

Creating a KPI Template for Brownstock Washers

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Special Thanks

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Agenda

- WestRock Company profile
- The Challenge
- Kraft and BSWashing process overview
- Project objectives
- Methodology
- Problems encountered
- Functional requirements defined
- AF structure configuration
- Visual display prototypes
- Conclusion

About WestRock

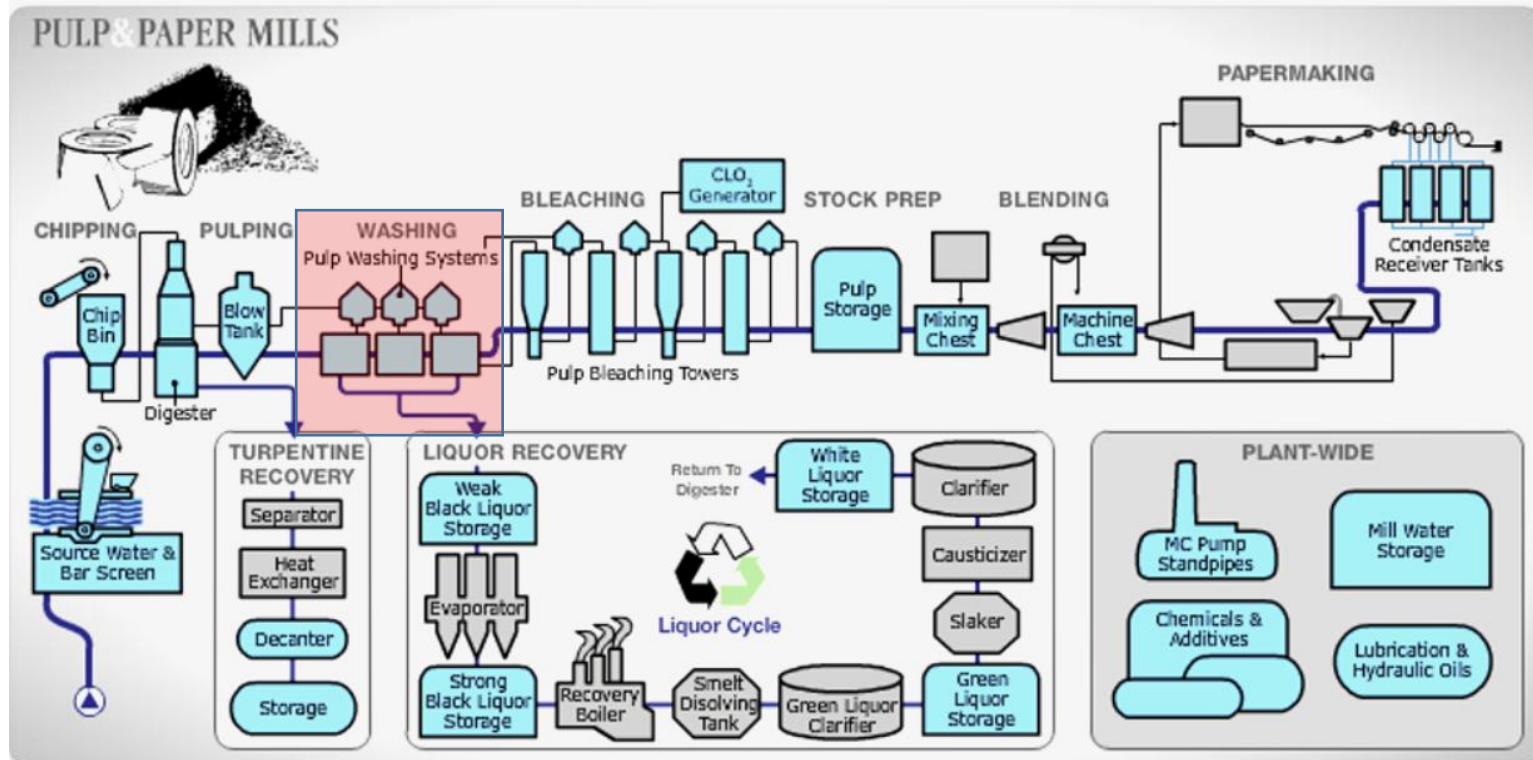


Challenge

The Primary Business Challenge is to standardize and deploy a way to display KPIs on critical equipment and processes across all of our mills, to all levels of our organization.

