

AVEVA PI WORLD

Tracking Downtime and Slowbacks

The Good, The New and the Not Ugly

Presented By: Rick Smith and Charles Copeland

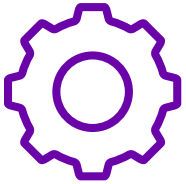
AVEVA



International Paper

- World's Largest Pulp and Paper Company
 - Founded 1898
 - \$20.6 Billion Net Sales (2020)
 - Sylvamo Spin-Off (Oct. 2021)

Tracking Downtime and Slowbacks



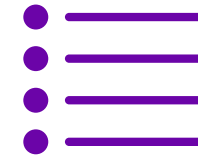
Challenge

- Enhance Reliability Tracking System (RTS) to Provide Improved Capability and Enterprise Reporting While Replacing Obsolete Technologies



Solution

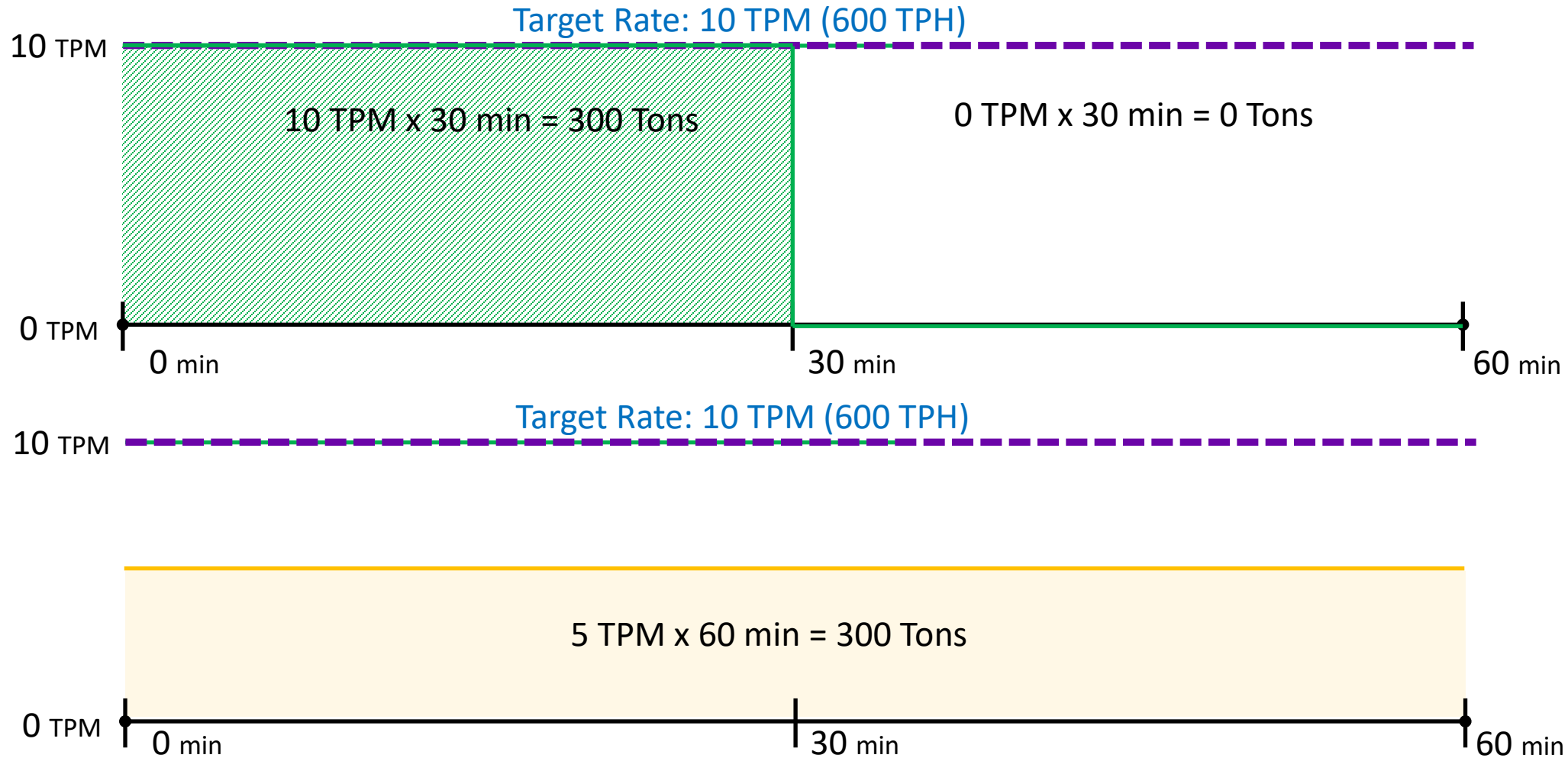
- Deployed the latest AVEVA PI System technology including PI AF, PI Vision and PI Integrator for Business Analytics to Improve Reliability Tracking.



Benefits

- Enterprise Reporting Based Using PI Integrator Based on Distributed PI AF Templates
- Simplified Troubleshooting
- Sustainable Solution
- Team Deployment Model Instead of Single Person Support

What is Equivalent Downtime (EQDT)?



The Beginning of a Journey...

Building the Case for PI AF in IP (2015)

- Build the Business Case
 - Incorporate Many Facets/Customers
 - Avoid “Shiny Rock” Syndrome
- Single Version of the Truth
 - Standardize Structure and Calculation Methodology
- Simplify Solutions (Reliability Tracking System -> PI AF)
- Reduce Work (“Jeff Reese” Excel Spreadsheet)

<https://www.osisoft.com/presentations/building-the-case-for-asset-framework-at-international-paper/>

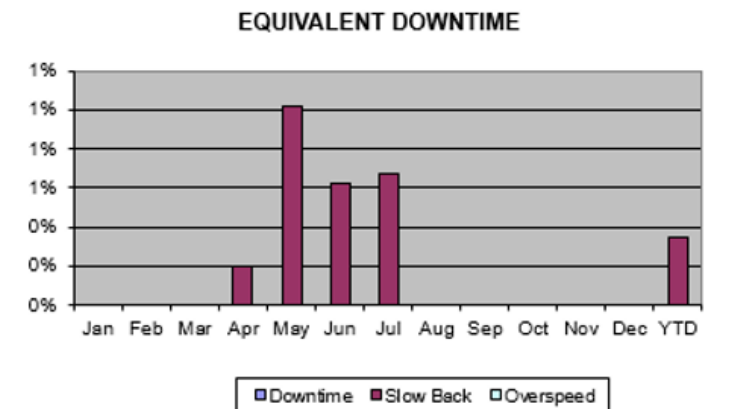
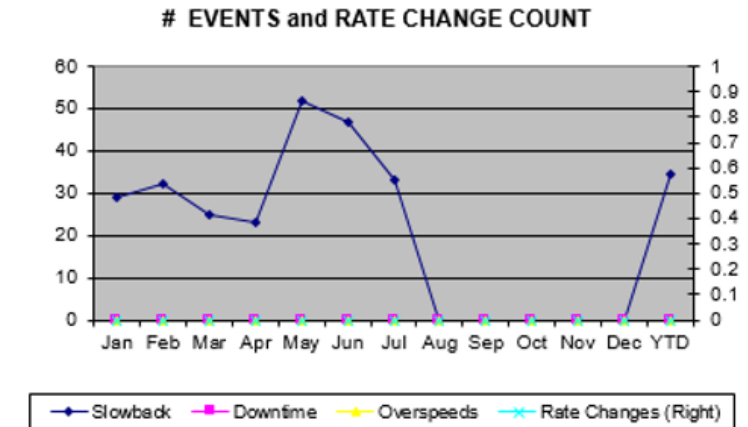


