WHITE PAPER · GAS DISTRIBUTION LEAK SURVEY

The Meter Set Is the Bottleneck



How the simplicity of Xplorobot Laser OGI reduces leak survey time by approximately half and provides an auditable record of what leaked and what did not



~90 s	~10 s	58.5%	53.8%
sniffer survey of one meter set, on average	Laser OGI scan of the same meter set	less field time per AMLD indication	less field time per 400-service map

Executive Summary

Leak survey labor consists primarily of two activities: walking and stopping. Walking the mains and each service line is a fixed cost, since no instrument changes how far a technician must travel. What varies is the time spent once the technician arrives at the meter set. That interval, repeated at every service on the map, accounts for a significant fraction of a survey program's labor budget, and it is the only place where a faster technology can meaningfully reduce total survey time.

From Contact Sweep to Standoff Observation

When a pump-driven survey instrument (i.e. a "sniffer") is used, surveying a meter set is a contact procedure. Depending on the utility, the procedure may call for the technician to "box" or follow a "trace outline" of the meter set, or it may prescribe probing and dwelling on every fitting on the assembly (i.e. riser, regulator, unions, meter connections and house line tie-in) one at a time, slowly enough for the instrument to respond. The industry average to survey the meter set alone is approximately 90 seconds per service, averaged over residential meters, larger commercial meter sets and multi-meter manifolds.



Figure 1. Residential meter set with a leak visualized by Laser OGI, scanned in approximately 5 seconds.

Xplorobot Laser OGI replaces this procedure with a rapid standoff observation. The technician traverses the guide laser of the Xplorobot sensor across the entire assembly, and any leaks present are detected in the process. The average in this case is approximately 10 seconds per service (again including individual meters and larger manifolds). If a leak is present, its location is shown immediately on the live camera image (Figure 1), accompanied by audible and vibration alarms.

The following analysis quantifies this difference for the survey-only portion of the work. Other efficiency gains (e.g. automated data capture and reporting) are set aside for now, since those scale with the number of leaks found.

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Two Methods for Estimating the Time Savings



Figure 2. Large meter set assembly with over 50 individual measurement points, which can be measured by Xplorobot Laser OGI in approximately 20 seconds.

Survey time at the meter for sniffers and Laser OGI can be compared in two ways using actual field data: 1) the time required to investigate a single leak indication from advanced mobile leak detection (AMLD) covering 12 services and 0.14 miles of main (i.e. a typical number of services per indication), and 2) the time required to survey an entire map section (400 services) using traditional walking leak survey (i.e. with no AMLD involvement).

Both methods use standard industry production rates from field trials (i.e. 50 services per mile of main, 2.5 miles of main walked per hour and 30 seconds to walk each service line) and hold everything constant except the instrument used to check the meter set for leaks. For simplicity, the model assumes neighborhoods where meter sets are at the fronts of structures with no can't-gain-access (CGA) constraints.

The resulting efficiency gain from using Laser OGI on above-ground infrastructure amounts to over 50% labor savings on the measurement portion of the survey, for both a single AMLD indication and a full map (Figure 3). Laser OGI can also be used for the entire process, including below-ground leak survey; above-ground infrastructure is simply where most of the efficiency is gained.