Brownstock Washing is the process where we chose to start.

The Kraft Pulping Process

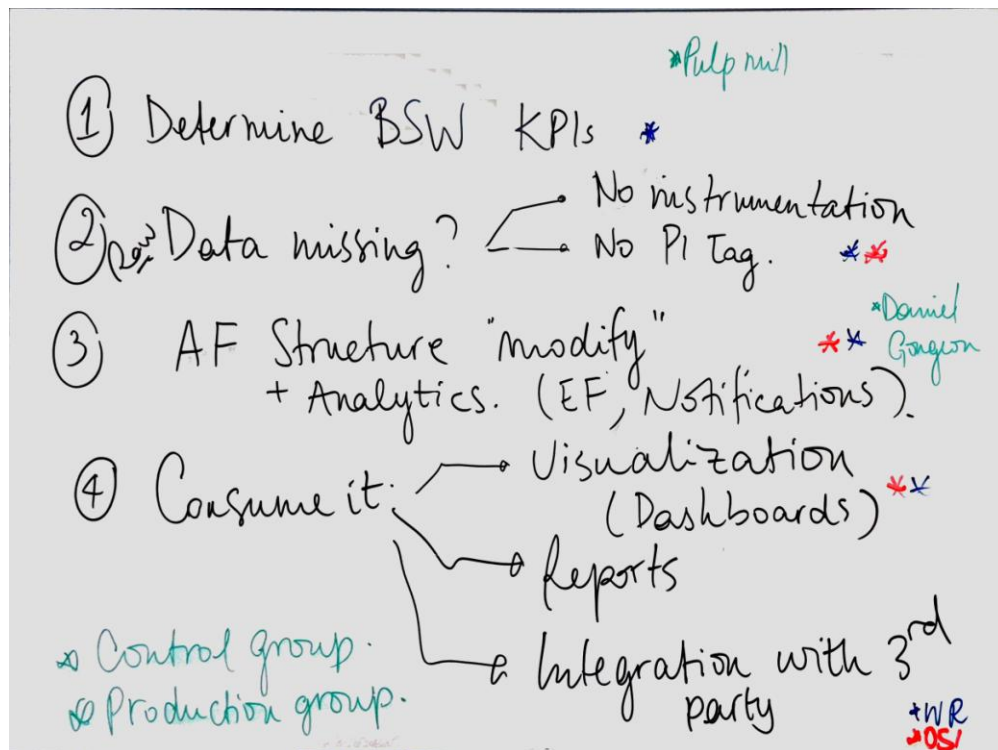


<http://wiringdiagramcircuit.co/wp-content/uploads/2018/02/great-process-flow->

Project Introduction and Objectives

- OSIssoft approached WestRock
 - Build a new process template
 - AF based
 - Track KPIs
- Additional Objectives
 - Define all potential users
 - Define dashboard hierarchy
 - Define specific KPIs for each level
 - Dashboard usable by all mills
- Joint team of OSIssoft and WestRock

Methodology



Production Input & KPI Levels

Level	KPI	Formula	Units	Data (Y/N)	PI Point (Y/N)
① WASHING	x1	• OEE • production (ton/shift, ton/h) • Yield (See #BLS)			
② LINE	x3	• %BLS • Dilution Factor (DF) • production ($\frac{\text{ton}}{\text{h}}$, $\frac{\text{ton}}{\text{shift}}$, $\frac{\text{blows}}{\text{shift}}$, $\frac{\text{total RPM}}{\text{shift}}$) • Kappa (HM&SN) • Shower flow/production (ton) (real-time, day) • #BLS/production (daily?)		• OEE	
③ STAGE	x9	• Re-pulping dilution flow (stage #3) • Exit conductivity, Drop Leg cond., Shower cond. (exclusive to stage #3) • Correlation Drop Leg T. vs Vacuum (exclusive to stage #1) • Correlation % valve op. vs production (all) • Shower flow (all) % TC water/shower flow (stage #3) • Shower temperature (stage #3)			