2015

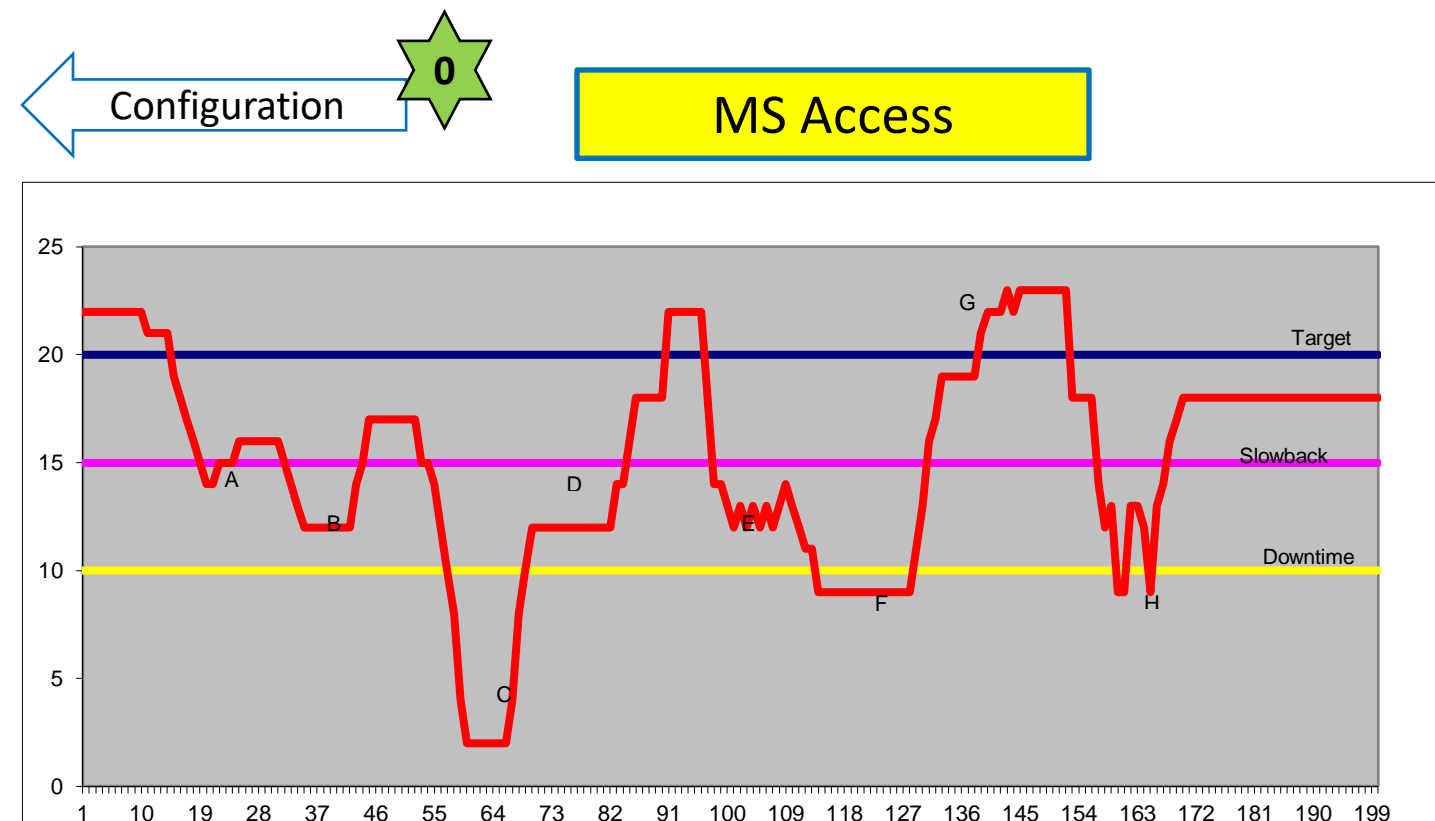
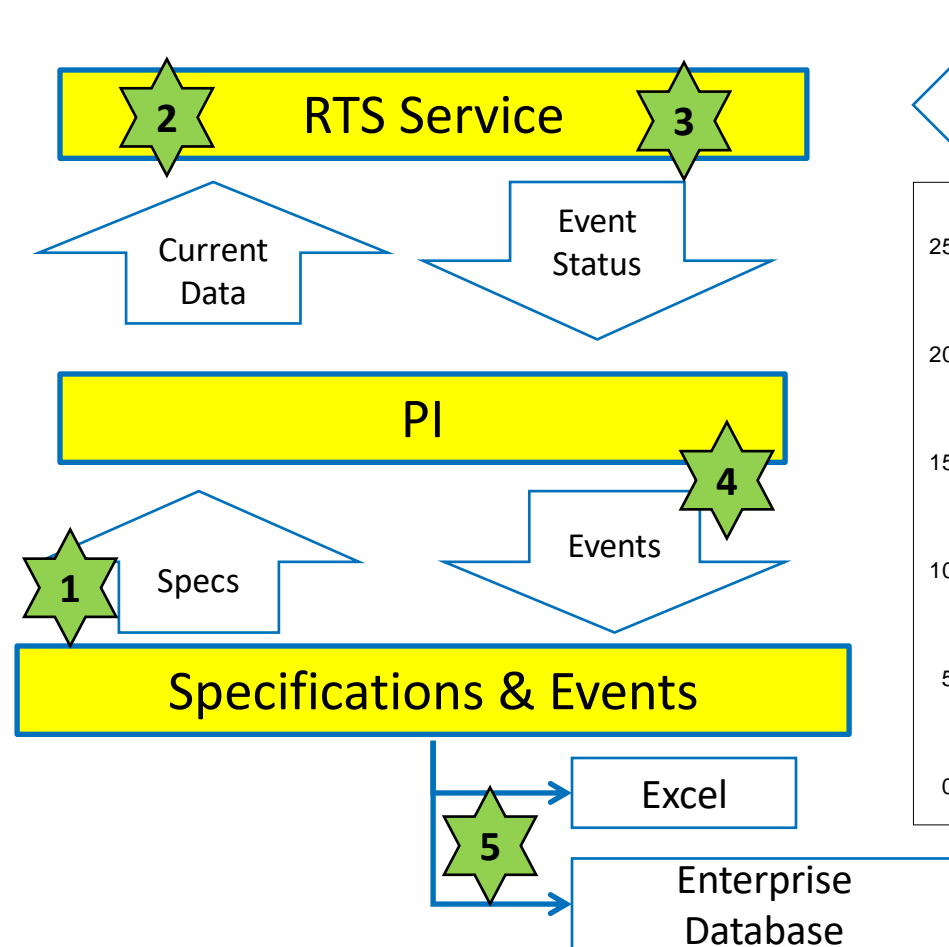
Reliability Tracking System: A Brief History

