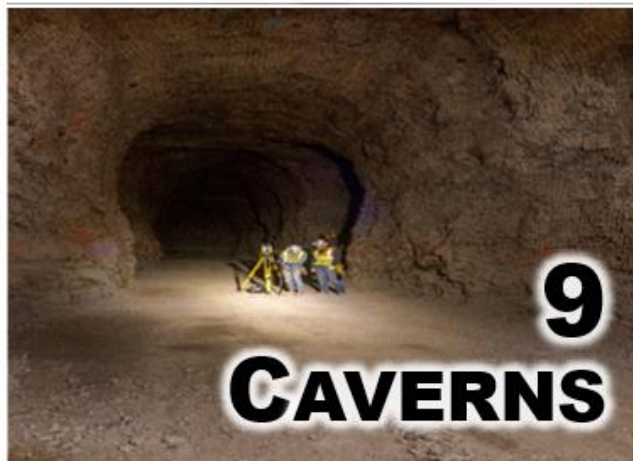
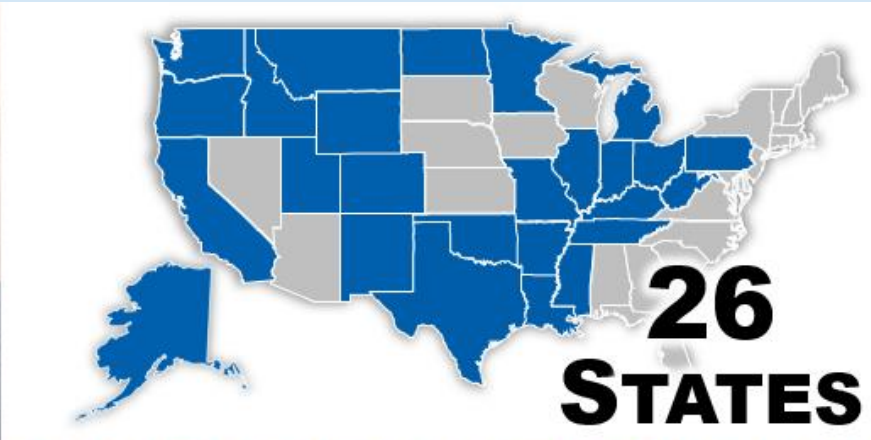


Finally... Scaling and Operationalizing ML Models Across Assets!

