FLOWSTATE
SEGMENT HEALTH MONITOR

Ensuring Continued Performance in Leak Detection

How do you know your leak detection solution is working as it should?

You've made an investment in leak detection on your system. You've tested to verify you have the desired performance. But how can you be assured that performance will last?

What are some causes of performance degradation?

There are many things that can happen in pipeline operation that can have an adverse effect on leak detection.

- Meter Drift or Calibrations
- Change in operations
- Hydraulic Changes
- Data Connectivity & Quality
- Unseen Equipment Operations

The Cost of Performance Degradation

Degraded performance in different aspects of your leak detection can lead to several undesirable conditions.

- Increased False Alarms (loss in reliability)
- Extended time to detection (loss in sensitivity, larger leaks)
- Missed Smaller Leaks (loss in sensitivity)
- Loss of Quality Coverage

Building Assurance with Health Monitoring

Recommended practice for a leak detection program (API 1175) suggests ongoing measurement of the performance of a leak detection system and emphasizes the importance of having methods to detect any anomalies or deterioration.

Operators should establish performance targets for their LDS and define and track KPIs to ensure performance targes are met. An active health monitoring system can provide this capability in a timely manner and deliver diagnostic information!

The result an be increased Clarity and Credibility in

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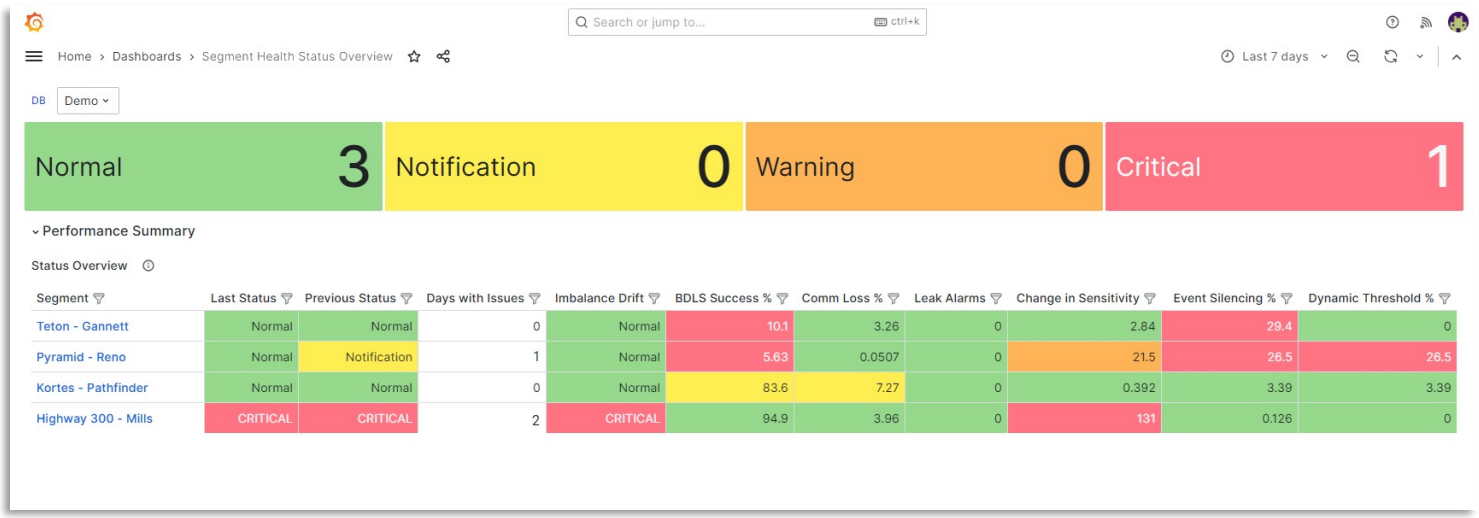


Segment	Last Status	Previous Status	Days with Issues	Imbalance Drift	BDLS Success %	Comm Loss %	Leak Alarms	Change in Sensitivity	Event Silencing %	Dynamic Threshold %
Teton - Gannett	Normal	Normal	0	Normal	10.1	3.26	0	2.84	29.4	0
Pyramid - Reno	Normal	Notification	1	Normal	5.63	0.0507	0	21.5	26.5	26.5
Kortes - Pathfinder	Normal	Normal	0	Normal	83.6	7.27	0	0.392	3.39	3.39
Highway 300 - Mills	CRITICAL	CRITICAL	2	CRITICAL	94.9	3.96	0	131	0.126	0

You may be asking yourself...

