

OCTOBER 24, 2023

AVEVA™ PI System™ as a Process Degradation Early Warning System

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AVEVA

International Paper

Who We Are

- Founded in 1898
- 39,000 employees worldwide
- 250 facilities (35 U.S. states & 10 countries)
- 21,000 customers in 150 countries
- \$21.2 billion net sales in 2022

Recognition



FTSE4Good



THE WORLD'S MOST ADMIRABLE COMPANIES



Core Values

It's about...
LIFE LIFE-CHANGING INJURY AND FATALITY ELIMINATION



Source: International Paper – Corporate Communications

International Paper

Our Businesses

Industrial Packaging

82% Total Revenue



Global Cellulose Fibers

15% Total Revenue



Source: International Paper – Corporate Communications

Pulp & Paper – Continuous Industrial Manufacturing

Typical Pulp Mill

- 4 main unit operations
- ~30,000 total equipment assets
 - ~5% designated critical
 - ~1% high priority critical assets
- ~1,500 control loops
- ~30,000 to 100,000 process data tags

International Paper – by the numbers

- Facilities: 29
- PI System Servers: 46
- PI System Tags: 1.5 Million
- Equipment: 120,000 Rotating Equipment



Source: International Paper – Corporate Communications

The Challenge



- Process Audits Occur Every 3-4 Years...
- Subject Matter Experts Identify Improvement Opportunities...
- Improvements Implemented, But Performance Erodes Occurs Over Time...
- **Identify and Fix Degradation** Before the Condition Becomes the “New Normal”

Process Health Dashboards (PhD) Check Engine System



Prevent performance erosion (backsliding) over time using continuous online monitoring of a process or set of processes