Correlation?
• drmm Amp.
• Vat level, PV & OP
• Vacuum (all)



Required Some “Heavy Lifting”

- “Devil in the details”
- Answer/address many questions
 - How will we calculate each KPI?
 - What PI Tags are needed to support the calculation?
 - Do these tags exist?
 - Where in the AF structure should these KPIs reside?
 - Can user’s find them easily?
 - How should non-process parameters be handled? e.g. lab tests

Problems Encountered

1. How will production rate be determined?
 - # cooks per shift/day * tons/cook
 - Flow * consistency: in-line measurements
 - Problem- recycle loops
 - Accuracy of field measurements- consistency
2. Over what time frame to integrate- update frequency
 - Minute/hourly/daily/monthly
 - Higher level= longer period
 - Lower level user= shorter period

Problems Encountered

3. Some KPIs inaccurate over short term
 - Those involving passing through tanks- level changes
 - Parameter only available once a day
 - Yield- only accurate over a month= (OD pulp/ OD wood)
4. Measurements do not exist
 - Refractometers needed
 - Measure % black liquor solids
 - Need dry mass flow number
 - Flow meter needed
 - Also needed for dry mass flow calculation

Design Document

REMOVED

Key Performance Indicators

KPI		KPI	
LEVEL 1(x1)	OEE	LEVEL 1 (x1)	OEE
	Production Rate (Basis unit) TPDi		Production Rate (Basis unit) TPDi
	Production For the Last shift		Production For the Last shift
	Stock Flow (Volumetric)		Stock Flow (Volumetric)
LEVEL 2(x3)	Yield	LEVEL 1 (x1)	Yield
	Comparison between Boumé % BLS vs % BLS		
	Boumé % BLS		
	% BLS		
	Dilution Factor		
	Wash Ratio		
	Mat Liquor Mass (LD)		
	Shower Water Mass (L _{sh})		
	Production per Shift		

Color Code

Data missing or definition unclear for KPI

No instrumentation/No Data/No PI Tag

PI Tag exists for variable

Key Performance Indicators

KPI	
LEVEL 1(x1)	OEE
	Production Rate (Basis unit) TPDi
	Production For the Last shift
	Stock Flow (Volumetric)
LEVEL 2 (x3)	Yield
	Comparison between Baumé % BLS vs % BLS
	Baumé % BLS
	% BLS
	Dilution Factor
	Wash Ratio
	Mat Liquor Mass (LD)
	Shower Water Mass (L_W)
	Production per Shift

LEVEL 2 (x3)	Comparison between Baumé % BLS vs % BLS
	Baumé % BLS
	% BLS
	Dilution Factor
	Wash Ratio
	Mat Liquor Mass (LD)
	Shower Water Mass (L_W)
	Production per Shift

Color Code

Data missing or definition unclear for KPI

No instrumentation/No Data/No PI Tag

PI Tag exists for variable

Units & Required Inputs

UNITS	REQUIRED INPUTS
%	TBD
tons/day (Instantaneous)	Stock flow (Volumetric) Stock Consistency (15KICA12.PV)
tons/shift	TPDi
GPM	Stock Flow to Refiner (15OF1605.PV) Screen Reject Flows: Screen 1 (15FIC214.PV), Screen 2 (15FIC211.PV), Screen 3 (15FIC651.PV)
%	TBD
	Baumé % BLS (PNFLBAM3.PV) %BLS (15AI801.PV)
%	Baumé % BLS (PNFLBAM3.PV)
%	%BLS (15AI801.PV)
#of liquor/#of OD pulp	Liquor in discharge Liquor in Shower water
#of liquor/#of OD pulp	Mat Consistency (PI Tag need to be created)
#of liquor/#of OD pulp	3rd Stage Shower Flow (15FIC258.PV)

