

# Alternative Work Practice (AWP) Strategies



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# Overview

- Procedures
  - Technology
  - Program Set-up
  - Survey Planning
  - Best Practices
- Recordkeeping and Reporting
  - Onsite Data Capture
  - Online Data Management







## Terence Trefiak, PE

Terence Trefiak brings over 19 years of industry experience to the Montrose team where he currently serves as Vice President of LDAR, Canada. Prior to joining the Montrose team, Terence worked in various engineering positions for companies such as ConocoPhillips and BJ Services. He is an expert in fugitive emission management and specializes in OGI for GHG and LDAR compliance. Terence is a Registered Professional Engineer in Alberta, Canada and is a member of the Association of Professional Engineers and Geoscientists of Alberta. Terence holds a BS in Chemical Engineering from the University of Calgary.



## Andrew Sheffler, EIT

Andrew Sheffler currently serves as a Senior Project Manager, OGI USA. Andrew has over 5 years of experience in conducting and managing Optical Gas Imaging fugitive emission surveys. Andrew currently oversees the largest AWP project in the USA (Freeport LNG, Texas). Andrew holds a BS in Petroleum and Natural Gas Engineering from Penn State.



# About Us

Montrose is an environmental services provider offering solutions to clients across a wide array of sectors. Headquartered in Orange County, California, Montrose has over 70 offices and over 1,700 employees

- **EXPERIENCE**

- providing OGI LDAR since 2007 (over 30,000 surveys)
- currently perform OGI LDAR and GHG services for over 1,200 sites in USA & over 7,600 sites in Canada
- 7,820,630 Method 21 monitored components per year on over 1,100 sites
- only company in USA offering AWP to meet or exceed EPA requirements  
**(22 Gas Processing Plants, 2 LNG Export )**



# Technology



**OGI CAMERA**



**PPM MEASUREMENT  
Bascom Turner Gas  
Rover**



**FLOW RATE  
QUANTIFICATION  
Bacharach Hi Flow  
Sampler**



**BUBBLE TEST  
Snoop**



# Technicians

- significant impact on leak detection rates and efficiency of survey
- comprehensive training program with testing and field auditing is recommended
- OGI is an effective tool but its only as effective as the Equipment Operator
- Technicians need to have experience/knowledge of processes and equipment to determine scanning pathways and make effective leak/repair descriptions
- A written protocol for training and monitoring procedures is essential for consistent and compliant surveys



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# On-site Protocols

- Pre-Planning
  - Regulatory/Client Requirements/Monitoring Program and Plan
  - Equipment Selection
- Arriving Onsite
  - Completing permitting process
  - Answering any questions operations may have
- Walkthrough of Facility
  - Gather information on what areas are operational and safe to access
  - Plan out workflow to efficiently survey the facility, route plan
- Follow Target protocols to safely and efficiently survey the facility
  - OGI performance test, PPM Monitor calibration/drift tests, Hi Flow Sampler calibration and other calibration/bump tests
  - Scanning protocol
- QA/QC
  - All data entered during that day is reviewed, including verification of picture and video quality
  - Data is synced at the end of the day and reports are accessible immediately



# Quantification

- Measurement of leaks helps to categorize severity and prioritize repairs, significant impact to total emissions/recovery
- Direct measurement (Hi - Flow Sampler) is most accurate method for leak flow rates
- PPM Concentration (Method 21) is very poor indication of actual leak rate
- OGI leak rate estimation can be nearly as accurate as quantification when done by an EXPERIENCED Technician
- QOGI – software to estimate leak rates can be effective in prime conditions but less so in field settings and takes considerable time to get readings



# “A leak is not a leak”

PPM Reading	EPA Emission Factor (EF) Calc (Table 2-10) lbs/hour	Emission Factor ft <sup>3</sup> /min	Actual ft <sup>3</sup> /min	% Error	Leak Weight	Severity
500	0.0003	0.0001	0.0001	18%	1	Minute
10,000	0.0029	0.0011	0.0010	9%	10	Very Small
50,000	0.0096	0.0036	0.01	-180%	100	Small
100,000	0.0160	0.0060	0.25	-4098%	2,500	Medium
500,000	0.0521	0.0194	1	-5045%	10,000	Large
1,000,000	0.0867	0.0323	2 to 200+	-5,653% to -575,187%+	20,000 to 200,000+	Very Large

- There is not a direct correlation between concentration and rate, but all LDAR programs use ppm as basis for size
- PPM is a poor tool to calculate a leak rate, and the fact that most instruments max out at 100,000 ppm is very limiting
- Changing mindset from finding all leaks equally to focusing on the largest leaks first will reduce over 99% of emissions.
- This can only be done with technologies like OGI