Actionable

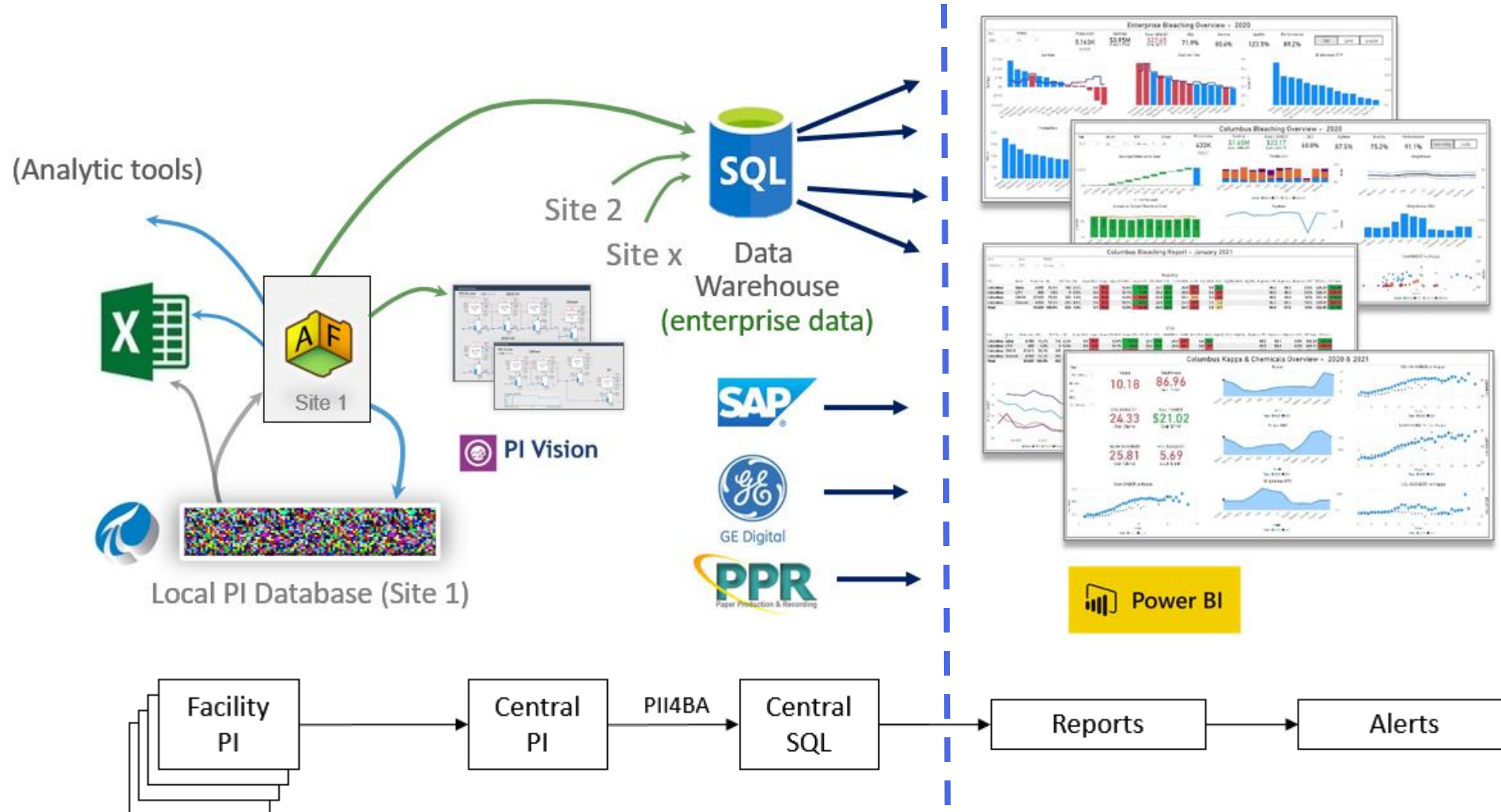


Financially Significant



Unnoticed

Process Health Dashboards (PhD) Check Engine System



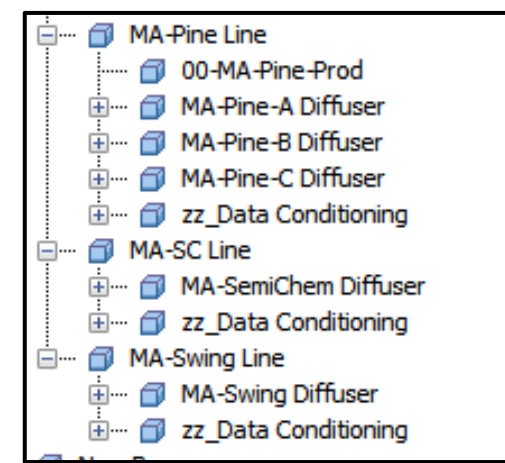
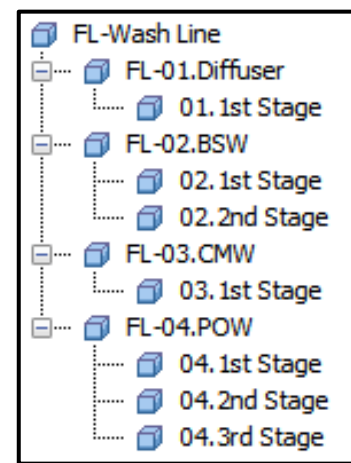
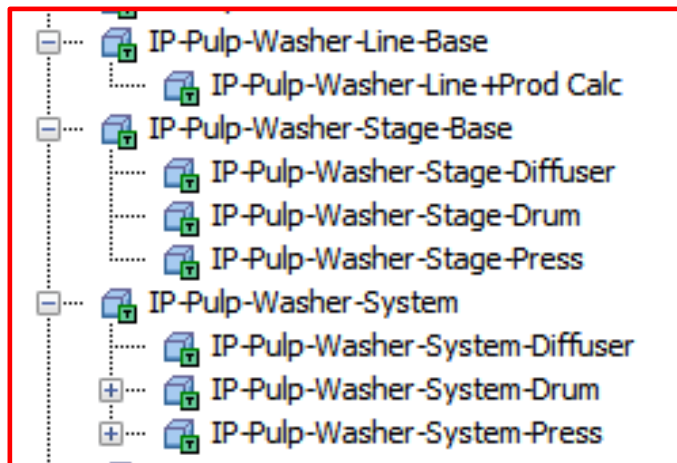
Asset Framework: Unit Operation Templates

Process

- Bleach Plant
- Caustic Plant
- Crude Tall Oil Plant
- Digesters-Batch
- Digesters-Continuous
- Evaporators
- O2 Delignification
- Paper Machines
- Pulp Washing
- Recovery Boilers
- Turbines (Condensing)

Functional

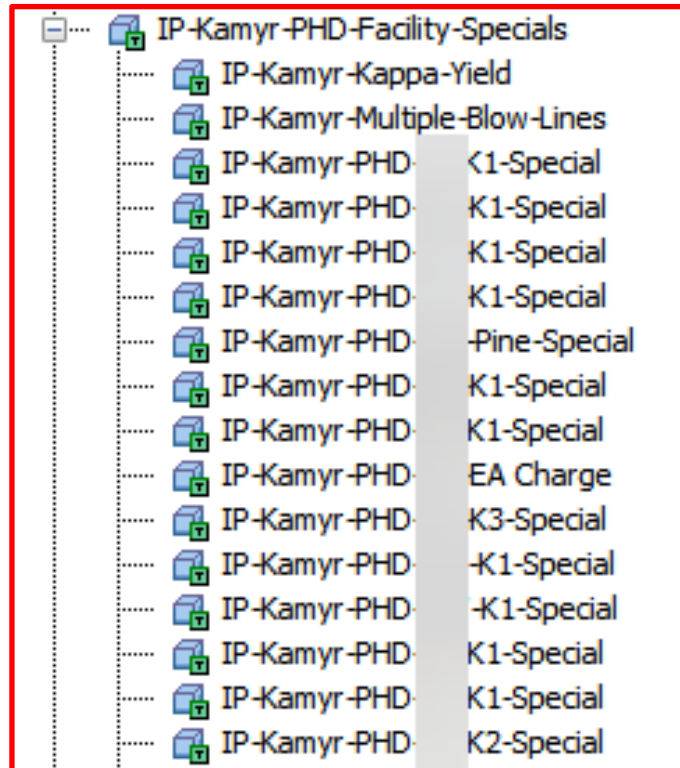
- Adv. Control Uptime
- Data Conditioning
- Target Compliance



	i		Name
+			Category: Configuration
+			Category: Inputs
+			Category: Outputs
+			Category: PI Vision
+			Category: Water Balance

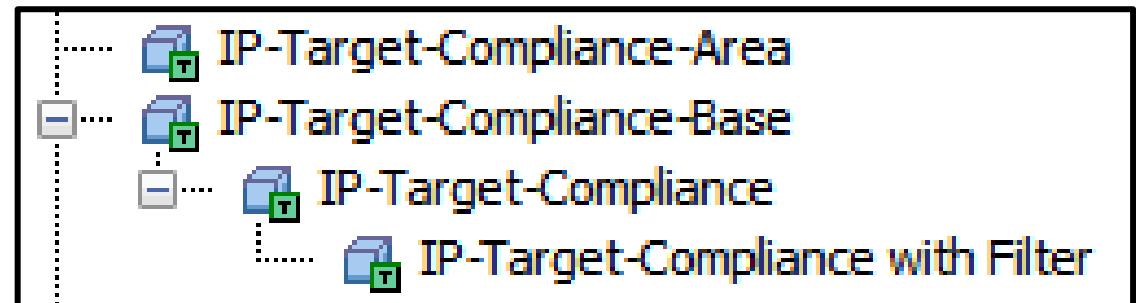
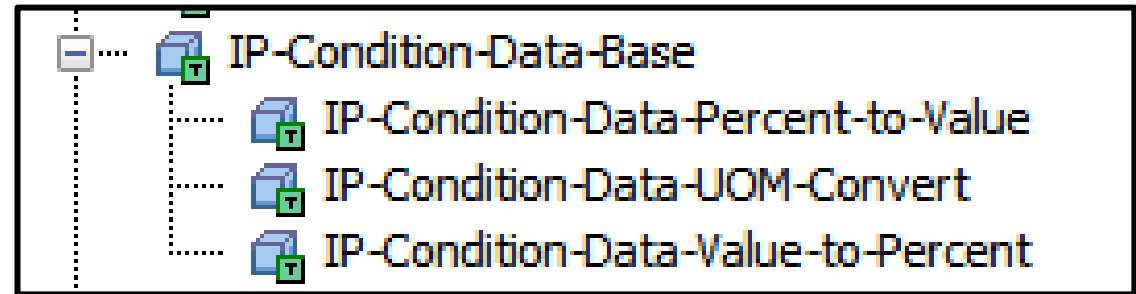
Asset Framework: Consider the Following

