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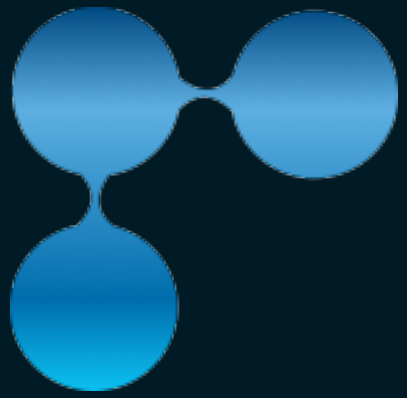
METALS & MATERIALS

Seeq

Zach Baer,
Manufacturing Data Analyst

International Paper

conneqt
FONTAINEBLEAU, LAS VEGAS MAY 13-15, 2025



Recovery Boiler Asset Group Usage

Zach Baer

International Paper

Agenda

- Company Overview
- Process Overview
- Reduction Efficiency Analysis
- Strain Gauge Fouling Rate
- Boiler Steam Efficiency Tag
- Asset Groups

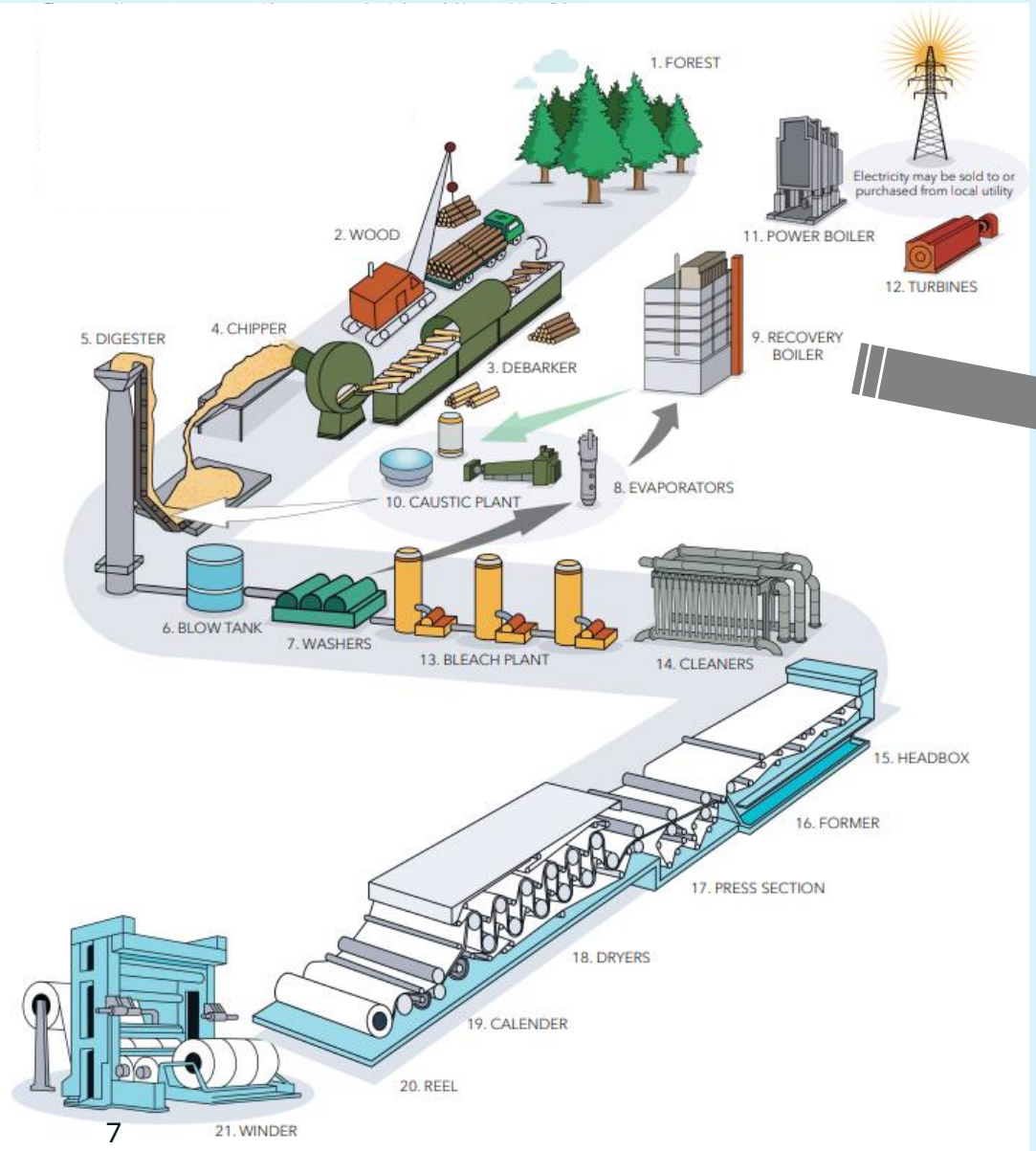
International Paper

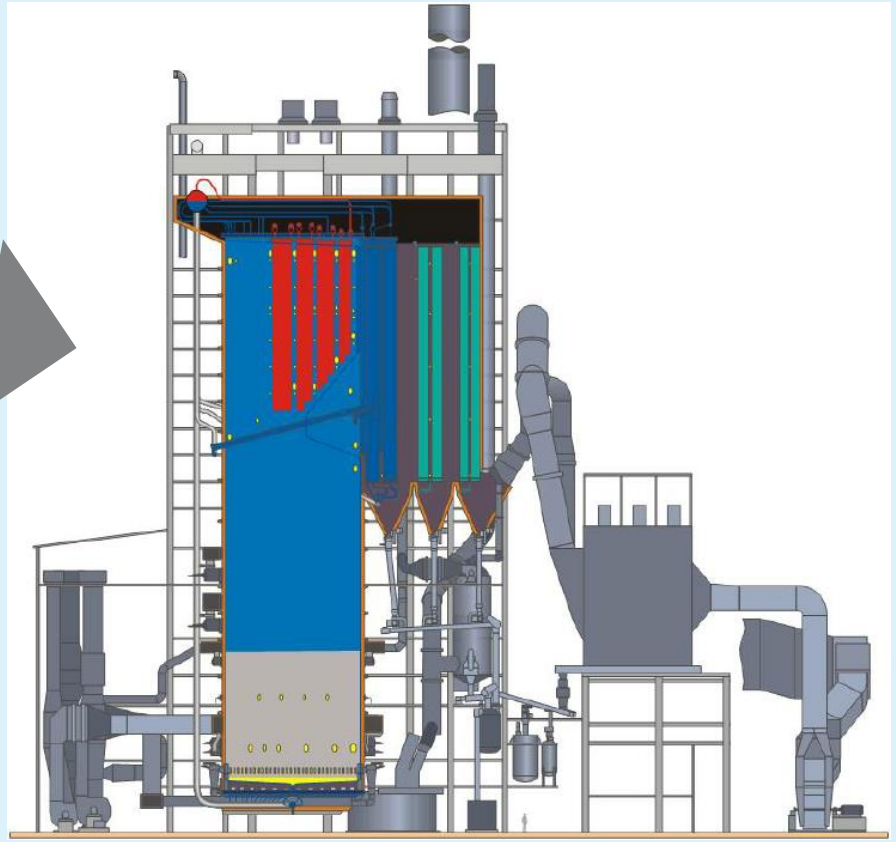
For more than 125 years, International Paper has been a catalyst in the global economy. We make essential products people depend on every day — from sustainable packaging to absorbent pulp for personal care and other products.

Building on our strong foundation, we're here for what's now and we're **creating what's next.**