Color Code

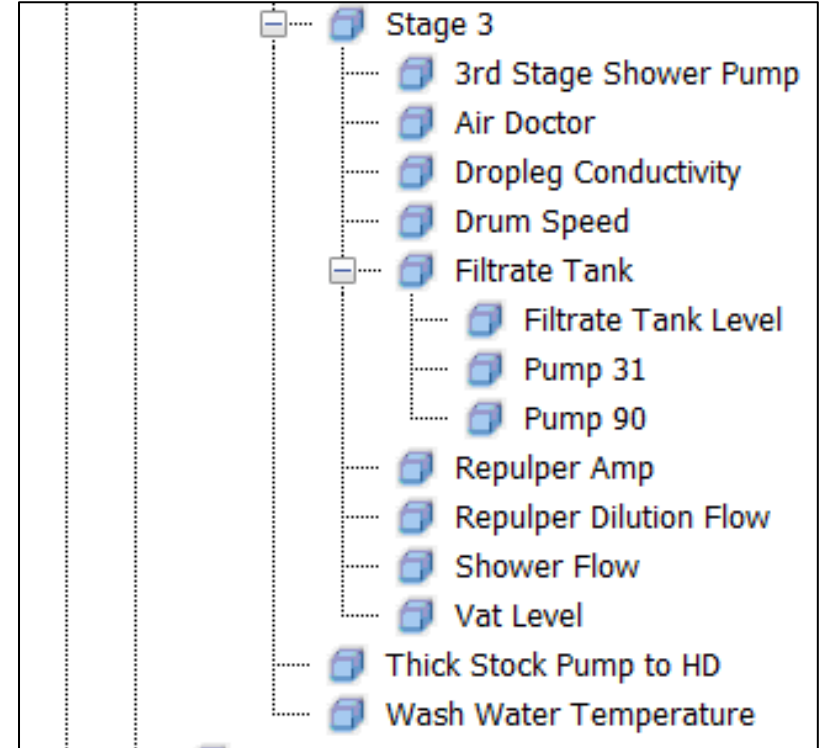
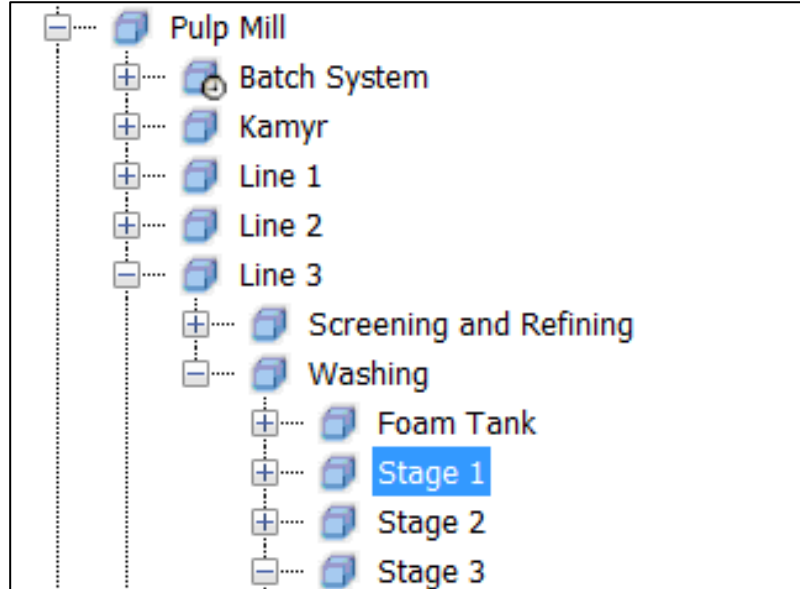
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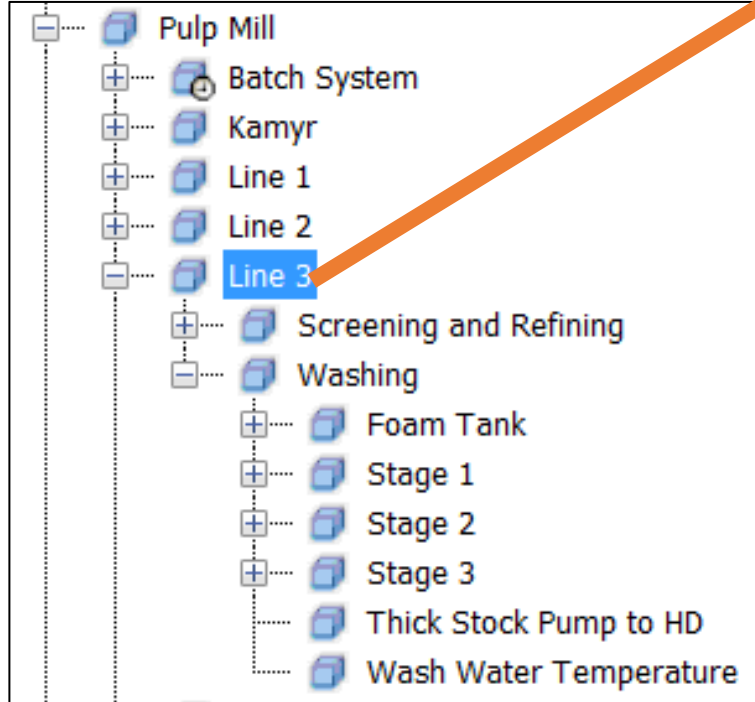
PI Tag exists for variable