Is my leak detection system still functioning as intended?

Have I lost sensitivity, reliability, accuracy, or robustness over time?

What are the root causes of issues I'm seeing?

Flowstate's **Segment Health Monitor** (SHM) runs daily analytics on several key performance indicators to watch for degradation.

Performance is measured against targets to alert users of the existence and severity of an issue.

SHM analytics include running daily background digital leak simulations (BDLS).

	Segment Health Monitor				
	Alarm Monitoring	Imbalance Drift	BDLS Success	Comm Issues	Event Handling
Reliability Can you depend on the alarm?	✓	✓	✓	✓	✓
Sensitivity How small of a leak can you detect?	✓	✓	✓		
Accuracy How good are the leak size/location estimates?		✓	✓		
Robustness Will it work in a less-than-perfect environment?	✓		✓	✓	✓

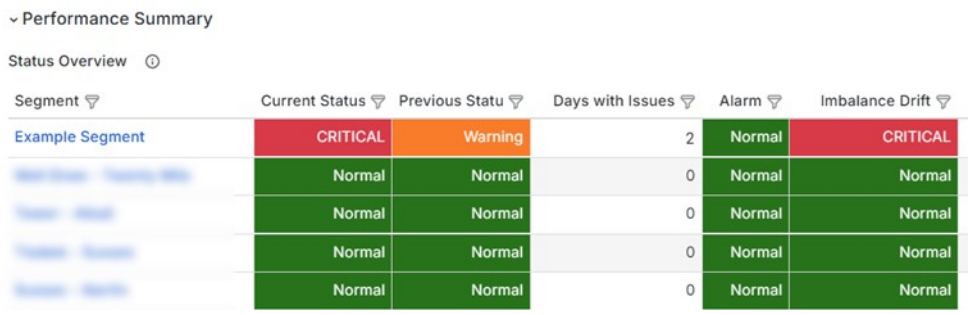
Monitor → Identify → Diagnose → Resolve

Case Study #1 - Change in Operations

The following example shows how the Segment Health Monitor identified a change in operations that was not initially incorporated into the leak detection.

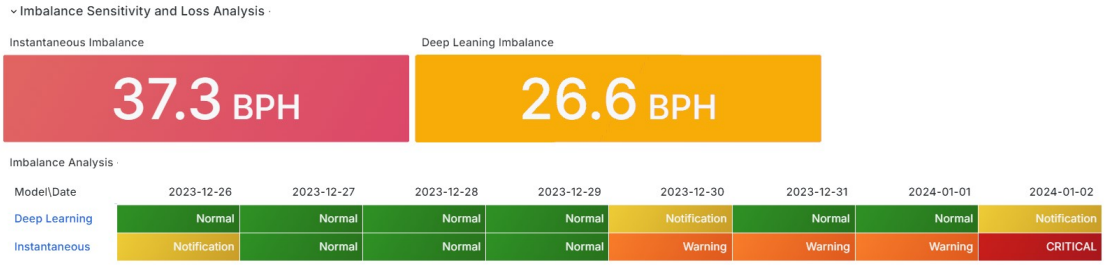
ALERT

The SHM Overview dashboard shows a CRITICAL status for the segment and identifies Imbalance Drift as the contributing factor.