Source: International Paper – Corporate Communications

Process Overview



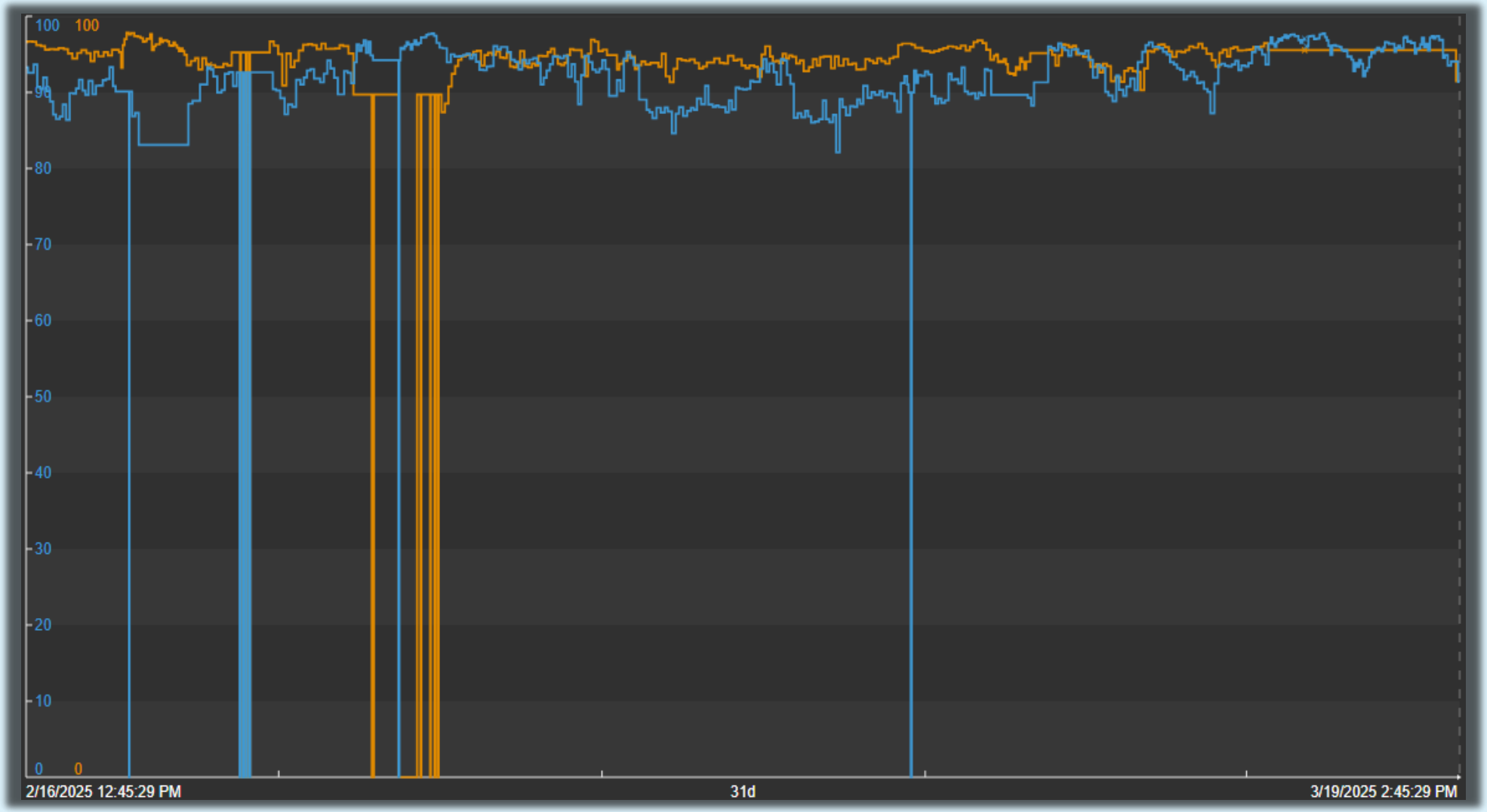


Reduction Efficiency Analysis

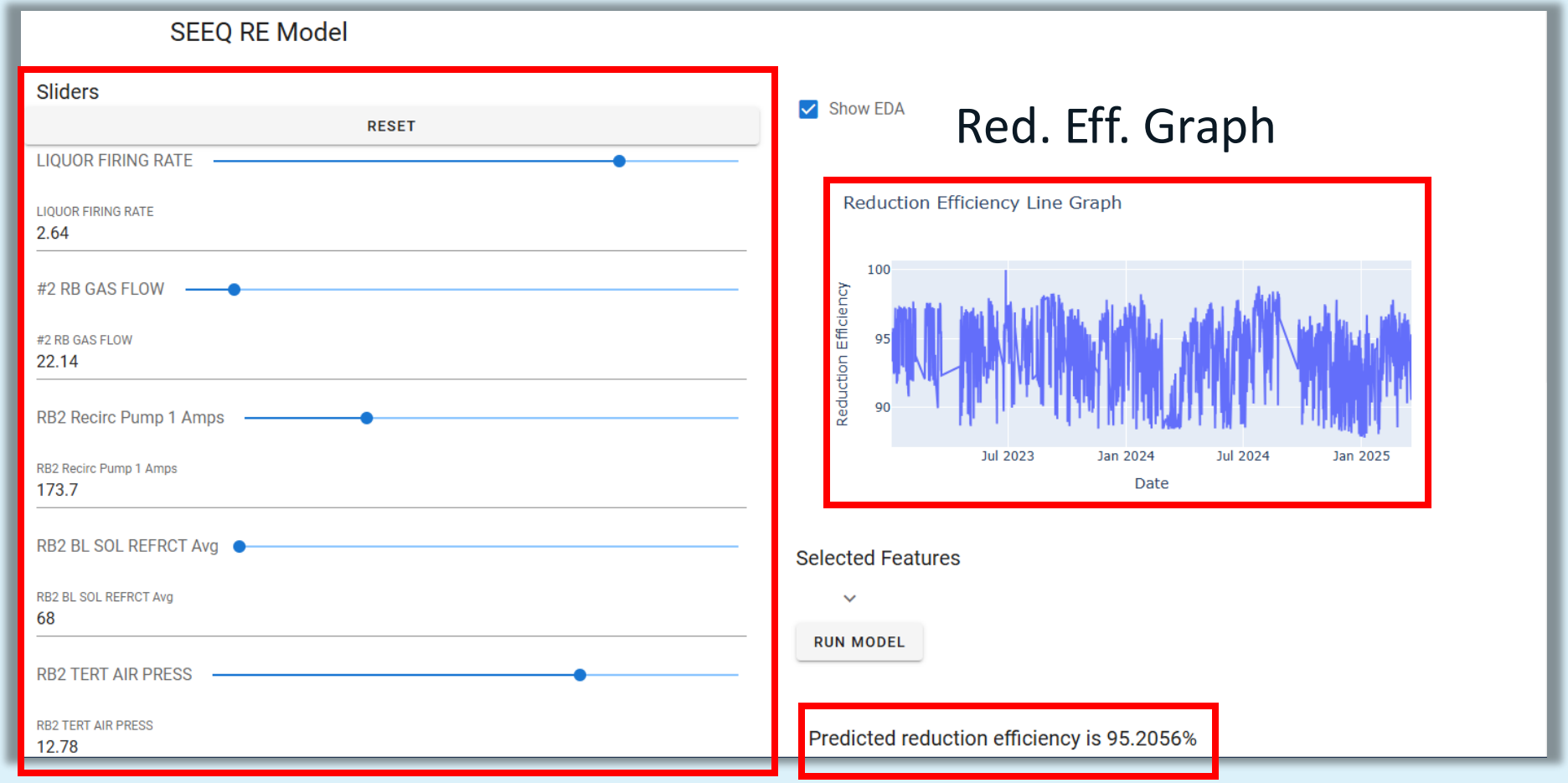
Current View

Old method: Samples 1x per week

New method: Samples every 2 hours



Visualization



Model Variables

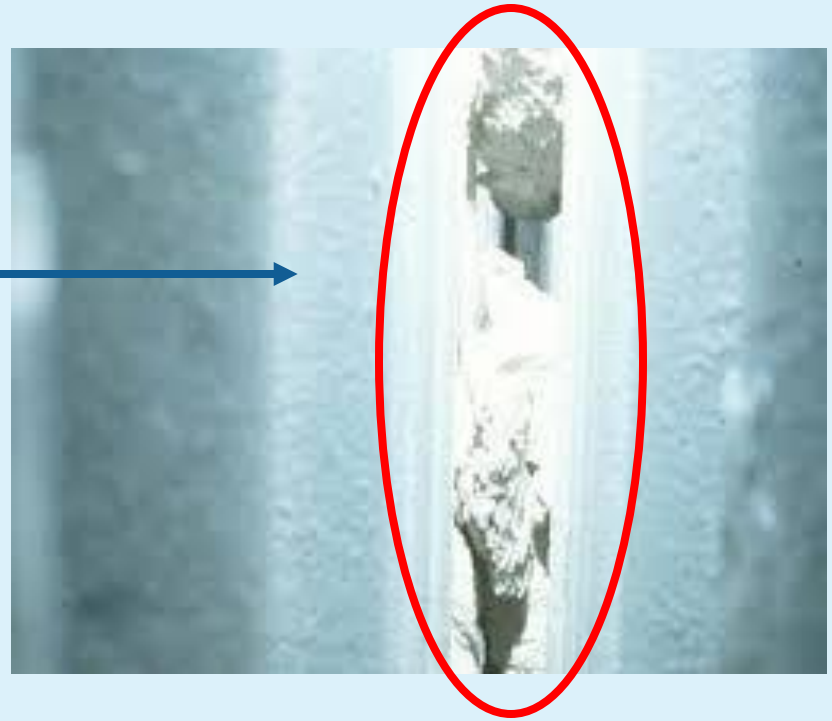
Predicted Reduction Efficiency

- Tool built using Seeq Data Lab
- Used PI Vision Werusys Embedder to display add-on
- Users able to see how changes impact Reduction Efficiency

Strain Gauge Fouling Rate

Background

- Would only watch Superheater zone weight
- Did not compare current to previous operations
- No “assessment” of chill & blow cleanings
- Made judgement (gut-feeling) calls for cleanings



