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Lessons Learned from a Refinery OGI AWP LDAR Program

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Abstract

Optical gas imaging (OGI) for leak detection and repair (LDAR) is at a tipping point. It has been established as a safer and equivalent emission reduction method to Method 21. The new OGI monitoring protocol in Appendix K is forthcoming this year, but the 15-year-old AWP may be a more viable alternative work practice. This presentation will discuss the technical, regulatory, and guidance lessons learned from a recent refinery OGI Pilot Program and Full Implementation using the Alternative Work Practice and how they might be applied to your facility as you await and evaluate the new Appendix K protocol and work practice.





Summary of Alternative Work Practice (AWP) Requirements

- **OGI is an Alternative Technology to Find Fugitive VOC, Methane, and Some OHAP Emissions (published by EPA in December 2008)**
 - Select which equipment is subject to this program
 - Allows a facility to survey equipment using OGI on a monthly, bimonthly, or semi-quarterly frequency to visibly detect hydrocarbon leaks
 - Any visible emissions found using OGI are considered a leak and must be repaired
 - OGI is not permitted for use on certain equipment: closed-vent systems, leakless equipment, or equipment designated for no detectable emissions
 - Requires video records of all monitoring (not just leaks)
 - Emissions equivalence requires the use of EPA Method 21 in place of OGI at an annual monitoring event and to submit monitoring data to EPA



OGI Pilot Program



LDAR Program Structure & Challenges

Traditional LDAR Program

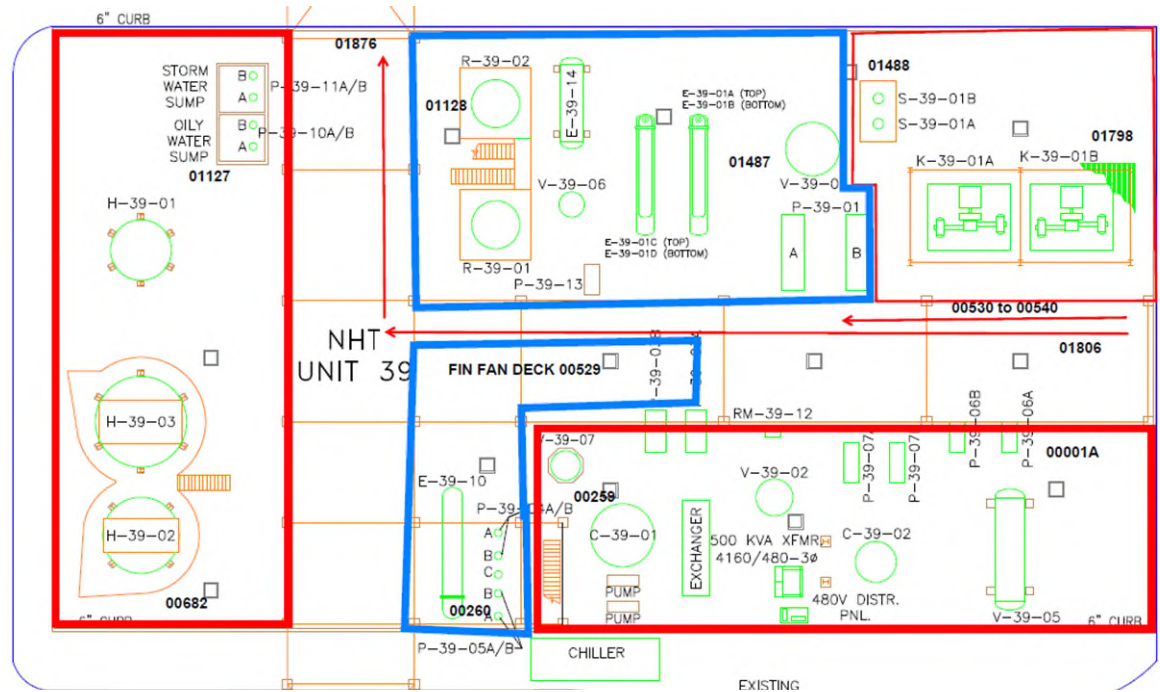
- Third-party technicians to inspector/monitor weekly, monthly, quarterly, annually using traditional Method 21.
 - Headcount (9 FTEs) and heightened risk (7 field FTEs)
 - Coordination with nested maintenance contractor for repairs
 - Performance expectations and significant oversight

OGI LDAR Program

- Bimonthly OGI surveys and annual Method 21
 - Reduced headcount (5.5 FTEs, 4.5 in field)
 - Refined workflow and coordination with maintenance contractor
 - Oversight through video review and field evaluations

OGI LDAR Field Implementation

- Transition from a P&ID-based program to a geographically-based program to identify OGI vantage points.