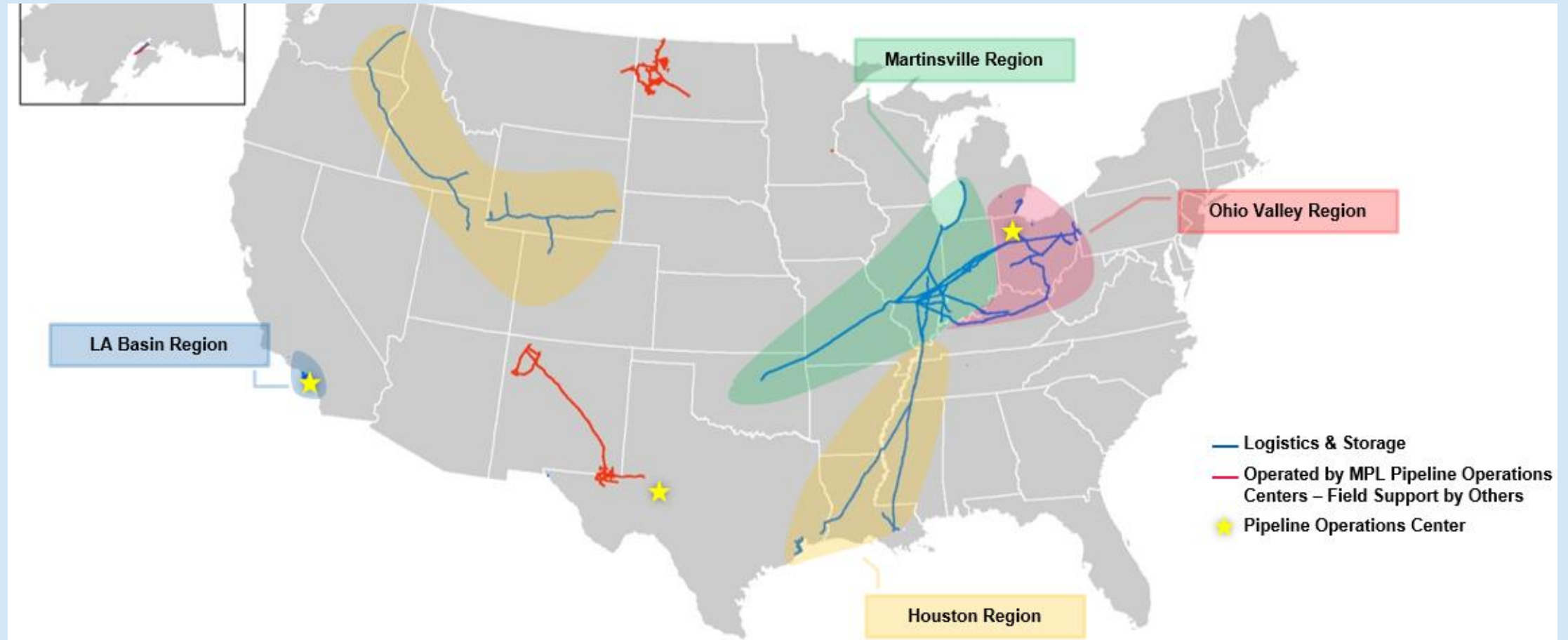
Kyle Miller, P. E.
Marathon Pipe Line



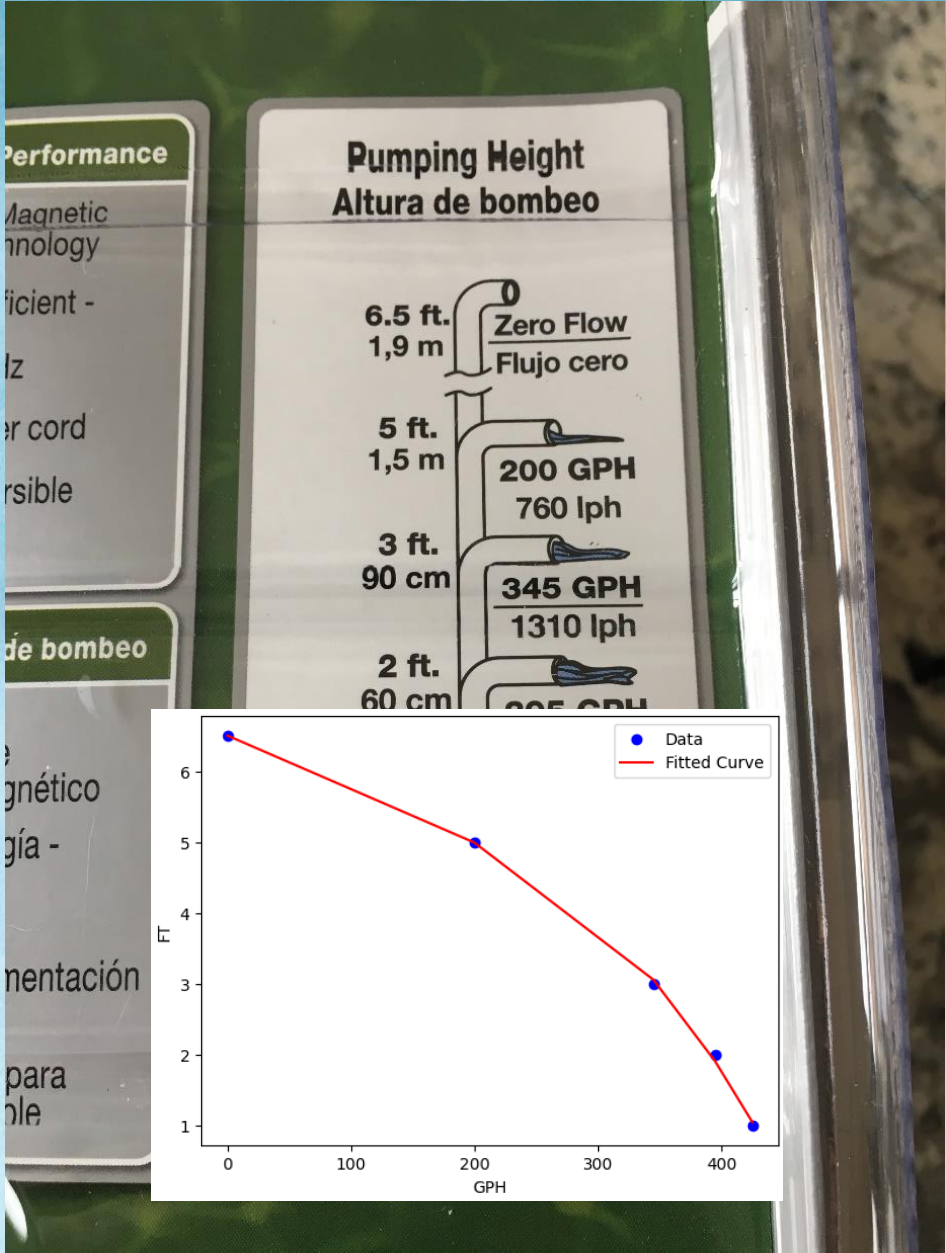
Marathon Pipe Line – By The Numbers



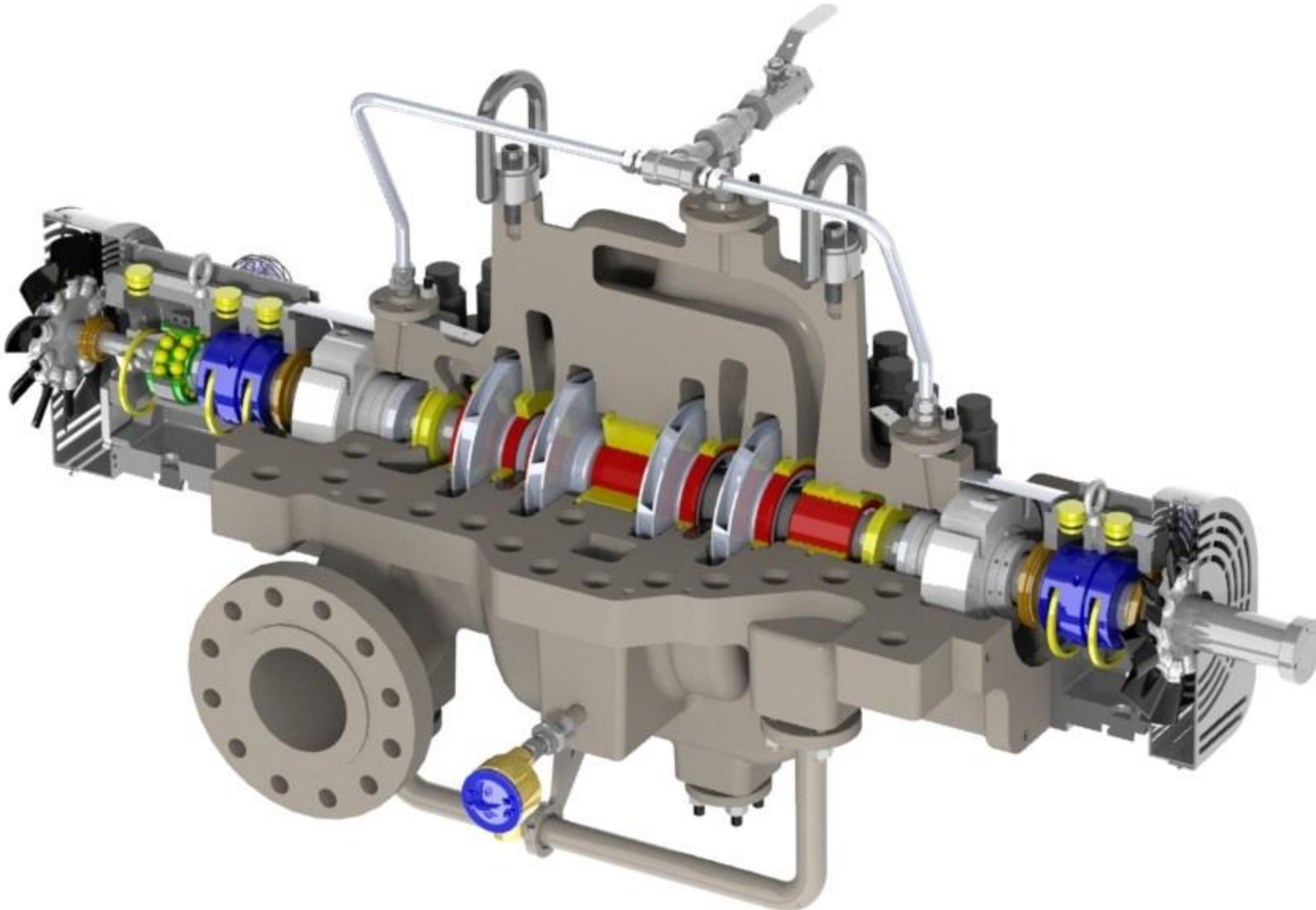
Marathon Pipe Line – Operating Map



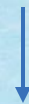
The Heart of Pipeline



The Mighty Centrifugal Pump



- Suction Pressure
- Discharge Pressure
- Horsepower
- Flow Rate
- Density of Fluid
- Bearing Temperatures
- Seal Temperatures
- Motor Winding Temperatures
- Vibration
- Etc.



