narrative**wave**

Case Study:
Proactively Detecting Meter Anomalies

History of Meter Failure and the Distribution System

It's time for a change in the water industry.

Despite their essential functionality, or perhaps because of it, water utilities often exist as bare-bone operations fueled by passionate operators who simply cannot monitor it all.

With a decreasing workforce, increasing breadth operations, and consistent budget constraints, water engineers lack the time to manually analyze an ever-accumulating pile of operational data. The results being overbilling, underbilling, and a lack of insight into what is occurring in their operation.

The need to proactively analyze data to prevent billing errors, mitigate customer complaints, and strengthen overall public perception is not new for water utilities - but the simple solution to these problems are.

Meet the Water Utility

This U.S. based Water Utility has been serving the North West region for over six decades. They are dedicated to providing a seamless customer experience, yet complaints were up. They needed to discover why but lacked the insight to do so. They realized this was the result of living in spreadsheets, multiple data-systems, and suffering from low data quality.

They reached out to NarrativeWave having recognized a need for improvement based on the ongoing costly issues that could have been avoided with proactive interception.

The Fix

Proactively detect meter anomalies

Water treatment operators at this utility were manually analyzing data, and missing issues, like massive water loss, and underbilling. They needed a way to actively and accurately report on water production.

The best way to do so was by gaining a proactive understanding of water loss by region, thus preventing future outages and downtime.

STEP 1   Detect anamolies

STEP 2   Make it easy to use, and use it everyday

Anomaly Detection - Machine Learning
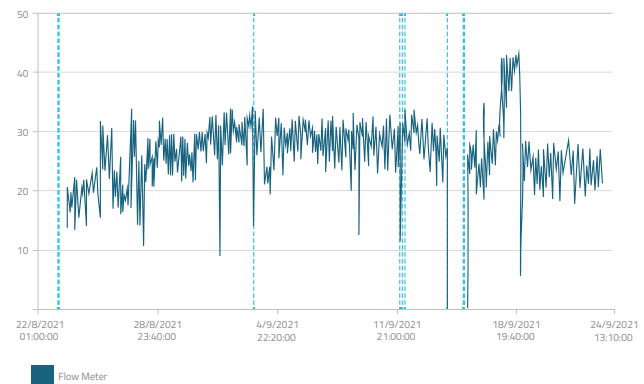
This occured 19 times in the dataset. The last occurence took place on September 24, 2021 between 05:00 and 06:10. During this occurrence, the max value for flow meter was 18.2.

The Proposal

In order for this utility to be able to proactively manage their data and mitigate issues, they needed to illustrate their existing process. In turn, NarrativeWave was able to identify opportunities to use analytics and automation to improve.

Proposed Before:	Proposed After:

1. Abnormalities detected, for ex:
   a. "Meter mismatch", "Overbilling"
2. Water utility Investigates Findings
3. Utility aims to fix internally
4. Utility strategizes on on-going improvements/needs/fixes
 	
  • Utility is not in control
  • Outside vendor is responsible for finding problems
  • Internal time / adjustments are lengthy
  • Reputational Risk
	1. NarrativeWave alerts utility of issues detected, for ex:
	   a. "Flow anomaly detected"
	2. Utility can immediately investigate
	3. Confirm meter reading, make adjustment
	4. Request outside agency to confirm agency meter reading.
	
	  • Utility catches majority of issues first
	  • Utility in control of process
	  • Internally productive
	  • Perception: Proactive, advanced, in control

Types of Meter Sensors Now Equipped with Automation

1. Wrong Scaling Factors: Faulty valves & proactive view

2. Meter Fault

3. Telemetry Fault: Gradual failure/ drifting meters

4. Low Flow: Number of dropouts

5. High Flow: Maxed out over max threshold. Over max rating - holding at max

6. Showing Zero: Sudden meter going on

The Outcome:

NarrativeWave was able to detect anomalies in meter activity that could have potentially lead to failure, giving staff an early warning and allowing them to take corrective action before the failure occurred.

With over 350 meters in the system this was a significant savings in labor and revenue dollars to the client.