OGI Technical Implementation Lessons Learned

Field Observation Lessons

- OGI detected leaks as low as 500 ppm concentration
 - Method 21 measurement of visual plume(s)
- OGI allows for more productivity than Method 21
 - Typical daily rate was ~1,500 to 2,000
- One-person crew proved effective approach
 - Initially tested two-person crew then refined workflow with one person
- Re-enforced the importance of a video preview, viewing multiple angles, image polarity
 - Planning, unit orientation, and uniformity in surveying



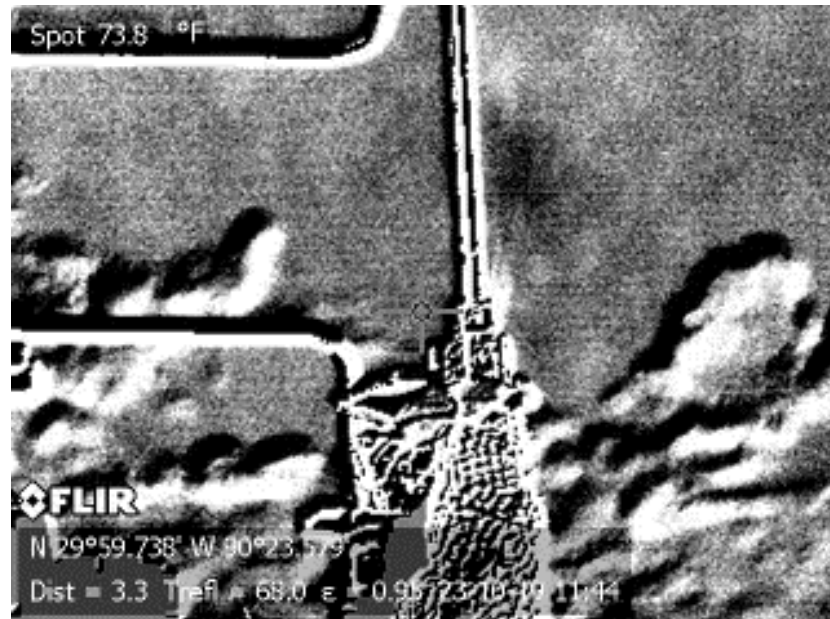
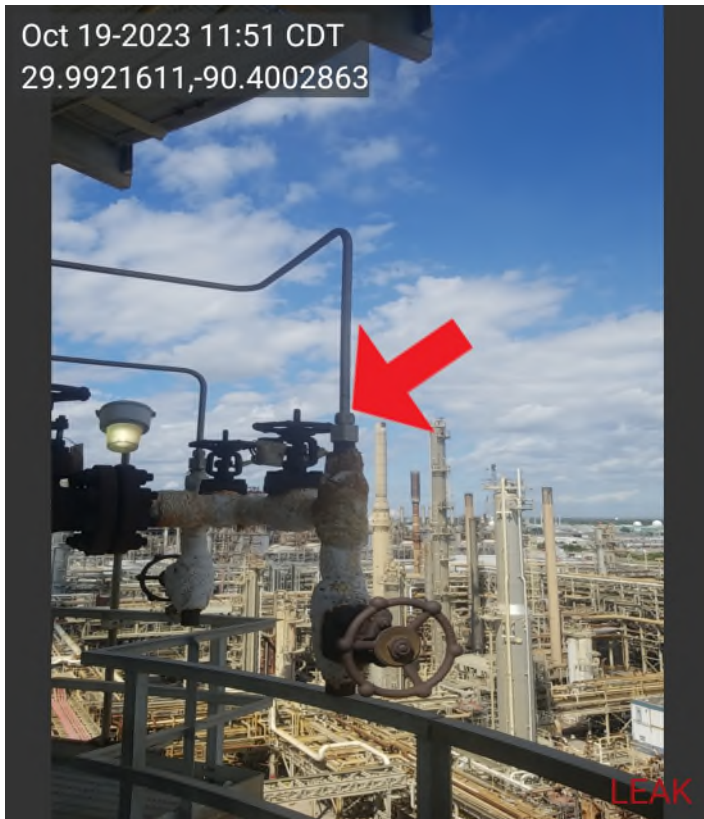
AWP Pilot Program Survey Results