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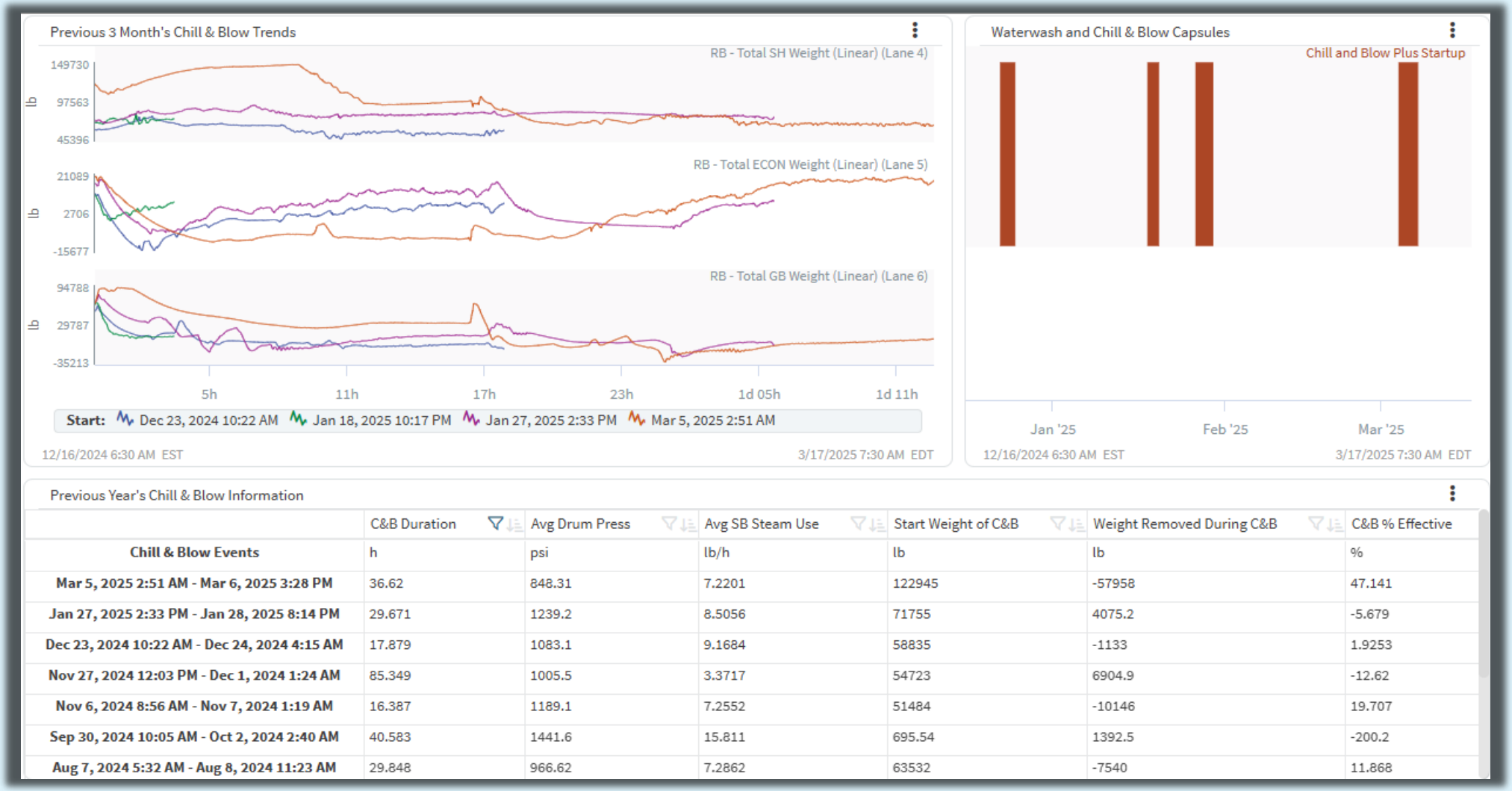