OGI

## Method 21



# OGI Pitfalls

OGI Pitfalls	Corrections
Inexperienced with camera use and the concepts of OGI	Technicians follow a detailed and prescriptive inspection protocols
Not using multiple camera angles	Maintain a high degree of Quality Control
Constantly moving the camera from scene to scene without pausing in each view to look for gas images	Contains technical procedures, training requirements, and individual and team performance audits
Area where questionable thermal background is present that may reduce the detection capabilities of the camera	Ensure that all processes and equipment are scanned
Scanning too fast and missing components/areas	Continuously performing a qualitative analysis of the thermal properties of the background to ensure that adequate thermal background is present (multiple performance tests)
Poor data management	Ensure that all source data is consistently recorded - Database Management Systems



# Safety

- Having a standard leak hazard assessment protocol is important
- The protocol should provide clear instructions for hazard communication

Severity	Consequences					Probability			
	People	Assets	Environment	Reputation	LEL/Toxic Gas Level	A	B	C	D
						Low	Slight	Mod.	High
0	No injury or health effect	No Damage	No effect (<0.01 cfm)	No impact	0% LEL and Oppm <u>Toxics</u> within 0.5 m of source				
1	Slight inhalation/odor risk	Slight wear	Slight effect (0.01 – 0.05 cfm)	Slight impact	0% LEL and Oppm <u>Toxics</u> within 0.5 m of source				
3	Minor fire/explosion injury risk or exposure risk	Minor Damage	Minor effect (0.05 – 1.0 cfm)	Minor impact	1-5% LEL and below alarm level <u>Toxics</u> within 0.5 m of source				
4	Moderate fire/explosion injury risk or exposure risk	Moderate Damage	Moderate Effect (1.0 – 10 cfm)	Moderate impact (Regulator involvement)	Cause of LEL of 1-5% <u>and</u> alarm level <u>Toxics</u> in building				
5	Extreme fire/explosion or toxic exposure fatality risk	Major Damage	Major Effect (>10.0 cfm)	Major impact (Regulator enforcement)	Cause of LEL 10% and over and above alarm level <u>Toxics</u> in building				

	<b>LOW RISK</b>	The risk is not serious. It does not require immediate <u>action</u> , but should be periodically revisited to ensure that risks remains acceptably low.
	<b>MODERATE RISK</b>	The risk is moderate. It requires further review of controlled responses to determine the potential for escalation and to ensure risk is within acceptable limits.
	<b>HIGH RISK</b>	The risk is high. It requires immediate action and prompt review of control and mitigation measures.



# AWP Best Practices

## PERFORMANCE TEST

- Normal practice to use 100% Methane at 30 grams/hour
- Range finder is used while scanning

## LEAK MEASUREMENT

- Leak rate is estimated based off camera estimation and tested with Method 21 Device
- Some clients also request quantitate flow rate measurement (Hi Flow Sampler)

## DATA RECORDING

- Inspections recorded in segments (approx. 30 min.) based on process blocks and backed up onsite
- Picture of leak with leak point ID and 10 second video is captured

## REPAIR CONFIRMATION

- Bubble test all leaks to enable facility staff to perform own confirmations
- M21, Snoop, or OGI can be used for confirmation