- Program **created in 2002** to track downtime and slowback
- Written in **VB6** – ouch!
- Nightly MS Excel Reporting
 - 1 file per unit

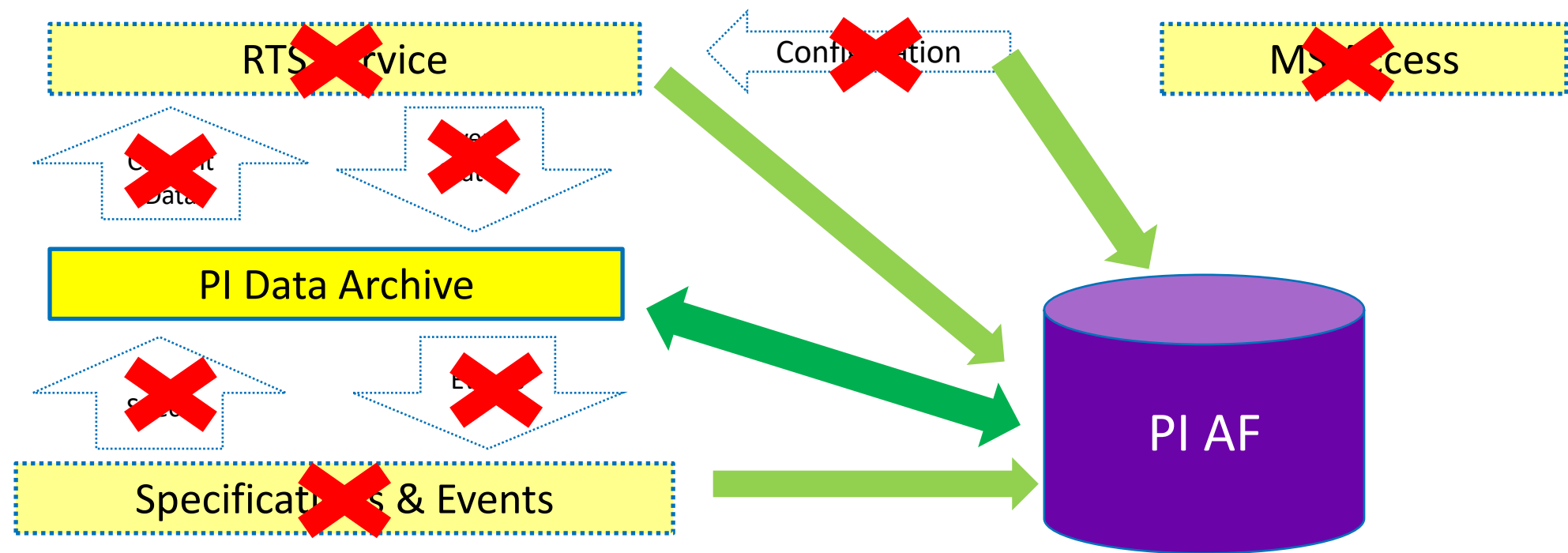
INTERNATIONAL PAPER						
RTS Monthly Report Downtime Summary						
Date		07/20/21				
Mill						
Equipment						
EQUIVALENT DOWNTIME	For Month			Year-To-Date		
	No. of Events	Duration (Hr)	Equival. DT (%)	No. of Events	Duration (Hr)	Equival. DT (%)
Slowback Mode	33	47.5	0.7%	241	1182.9	0.3%
Downtime Mode	0	0.0	0.0%	0	0.0	0.0%
Total			0.7%			0.3%
Overspeed Mode	0	0.0	0.0%	0	0.0	0.0%
Availability (100 - Downtime %)	480.0	100.0%		4824.0	100.0%	
Avg. Time Between DT Events	0.0	hr		0.0	hr	
Average Downtime Event Time	0.0	hr		0.0	hr	



Downtime Data Flow (2002-Present)



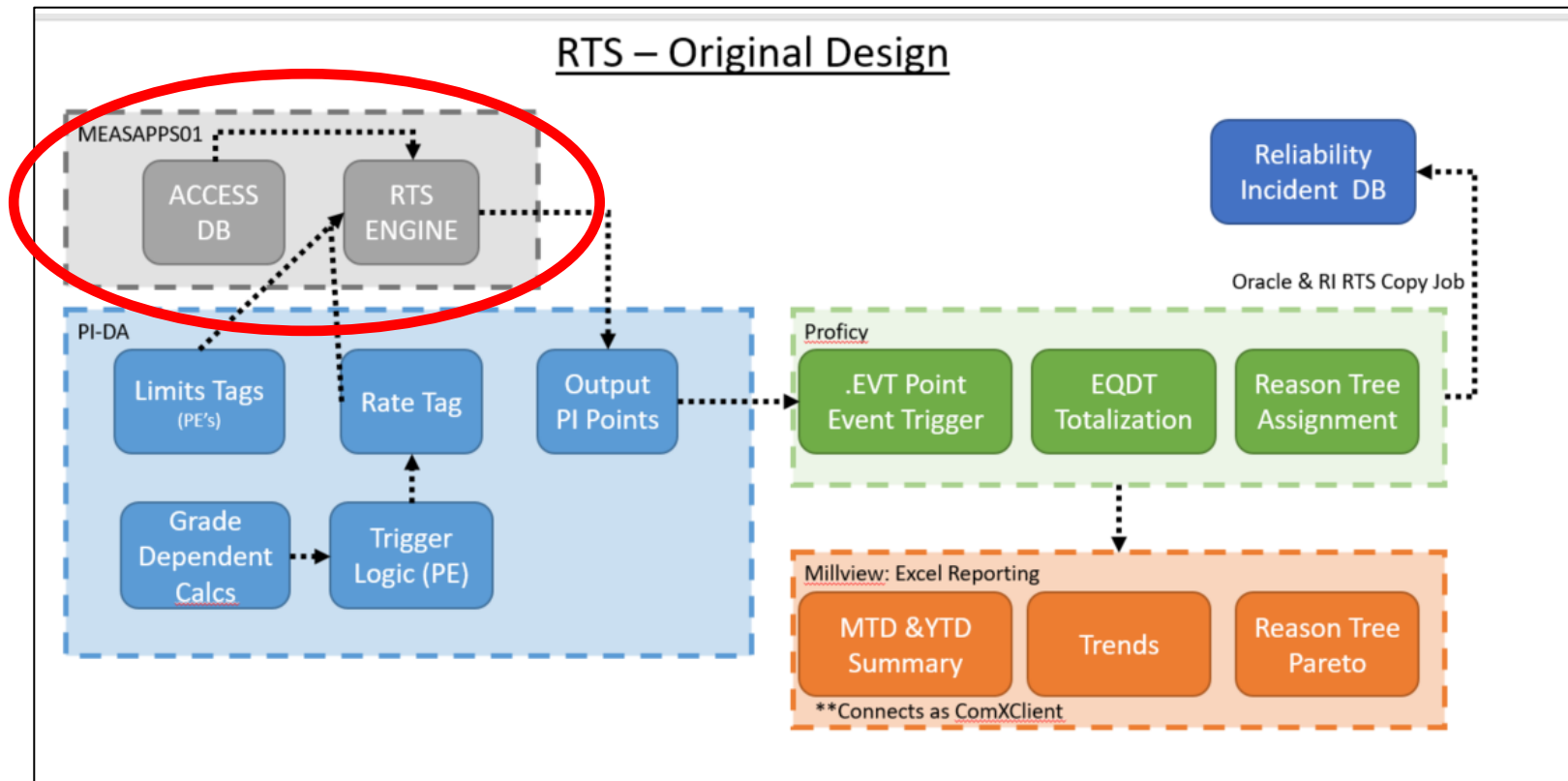
Future Downtime Data Flow from 2015 Concept...