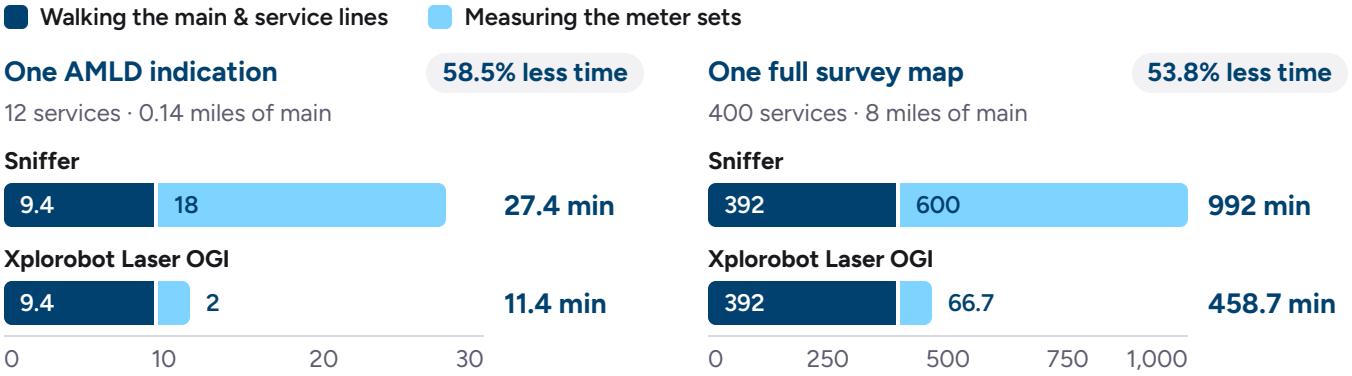


Figure 3. Field time in minutes. The two panels use different time scales, so bars should be compared within a panel rather than across panels. Values include survey time only and exclude travel to and from the map, sniffer warmup and calibration, and leak grading, none of which depend on the instrument.

FIELD TIME	PER INDICATION	PER MAP
Services in scope	12	400
Miles of main (at 50 services per mile)	0.14	8.0
Walking the main (at 2.5 miles of main per hour)	3.4 min	192.0 min
Walking all service lines (30 sec. each)	6 min	200.0 min
Meter sets — sniffer (90 sec. each)	18 min	600.0 min
Meter sets — Laser OGI (10 sec. each)	2 min	66.7 min
Total field time — sniffer	**27.4 min**	**992.0 min**
Total field time — Xplorobot Laser OGI	**11.4 min**	**458.7 min**
Labor saved	**58.5%**	**53.8%**

Two Notes on Conservatism

This example deliberately excludes drive time, setup, CGA time and leak grading, which are unaffected by the choice of technology since find rates are generally similar with both. This is the main reason the 27-minute sniffer figure for a single AMLD indication is well below the 60 to 120 minutes commonly cited for that work.

If a utility's actual survey-only follow-up times are higher, the time savings are larger, not smaller.

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Ease of Use Is the Mechanism, Not a Feature

A survey time of ten seconds per meter set is achievable only if the instrument requires nothing of the operator beyond observation. Three properties make this possible:

- **The entire meter assembly is measured in one sweep.** There is no sequence to execute and nothing to physically reach. The image from a single sweep covers the riser, regulator, meter and all connections at once.
- **There is nothing to interpret.** A leak is rendered in color on the live view in real time, exactly where it is, and its concentration is digitally logged.
- **Distance detection addresses access problems.** Where access is limited, effective detection from 50 ft or more allows surveying over or through fences and gates, and reaching high or hard-to-reach components without a ladder, a gate key or a return trip.

The same property also improves survey quality. The reliability of a contact sweep depends on whether a particular technician, on a particular afternoon, actually probed every fitting on the manifold. An image, by contrast, does not vary by operator, so survey results become repeatable across crews rather than a function of individual technique and diligence.

A Record of Coverage for Leaking and Non-Leaking Assets Alike

A sniffer survey cannot structurally provide this capability. When a sniffer survey finds no leaks, it produces no artifact beyond, at most, a breadcrumb and methane readings showing that the route was walked; there is no digital evidence of what was checked or proof that it was measured. The absence of a leak report is not proof of a survey.

Leaks are recorded as time-stamped, 3D geospatial leak tags (i.e. methane image, component, GPS coordinates, concentration and leak rate) attached to the equipment record.

Non-leaking assets are recorded as zero-emission tags, i.e. an affirmative, time-stamped 3D geospatial methane field-of-view overlay on an image of the measured infrastructure, showing that each individual component was surveyed and read clean.

The route itself is captured as GPS breadcrumbs with associated methane readings, showing where the surveyor walked and which assets were passed (Figure 4).

The result is coverage that is traceable, verifiable and complete. Questions such as “When was that meter set last surveyed, and where exactly was the leak?” become simple database queries. The digital audit trail is produced as a by-product of the survey rather than as additional work afterward.