- Improve the process and use automation
- Eliminated need for repetitive trips to the field
- Workflow Automation
- Prevent billing errors
- Create triggers based on sensor notifications
- Assigning Events to Users
- Adding in Feedback, Scoring, and Actions, like checking flow meters.
- Mitigate complaints
- Create real processes and workflows
- Reduce time in the field, failures, and increase visibility.
- Strengthen public perception

90% Reduction in downtime

75% Reduction in time (90 days)
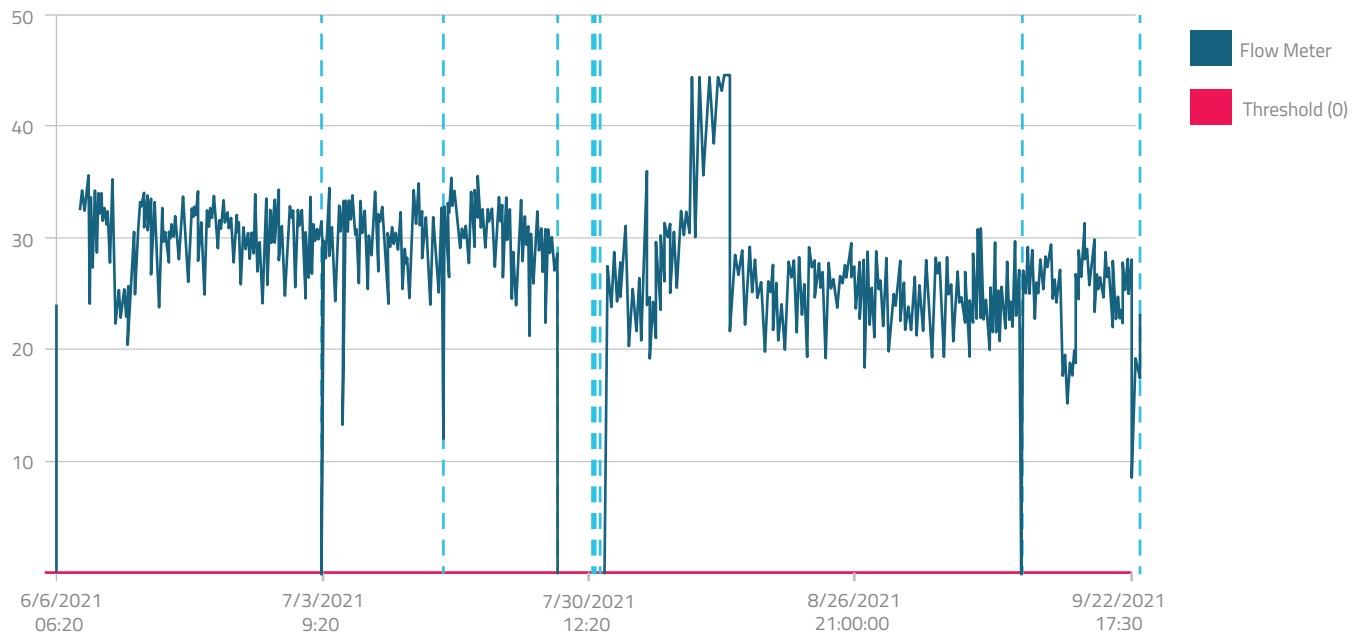
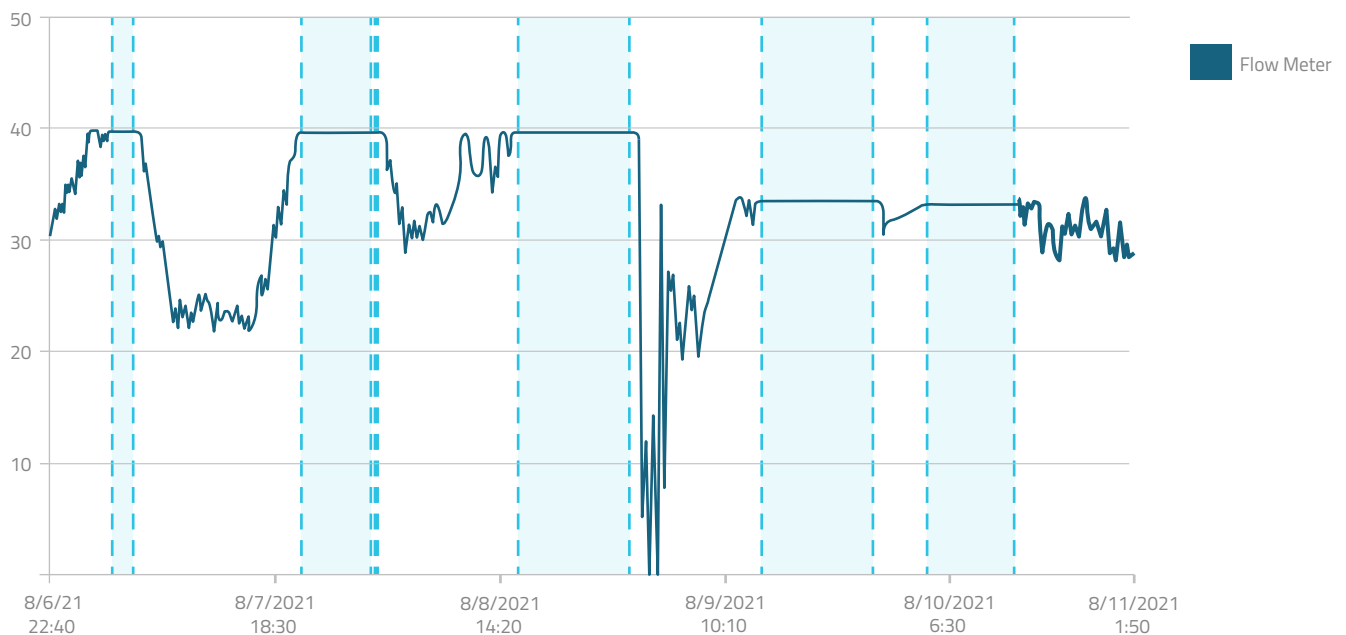**80%** Reduction in time to analyze