Event name	Start time	End time	Duration	Target.Average	Value.Average
EF_RTS_RTS-Test1_SS_2014-09-12 06:50:00	12-Sep-14 06:50:00			40.00	45.67
EF_RTS_RTS-Test1_SS_2014-09-16 06:20:00	16-Sep-14 06:20:00	16-Sep-14 06:31:00	0 0:11:00	40.00	27.75
EF_RTS_RTS-Test1_SS_2014-09-16 06:50:00	16-Sep-14 06:50:00	16-Sep-14 11:22:00	0 4:32:00	40.00	8.11
EF_RTS_RTS-Test1_SS_2014-09-16 18:32:00	16-Sep-14 18:32:00	16-Sep-14 23:07:00	0 4:35:00	40.00	9.42
EF_RTS_RTS-Test1_SS_2014-09-16 23:11:00	16-Sep-14 23:11:00	16-Sep-14 23:32:00	0 0:21:00	40.00	26.70

2018 Project Scope

- Transition the RTS engine to PI-AF.
- Rewrite the engine to closely match results with a seamless transition.



2021 Project Transition

- February 2021 technical lead left the company.
- Complex code with limited documentation.
- Project was expanding to replace another event tracking tool.

SBGradeCheck	TagVal('SlowbackMaximumTag',GradeChecktime)
SBNOW	TagVal('SlowbackMaximumTag','*')
LookFor	<pre>if (SheetBreak = true) then if ('Sheetbreak Setup Sheetbreak Tag' <> PrevVal('Sheetbreak Setup Sheetbreak Tag','*')) then '*' else parsetime("01-Jan-2018 00:00:00") else if (OldIncident = 1 and GetIncident = 0) then if SlowbackMaxChange then '*' else findLE('RateTag','*','*-30d','SlowbackMaximumTag') else if (OldIncident = 2 and GetIncident = 0) then if ('Downtime Method' = "Indicator") then '*' else findLE('RateTag',StartTime,'*-30d','DowntimeMaximumTag') else if (OldIncident = 0 and GetIncident = 1) then if (SheetBreakEnd = true) then '*' else if (SlowbackIncrease = true or SlowbackMaxIncrease = true) then parsetime("01-Jan-2018 00:00:00") else if (GradeNext > GradePrevious) then '*' else findGE('RateTag',StartTime,'*-30d','SlowbackMaximumTag') else if (OldIncident = 2 and GetIncident = 1) then if ('Downtime Method' = "Indicator") then '*' else findGE('RateTag',StartTime,'*-30d','DowntimeMaximumTag')</pre>

2021 Project Research

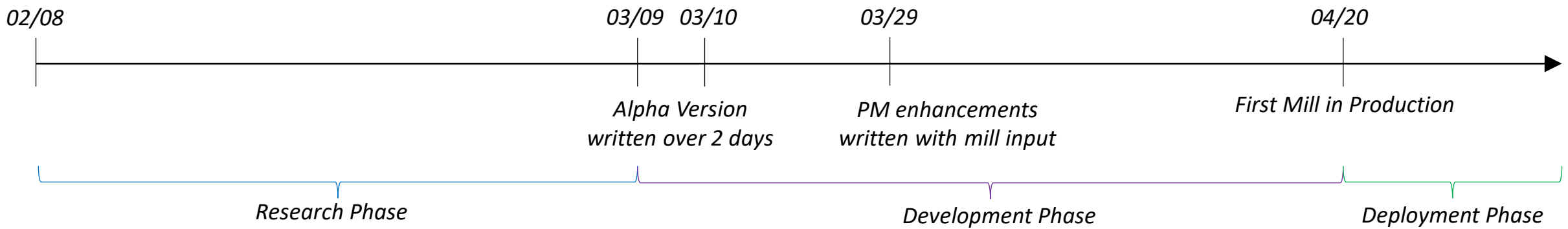
POTENTIAL CALCULATION IMPROVEMENTS

- **Array handling and operations in PI-AF analytics**
 - **Event Frame Outputs to PI tags**
 - PI Integrator for Business Analytics improvements
 - Consolidation of calculation and evaluation engines to one source
 - Extensible through use of derived templates
-
- Conducted code reviews, and interviews with various product SME's
 - **Took time to understand** the various methods to calculate the desired outcomes