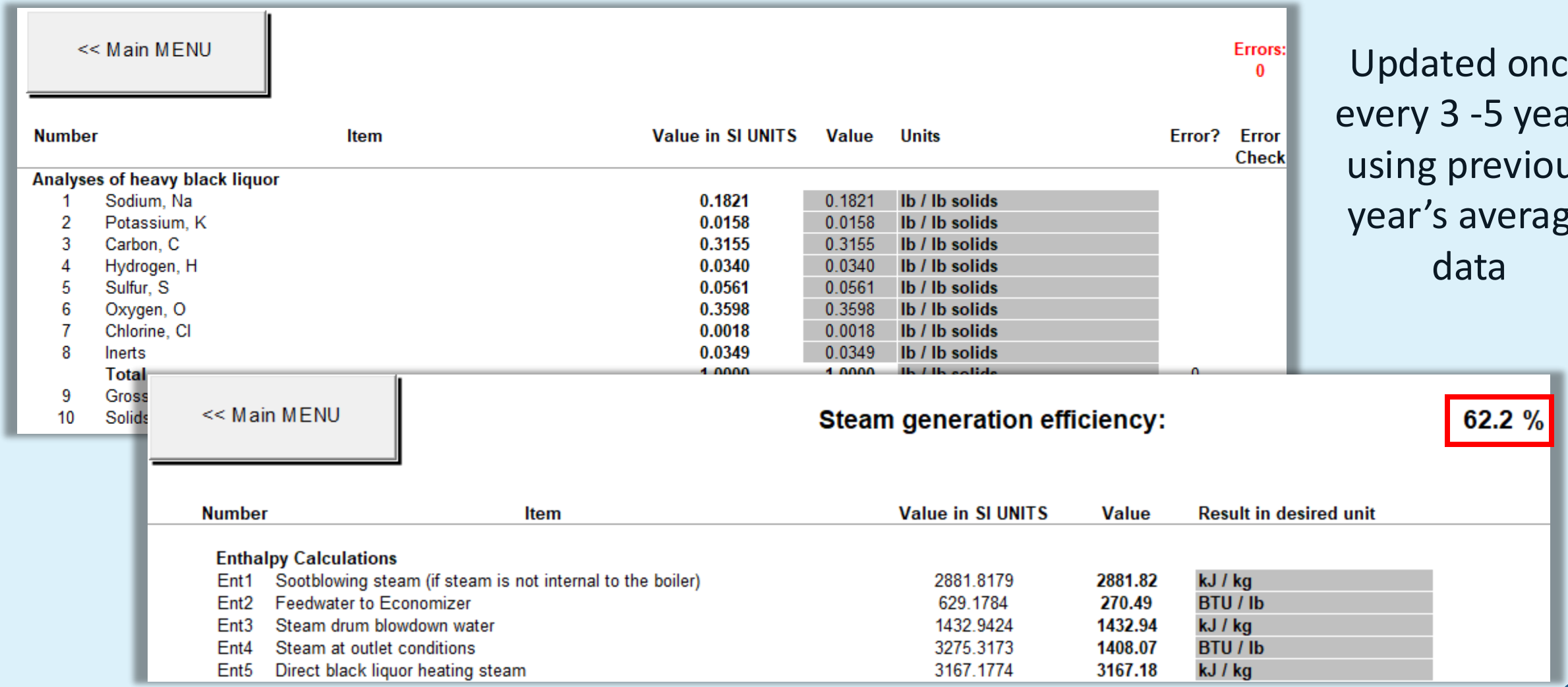
Previous Year's Chill & Blow Information

Chill & Blow Events	C&B Duration	Avg Drum Press	Avg SB Steam Use	Start Weight of C&B	Weight Removed During C&B	C&B % Effective
	h	psi	lb/h	lb	lb	%
Mar 5, 2025 2:51 AM - Mar 6, 2025 3:28 PM	36.62	848.31	7.2201	122945	-57958	47.141
Jan 27, 2025 2:33 PM - Jan 28, 2025 8:14 PM	29.671	1239.2	8.5056	71755	4075.2	-5.679
Dec 23, 2024 10:22 AM - Dec 24, 2024 4:15 AM	17.879	1083.1	9.1684	58835	-1133	1.9253
Nov 27, 2024 12:03 PM - Dec 1, 2024 1:24 AM	85.349	1005.5	3.3717	54723	6904.9	-12.62
Nov 6, 2024 8:56 AM - Nov 7, 2024 1:19 AM	16.387	1189.1	7.2552	51484	-10146	19.707
Sep 30, 2024 10:05 AM - Oct 2, 2024 2:40 AM	40.583	1441.6	15.811	695.54	1392.5	-200.2
Aug 7, 2024 5:32 AM - Aug 8, 2024 11:23 AM	29.848	966.62	7.2862	63532	-7540	11.868

- Built tool in Seeq Workbench
- Using Seeq Organizer to display to mill
- Allows mill to see quick comparisons of current operations vs previous

