

connect

ORLANDO JUNE 1-3, 2026



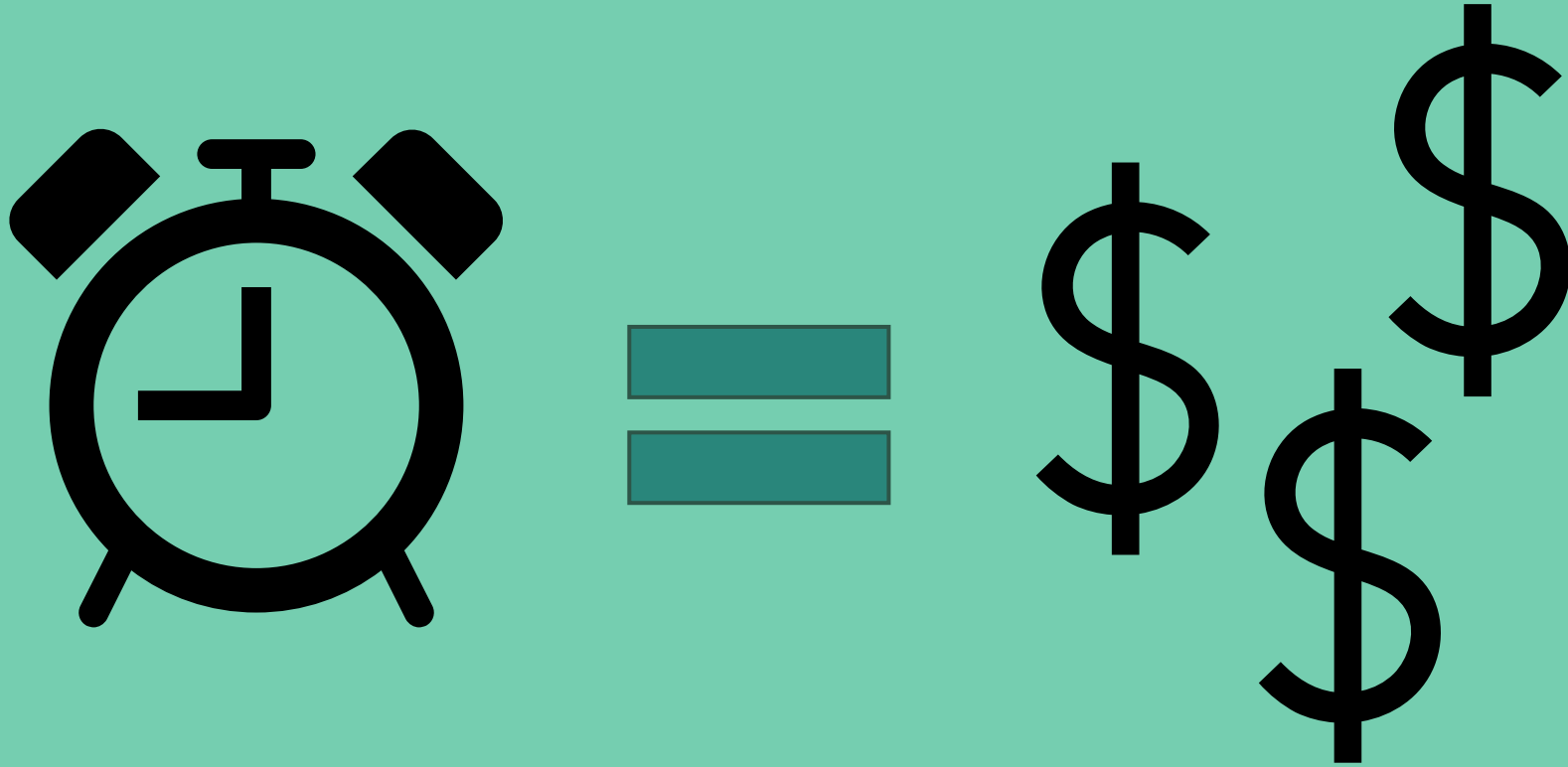
From Idle Time to Output: Cycle Time Analytics for Batch Reactors

Rebecca Hedges

Ecolab



Why are we here?