POTENTIAL VISUALIZATION IMPROVEMENTS

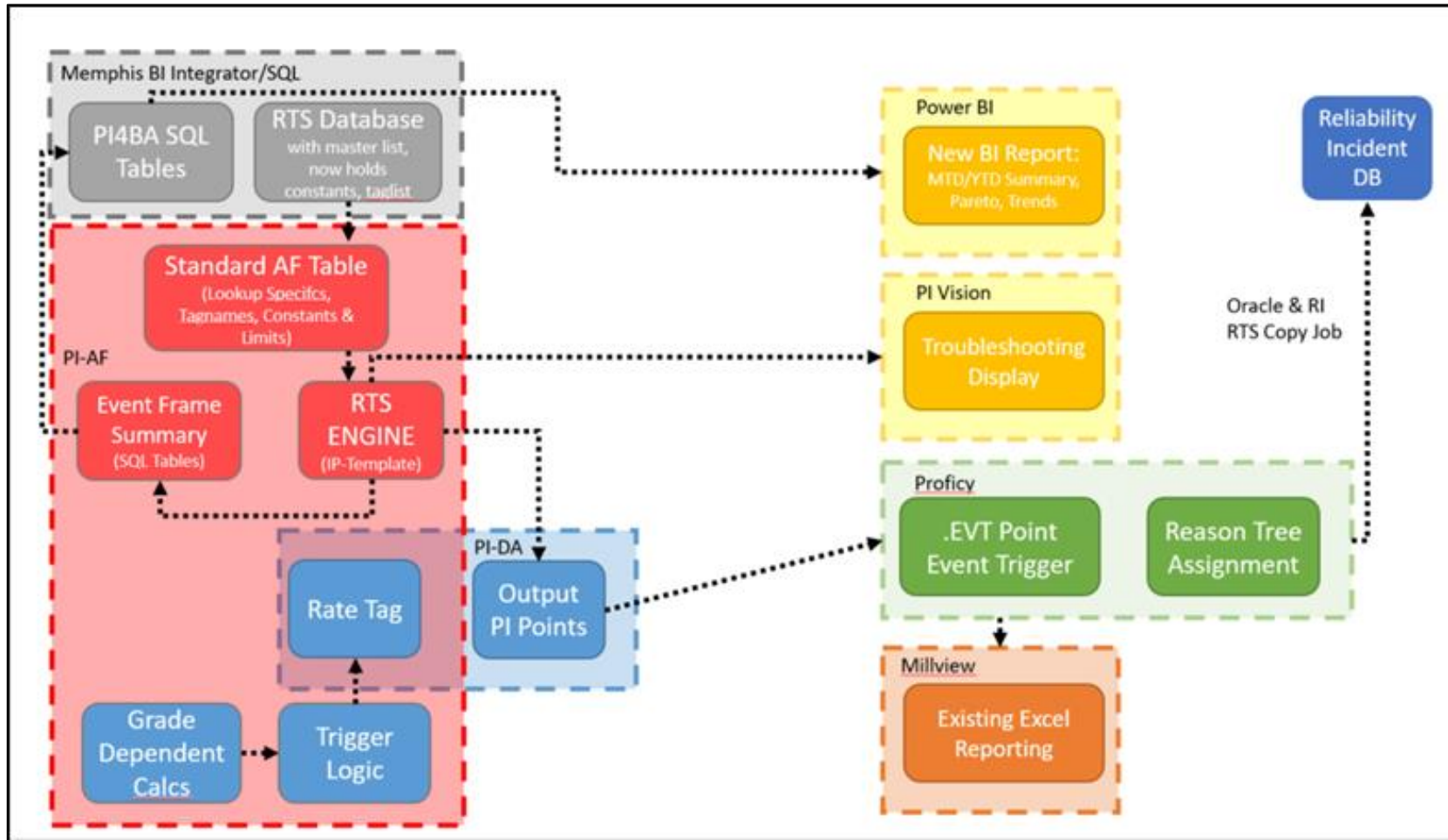
- PowerBI gaining traction within organization
- PI Vision 2020 improvements
- Both products are mobile compatible

2021 Project Timeline



- Able to build initial version in 2 days due to power of PI AF functions and analytics
- Springfield mill was the initial pilot and the first mill to reach full production
- Beta site of Cedar River was integral with vetting calculations and improvements
- Subsequent site deployments have been very smooth thus far

RTS 2021 Design



Analysis Evaluation Improves Sustainability

- Utilized most up-to-date features within PI-AF such as Arrays and Event Frame Outputs.
- Full form comments added to coach users through each step of the evaluation.
- Analysis preview simplifies troubleshooting.

The screenshot displays the 'MEMPHIS-Sinusoid' analysis configuration window. The 'Analyses' tab is active, showing a list of analysis elements and their backfilling status. Below this, the 'Evaluate' button is visible. The main table shows the evaluation results for various variables, including vSCMTime, vSCMTS, vRate, vSBTrigger, vDTTrigger, vRateArray, and vStateArray. The table includes columns for Name, Expression, Value at Evaluation, Value at Last Trigger, and Output Attribute. A status bar at the bottom indicates the evaluation time and last trigger time. A small inset window shows the total number of values and a list of timestamps and values.

Name	Expression	Value at Evaluation	Value at Last Trigger	Output Attribute
vSCMTime	//Minimum time a unit must continuously be in a state before a change has 'StateChangeMinimumTime'	10 min	10 min	Map
vSCMTS	//State change minimum timestamp, looks up the values from the proper time ParseTime(Concat("* - ", 'StateChangeMinimumTime', "m"))	8/27/2021 4:20:33	8/27/2021 4:20:00	Map
vRate	//Monitored Rate of Unit, should include all specific or special conditions 'RateTag'	63.747	63.747	Map
vSBTrigger	//Going below this value triggers a slow state 'Limit-Slowback'	45	45	Map
vDTTrigger	//Going below this value triggers a down state 'Limit-Downtime'	15	15	Map
vRateArray	//All of the rate tag values in the time window plus one interpolated value //Recommendation is for RateTag to have at least 1 value per minute and be RecordedValues('RateTag', vSCMTS, "*", "Interpolated")	[66.748, 63.747]	[66.974, 63.747]	Map
vStateArray	//For each value in the array full of Rate Tag values, compare that rate //and assigns the appropriate translation to a state MapData(vRateArray, If \$val < 'Limit-Downtime' THEN "DOWN" ELSE IF \$val <	[NORMAL, NO]	[NORMAL, NO]	Map

Evaluation Time: 8/27/2021 4:30:33 PM Last Trigger Time: 8/27/2021 4:30:00 PM

Scheduling: ☐ Event-Triggered ☒ Periodic

Period: 00h 01m 00s

AMMEASAS21 Version: 1/1/1970 12:00:00 AM, Revision 20

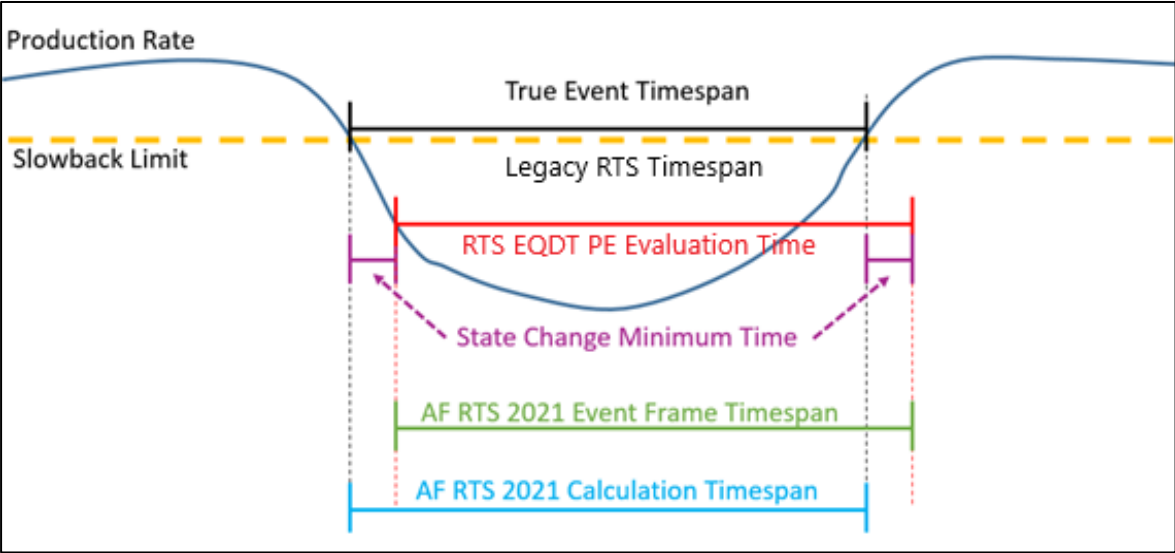
To access the values, use a one-based index.
For example, vStateArray[1] will return NORMAL.