Formulas & Update Frequency

AF Database Hierarchy



AF Attributes



Category: Control Monitor		
	Time on Control	75.04385 %
Category: KPI		
	Dilution Factor	7.5385766
	Repulper Dilution Flow to...	14.655229
	Shower Flow to Product...	16.5385761
	Wash Ratio	1.83761966
Category: Lab Values		
	Baume	7 %
	Kappa	58.7
	Mat Consistency	10 %
Category: Process Values		
	Filtrate BLS	Bad
	Recirc To Blow Tk	CLOSE
	Stock Consistency	4.599392 %
Category: Production Summary		
	Blow Tk Flow to Line 3 R...	49.62057 %
	Line 3 Volumetric Stock ...	2572.787 US gal/min
	Net Volumetric Stock Flow	Calc Failed
	Total Shift Production	134.5537 ton
	TPH Production Rate	6.822614 t/hr

New
KPIs

AF Attribute Analysis

Line 3

General Child Elements Attributes Ports Analyses Notification Rules

Filter

Name	Value
Category: Control Monitor	
Time on Control	75.4385 %
Category: KPI	
Dilution Factor	7.5385766
Repulper Dilution Flow to...	14.6552229
Shower Flow to Production	16.5385761
Wash Ratio	1.83761966
Category: Lab Values	

Line 3

General Child Elements Attributes Ports Analyses Notification Rules Version

Name	Backfilling
Dilution Factor	✓
Pulpmill Wash Line Volumetric Stock Flow	✓
Repulper Dilution To TPD	✓
Time on Control	✓

Evaluate

Name	Exp	Value at Evaluation	Value at Last Trigger	Output Attribute
MatLiquorMass		9	9	Map
ShowerWaterMass	(T	14.332	14.458	Shower Flow to P
DilutionFactor	Sh	5.3322	5.4583	Dilution Factor
WashRatio	Sh	1.5925	1.6065	Wash Ratio