- **Plan for Missing Inputs**
 - Default Values (Template)
 - PI Tags
 - Formulas / Table Lookups
 - Synthesized Values (“Specials”)
- **Plan for AVEVA PI Vision and PII4BA**
 - Multistate Values/Limits (PI Vision)
 - Latch Values (PII4BA)
- Many Data Science **Tools are Tag Centric**



Asset Framework: Drop-In Functional Templates

- **Data Conditioning (6000+)**
 - Reduce Data Frequency from Seconds to Minutes/Hour
 - Average/Maximum/Minimum/Interpolated
 - Periodic or Event Triggers
 - Base, Percent to Value, Value to Percent, UOM Convert
 - PI Tag Creation
- **Target Compliance (750+)**
 - Day / Week / Month
 - Statistic from Data Conditioning
 - Compliance Percentage to Target Range



Asset Framework: Drop-In Technology

Before

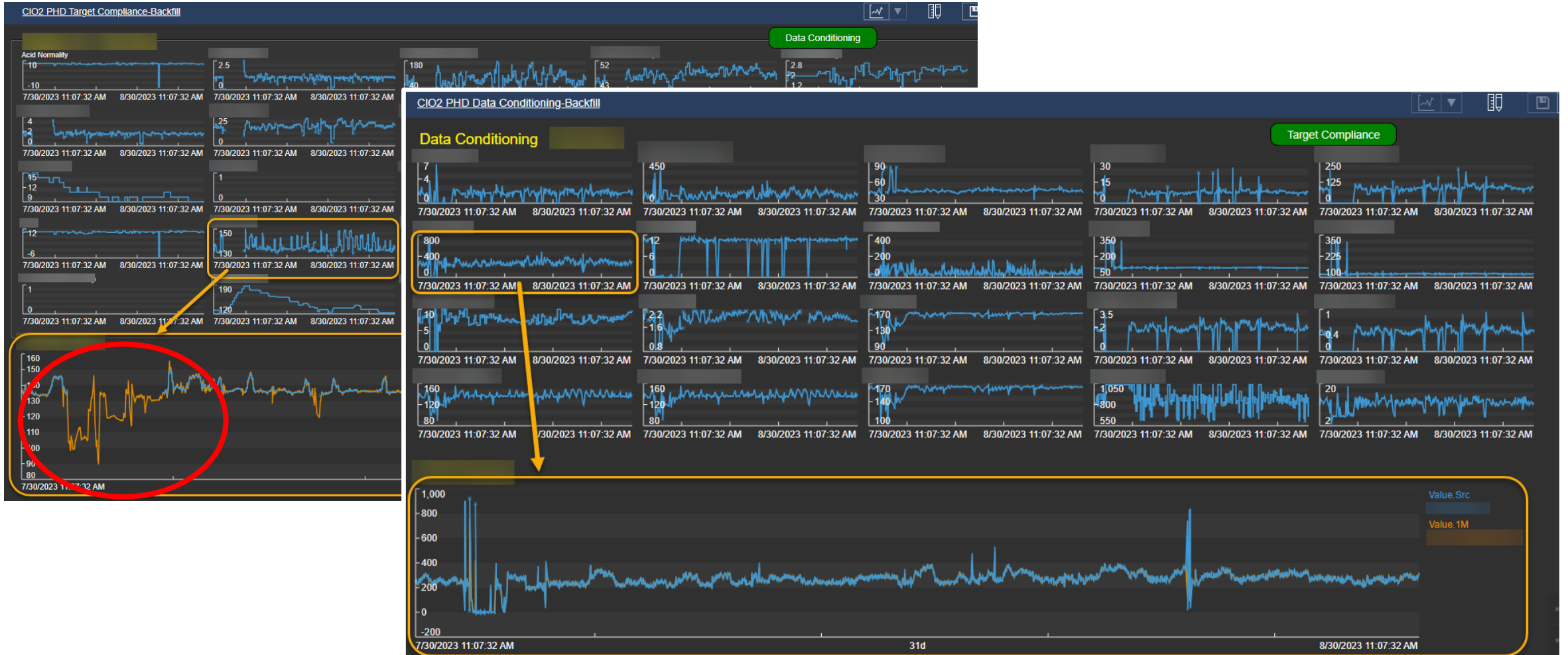
After

	A	B	D	G	J	K	L	M
1	Self Parent	Name	Template	Convert-UOM	Final-UOM	Value.1M	Value.Src	
2	x	ry\zz-Data-Conditioning	SCF HW Shower Temp	IP-Condition-Data-Base			.PV.1M	
3	x	ry\zz-Data-Conditioning	SCF to Vacuum	IP-Condition-Data-Base			.PV.1M	
4	x	ry\zz-Data-Conditioning	Steam Flowrate	IP-Condition-Data-Base			.PV.1M	:UOM=lb/h
5	x	ry\zz-Data-Conditioning	Steam Flowrate-Convert	IP-Condition-Data-UOM-Convert	TRUE	KPPH	.PV.KPPH;UOM=KPPH	:UOM=lb/h