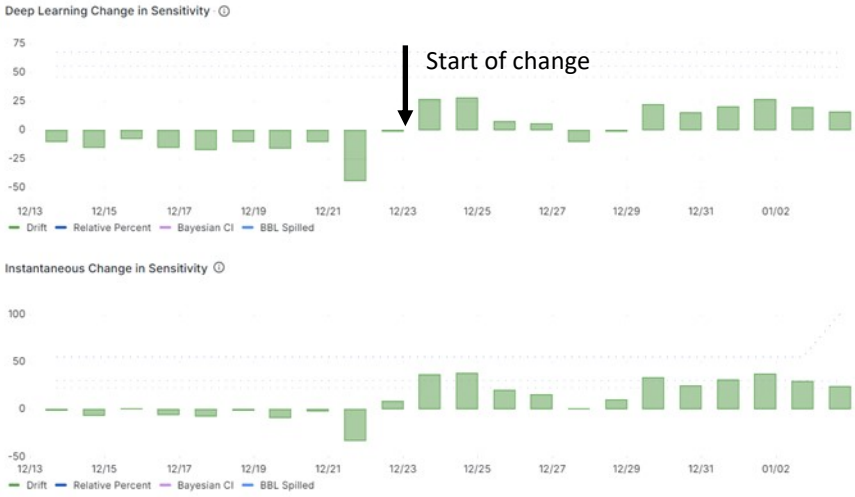
IDENTIFY

The SHM Segment view shows that both the Instantaneous and Deep Learning imbalance models are showing >20 bph of lost sensitivity for multiple days.



DIAGNOSE

A more detailed look at the monitor for change in sensitivity shows that a clear trend started on or around 12/2a2.



RESOLVE

It was quickly discovered that a new injection started initial production—but had not been incorporated into the leak detection model for the segment.

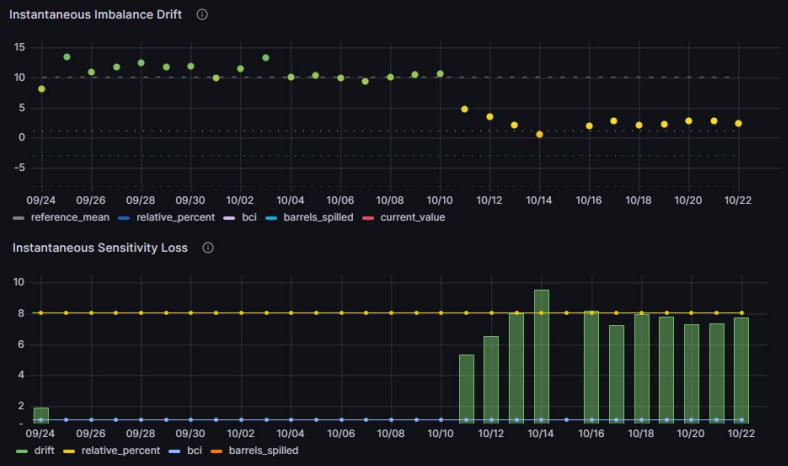
The model was updated and the

HIDDEN DANGER—LOST SENSITIVITY

In this case, the leak detection system was seeing more commodity coming out than going in due to the unaccounted for injection. As a result, the system had lost sensitivity. In other words, it would have to see a leak larger than the new injection to be detected! Without a monitor for this situation, the system may never alarm and the operator would not be aware of the degraded performance.