- Conducted two on-site trials to compare the AWP to our M21 LDAR program.

Monitoring Method	Method 21		OGI	
	Full Unit Surveys		Partial Unit Surveys	
Monitoring Rate	200-385 per monitor per day per tech (Jan 2023 avg)		250-275 per monitor per hour per tech (2022 pilot testing)	
	900-1,900 per day total		4,000-4,400 per day total	
Leak Rate	Sec 3 TF	0.08%	Sec 3 TF	0.15%
	14-Alky	0.90%	14-Alky	0.32%
	39-NHT	0.70%	39-NHT	0.53%
	72-Crude	0.13%	72-Crude	0.49%
	92-FCC	0.60%	92-FCC	0.61%
	943-HCU	0.34%	943-HCU	0.39%
	2022 AVG	0.46%	PILOT AVG	0.42%



Example of an OGI Leak



Component: 0.5" union
Leak Rate: 11,279 ppm



OGI Program Implementation



OGI Regulatory Implementation Lessons Learned

State Agency Guidance on AWP Applicability

- Discussed approval and hurdles with your state air permitting staff
 - LAC 33:III.2121 and 2199 rules allow OGI
- May need to identify a different path to regulatory approval
 - TCEQ Chapter 115 allows OGI but 28-series BACT conditions do not, so permits need to be amended

TCEQ Permit Number 100114, Special Condition 19.F:

- *When monitoring using the OGIC, components within the OGIC field of view will be observed for a minimum of three seconds. All emissions imaged by the optical gas imaging instrument are considered to be leaks and are subject to repair. All emissions visible to the naked eye are also considered to be leaks and are subject to repair.*



OGI AWP Regulatory Interpretation from EPA

EPA Guidance on Difficult and Unsafe-to-Monitor Components

- DTM components can be excluded from the AWP and would (still) only be subject to annual monitoring
- Leaking DTM components imaged during an OGI survey cannot be ignored for repair
- UTM components under a Method 21 program are likely still UTM with OGI because of the complications in safely making repairs
 - *“monitoring personnel would be exposed to an immediate danger as a consequence...”*
- Surveying UTM components during safe-to-monitor times is equivalent to Method 21 monitoring and could be used in lieu
 - *there are no provisions or guidance regarding “unsafe to repair”*



AWP LDAR Program Success

Leak Rates and Work Flow

- Careful surveys with AWP catch the big leakers, and more frequent monitoring reduces emissions
- Disproved assumptions that converting to the AWP would increase leak rates.
- Improved coordination, closing most LDARs leaks within 2-day goal using nested repair crew, or reliability engineering by day 8

Ongoing Oversight

- Like Method 21, OGI surveys can be “too fast”
- Training, oversight, and QA/QC are important for survey uniformity
- Video and field review of adequate scanning time and viewing angles
- Third-party review of processes and systems plus field observations



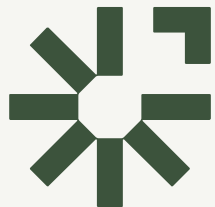
Summary

Overall Program Success since July 1, 2023 Transition

- Technical and regulatory challenges require careful planning and workflow for successful implementation
 - Translation of database locations to survey areas and routes
 - Verification of camera imaging capability for ambient conditions
 - OGI and Method 21 steps prior to leak repair
 - Coordination with Maintenance and Operations
 - Monitoring technician training to ensure leak detection ability
- Review your permits, talk to your regulator, coordinate with internal stakeholders (and don't forget your ESG people)



Do you
have any
questions?



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