Boiler Steam Efficiency Tag

Background



<< Main MENU

Errors: 0

Number	Item	Value in SI UNITS	Value	Units	Error?	Error Check
Analyses of heavy black liquor						
1	Sodium, Na	0.1821	0.1821	lb / lb solids		
2	Potassium, K	0.0158	0.0158	lb / lb solids		
3	Carbon, C	0.3155	0.3155	lb / lb solids		
4	Hydrogen, H	0.0340	0.0340	lb / lb solids		
5	Sulfur, S	0.0561	0.0561	lb / lb solids		
6	Oxygen, O	0.3598	0.3598	lb / lb solids		
7	Chlorine, Cl	0.0018	0.0018	lb / lb solids		
8	Inerts	0.0349	0.0349	lb / lb solids		
	Total				0	
9	Gross					
10	Solids					

<< Main MENU

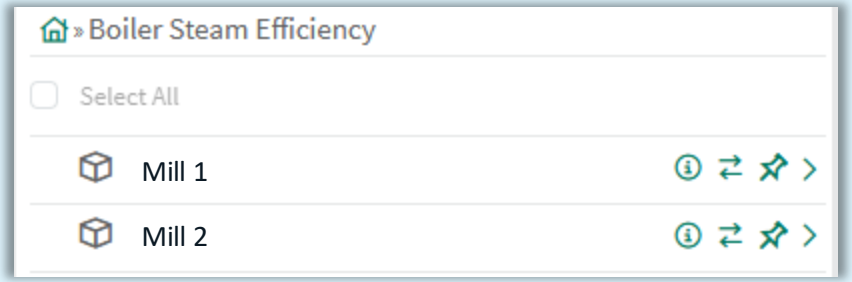
Steam generation efficiency: **62.2 %**

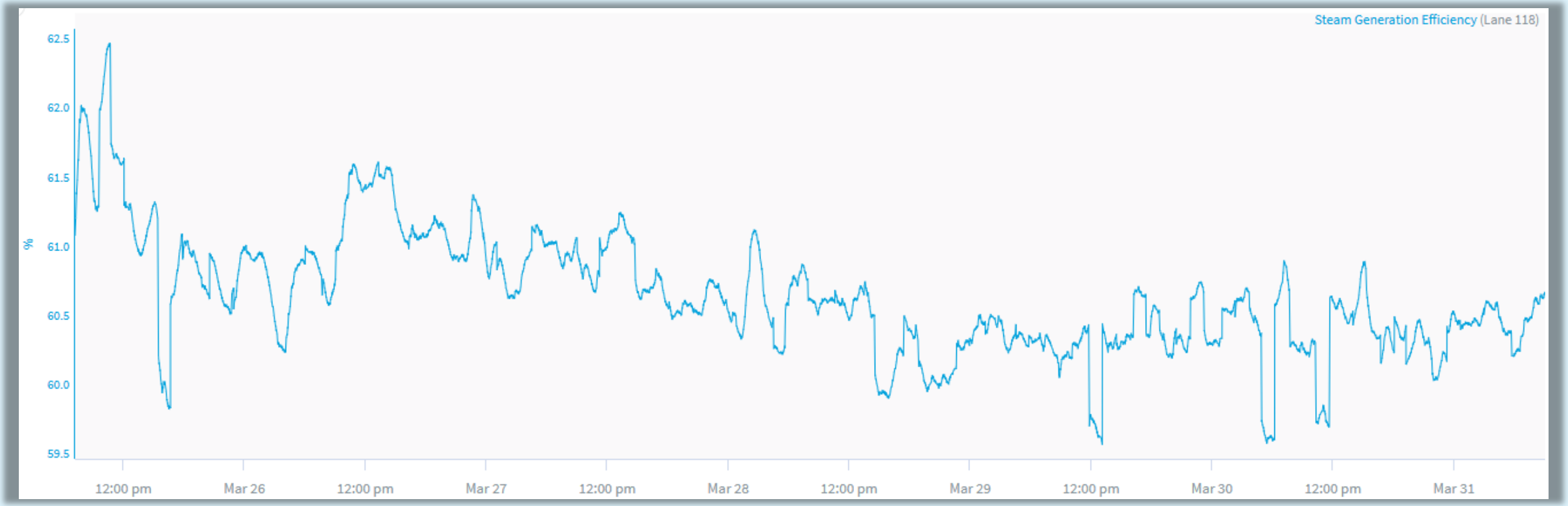
Number	Item	Value in SI UNITS	Value	Result in desired unit
Enthalpy Calculations				
Ent1	Sootblowing steam (if steam is not internal to the boiler)	2881.8179	**2881.82**	kJ / kg
Ent2	Feedwater to Economizer	629.1784	**270.49**	BTU / lb
Ent3	Steam drum blowdown water	1432.9424	**1432.94**	kJ / kg
Ent4	Steam at outlet conditions	3275.3173	**1408.07**	BTU / lb
Ent5	Direct black liquor heating steam	3167.1774	**3167.18**	kJ / kg