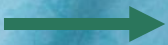
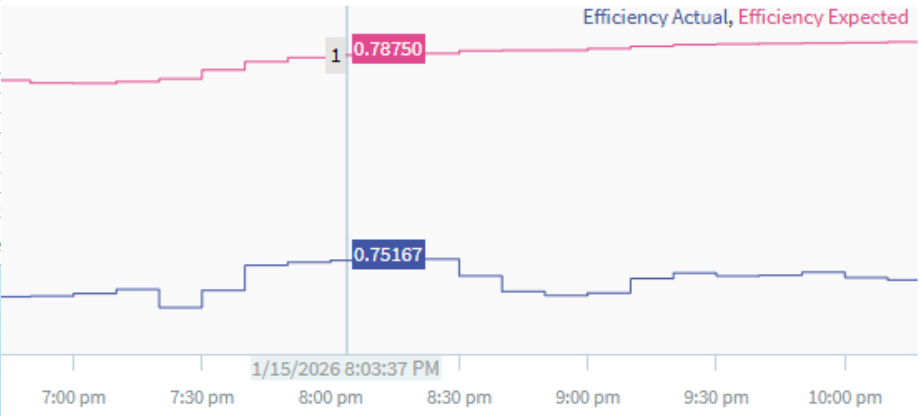
Efficiency!

Delivered / Expected

conneqt

Univariate Analysis of Efficiency Difference

Name	Expression
ComputableCheck	<code>IF 'Efficiency Parameters Analyses Computable' <> "Fully Computable" THEN Exit() ELSE NoOutput()</code>
FlowRate	<code>IF BadVal(TagAvg('Flow Rate - Pump', '-15m', '')) THEN 0 ELSE TagAvg('Flow Rate - Pump', '-15m', '')</code>
SteadyState	<code>NoOutput()/IF Range('Flow Rate - Pump', '-15m', '') > 'Efficiency Parameters Flow Rate Steady State Threshold' or FlowRate < 'Efficiency Parameters Minimum Flow Rate' or 'Eff</code>
HEPn	<code>'Efficiency Parameters HEP Head'/'Efficiency Parameters Number of Stages'</code>
LumpedViscFactor	<code>26.6 * ('Efficiency Parameters HEP Head'/'Efficiency Parameters Number of Stages')*0.0025 / ('Efficiency Parameters HEP Flow' * 0.7)*0.375 / ('Efficiency Parameters Rotational S</code>
ProductCode	<code>'Product Code'</code>
SG	<code>IF BadVal(TagAvg('Efficiency Parameters Specific Gravity', '-15m', '')) THEN 0 ELSE IF ProductCode = "H0M" THEN 0.500 ELSE IF ProductCode = "ISO" OR ProductCode = "CCB" THEN 0.565 ELSE IF ProductCode = "P80" OR ProductCode = "EMH" OR ProductCode = "H80" OR ProductCode = "P8V" THEN 0.510 ELSE TagAvg('Efficiency Parameters Specific Gravity', '-15m', '')</code>
PressureActual	<code>IF BadVal(TagAvg('Pump Pressure Actual', '-15m', '')) THEN 0 ELSE TagAvg('Pump Pressure Actual', '-15m', '')</code>
Suction	<code>IF BadVal(TagAvg('Suction Pressure', '-15m', '')) THEN 0 ELSE TagAvg('Suction Pressure', '-15m', '')</code>
Case	<code>IF BadVal(TagAvg('Case Pressure', '-15m', '')) THEN 0 ELSE TagAvg('Case Pressure', '-15m', '')</code>
MotorHP	<code>IF BadVal(TagAvg('Horsepower', '-15m', '')) THEN 0 ELSE TagAvg('Horsepower', '-15m', '')</code>
Viscosity	<code>IF BadVal(PrevVal('Flow Viscosity', '')) THEN 5 ELSE PrevVal('Flow Viscosity', '')</code>
PctSpeed	<code>IF BadVal('Unit Percent Speed') THEN 1 ELSE (TagAvg('Unit Percent Speed', '-15m', ''))/100</code>
EfficiencyActual	<code>IF 'Flow Rate - Pump' > 'Efficiency Parameters Minimum Flow Rate' THEN FlowRate * PressureActual * 2.31 / 5657 / MotorHP ELSE NoOutput()</code>
CurvePressureRaw	<code>//IF SteadyState and MotorHP > 0 THEN ('Efficiency Parameters Head Curve Constant'*PctSpeed^2* 'Efficiency Parameters Head Curve X'*FlowRate*PctSpeed + 'Efficiency Parameters Head</code>
CurvePRaw	<code>//Else 'No Output Digital State' //IF SteadyState and MotorHP > 0 THEN ('Efficiency Parameters Horsepower Curve Constant'*PctSpeed^3* 'Efficiency Parameters Horsepower Curve X'*FlowRate*PctSpeed^2 + 'Efficiency Pa //Else 'No Output Digital State'</code>