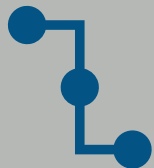
TIME IS MONEY

Session Overview



Challenge

Variable Cycle Times = Ineffective Planning, Efficiency Loss, & Defects



Solution

Quantify Cycle Time Losses & Standardize to Golden Batch



Results

Improve Efficiency to Enable Volume

Additional Quality and Planning Benefits

Rebecca Hedges

Quality Engineer



Chicago

Nashville

Houston

Education

**Chemical
Engineering
B.E.**

**Vanderbilt
University**

Career

**Production
Engineering
Intern**

2023

**Quality
Engineer**

2024 - Present

Hobbies

Figure Skating

Travel

Baking

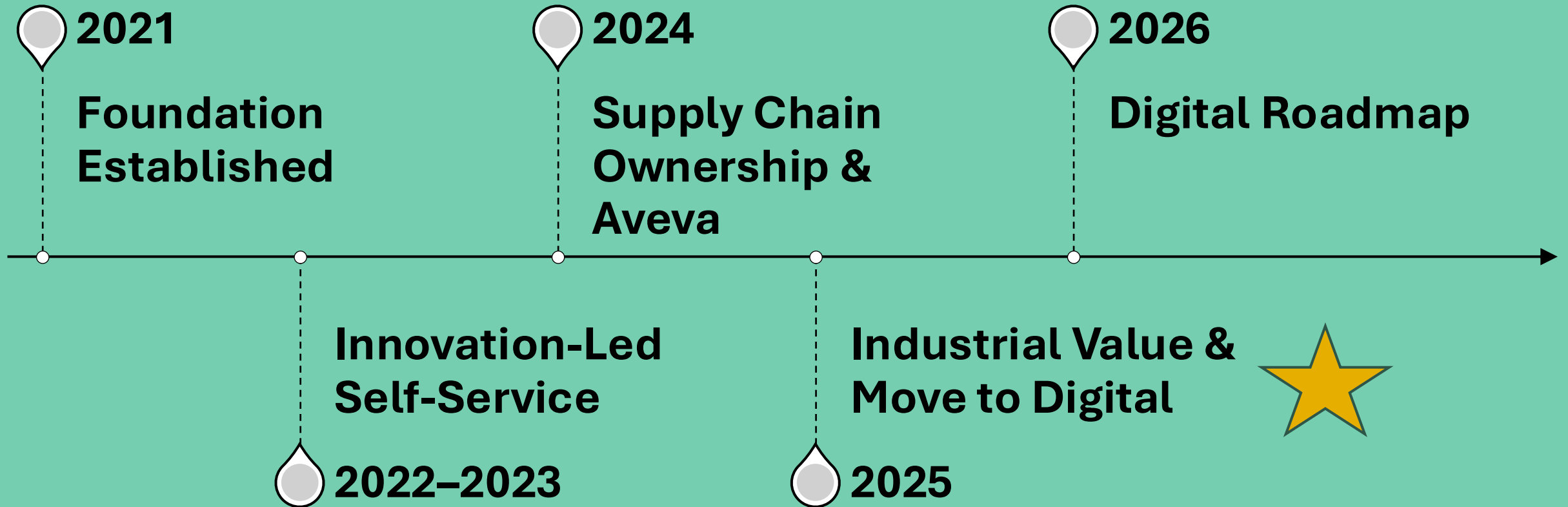
Reading

Survivor



connect

Partnership Timeline



Fresno Plant History

1976

Champion
Chemicals

1990-2013

Champion
Technologies

2013

Nalco
Champion

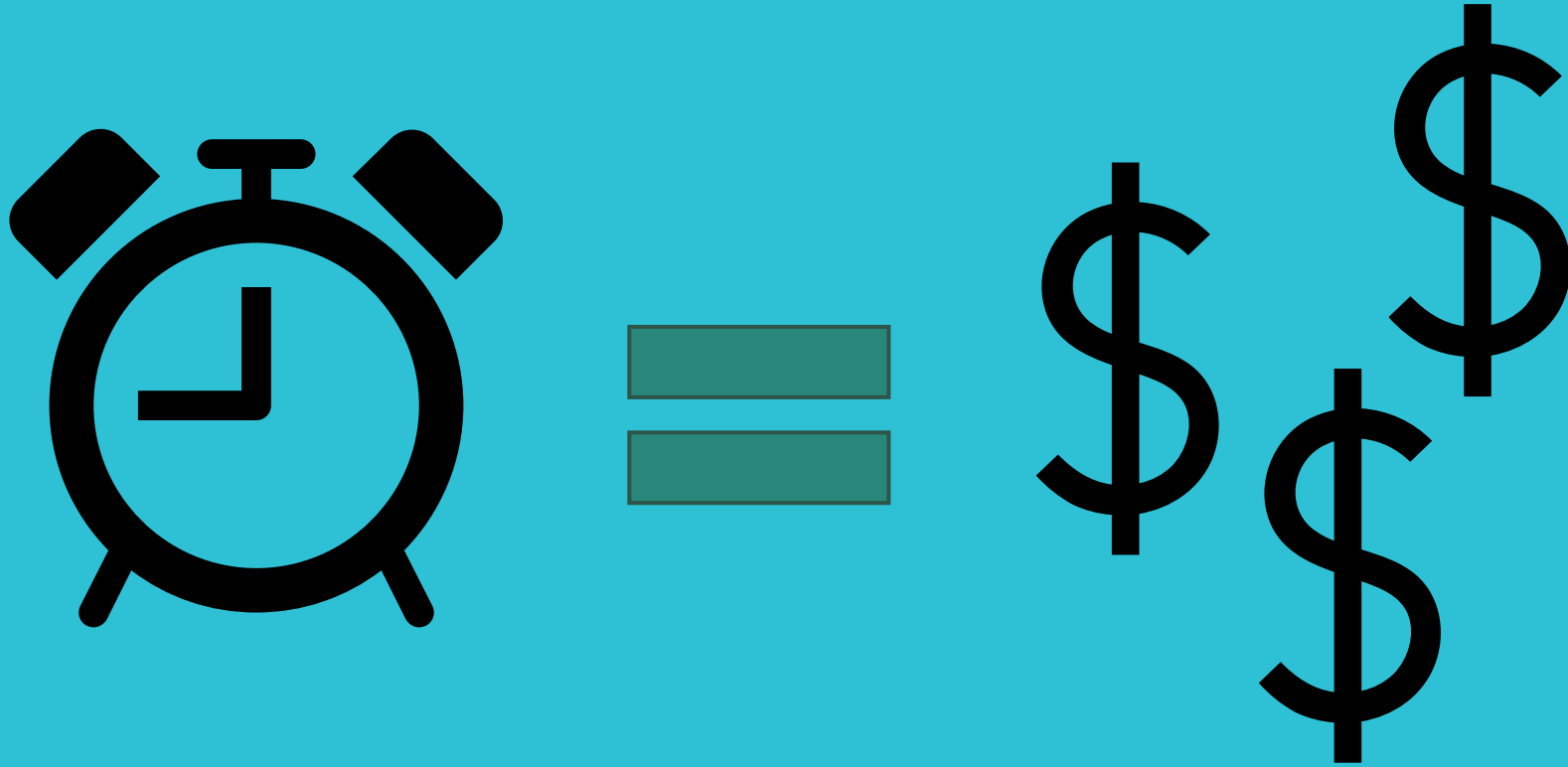
2020-2026

Nalco Water

200+ new products
introduced
\$30MM in capital
investment

5 - 20 hr batch times to **13 - 36** hr
Minimum cleaning to **extensive**
rinse requirements

Why are we here?



TIME IS MONEY

Overall Process Efficiency (OPE)

$$OPE = \frac{\text{Value Added Time}}{\text{Available Production Time}} * 100\%$$

Key Assumption

All processing time is “Value Added”

Monday	Tuesday	Wednesday
100 %	100 %	92 %

Thursday	Friday	Saturday	Sunday
100 %	85 %	100 %	100 %

So, what's missing?