AF Attribute Analysis Expression



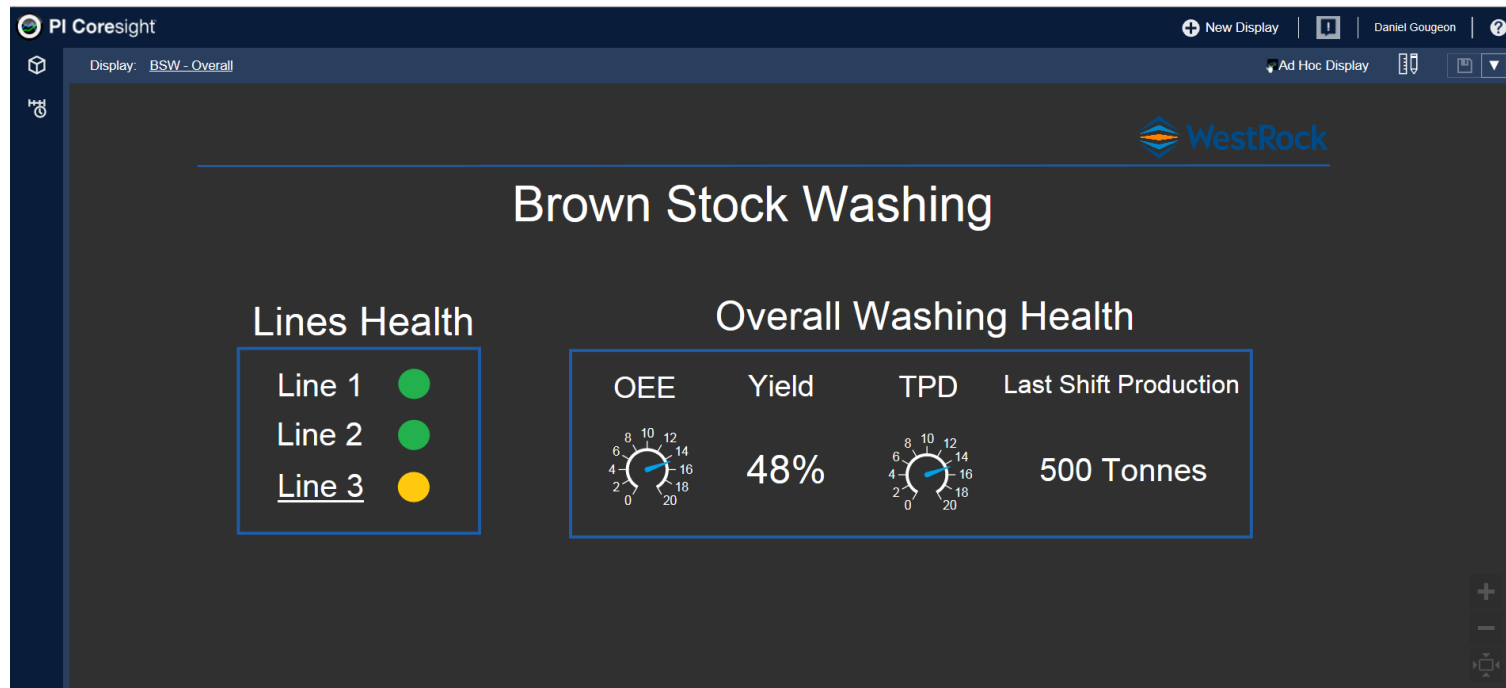
Name	Expression	V _i	V _e	O
MatLiquorMass	(100-'Mat Consistency')/'Mat Consisten	9	9	M
ShowerWaterMass	(TagAvg('.\Washing\Stage 3\Shower Flow	14	14	Sh
DilutionFactor	ShowerWaterMass-MatLiquorMass	5.3	5.4	Di
WashRatio	ShowerWaterMass/MatLiquorMass	1.5	1.6	W

AF Attribute Expression Formula

Name	Expression
MatLiquorMass	(100- 'Mat Consistency')/'Mat Consistency'
ShowerWaterMass	(TagAvg('.\Washing\Stage 3\Shower Flow Process Value', '*-1m', '*')*8.34*60)/(TagAvg('TPH Production Rate', '*-1m', '*')*2000)
DilutionFactor	ShowerWaterMass-MatLiquorMass