Overview » Cleanse » Signal Smoothing

Efficiency Actual Minus Expected

Select a signal to smooth

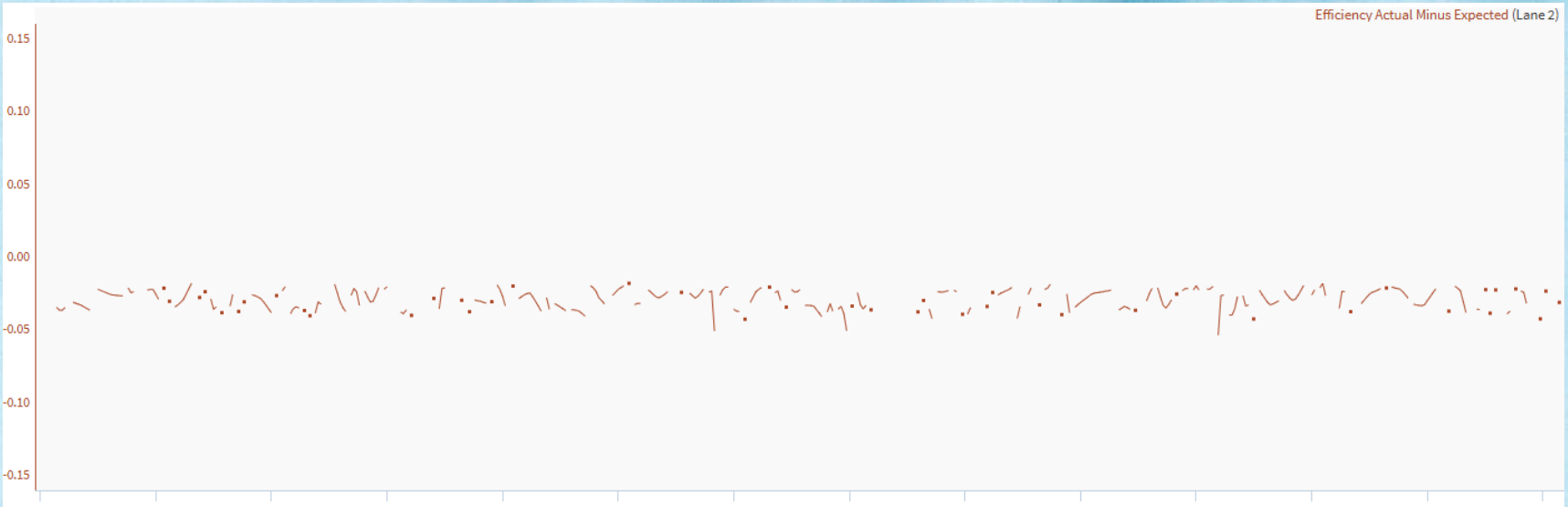
Efficiency Actual Minus Expected
MPL_PROD » MPL Applications » Unit Health
h » UNT-01 Health

Algorithm ?

Seeq Agile

Smoothing window ?

10 minute(s)



Intuitive ML Tools Within the Interface

Data Tools Journal

Filter tools...

Overview

Identify
Create Conditions to find events and capture periods of interest

Quantify
Aggregate your data to calculate key process metrics

Cleanse
Clean or filter a signal to prepare it for further analysis

Model & Predict
Create analytical models or golden profiles to predict future behavior

Machine Learning
Detect anomalies and model behavior using machine learning algorithms

Import/Export
Import and export in different formats

Add-ons
Add-on tools that integrate with Seeq

Formula
Create a signal or condition using simple math and a library of powerful functions