Cycle Time Adherence



Seeq Strategy

Step 1

Quantify Cycle
Time Losses



Step 2

Identify
Improvement
Opportunities



Step 3

Implement
Solutions and
Quantify Results

Step 1

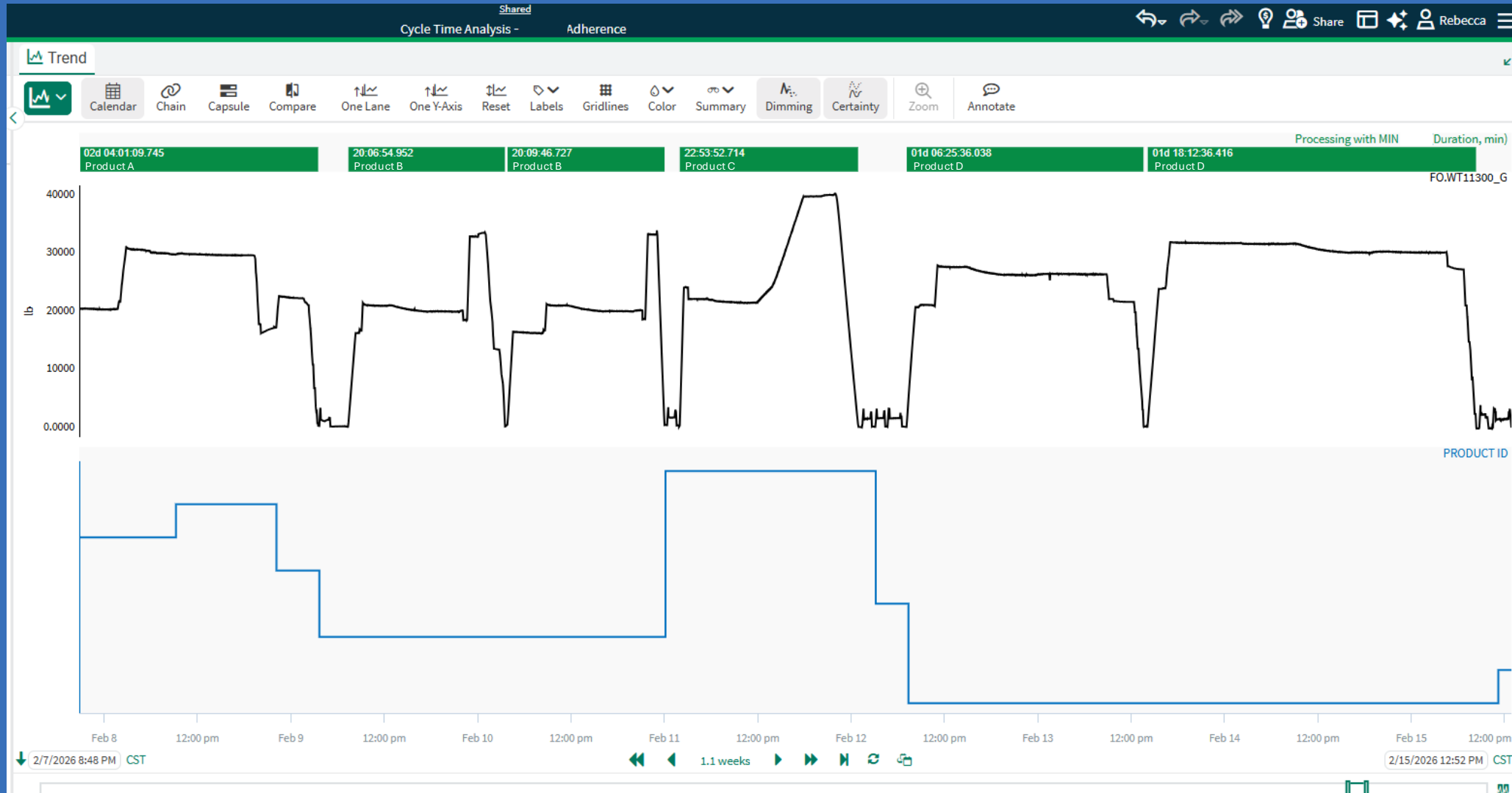
Quantify Cycle Time Losses

Step 2

Identify Improvement Opportunities

Step 3

Implement Solutions and Quantify Results



Step 1

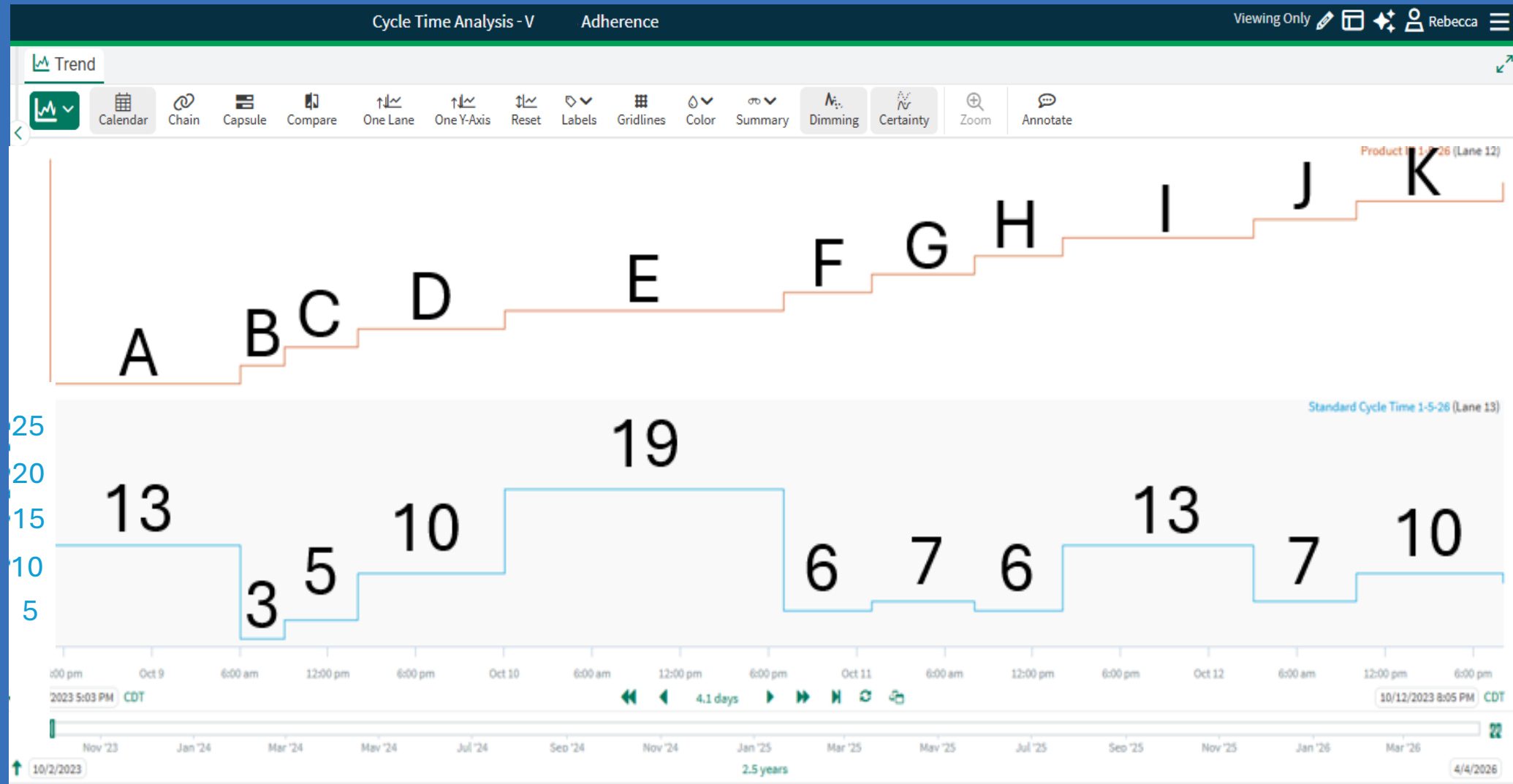
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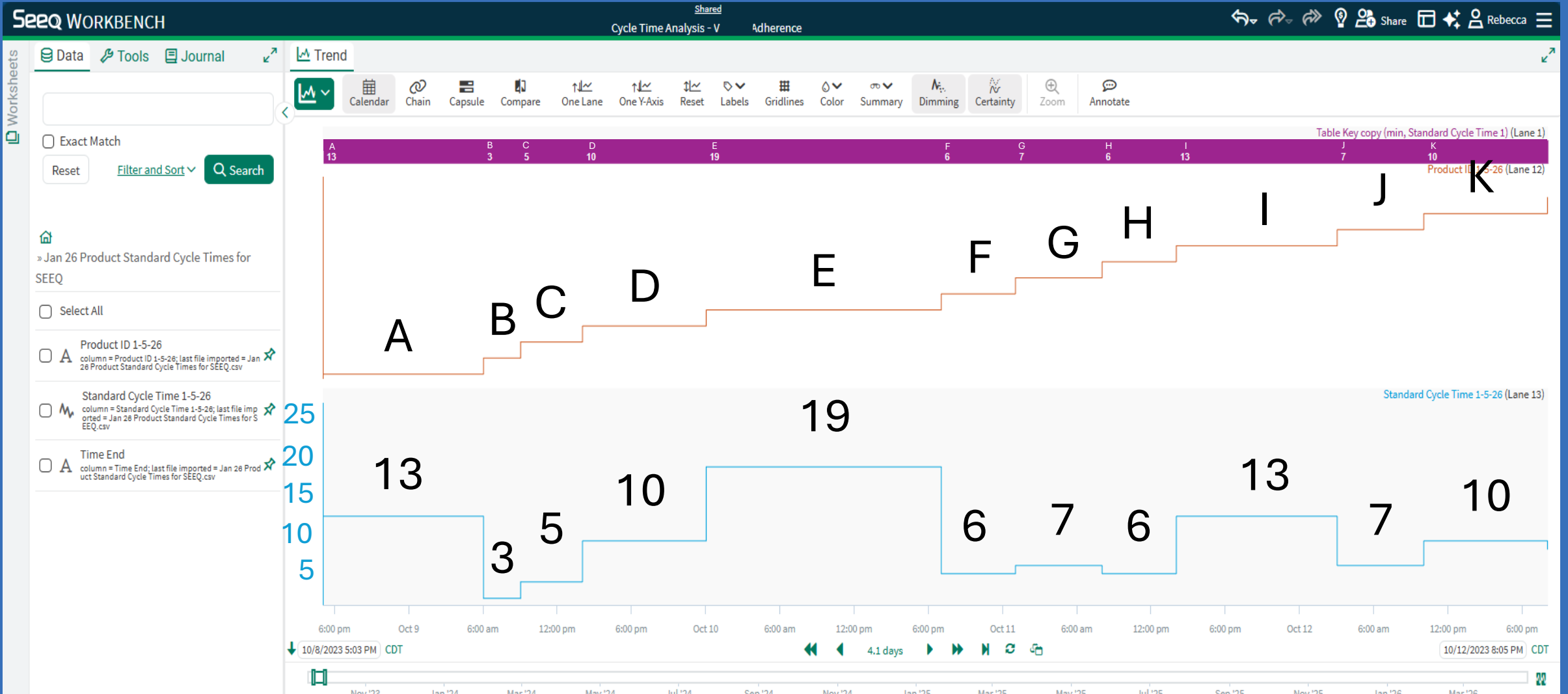
Implement Solutions and Quantify Results



Step 1
Quantify Cycle Time Losses

Step 2
Identify Improvement Opportunities

Step 3
Implement Solutions and Quantify Results



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Formula



Explain With AI

```
1 $rtpi.removeLongerthan(200h).mergeProperties(nearEach($tk.removeLongerthan(48 hr), 3 year)
2 .byProperty('min'))
3
```



General Agent

Formula Definition > Near Each = VLOOKUP

Find source capsules that are near each capsule of a target condition. "Near" only considers the start of the capsules before or after each other, not their duration.

Examples

Merge capsule properties from condition `$other` into the capsules of `$condition`, but only when the capsules share the same property value of `batchId` and start within an hour of the target capsule start.

```
$condition.mergeProperties(nearEach($other, 1h).byProperty('batchId'))
```