Updated once every 3 -5 years using previous year's average data

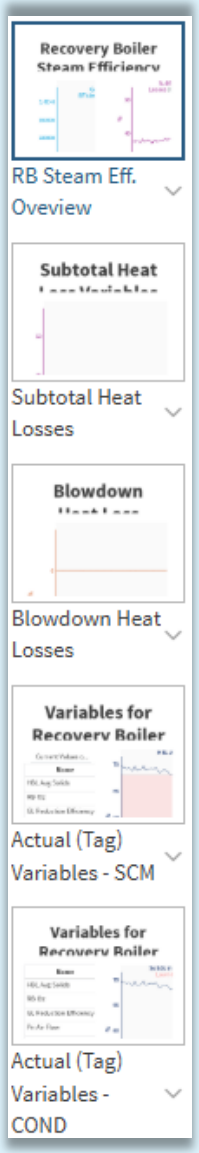
Boiler Steam Efficiency Tag

[Recovery Boiler Steam Efficiency Seeq Workbench]





Visualization



Asset Groups

Asset Group Creation

Variables

Assets	Air Temp to...r Flow	Air Temp to...r Temp	Air Temp to...r Flow	Air Temp to...r Temp	Air Temp to...r Flow	Ash Recycle	CO in Flue ... vol.)
Mill 1	✓	✓	✓	✓	✓	ƒx	ƒx
Mill 2	✓	✓	✓	✓	✓	ƒx	ƒx

Stay the same

Name	Asset
GL Reduction Efficiency	Mill 1
Smelt Reduction Efficiency	Mill 1
O2 in Flue Gas (% wet vol.) A	Mill 1
O2 in Flue Gas (% wet vol.) B	Mill 1
Avg RB O2 %	Mill 1
CO in Flue Gas (ppm wet vol.)	Mill 1
SO2 in Flue Gas (ppm wet vol.)	Mill 1
Air Temp to Furnace (weighted avg mass flow) Pri Air Flow	Mill 1
Air Temp to Furnace (weighted avg mass flow) Pri Air Temp	Mill 1
Air Temp to Furnace (weighted avg mass flow) Sec Air Flow	Mill 1

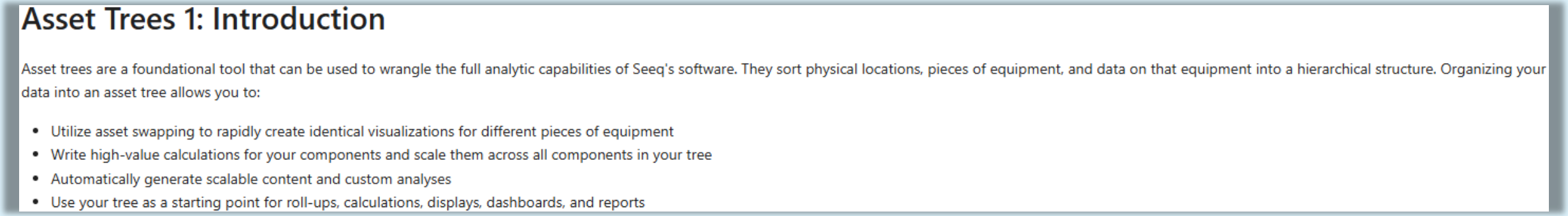
Changes mills

Benefits

- Troubleshooting Help
- Better insights during trials
- Improve Recovery Boiler Operations
  - Reduce Natural Gas & Salt Cake usage
  - Understand & Control Fouling Rate better
  - Increase Boiler Steam Efficiency
  - Higher Steam Flow, Pressure, & Temperature
- Turbine Performance Improvements
- Lower Maintenance and Downtime

Learnings

- Importance of Asset Groups
  - Only have to develop equations once
  - Include tags, calculations, and conditions
- Able to customize calculations & conditions for each asset
- Friendly Names have to match to be able to swap
- Workbench vs Data Lab creation
- Useful in Organizer



Asset Trees 1: Introduction

Asset trees are a foundational tool that can be used to wrangle the full analytic capabilities of Seeq's software. They sort physical locations, pieces of equipment, and data on that equipment into a hierarchical structure. Organizing your data into an asset tree allows you to:

- Utilize asset swapping to rapidly create identical visualizations for different pieces of equipment
- Write high-value calculations for your components and scale them across all components in your tree
- Automatically generate scalable content and custom analyses
- Use your tree as a starting point for roll-ups, calculations, displays, dashboards, and reports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QUESTIONS?

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THANK YOU!