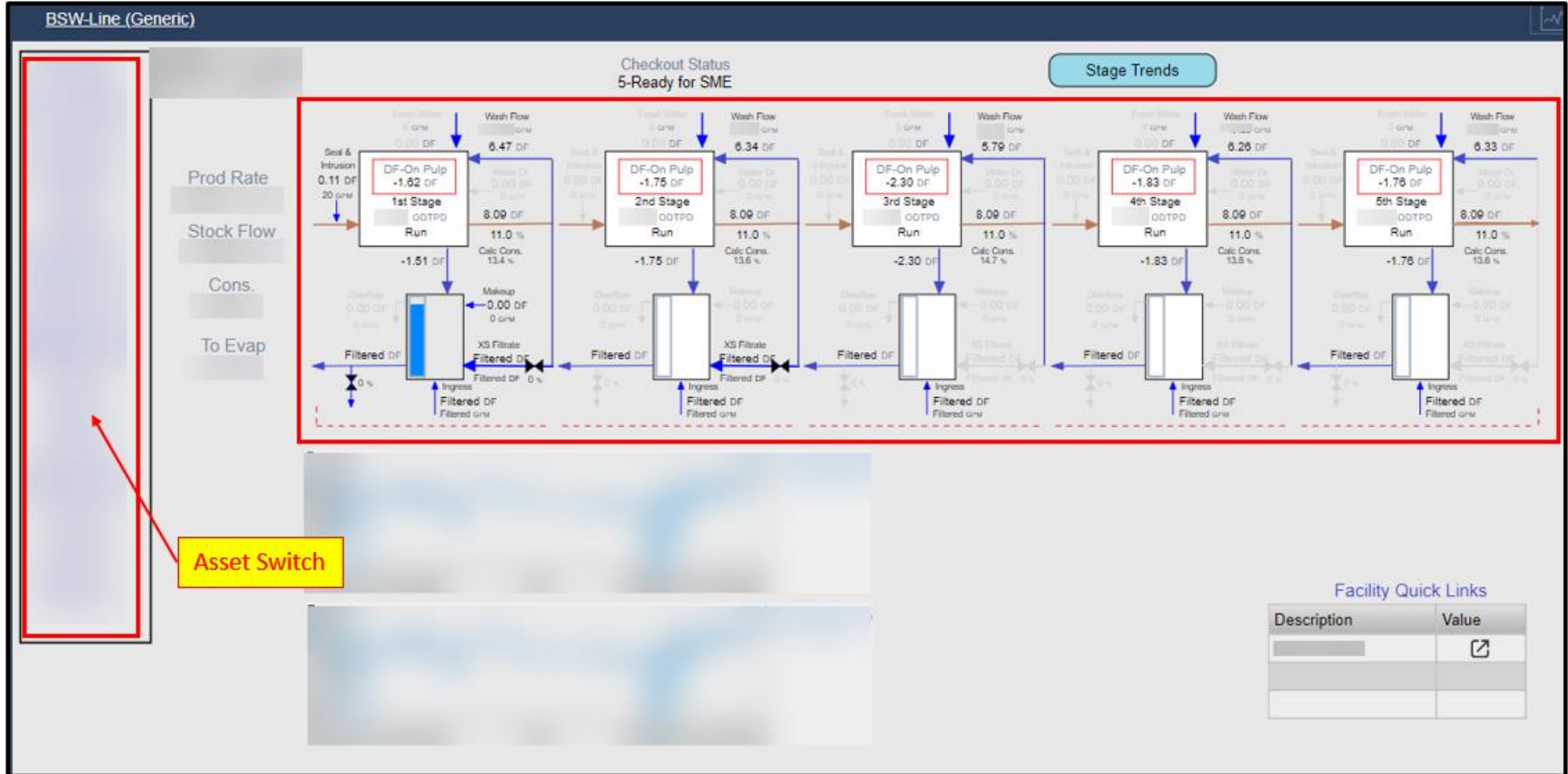
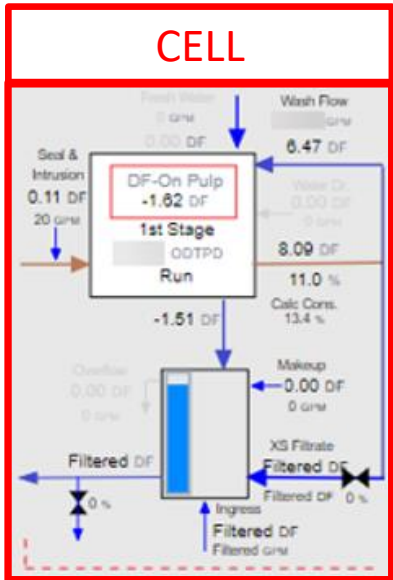
Asset Framework: Keeping Track of Backfills