Step 1

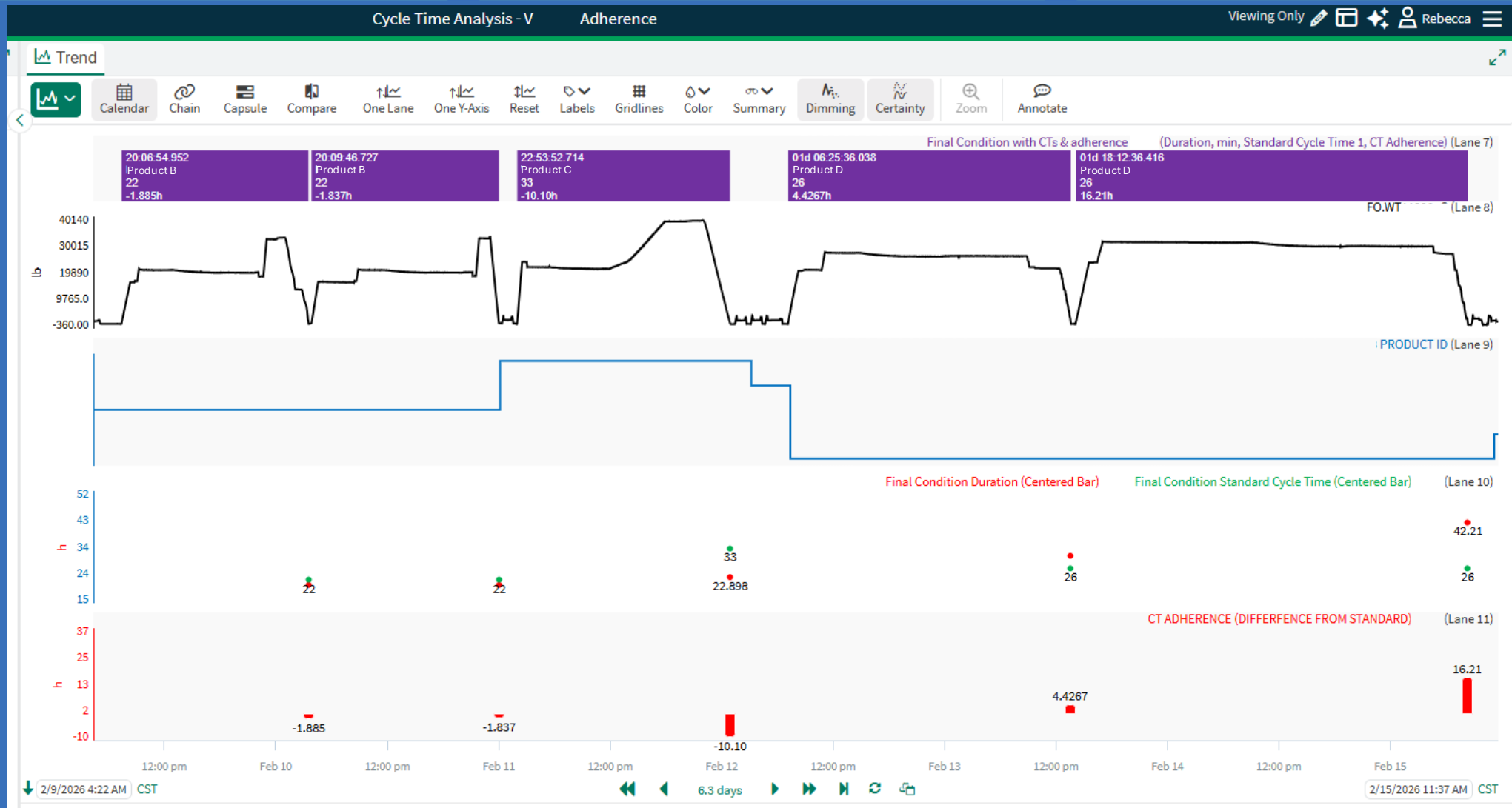
Quantify Cycle Time Losses

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Step 1
Quantify Cycle Time
Losses

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Plant	Reactor	Batches					
Plant 2	R-103	MIN	Hours over CT	Duration	Standard CT	Start	End
	R103 Daily Hours over 14.173 h CT	EMPTY	-	14:10:23.000	-	May 2, 2026 12:08 AM	May 2, 2026 2:18 PM
	R-104	MIN	Hours over CT	Duration	Standard CT	Start	End
	R104 Daily Hours over 33.827 h CT	Product A	26.827	1d 09:49:36.000	7	May 1, 2026 4:40 AM	May 2, 2026 2:30 PM
Plant 3	R-108	MIN	Hours over CT	Duration	Standard CT	Start	End
	R108 Daily Hours over 0 h CT	RINSE	-	02:56:22.929	-	May 3, 2026 3:41 AM	May 3, 2026 6:37 AM
	R-110	MIN	Hours over CT	Duration	Standard CT	Start	End
	R110 Daily Hours over 0 h CT	Product B	-2.982	1d 04:01:03.000	31	May 2, 2026 2:36 AM	May 3, 2026 6:37 AM
Blenders	B-103	MIN	Hours over CT	Duration	Standard CT	Start	End
	B103 Daily Hours over 6.8907 h CT	Product C	6.8907	1d 07:53:26.567	25	May 1, 2026 1:49 PM	May 2, 2026 9:43 PM
	B-104	MIN	Hours over CT	Duration	Standard CT	Start	End
	B104 Daily Hours over 0.2563 h CT	Product D	0.2563	09:15:22.783	9	May 2, 2026 4:50 AM	May 2, 2026 2:05 PM
Plant 4	R-112	MIN	Hours Over CT	Duration	Standard CT	Start	End
	R112 Daily Hours over 19.834 h CT	Product F	19.834	1d 14:50:00.873	19	Apr 30, 2026 9:26 PM	May 2, 2026 12:16 PM
	R-113	MIN	Hours over CT	Duration	Standard CT	Start	End
	R113 Daily Hours over 0 h CT	Product G	-4.699	14:18:03.000	19	May 2, 2026 4:19 PM	May 3, 2026 6:37 AM
Plant 4	R-112	MIN	Hours Over CT	Duration	Standard CT	Start	End
	R112 Daily Hours over 19.834 h CT	Product F	19.834	1d 14:50:00.873	19	Apr 30, 2026 9:26 PM	May 2, 2026 12:16 PM
	R-113	MIN	Hours over CT	Duration	Standard CT	Start	End
	R113 Daily Hours over 0 h CT	Product H	-5.023	1d 03:58:36.334	33	May 2, 2026 2:39 AM	May 3, 2026 6:37 AM