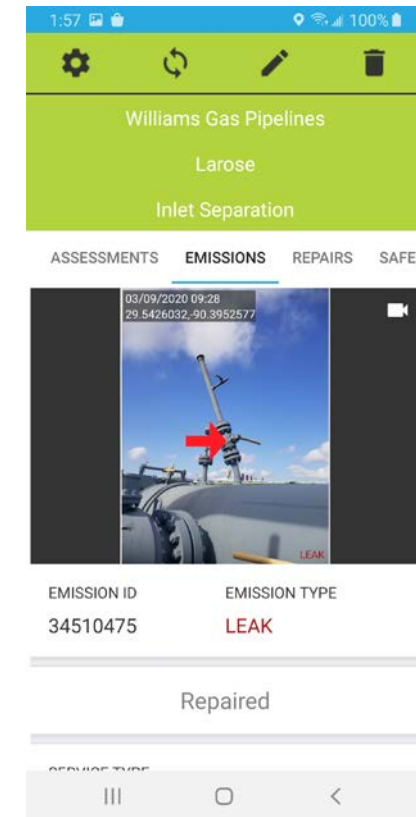
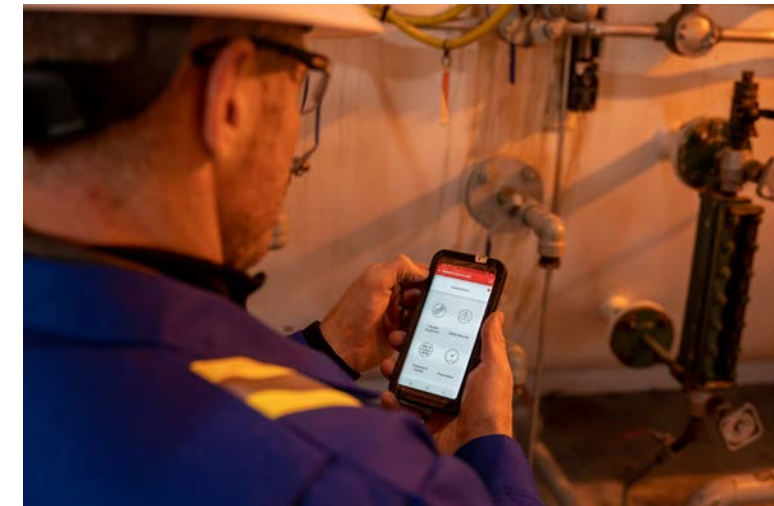
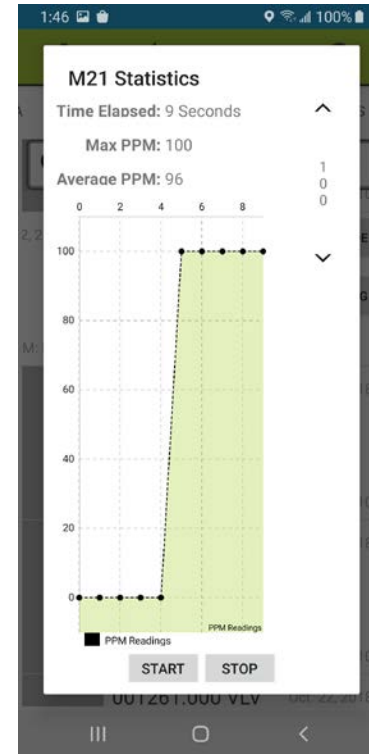
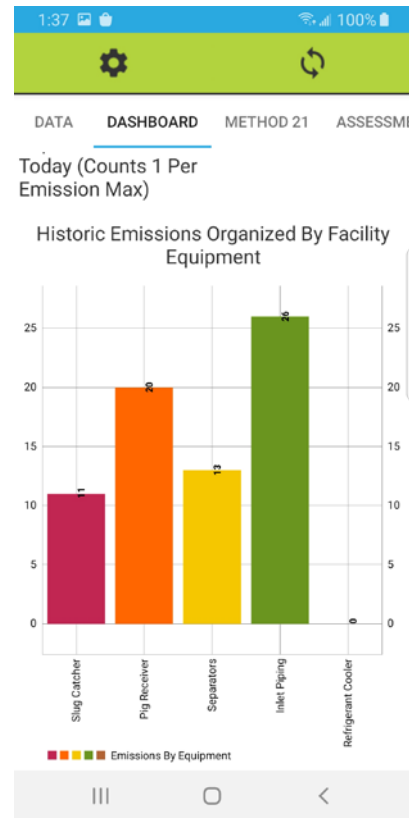
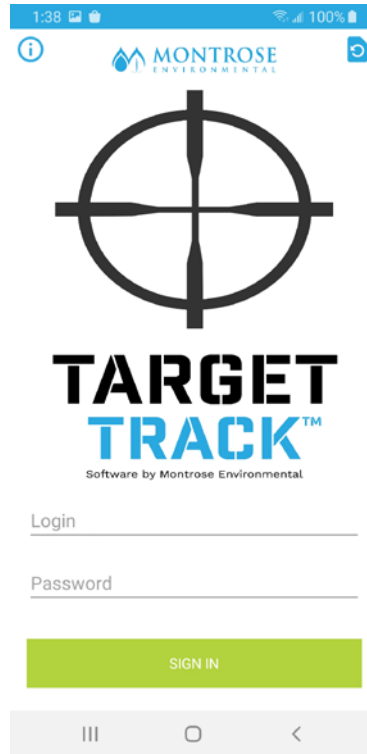
## ANNUAL M21