Overview » Machine Learning

Self Organizing Map
Detect anomalies with an unsupervised clustering model

Isolation Forest
Detect anomalies with an Isolation Forest model

Self Organizing Map Model

Input signals

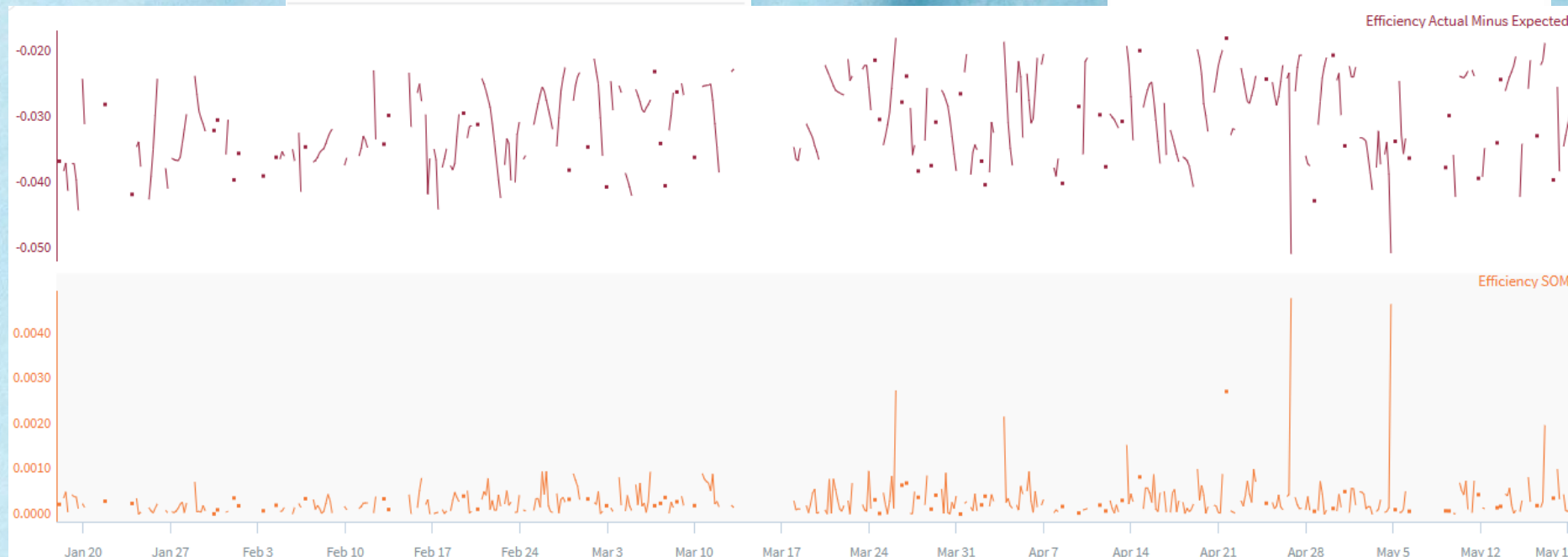
Efficiency Actual Minus Expected
MPL PROD » MPL Applications » Unit Health » Health