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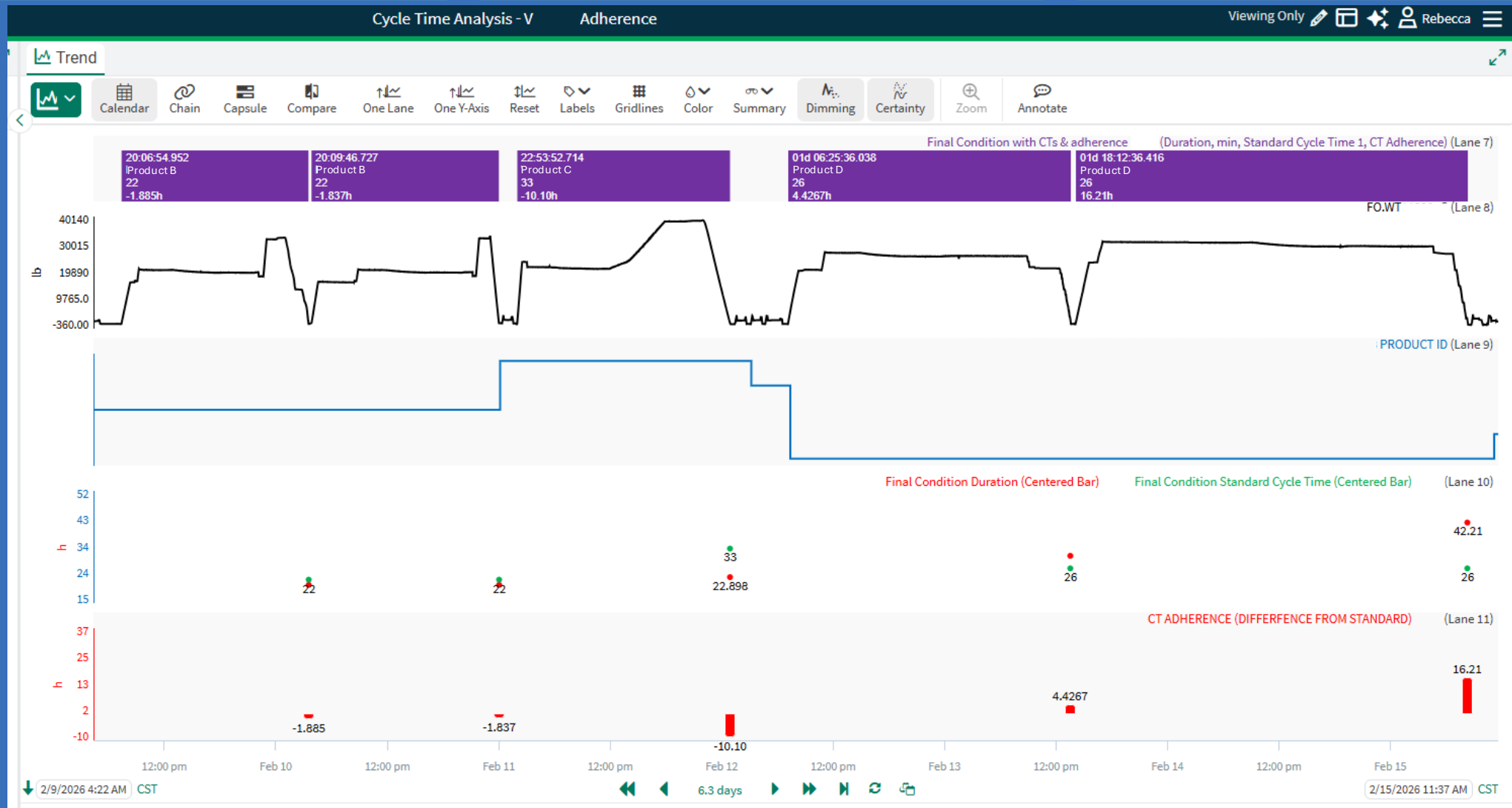
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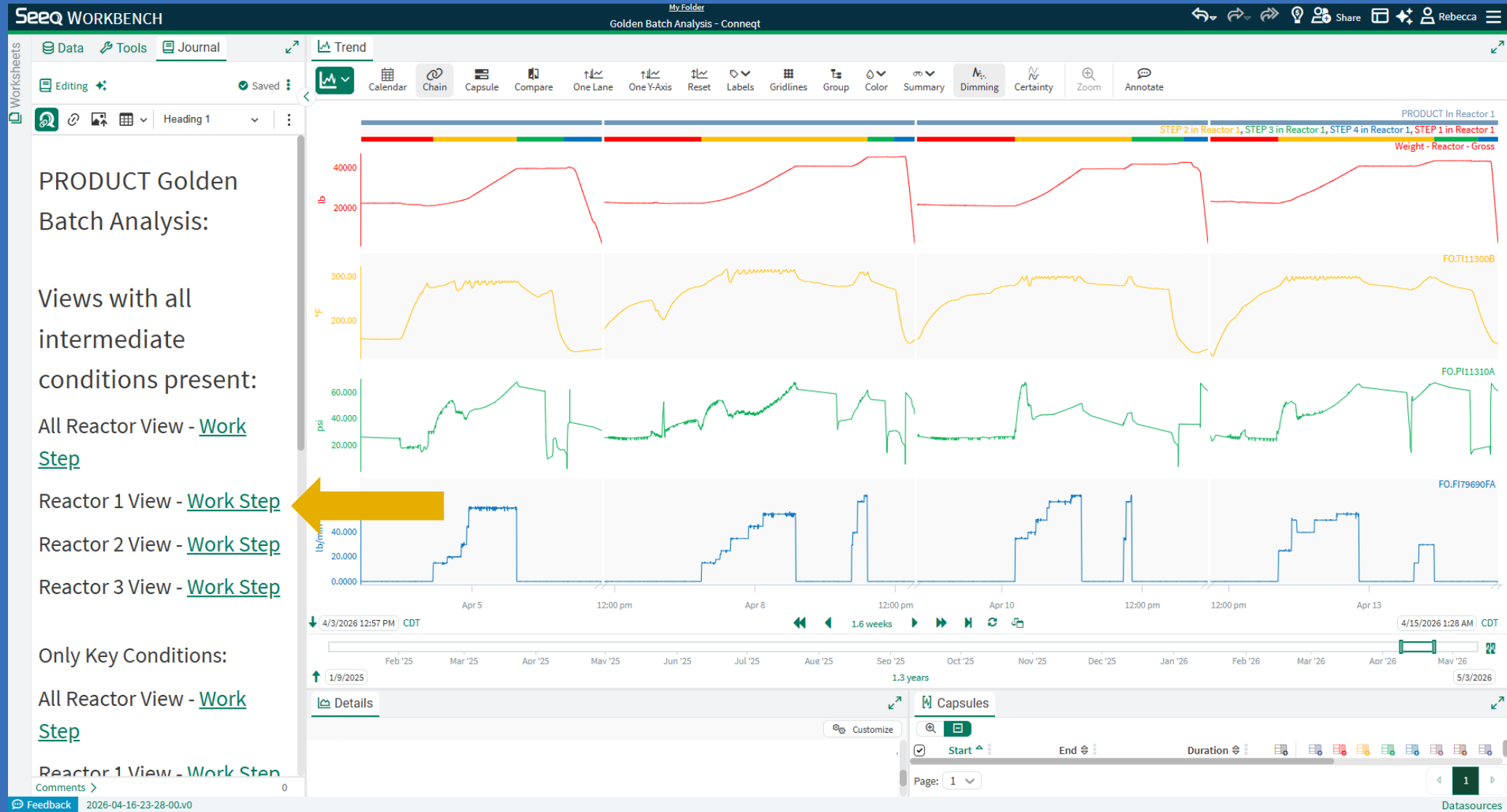