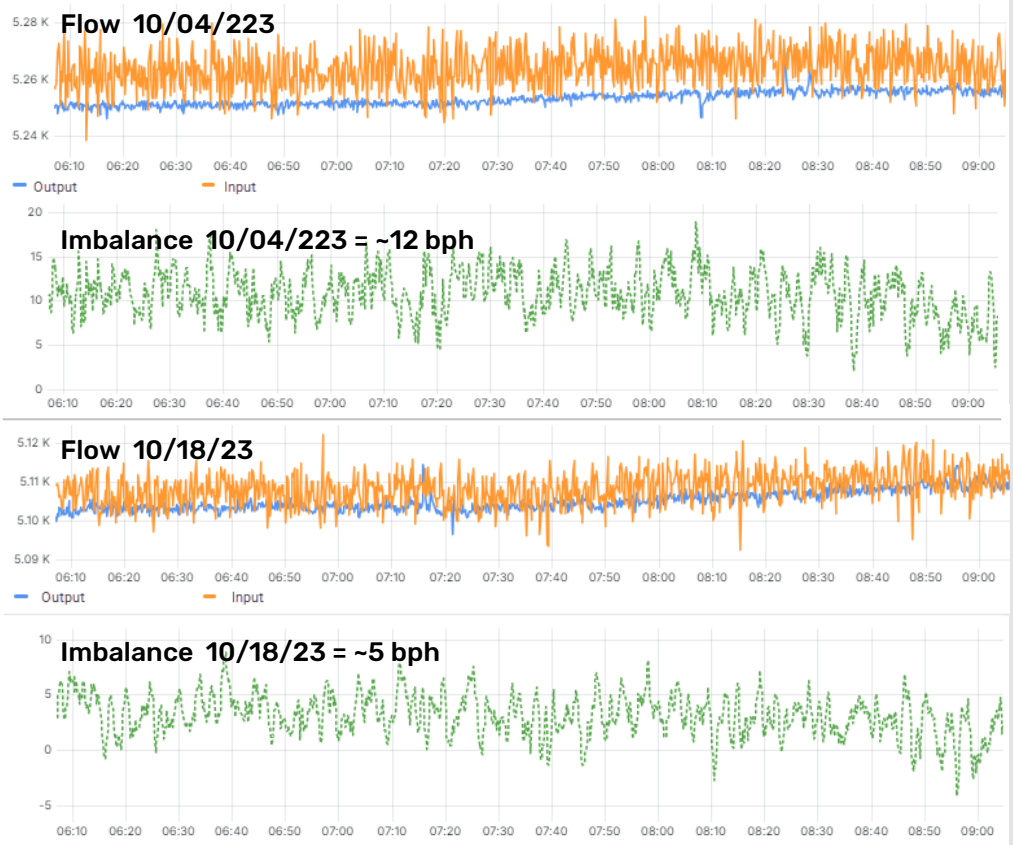
Case Study #2 - Change in Meter Offset

The following example shows how the Segment Health Monitor identified the effects of common operations on leak detection sensitivity. In this case, the line has Coriolis meters at both input and output with a known meter offset. After months of nominal performance, the SHM issued an alert for Imbalance Drift .



The top plot here shows how the average imbalance offset changes abruptly on 10/10, shifting by approximately 10 bph.

The bottom plot shows the resulting change in sensitivity for the segment. Due to the change in imbalance offset, the segment has lost approximately 8 bph of sensitivity.

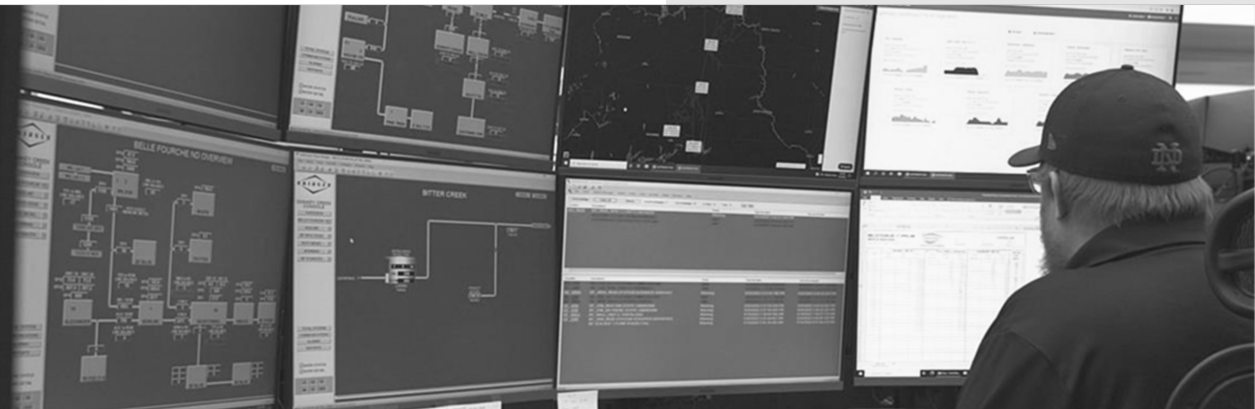


AN EYE ON METER PERFORMANCE

The Segment Health Monitor has detected various meter changes that can adversely affect leak detection due to resulting changes in meter offset.

This includes things like switching from one meter to a back-up meter and changing offset in ultrasonic meters due to rate changes or thermal effects.

Scan to read more!



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