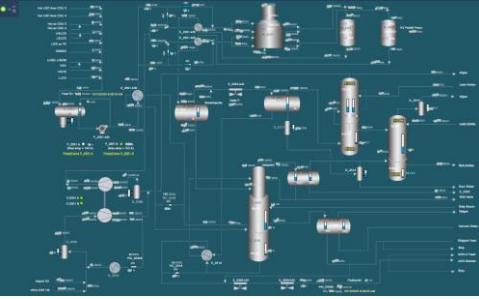
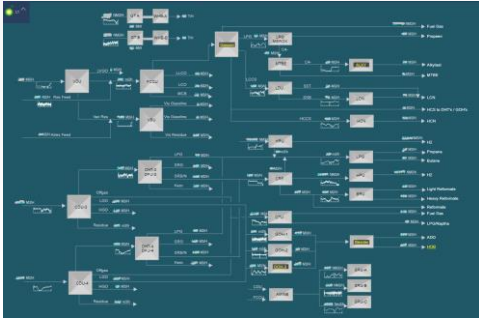
User starts his journey here.

Ontologies/Asset Hierarchy and PI-AF functions as the "data directory" to organize and enhance data. This hosts centralized standards and static / design equipment information.

PI Vision for schematics & trending, and more use cases in accordance to centralized standards



# OPAL Use cases (subset on PI system)



FO Tanks Temperatures

Tank	Grade	Temperatures (DegC)					Last Result	Velocity	Vino Temp conversion	SI Factor
		Trend	15d	Actual	SP Low	SP High				
TK001	MEL/SIBSA			50.0	75.0	90.0	333.0m	18/11/2023 4:13:37 PM	3.8	
TK002	LS/VOO			60.0	80.0	90.0	275.0m	18/10/2023 11:03:30 AM	3.8	
TK003	MEL/SIBSA			30.0	74.0	90.0	221.0m	18/10/2023 12:42:25 PM	3.8	
TK004	VS/SAR			90.0	90.0	90.0	318.0m	13/10/2023 4:17:07 PM	3.8	
TK005	LS/VOO			50.0	88.0	90.0	14.0m	18/10/2023 8:38:18 PM	3.8	
TK006	MEL/SIBSA			90.0	90.0	90.0	86.0m	20/11/2023 8:53:24 PM	4.0	
TK007	MEL/SIBSA			60.0	75.0	90.0	150.0m	18/10/2023 4:42:25 PM	4.0	
TK008	MEL/SIBSA			90.0	90.0	90.0	15.0m	18/10/2023 11:37:57 AM	4.0	
TK009	MEL/SIBSA			60.0	78.0	90.0	381.0m	13/10/2023 8:48:46 AM	3.8	
TK010	MEL/SIBSA			60.0	78.0	90.0	336.0m	18/10/2023 9:44:01 PM	3.8	
TK011	MEL/SIBSA			50.0	78.0	90.0	328.0m	18/10/2023 18:21:40 PM	3.8	
TK012	MEL/SIBSA			60.0	72.0	90.0	387.0m	18/10/2023 8:45:41 AM	3.8	
TK013	MEL/SIBSA			1.0	45.0	90.0	8.0m	18/10/2023 10:27:07 PM	4.1	
TK014	VS/SAR			90.0	90.0	90.0	425.0m	18/10/2023 12:16:16 PM	3.8	
TK015	VS/SAR			90.0	90.0	90.0	455.0m	18/10/2023 12:06:19 AM	3.8	
TK016	VS/SAR			90.0	90.0	90.0	412.0m	18/10/2023 8:00:20 AM	3.8	

# Questions?

Please wait for the microphone.  
State your name and company.



# Please remember to...

Navigate to this session in the mobile app to complete the survey.



# Thank you!





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# Kenneth Guidry

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