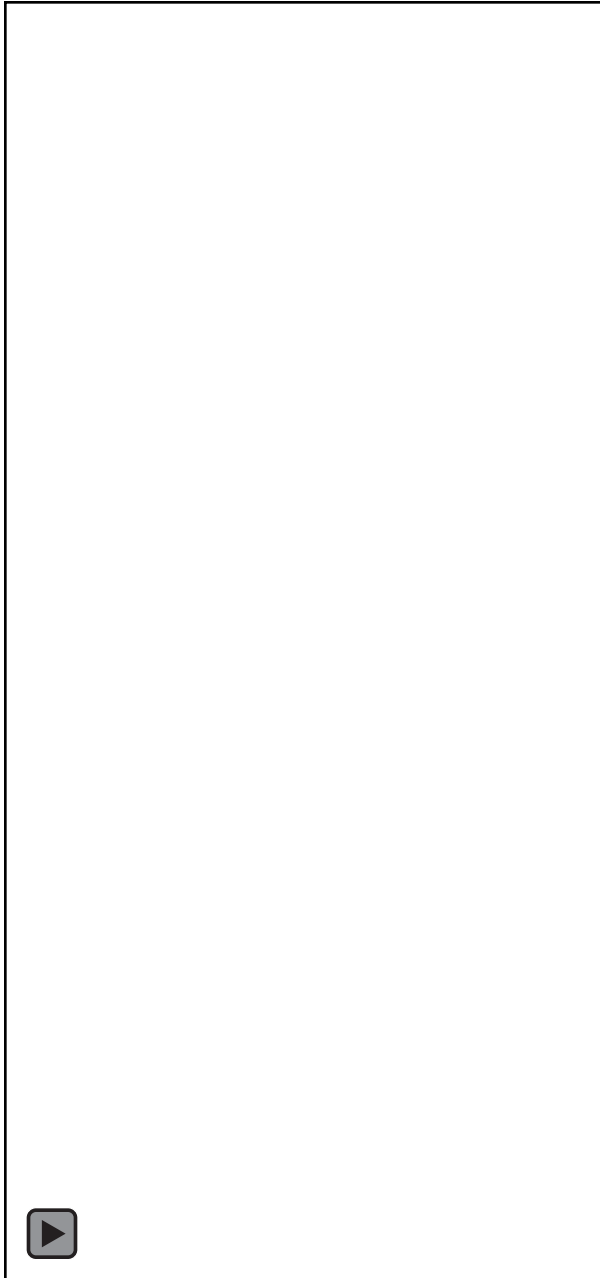
- Either done in place of one bi-monthly OGI or spaced out in 6 separate events