Total number of values: 3

Timestamp	Value
8/27/2021 4:20:33 PM	NORMAL
8/27/2021 4:28:05 PM	NORMAL
8/27/2021 4:30:33 PM	NORMAL

● Connected to the PI Analysis Service.

Event Frame Evaluation Improves Accuracy



Outputs at close	
vActualStart	//EventFrame Start minus the State Change Minimum Time ParseTime(Concat(EventFrame("StartTime"), "-", 'StateChangeMinimumTime', "m"))
vActualEnd	//EventFrame End minus the State Change Minimum Time ParseTime(Concat(EventFrame("EndTime"), "-", 'StateChangeMinimumTime', "m"))
vEventDuration	//Double check of event duration (should match the event frame duration) Convert(Convert(Float(vActualEnd - vActualStart), "s"), "min")
vProdDefEvent	//ProdDeficit for EventFrame and time before including State Change Minimum Time if TagVal('RTS-State', '*-30s') = "DOWN" then 100 else TagAvg('ProdDeficit-Rate', vActualStart, vActualEnd)

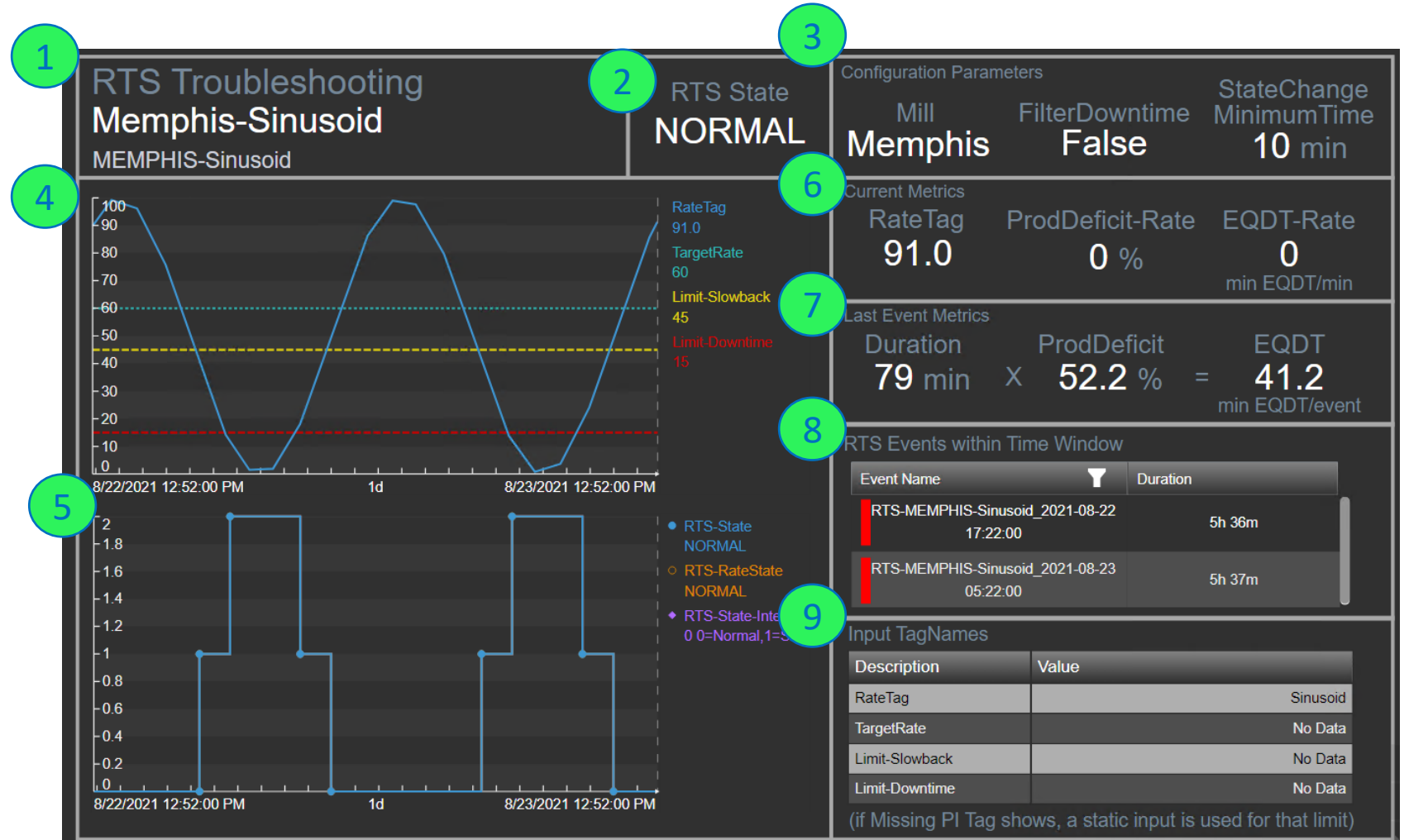
PI Vision Display Improved Understanding

- PI Vision simplified troubleshoot by highlighting state transitions.
- Single display based on PI AF Templates.
- Automatically picks up any new units added within PI AF.
- Dramatically reduced development labor and standardized consumption.



RTS Troubleshooting – Data Overview

- 1) Unit Description & Element Name
- 2) Current Unit State Value
- 3) Configuration Parameters
- 4) Rate Trend
- 5) State Trend
- 6) Current Metrics
- 7) Last Event Metrics
- 8) RTS Events in Time Window
- 9) Input TagNames