Name	Prod Ratio	Balance Error	EA Ratio	Sprint	Data Conditioning	DC Backfill 2022	DC Backfill 2021	DC Backfill 2020	DC Backfill 2019	PHD Connection	PHD Backfill 2022	PHD Backfill 2021	PHD Backfill 2020	PHD Backfill 2019	Integrator
	1.010	-2.8%		Sprint 1	X	X	X	X	X	X	X	X	X	X	X
	0.978	6.5%		Sprint 1	X	X	X	X	X	X	X	X	X	X	X
	0.996	-4.0%		Sprint 3	X	X	X	X	X	X	X	X	X	X	X
	1.019	-2.8%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X
	1.000	4.5%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X
	1.007	11.0%		Sprint 3	X	X	X	X	X	X	X	X	X	X	X
	1.010	-14.0%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X
	1.000	4.0%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X
	1.000	1.0%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X
	1.000	7.0%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X
	1.018	-5.5%		Pre-Sprint	X	X	X	X	X	X	X	X	X	X	X
	1.047	6.5%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X
	1.020	-2.4%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X
	1.000	-5.1%		Pre-Sprint	X	X	X	X	X	X	X	X	X	X	X
	1.004	-6.8%		Sprint 3	X	X	X	X	X	X	X	X	X	X	X
	1.000	6.6%		Sprint 3	X	X	X	X	X	X	X	X	X	X	X
	1.010	1.7%		Sprint 1	X	X	X	X	X	X	X	X	X	X	X
	1.010	-2.9%		Sprint 1	X	X	X	X	X	X	X	X	X	X	X
	1.050	3.4%		Sprint 1	X	X	X	X	X	X	X	X	X	X	X
	0.993	1.0%		Pre-Sprint	X	X	X	X	X	X	X	X	X	X	X
	1.000	1.0%		Pre-Sprint	X	X	X	X	X	X	X	X	X	X	X
	0.970	5.5%		Pre-Sprint	X	X	X	X	X	X	X	X	X	X	X
	1.060	-5.0%		Sprint 1	X	X	X	X	X	X	X	X	X	X	X
	1.000	4.1%		Pre-Sprint	X	X	X	X	X	X	X	X	X	X	X
	1.000	3.2%		Sprint 3	X	X	X	X	X	X	X	X	X	X	X
	1.000	5.3%		Sprint 3	X	X	X	X	X	X	X	X	X	X	X
	1.000	2.0%		Sprint 3	X	X	X	X	X	X	X	X	X	X	X
	1.000	4.7%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X
	0.991	-6.0%		Sprint 2	X	X	X	X	X	X	X	X	X	X	X

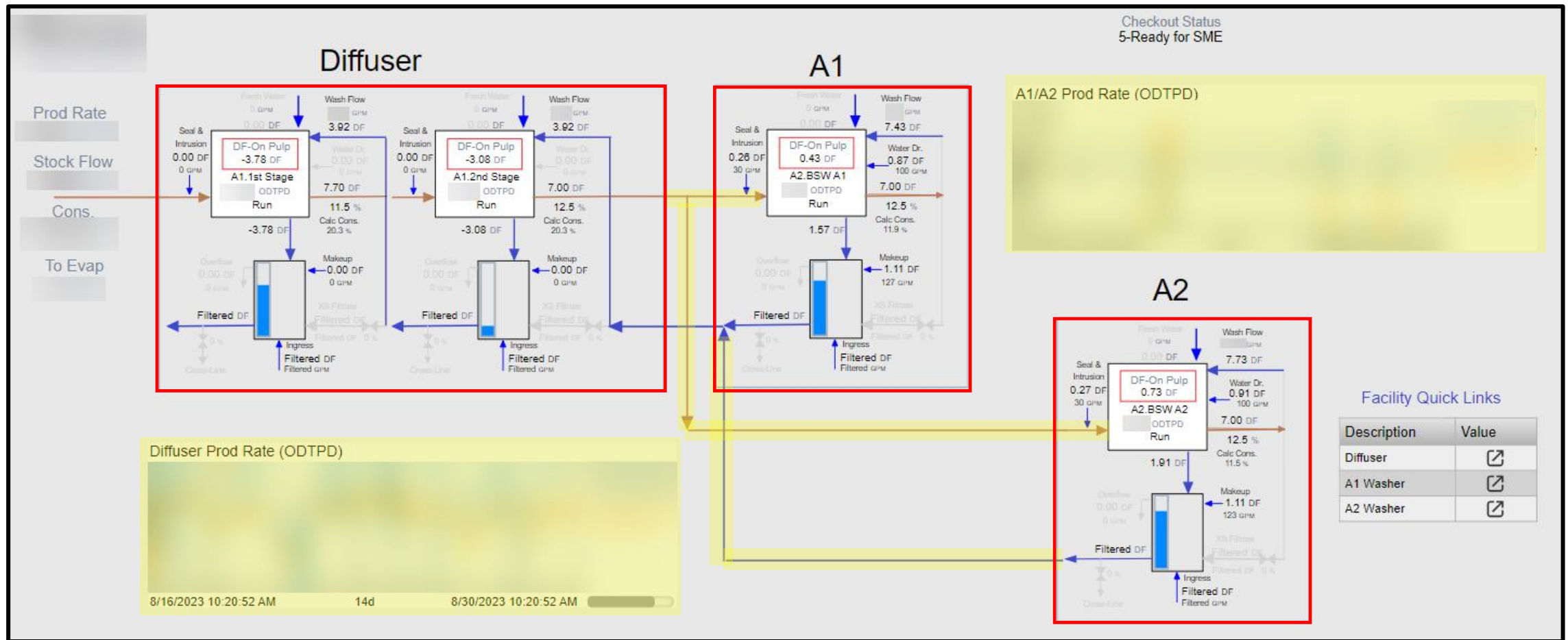
AVEVA PI Vision: Keeping Track of Backfills