Remove all

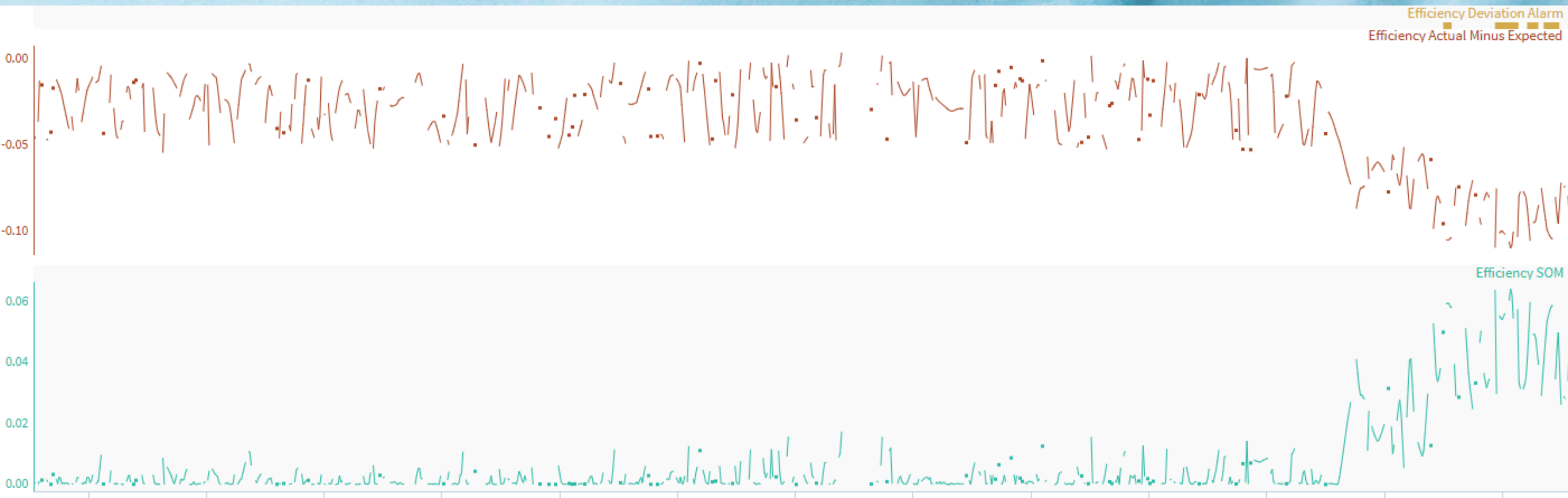
Training window

Refresh

Date/Time Date/Time
1/17/2025 9:00 PM - 5/19/2025 2:00 PM



Setting My 'Check Engine' Light



... For Every Car in the Fleet! Scaling Tables Apply to All

Trend

Scaling Table Builder X

Unit Health Scaling

Edit the search

Columns

Create descendant column

Select a column to create a shortcut

Search Items

Filter

4)

☐ Pump Outboard Bearing Temperature Threshold (164)

☐ Pump Outboard Vibration (164)

☐ Pump Pressure Actual (164)

☒ Pump Pressure Delta (164)

☐ Pump Pressure Expected (164)

☐ Region (164)

☒ Run Status (164)

☐ Shutdown Status (164)

☐ Source Data Archive (164)

☐ Specific Speed (164)

☒ Station Name (164)

☒ Suction Pressure (164)

☐ Suction Pressure - Station (164)

☐ Suction Pressure - Station Tag (164)

☐ System Code (164)

☒ System Name (164)

Seal Lockout Condition

Station Name

Pump IB Lockout Condition

Model Training Start Date

Model Training End Date

'2024-01-01T00:00:00-06:00'

'2024-02-01T00:00:00-06:00'

'2024-01-01T00:00:00-06:00'

'2024-02-01T00:00:00-06:00'

'2025-12-01T00:00:00-06:00' X

'2026-02-01T00:00:00-06:00' X

'2025-11-15T00:00:00-06:00' X

'2026-02-01T00:00:00-06:00' X

'2024-01-01T00:00:00-06:00'

'2024-02-01T00:00:00-06:00'

'2024-05-01T00:00:00-06:00' X

'2024-07-01T00:00:00-06:00' X

'2024-01-01T00:00:00-06:00'

'2024-02-01T00:00:00-06:00'

'2024-01-01T00:00:00-06:00'

'2024-02-01T00:00:00-06:00'