RTS Troubleshooting – Navigation Overview

1) Asset Navigation

Drop Down

2) Event Frame Pane

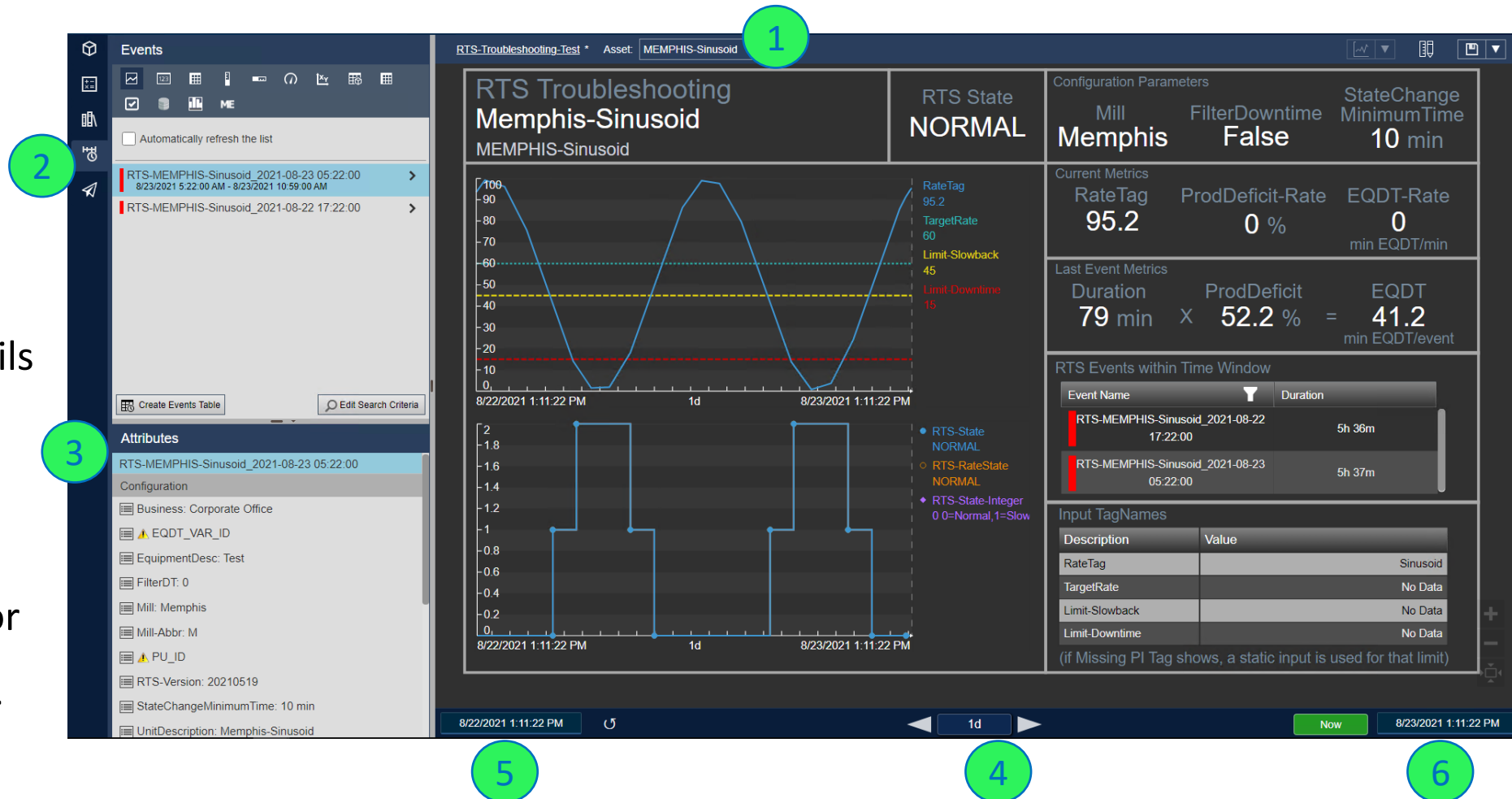
3) Event Frame Details

4) Display Timespan

Selector

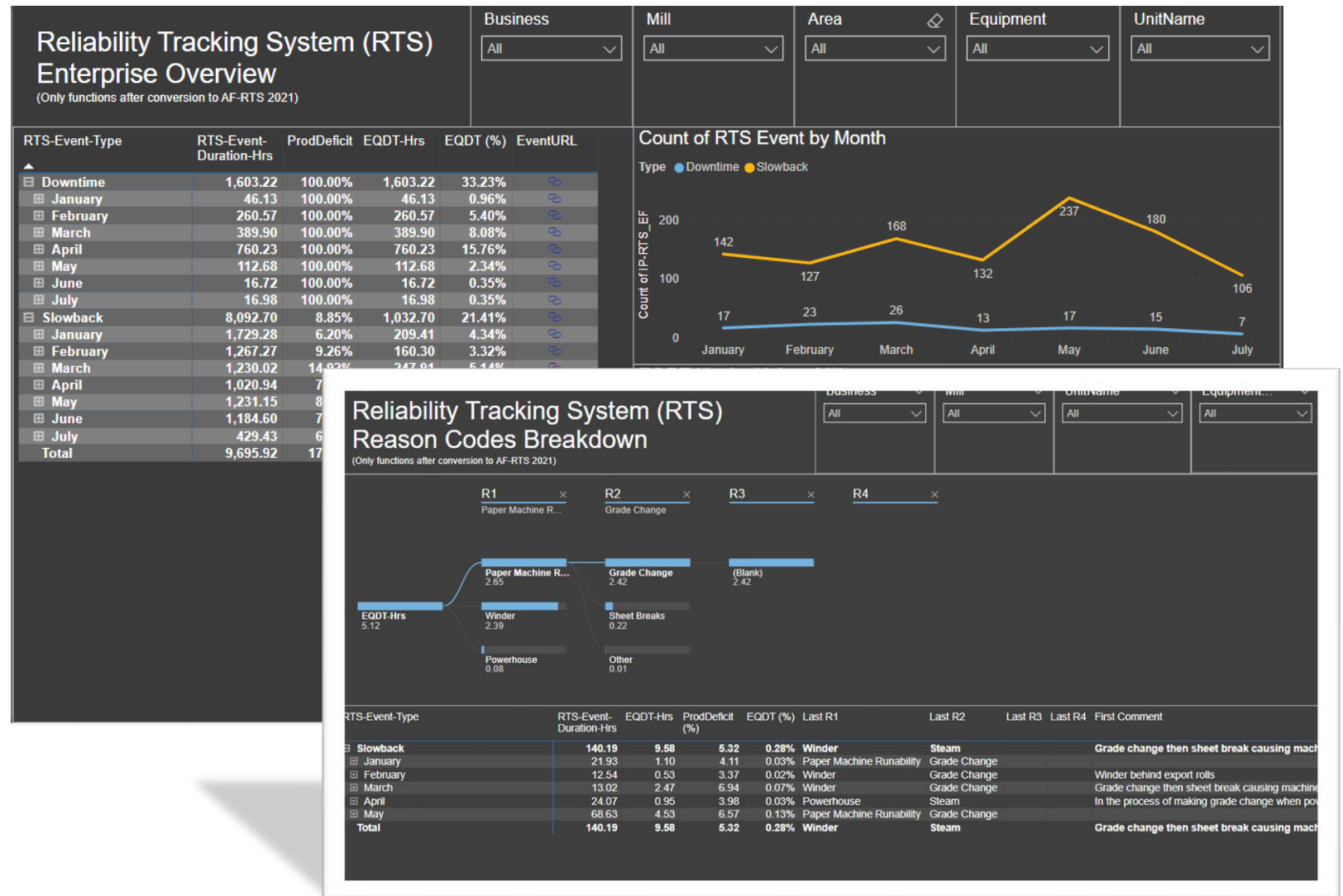
5) Start Time Selector

6) End Time Selector



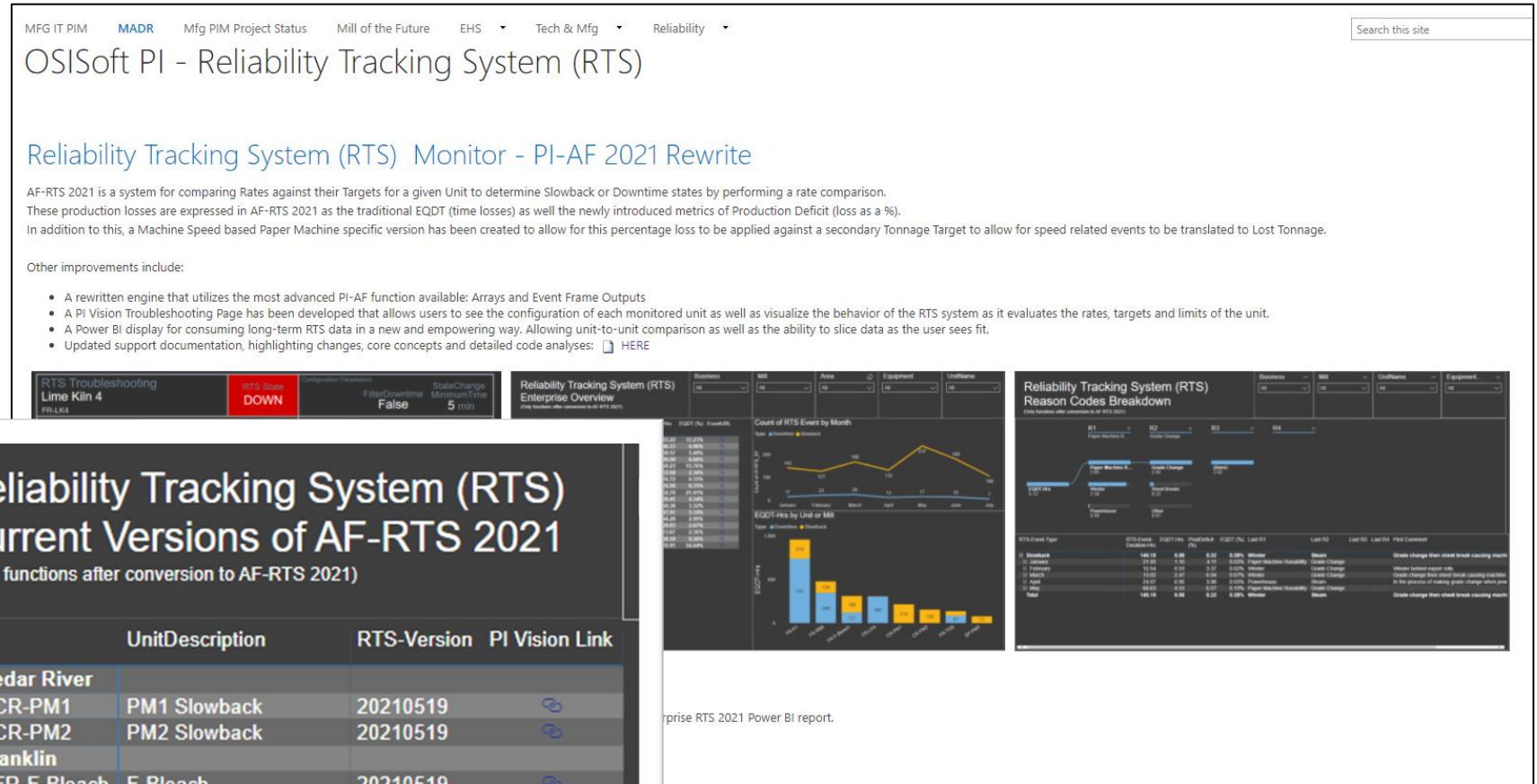
PowerBI Data Visualization

- PowerBI improved long term trending, reporting and data consumption.
- Slicers allow for interactive data discovery by slicing values by reason code or comparing unit to unit or mill to mill.
- PowerBI links back the facility RTS Event in PI Vision for further analysis



Link Power BI to PI Vision & Documentation

- Power BI hosts links to each unit's PI Vision display and the overall support documentation.
- 'Versions' tab was included in the Power BI Report help keep all units up-to-date.



Enterprise RTS 2021 Power BI report.

Deployment Status and Plan (4 deployment teams)

- ❑ Goal is to be fully converted to AF-RTS 2021 by End of Year 2021 and have all instances of RTS Service Stopped
- ❑ Plan to finish remediation of any legacy RTS installation or PI tags by end of Q4 2021
- ❑ Deployment is occurring in 4 parallel paths by region:

Tom Lee	East Region	RW	EO	TI	GT	SV	RM			
Lee Parker	Midwest Region	HE	PE	MV	PR	PH	RD	NP	VB	
Todd Moore	West Region	RR	MA	VA	BG	OR				
Charles Copeland	Pilots/GCF	SP	CR	FR	GP	CF	CM	NB	PW	FL

Green = Production, Orange = Checkout, Yellow = Dev, Blue = Research; Purple = Not Started



Understand and Solve the Problem, Don't Recreate the Solution

- By performing thoughtful **research** we were able to not only replace but drastically improve an essential product in the IP application portfolio.
 - It guaranteed the sustainability of the application by migrating to a relatively new platform that is part of the strategic direction moving forward.
 - It opened up access to the underlying code and should drastically broaden the supportability and understanding of the application.
 - It allowed for the modernization of how we interact with and consume the data, instead of just updating the back end with another black box.



Rick Smith

Internal IT Consultant

- International Paper
- Richard.SmithJr@ipaper.com




Charles Copeland


Internal IT Consultant