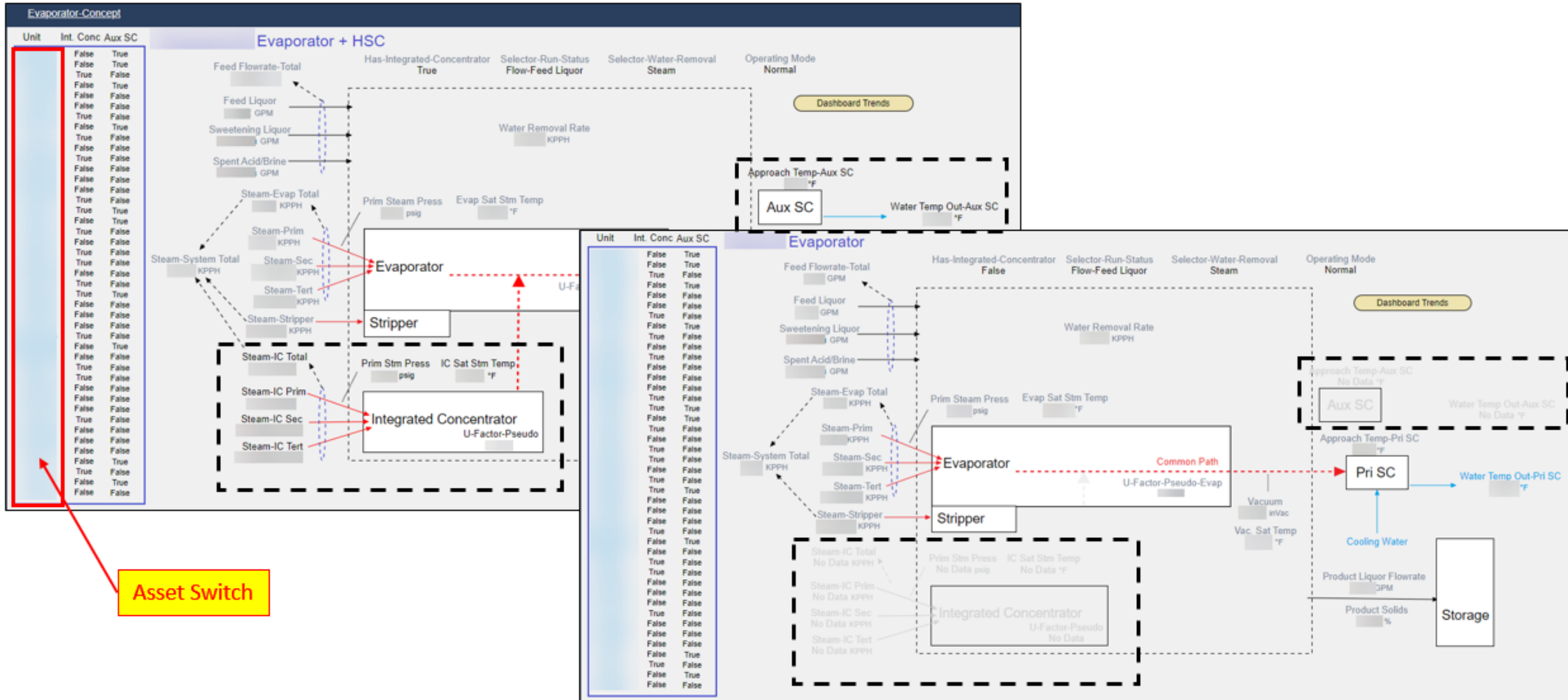
AVEVA PI Vision: Use Collections for Repeating Assets