Name

Efficiency SOM

Create variable list parameter

Name

Item

\$a Search Items +

\$aa Pump IB Temp Signal +

\$aaa Invalid Test +

\$b Pct of BEP +

\$hh Pump OR Temp Signal +

Explain With AI

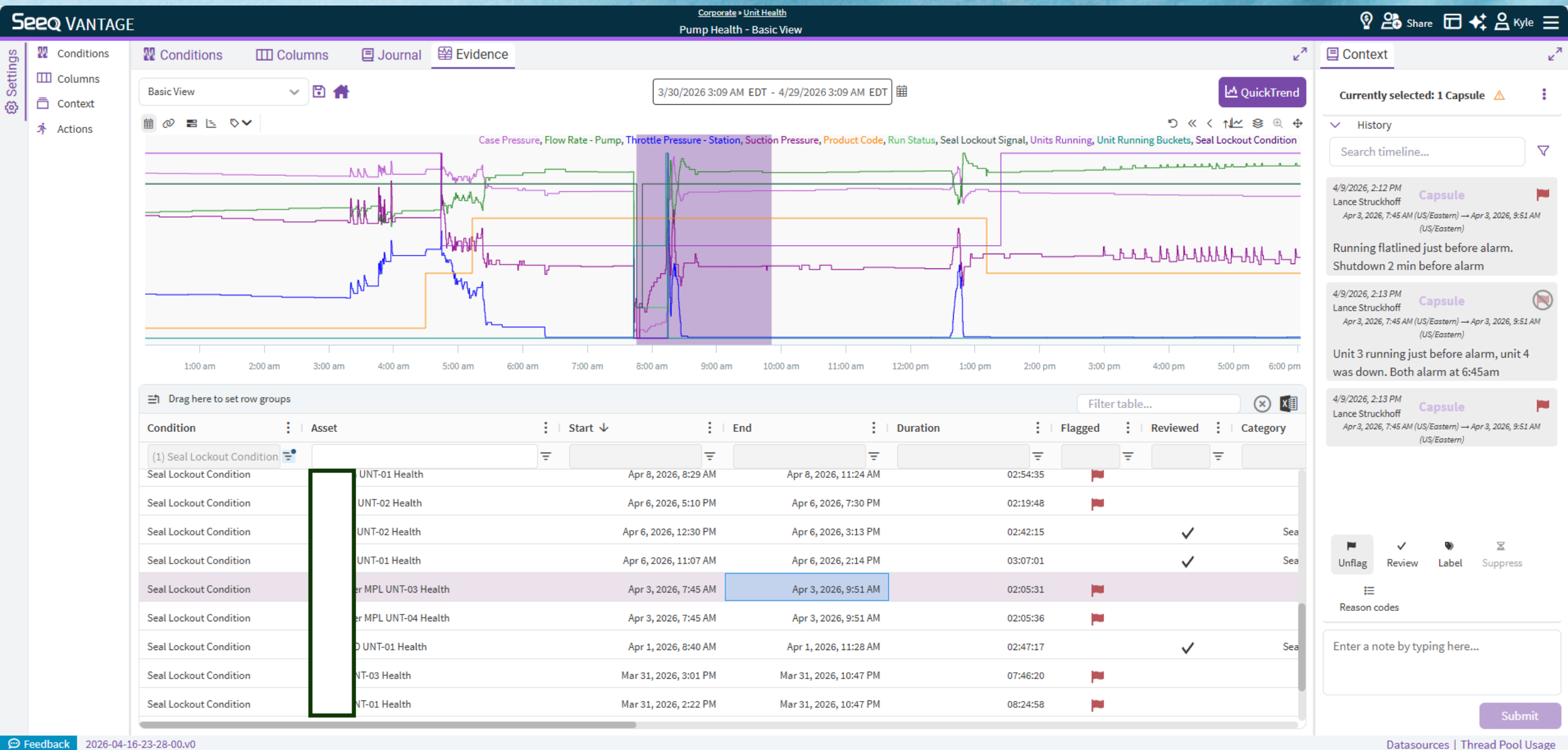
1 seeqSOM_selfOrganizingMap(\$hh.toGroup(capsule(\$mtsd,

2 \$mted), CapsuleBoundary.Intersect), options("anomalyThreshold", 95,

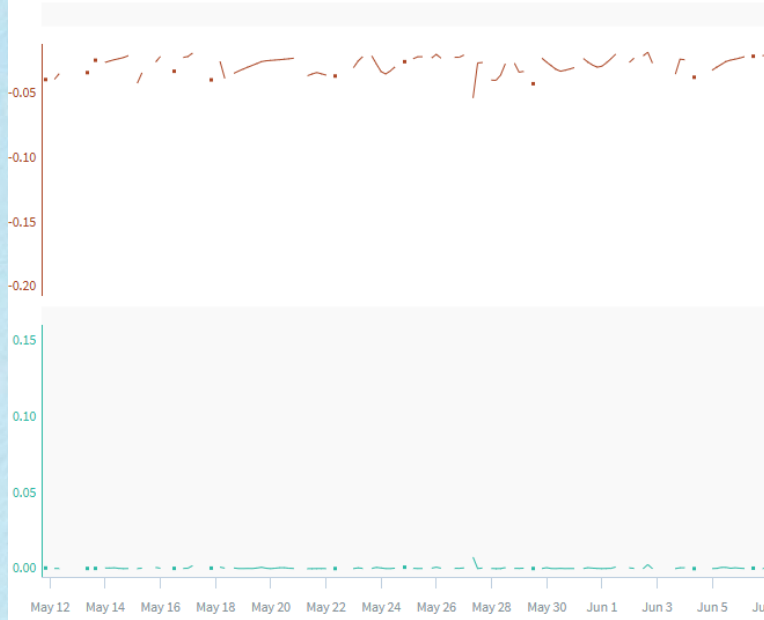
3 "sigma", 1, "learningRate", 0.5, "randomOrder", false), \$edc)

4 .toSignal('quantization_error', \$edc)

Enterprise-Wide Monitoring with Seeq Vantage



An Actual Find!



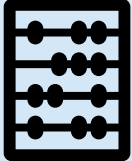
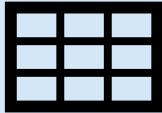
PAYWALL!

TO SEE PHOTOS OF THE PUMP

Please register for Seeq Connect 2026 in
Orlando, FL from June 1 – 3

SCAN ME

Closing Thoughts

- Seeq is amazing 
- Data Lab is always behind the scenes capable of anything 
- ... but Workbench is catching up
 - Scaling Tables 
 - Tree Builder 
 - Time Series ML in *Tools* 
- Vantage is where your SMEs live



- Path Forward

Questions?