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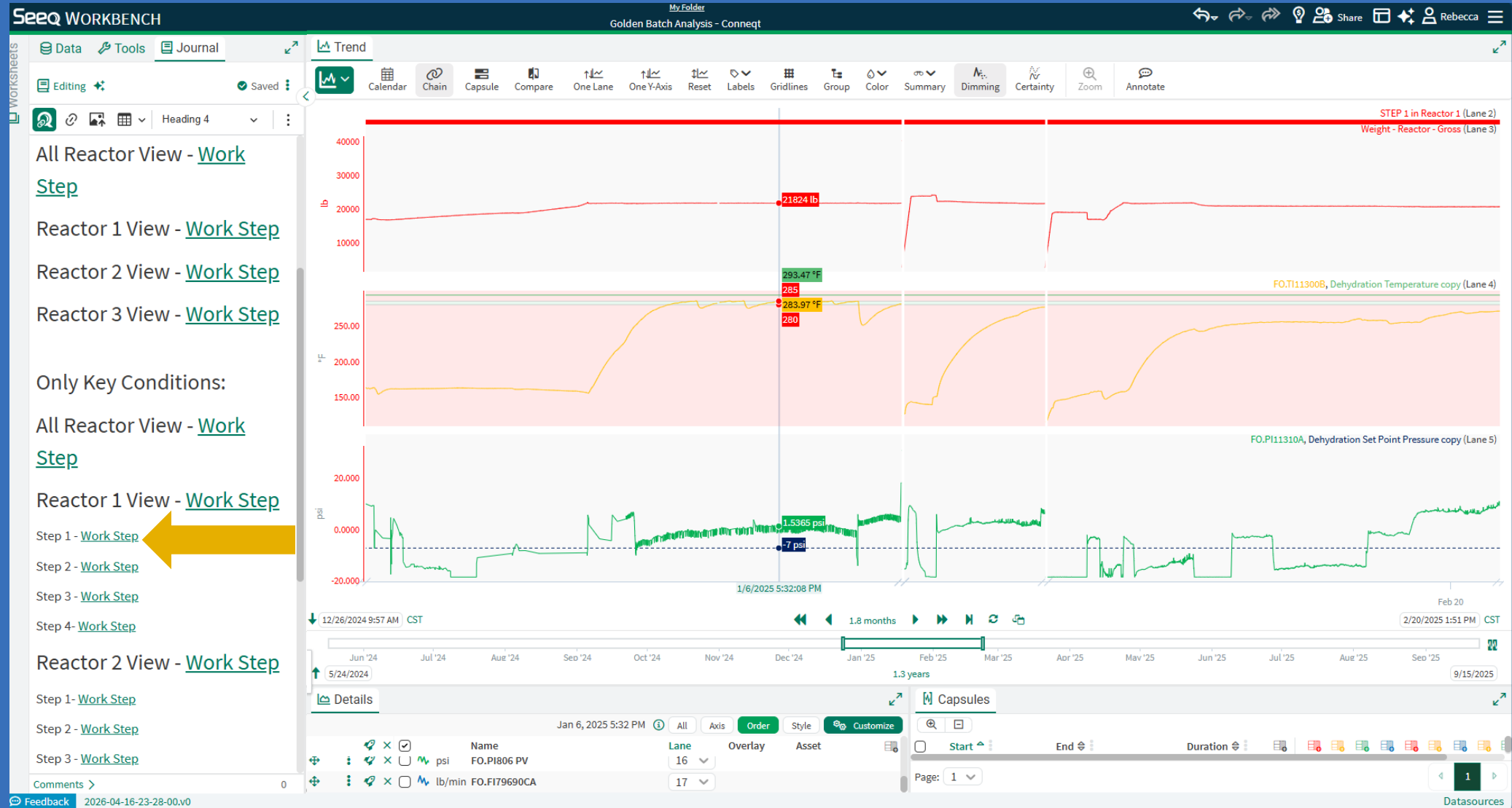
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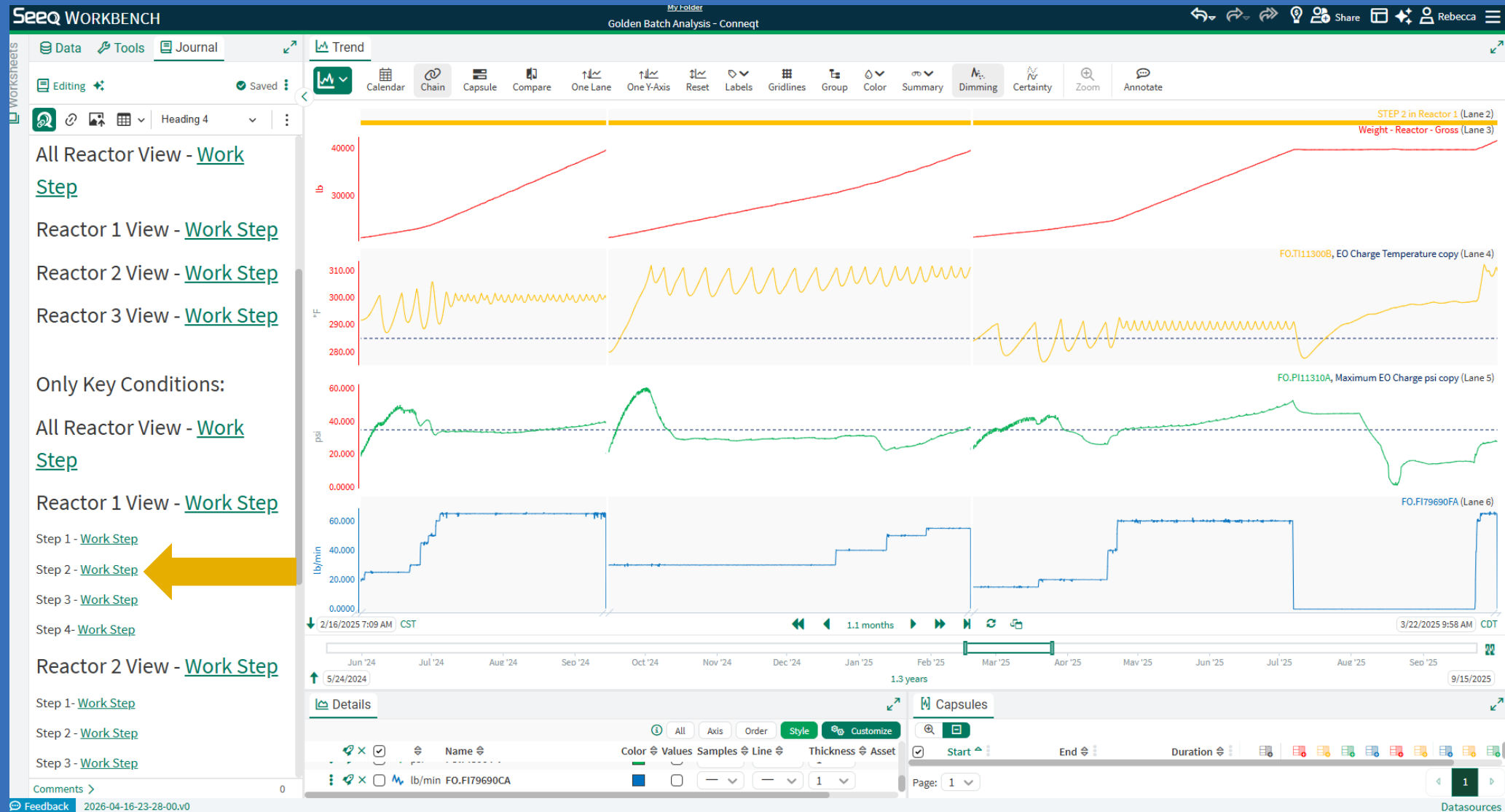
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Step 1