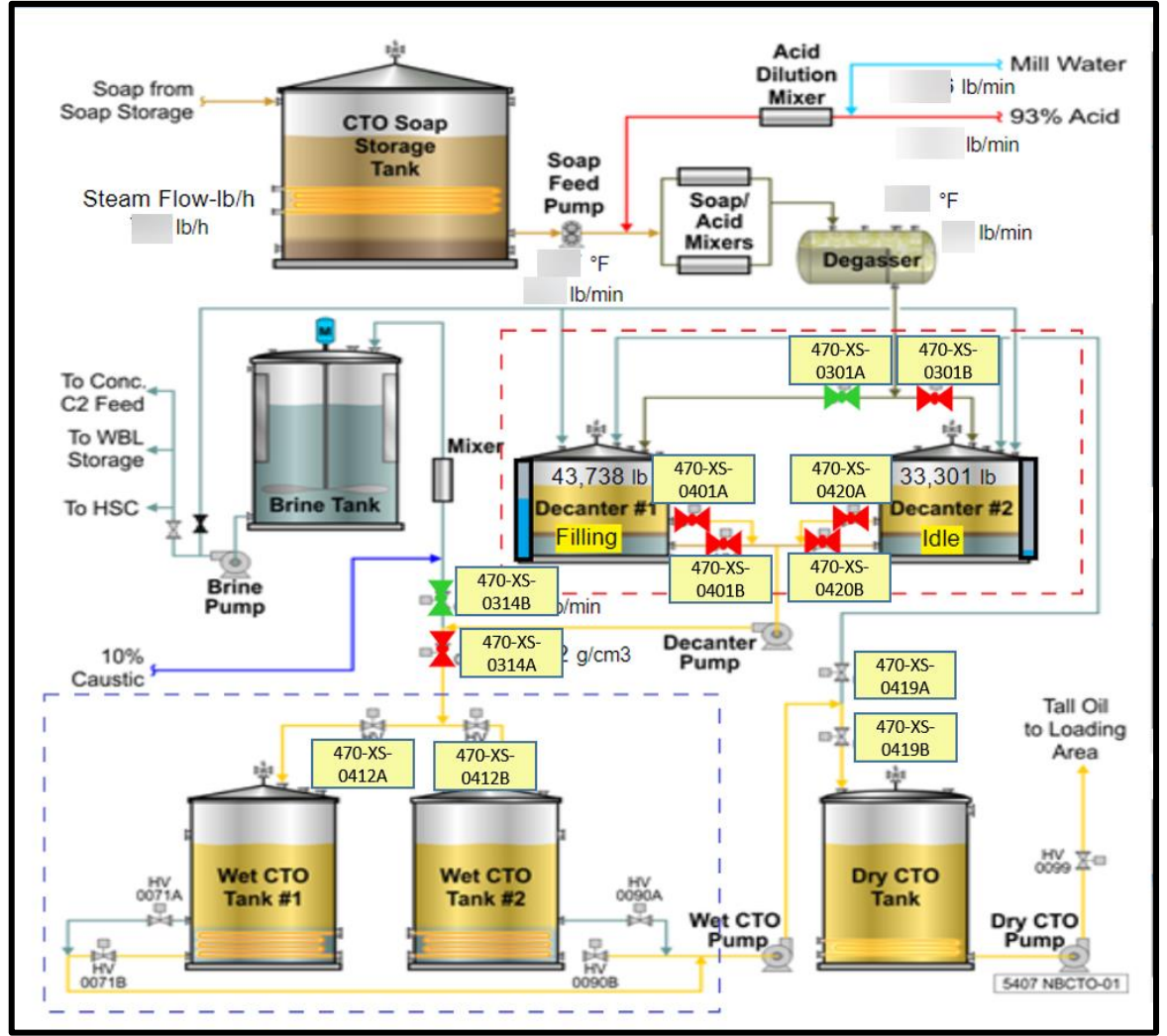
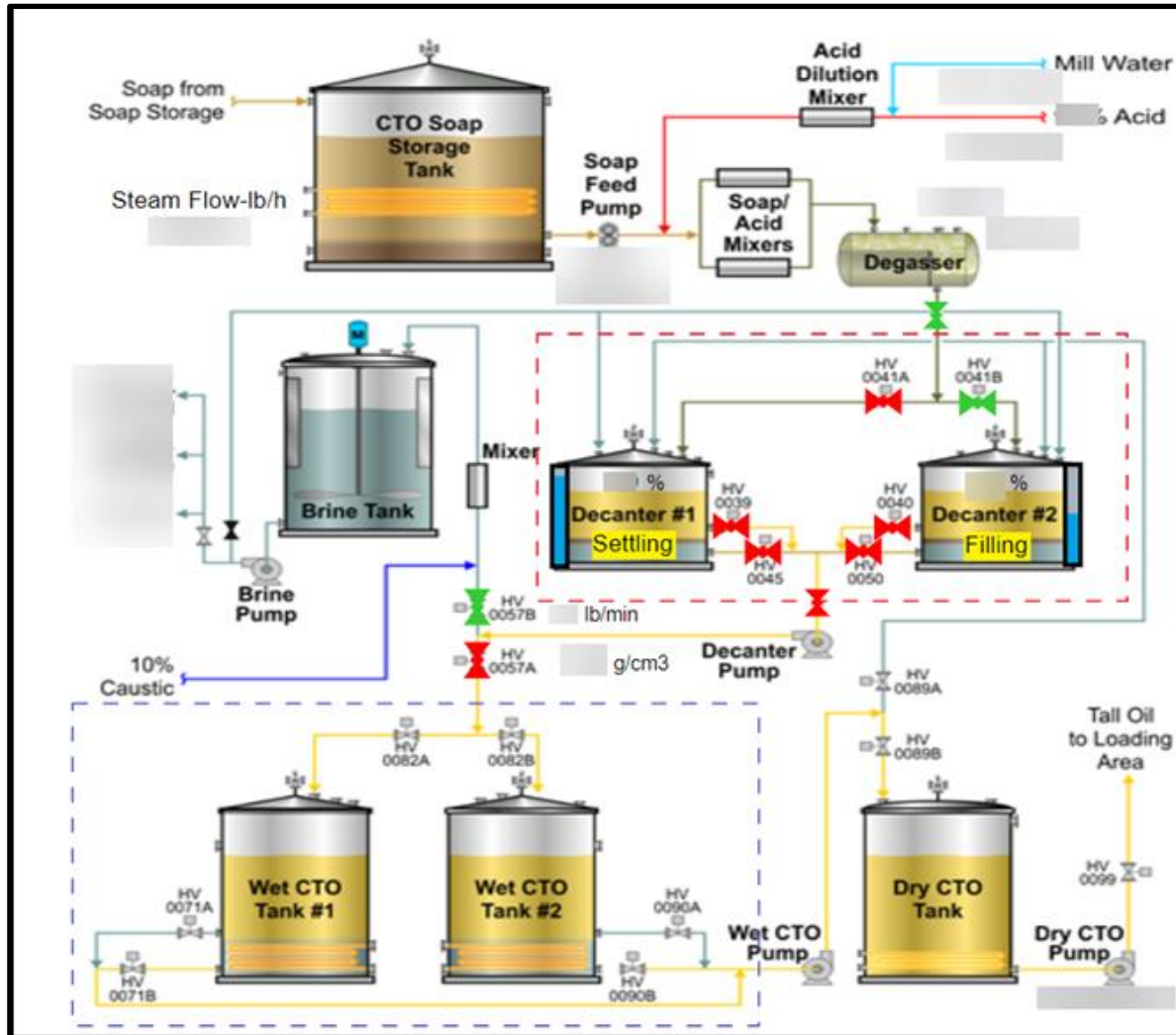
AVEVA PI Vision: Many Collections on One Display