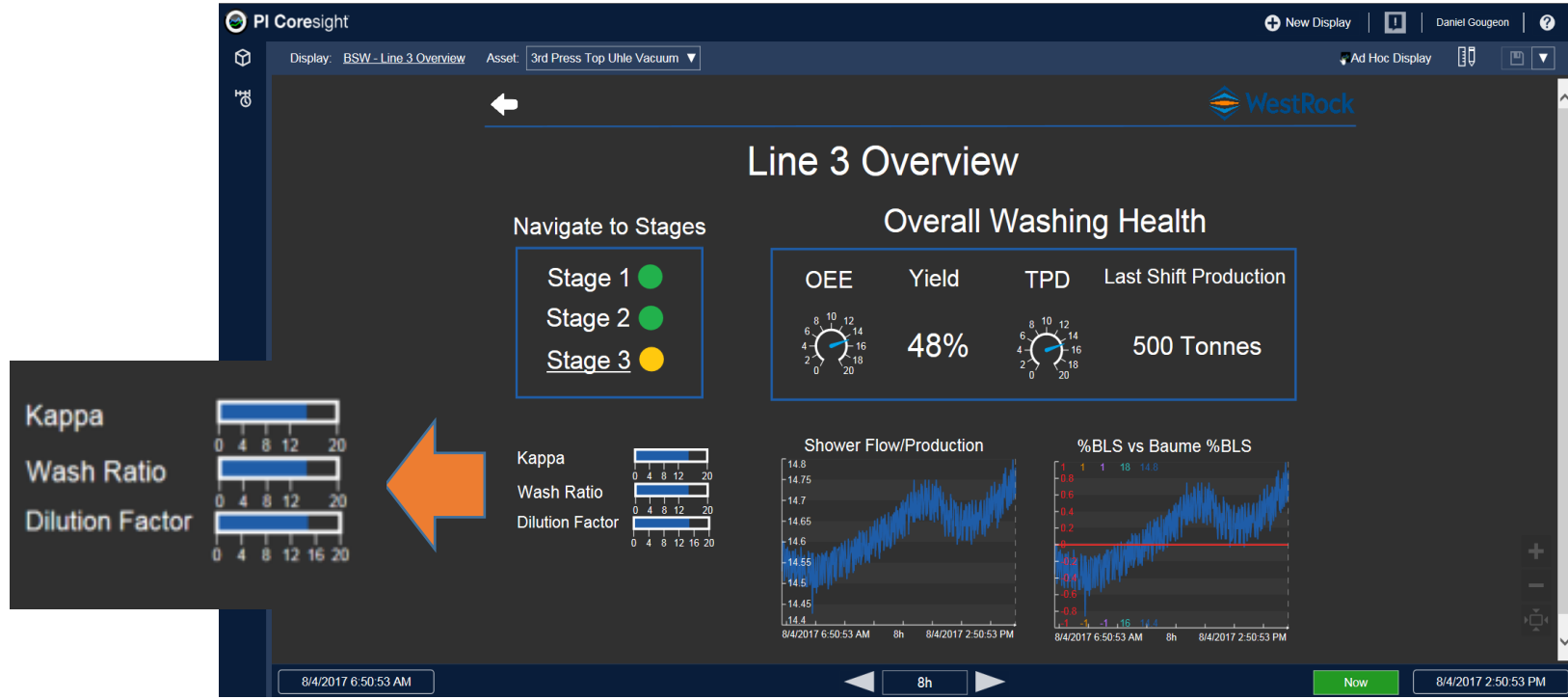
Click anywhere in the Expression Box to display the full FORMULA.

