Leak Management Cost Savings with Picarro Risk Ranking Analytics

PICARRO

WHITE PAPER

Picarro's leak management solution leverages the power of data analytics to prioritize leak indications by potential risk.

Methane plumes from natural gas leaks have unique signatures we can measure, allowing Picarro's analytics to rank indications by potential risk. By combining multiple data collection runs by multiple Picarro vehicles, Picarro's Risk Ranking Analytics allows utilities to maximize operational efficiency by prioritizing leak indications that are most likely to be Grade-1 and Grade-2 leaks. These analytics can also screen out indications from small, non-hazardous leaks thereby reducing leak backlogs and repair costs.

Since the system is able to specifically identify and locate the most important leaks much more quickly and efficiently than with other tools, it also reduces leak survey costs while improving infrastructure safety, isolating the most important leaks so crews can prioritize them for repair.

Traditional leak survey tools and processes often miss priority leaks, even with the most skilled personnel. On the other hand, using highly sensitive technologies can identify more leaks, but this can dramatically increase leak repair budgets and leak backlogs since all of the leaks that are found must be scheduled for repair according to severity – and while the smaller leaks are an issue, they take a second or third priority to those that could potentially cause a problem.

Picarro's unique solution combines high-sensitivity data collection with data analytics customized to each utility's unique infrastructure and unique cost and risk goals.

How It Works

Picarro's data collection vehicles conduct multiple patrols through a natural gas infrastructure, collecting methane plume data and sending it to the Picarro cloud. Driving is not surveying, it's simply data collection.

To assign a risk score to an individual natural gas leak plume, Picarro's analytics uses a number of measureable qualities of these plumes such as methane concentration, methane flow rate (emissions rate), ethane-to-methane ratio, and plume size and shape. A mathematical model is then able to use these measured plume signatures to predict the likelihood of a given plume being associated with a leak of a particular level of risk. This classification is arrived at using a training dataset from a particular utility to adjust the model parameters to properly predict risk for the particular leak grading criteria used by the particular utility and to account for specific details of that particular distribution network (physical network layout, relative number and severity of leaks in the network, etc.). The training dataset consists of Picarro measurements of the plumes and corresponding information about the exact location and type of the leaks that corresponded to the plume detections (this includes leak grade, type (above- or below-ground) and leak GPS location so that it can be spatially matched to the plume measurements by the Picarro system. The more times a leak plume is intersected and measured by the Picarro vehicle, the better the statistics that can be built up describing the plume's relative risk – this is why Picarro prescribes a six-pass-per-street driving protocol in the area containing pipeline assets of interest.

This can be illustrated intuitively as follows: leak grade (and risk) is driven mainly by the amount of sub-surface gas and its proximity to a structure – the more gas (emissions) and the closer to a structure, the higher the potential risk. The Picarro system can measure emissions rate and can in principle differentiate between, say, small "fuzz" leaks on the low-pressure side of a meter and large, underground leaks on the high-pressure side of a riser, for example. The Picarro system can also gauge the relative distance a leak is from the vehicle, in this case, discerning an underground leak on a gas main (generally near the vehicle) from a meter or riser leak, far from the vehicle. These aspects of a leak, combined with other factors previously mentioned, are used to build up a picture of what types of leaks might be associated with measured plumes.

After all the data is collected, leak survey managers can run Picarro's Risk Ranking Analytics which transform the data into actionable results for leak investigators. This can be done on a schedule that avoids overburdening emergency response crews. Armed with the indications and locations that are most likely to lead to important leaks, crews can maximize their impact while keeping costs and backlogs under control.

Picarro's risk-ranking analytics enables utilities to maximize the yield of Grade-1 and Grade-2 leaks, finding three to four such priority leaks per ten leaks found (this compared with finding one priority leak in ten without analytics). This keeps budgets under control, and maximizes the safety impact per dollar of expense.

Picarro's Risk Ranking Analytics model has been developed and validated using an initial dataset of several hundred thousand validated leaks and over 3.6 million associated plume measurements from a number of utilities. Based on a global analysis of these leaks, we find the performance shown in the table below. In this set of leaks, there was a mix of about 25% Grade-1 and Grade-2 leaks and about 75% Grade-3 leaks. In this case, the leaks are classified in four bins according to potential risk, with bin #1 having the highest risk score. This shows that 50% of indications identified as having the top risk score corresponded to Grade-1 and Grade-2 leaks, while 54% of the indications with the lowest risk score (bin #4) corresponded to Grade-3 leaks. Conversely, only 7% of indications that turned out to be Grade-3 leaks were ranked in bin #1, and only 20% of indications from Grade-1 & Grade-2 leaks were ranked in bin #4. Since the grade of a leak can only be accurately determined by investigating the leak itself, Risk Ranking Analytics is of course not a substitute for leak grading, but on large sets of leaks found every year by utilities, these ranking scores can translate into significant operational efficiencies and cost savings, discussed further below.

Bin (Risk Score)	% of all Indicators in Bin	% of Grade 1 & 2 in Bin	% of all Grade 3 in Bin
1	10	50%	7%
2	15	30%	14%
3	25	25%	25%
4	50	20%	54%

Cost Savings Opportunities

Picarro's Risk Ranking Analytics reduces a utility's operational leak management costs primarily by reducing construction costs associated with non-hazardous leaks. Since non-hazardous leaks may not require repair, these leaks can be safely removed from the set of leaks that would normally be identified for investigation and repair without the use of analytics. Picarro's Risk Ranking Analytics enables this separation. (Subsequent measurements of the leaks by Picarro in later cycles will allow Risk Ranking Analytics to prioritize them for repair if their risk level increases.) With most of these non-hazardous leaks removed, the overall leak repair budget is decreased. The number of priority and below-ground leaks yielded by analytics is increased, while the number of above-ground and non-priority leaks is decreased, leading to cost savings while simultaneously reducing more risk in the infrastructure in a given time period.

Alternatively, Risk Ranking Analytics can also reduce labor costs by facilitating the prioritization of labor for investigation and repair. Resources are directed and scheduled to the most important leaks first, minimizing unplanned work and reducing overtime costs. Analytics also allows utilities to transition to a risk-based survey framework which increases survey frequencies in the highest-priority areas.

Picarro's mobile solution and Risk Ranking Analytics allow utilities to transition to risk-based leak survey and to increase survey frequencies to potentially annual survey without ballooning O&M budgets. By collecting data over an entire gas distribution system annually, all the highest risk leaks are repaired within that year, within current budgets. In following years, the remaining lower-risk leaks can be repaired or can be left to be monitored by the next Picarro data collection cycle. In this way, utilities remain compliant within budget and reduce system risk annually, satisfying leak backlog monitoring requirements.

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