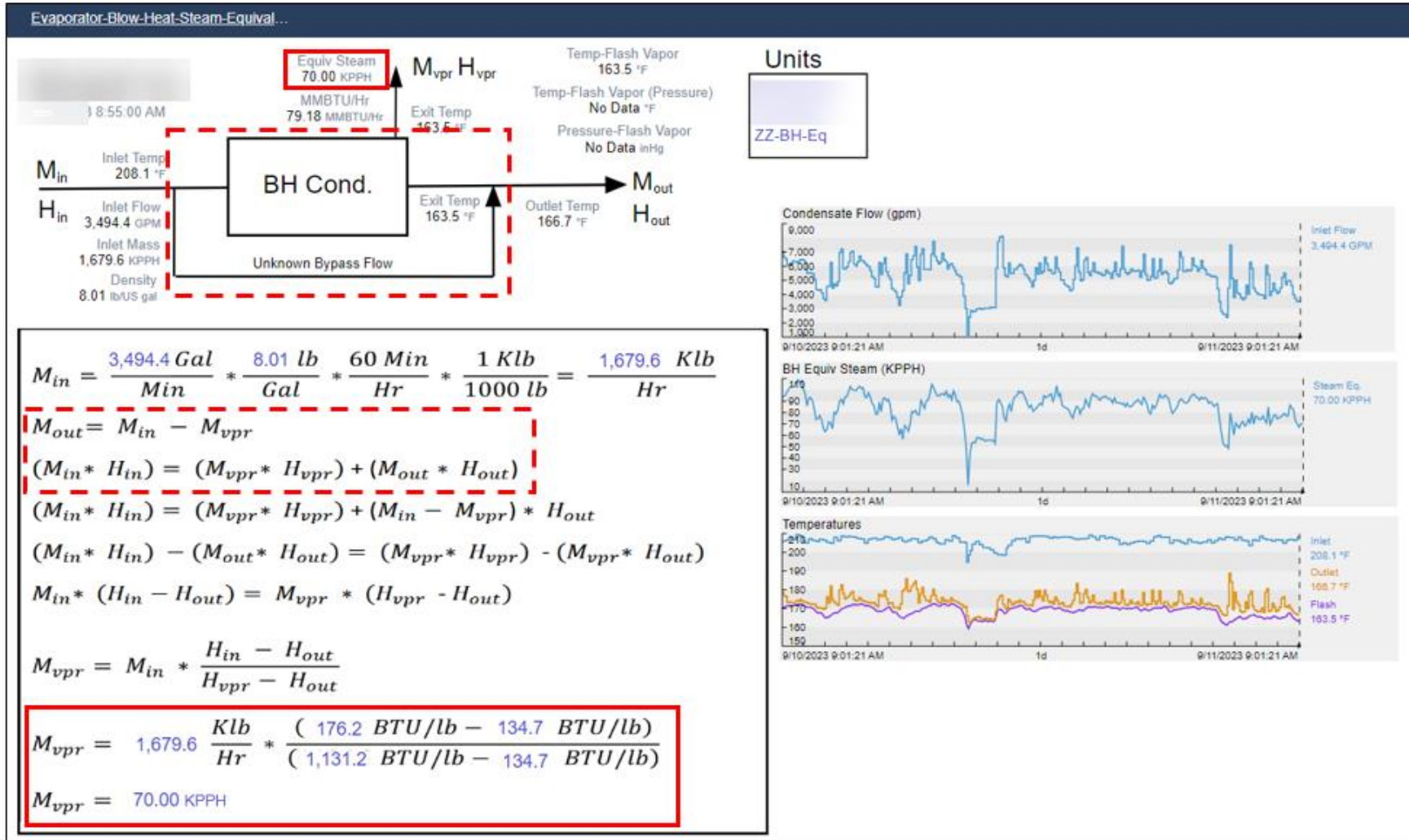
AVEVA PI Vision: Show/Hide Symbols with Multistate



AVEVA PI Vision: Live Data Superimposed Over Graphic



AVEVA PI Vision: Calculation Documentation



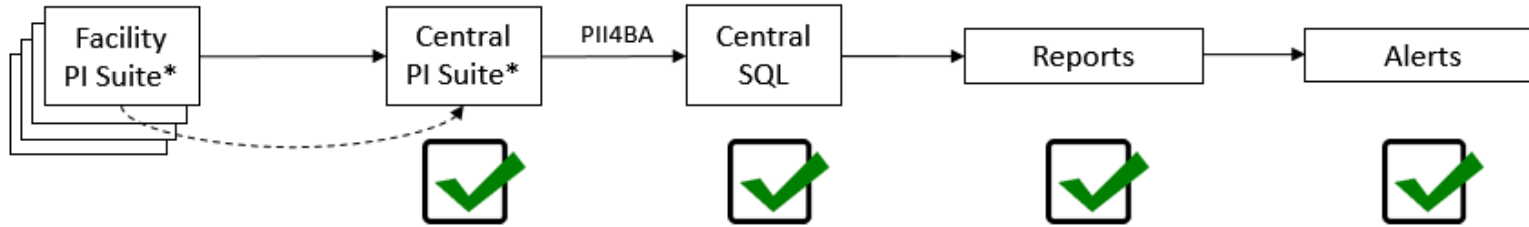
PII4BA: PHD Materialized View

- Metadata and Measured/Calculated Values
- Time Periods: **15 minute** / 1 Hour / 1 Day
- Statistics: **Average** / **Maximum** / Minimum / Interpolated
- Continuous Data: **Time-Based Statistic**
- Lab/Analyzer/Batch Data: **Event-Based Statistic**
 - Want NULLs if No Value in Time Window



Victory is Within Sight

PHD: Process Health Diagnostic Dashboard



COMPLETE means that phase 3 workflow has been configured and turned over to area SME for use

COMPLETE	3Q23	4Q23
Evaporators (complete)	Paper - Quality	Paper Operating - HP KPIs
Bleach Plant (complete)	Caustic Plant (Recaust)	Turbines (condensing)
CIO2 Generators (complete)	High Kappa BSW	O2D with BSW - (Started)
APC Overview (PhD Lite)		Paper Operating - All KPIs
CTO Soap (PhD lite)		Batch Digesters
Recovery Boilers (complete)		
Kamyr Digesters (complete)		

International Paper Fixes Process Performance Degradation Before It Becomes Systemic

Challenge

- Process Audits Occur Every 3-4 Years...
- Subject Matter Experts Identify Improvement Opportunities...
- Improvements Implemented, But Performance Erodes Occurs Over Time...
- **Identify and Fix Degradation** Before the Condition Becomes the “New Normal”

Solution

- Leveraging Asset Framework, AVEVA PI Vision and the AVEVA PI System Integrator for Business Intelligence Alerts Subject Matter Experts When Degradation Occurs and Provides Information for Detailed Analysis.

Results

- **Process Audits Available Every Day for Key Indicators**
- **1st Level Drill-Down Information Available**
- **System Triggering Significant Alerts each Month**
- **Work Flow System Tracks Status and Savings**





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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!

“Quotes really stand out on backgrounds like this.
Lorem ipsum dolor sit amet, consectetur
adipiscing elit, sed diam nonummy tincidunt ut
laoreet dolore magna aliquam volutpat.”

Quote Credit

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AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

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