Level 1 Dashboard Prototype



GM

Level 2 Dashboard Prototype

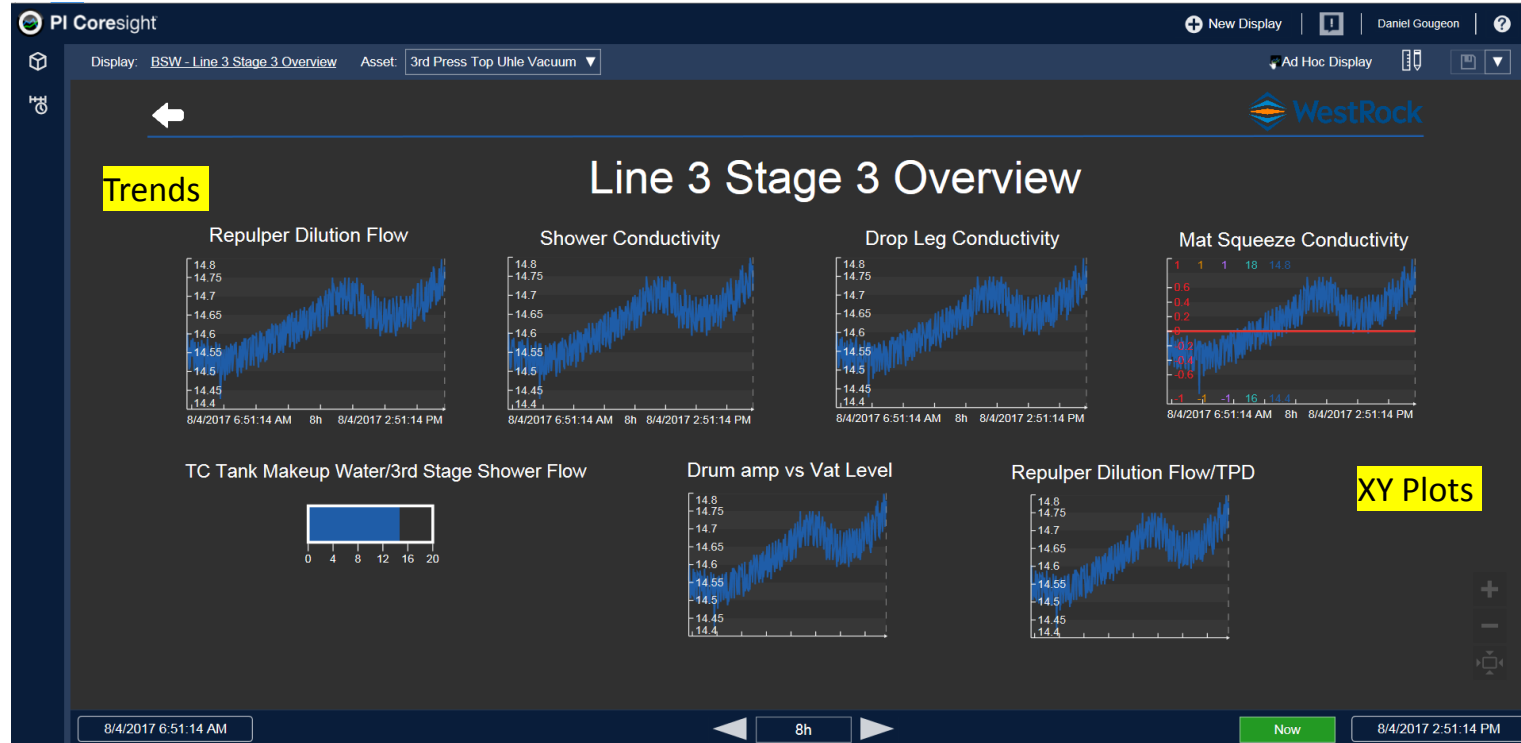


**Pulp Mill
Supt**



**Process
Engineer**

Level 3 Dashboard Prototype



Operators

Next Steps

- Finalize Dashboard
- Roll out to other mills
 - Complete AF databases
 - Identify missing measurements and PI Tags
 - Adapt to any mill specific process nuances

Brown Stock Washing KPIs



Standardize the way to look at KPIs from the Brownstock Washers (BSW) and deploy it through out our mills.



CHALLENGE

Each BSW is different, has different data available, and the KPIs presented are calculated manually or not at all

- The BSW process is generally known and understood. We need a way to make its KPI more consumable by the process engineers and operators.

SOLUTION

With the use of AF we were able to create a template that can be deployed to other mills, and can be visualized using PI Vision.

- In collaboration with the EA team we worked on a template and dashboards to show the most important KPIs for the BSW

RESULTS

- Standardization of best practices
- Sharing of knowledge and expertise through WestRock
- Able to benchmark operations against: design, other like-kind BSW systems across the company (~30), best in class.
- New control variables identified
- Will be able to optimize the performance through these new KPIs.

Credits and Acknowledgements

- OSIsoft
 - Laurie Dieffenbach: making this happen
 - Leila Chaouki-Juneau: Team Captain, Logistical Expeditor, Coordinator
 - Brian Palmer: Provided technical expertise and guidance
 - Mariana Sandin: Industry Principal – Forest and Paper Products
- WestRock
 - Daniel Gougeon: PI System specialist
 - Tiffany Smith: WestPoint Process Engineer

WestRock Friends

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Questions

Please wait for the **microphone** before asking your questions

State your **name & company**



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Merci

谢谢

Спасибо

Danke

Gracias

Thank You

감사합니다

ありがとう

Grazie

Obrigado