**2x** Improvement in speed & accuracy

Low Flow

Flow meter drops out, triggering an event and notification to the client. The client can then decide if the distribution team should investigate or if this is a case of the customer shutting the valve. We can match up other data to verify before action is necessary.

Meter Fault

Different in fingerprint to the Low Flow trigger, this fault is triggered when the meter reading is sporadic and drops below the setpoint as illustrated in this graphic. Different in fingerprint to the Low Flow trigger, this fault is triggered when the meter reading is sporadic and drops below the setpoint as illustrated in this graphic.

Telemetry Fault (Interpolation)
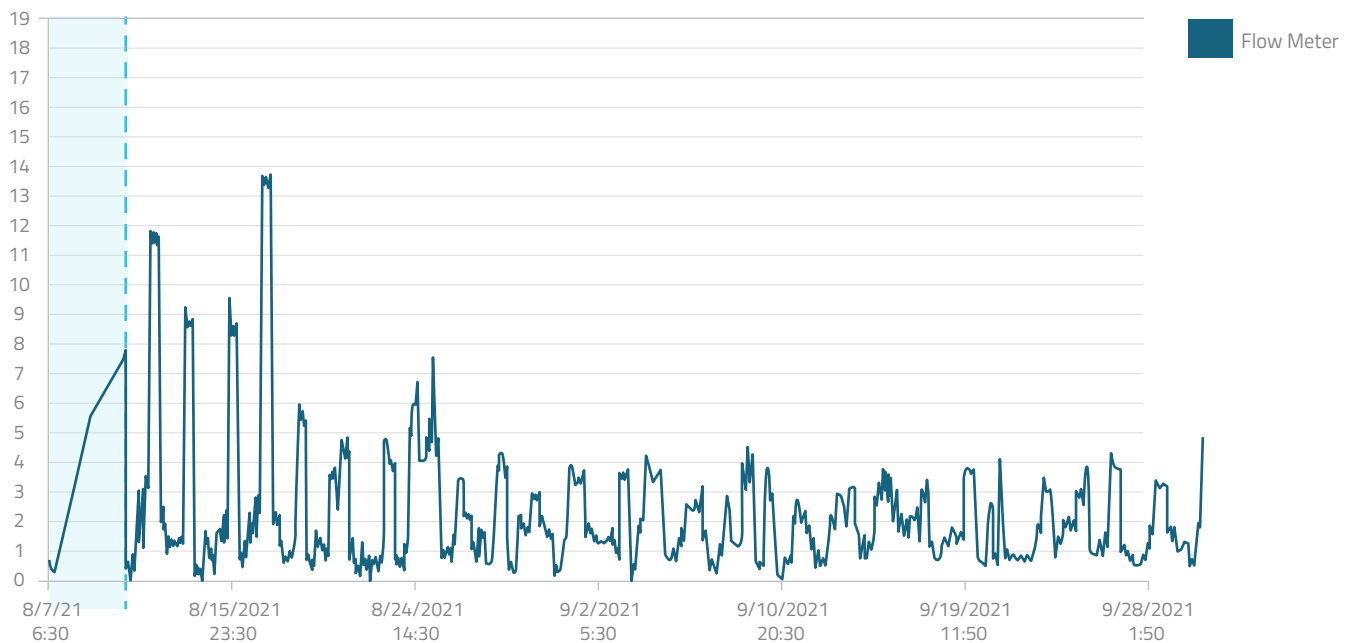
This illustration shows the client that the meter is spiking beyond the set point threshold, indicating the meter may be failing or the clients customer has opened the valve further needing more water. Again this data set could be matched against others to determine if this is indeed a telemetry fault or the customer needing more water.