- International Paper
- Charles.Copeland@ipaper.com

This presentation may include predictions, estimates, intentions, beliefs and other statements that are or may be construed as being forward-looking. While these forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could result in actual outcomes differing materially from those projected in these statements. No statement contained herein constitutes a commitment by AVEVA to perform any particular action or to deliver any particular product or product features. Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect our opinions only as of the date of this presentation.

The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

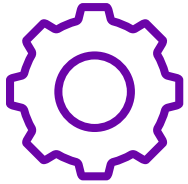
 [linkedin.com/company/aveva](https://www.linkedin.com/company/aveva)

 [@avevagroup](https://twitter.com/avevagroup)

ABOUT AVEVA

AVEVA, a global leader in industrial software, drives digital transformation for industrial organizations managing complex operational processes. Through Performance Intelligence, AVEVA connects the power of information and artificial intelligence (AI) with human insight, to enable faster and more precise decision making, helping industries to boost operational delivery and sustainability. Our cloud-enabled data platform, combined with software that spans design, engineering and operations, asset performance, monitoring and control solutions delivers proven business value and outcomes to over 20,000 customers worldwide, supported by the largest industrial software ecosystem, including 5,500 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 6,000 employees at 90 locations in more than 40 countries. For more details visit: www.aveva.com

Tracking Downtime and Slowbacks



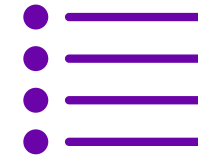
Challenge

- Enhance Reliability Tracking System (RTS) to Provide Improved Capability and Enterprise Reporting While Replacing Obsolete Technologies



Solution

- Deployed the latest AVEVA PI System technology including PI AF, PI Vision and PI Integrator for Business Analytics to Improve Reliability Tracking.



Benefits

- Enterprise Reporting Based Using PI Integrator Based on Distributed PI AF Templates
- Simplified Troubleshooting
- Team Deployment Model Instead of Single Person Support