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SeeQ WORKBENCH

My Folder

Golden Batch - PRODUCT connect

Worksheets

Trend



Simple

Condition

Chart View

Rows

Columns

Headers

Transpose

Striped

Asset

Group

Wipe Chart

New Metric

Copy

	PRODUCT STEP 1	PRODUCT STEP 2	PRODUCT STEP 3	PRODUCT STEP 4	PRODUCT STEP 5	PRODUCT STEP 6	PRODUCT STEP 7
Standard Length		3 h	5 min		1 h		
7/11/2025 - 7/13/2025	2.9932 h	2.5085 h	0.1587 h	18.527 h	2.7718 h	2.8799 h	1.1841 h
7/22/2025 - 7/23/2025	2.9966 h	5.2555 h	0.5914 h	17.916 h	2.1399 h	5.0542 h	3.2229 h
7/24/2025 - 7/26/2025	1.1915 h	4.2427 h	1.533 h	20.557 h	4.7306 h	4.0125 h	9.4985 h
7/26/2025 - 7/28/2025	2.1069 h	4.6081 h	0.0623 h	12.506 h	2.3692 h	4.0856 h	2.4301 h
8/9/2025 - 8/11/2025	1.7501 h	9.1843 h	1.6479 h	14.564 h	7.6111 h	2.5046 h	8.6098 h

Step 1

Quantify Cycle Time
Losses

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AUTOMATION

TRAINING

**ENGINEERED
SOLUTIONS**

**PROCEDURAL
UPDATES**

**PLANNING
STANDARDS**

**MAINTENANCE
SUPPORT**

Step 1

Quantify Cycle Time Losses

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Plant	Reactor	Batches				
Fresno	Reactor 1	Start	Fresno R-1 Processing Hours	Fresno R-1 Daily hours over CT	Fresno R-1 Daily hours spent rinsing	Fresno R-1 Daily Idle Time
		Apr 16, 2026 5:30 AM	21.489 h	0 h	0 h	2.2428 h
		Start	Fresno R-1 Total Non-Productive Cost Association	Fresno R-1 Over Cycle Time Cost Impact	Fresno R-1 Daily Cost of Rinsing	Fresno R-1 Idle Time Cost
		Apr 16, 2026 5:30 AM	488.93 \$	0 \$	0 \$	488.93 \$

↑ 7%

In # Batches
(2024-2025)

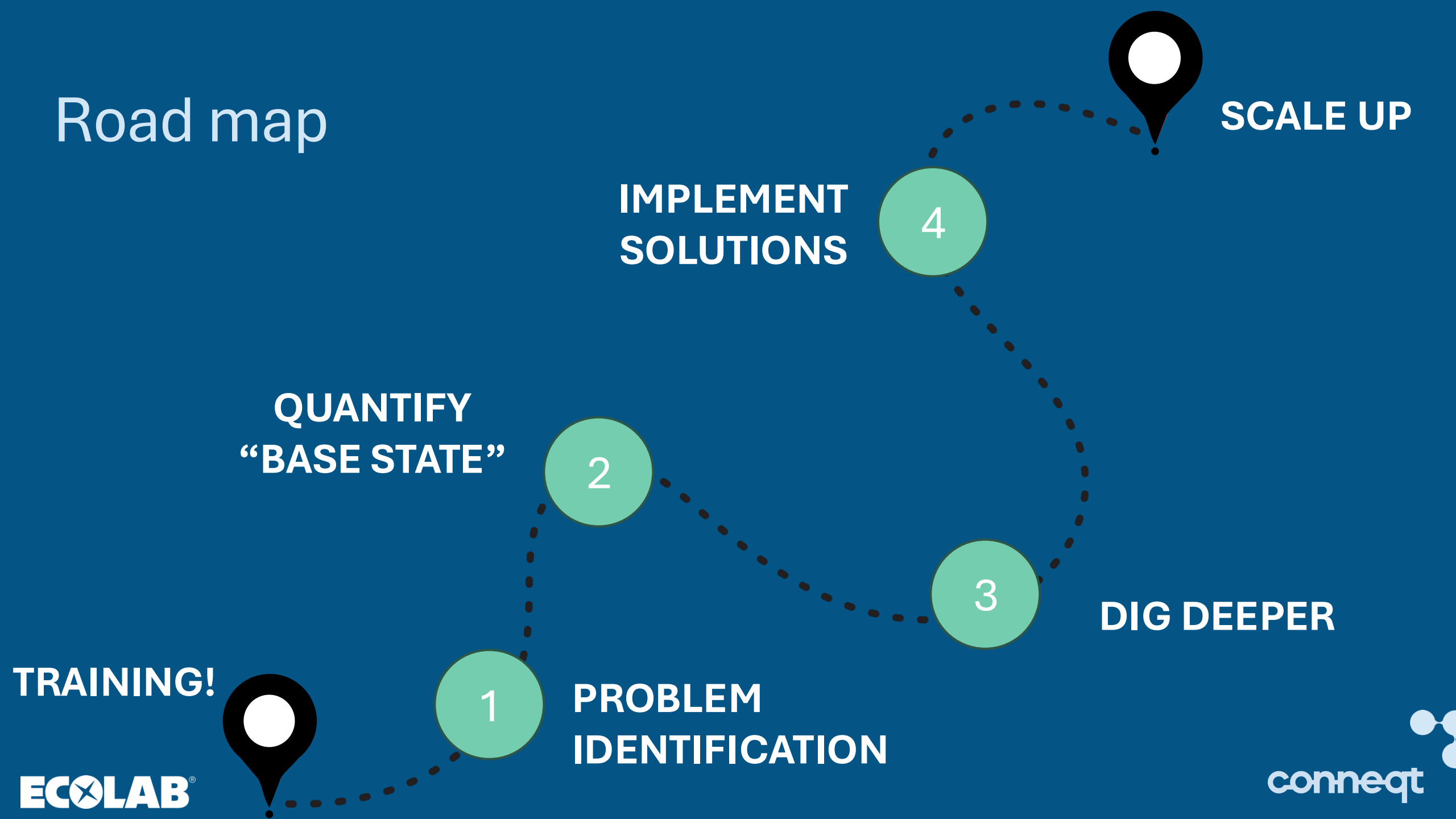
↓ 10%

In Over Cycle
Time Impact
(2024-2025)

\$1M +

Potential Benefit (with
Scaling)

Road map



TRAINING!

QUESTIONS?

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connect

connect

connect

connect

connect

connect