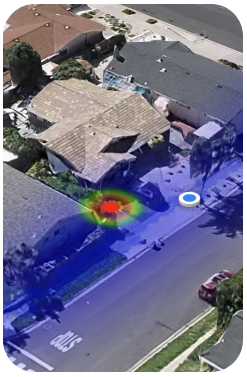


Figure 4. Breadcrumb field of view showing areas of zero or elevated methane concentration.

The Survey Documents Itself

The second major labor cost is documentation. Although that savings is not modeled here, Xplorobot combines documentation into the same trigger pull that captures the leak or zero-emission tag. When a surveyor tags a leak or records a zero-emission tag, the paired smartphone records the methane image, GPS position, time stamp, ambient temperature, wind speed, gas concentration in ppm-m and, optionally, a measured leak rate. Company procedure-specific details (e.g. leak type and grade) can also be entered from pre-populated dropdowns, and all of this is uploaded to the cloud. Nothing is transcribed, nothing is re-keyed from a paper sheet at the end of the shift, and nothing depends on what the surveyor remembers upon returning to the truck.

Reports and work orders are generated from the Xplorobot Dashboard and include the original tag details and imagery, so that repair technicians know exactly what was leaking and where. The platform integrates with company systems (e.g. ESRI and SAP), so the same information is available in the company’s system of record. The reinspection view places the prior and current methane images of the same component side by side for unambiguous repair and post-construction validation.

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In Service Today

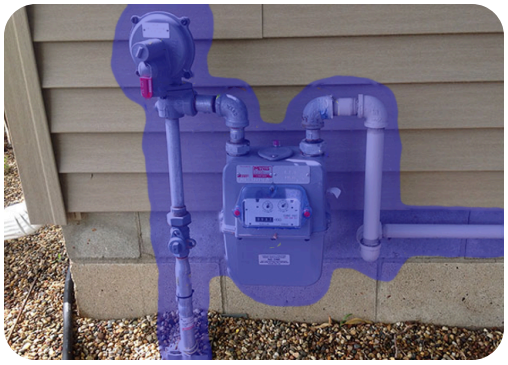


Figure 5. Zero-emission tag and proof of survey for a meter set with no leaks found, scanned in approximately 8 seconds.

Xplorobot is in service at 5,352 facilities across 79 corporate customers, 23 countries and 5 continents. One customer described the technology as follows:

> This technology has the ability to leapfrog camera-based OGI at about half the cost and provide a digital twin, a 3D model, at the same time. … I could teach you or anybody in five minutes how to use it. So I'm excited because it shows if you have a leak exactly where it is, how much it is, and then shows you where you didn't have a leak, and it has a digital record.
>
> **Paul Espenan**, Senior Vice President EHS&R, Diversified Energy

Additional Benefits Beyond Labor Hours

- **Fewer "can't-gain-access" reschedules.** Locked gates, dogs, unsafe neighborhoods and distance can often be overcome with standoff detection, which saves time and keeps crews safe.
- **High, inaccessible piping is now within reach.** Standoff detection allows survey of tall risers on the sides of buildings, which are notoriously difficult to survey and are where undetected leaks can cause utilities to chase odor calls for years.
- **Defensible leak rates.** Optional, high-accuracy quantification supports prioritization and emissions reporting of individual leaks, recorded at the time they are found.
- **Faster emergency and odor call response.** Large banks of meter sets can be cleared quickly, and windows, doors, foundations and high walls can be checked from a safe distance. Below-ground migration patterns can also be visualized.
- **Beyond leak survey.** Applications include post-construction and repair verification, open leak reinspection, and fast methane scans of transmission and M&R infrastructure that would take hours with a sniffer. Emerging applications include atmospheric corrosion detection and thermal imaging.
- **Integration with company systems and AMLD.** Data flows bi-directionally with ESRI and SAP, and AMLD indications and GIS layers can be overlaid on a live satellite map within the Xplorobot app.

Recommended Field Trial

Although it is based on real field data, the analysis above is a model. The recommended way to validate it is on the utility's own infrastructure with its own personnel: one map is surveyed using the current method, with actual field time recorded at the meter sets, and the same map is then surveyed with Laser OGI and recorded again. The time per service at the meter should be compared, along with how long the crew takes to become productive with the device, since that is the variable on which the entire model rests.

Learn more about Xplorobot Laser OGI for gas distribution at xplorobot.com.

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