Wrong Scaling Factor
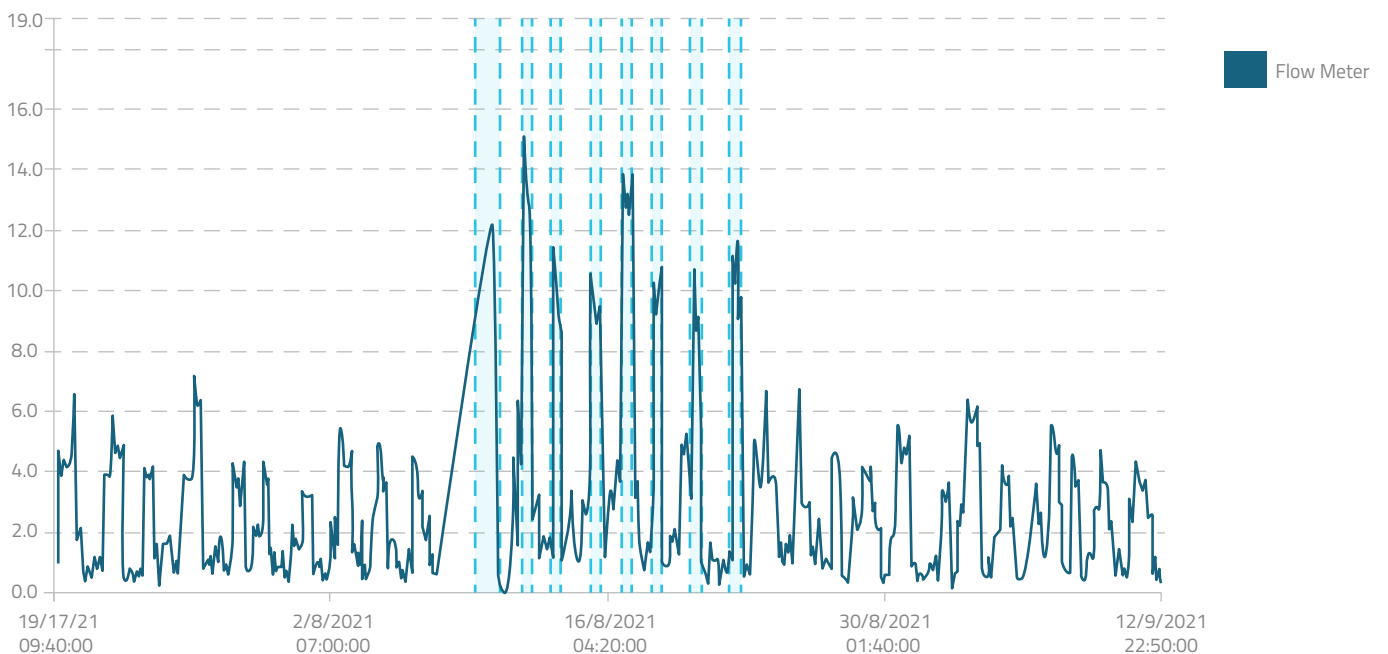
When new meters are installed or calibration is done on a unit, mistakes could be made in scaling the meter.   When this occurs you get gradual spikes or drops in the meter reading, indicating that its drifting off, providing a false measurement. We can create a set point in NW that detects this and notifies the field when it occurs to take corrective action.