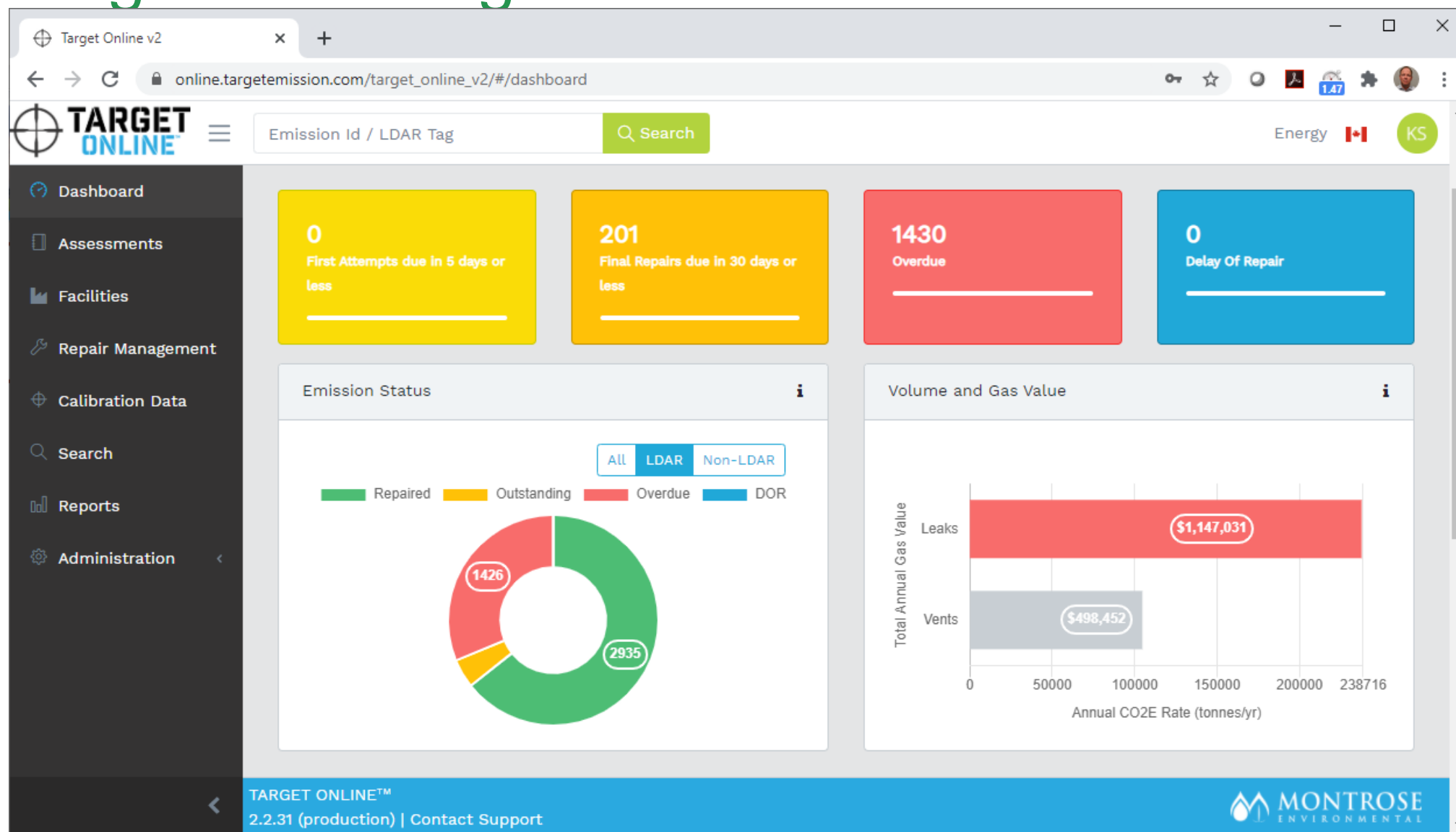


# Field Data Management

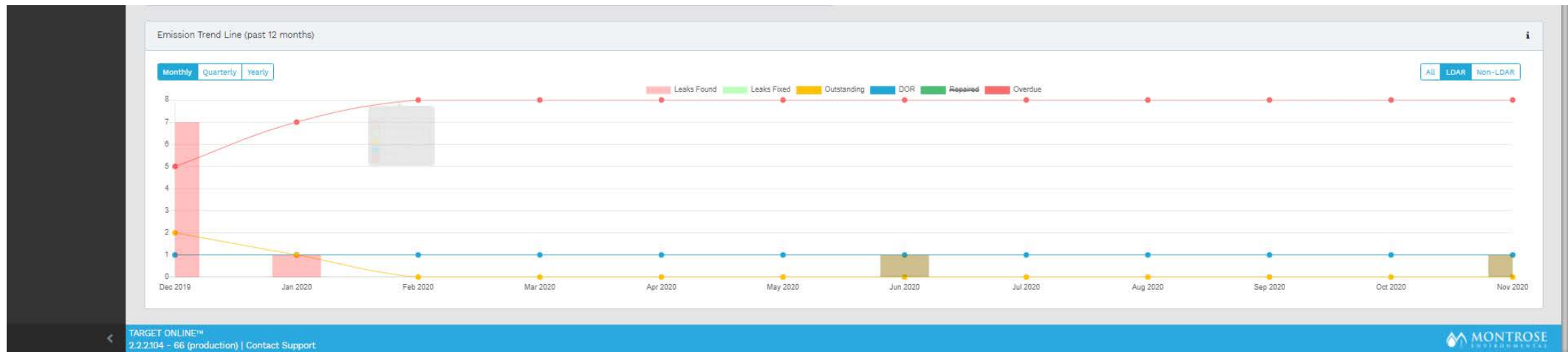




# Program Management



# Program Management Cont.





# Target Online Repair

Dashboard

Assessments

Facilities

Repair Management

Calibration Data

Search

Reports

AVO Management

Administration

Assessments / Assessment Detail / Emission Details

18/11/2019 09:58  
32.5352607,-103.827829

18/11/2019 10:02  
32.5357601,-103.8256791

18/11/2019 10:04  
32.5357601,-103.8256791

18/11/2019 10:06  
32.5357601,-103.8256791

18/11/2019 10:08  
32.535306,-103.8277431

18/11/2019 10:11  
32.5353061,-103.8277543

01/11/2020 07:20  
40.3601989,-80.1107088

Emission Details - 34710173 / 000100.000 Leak

Facility Name	Gas Plant Scan	Assessment	2611574084578 - assessed on Nov 18, 2019	Gas Type	Sweet Gas
Process Block	Inlet/Discharge Piping	Components	Valve	Instrument Used	Optical Gas Imaging
Status and Flow Rate	Leaked 0.02	PPM and Gas\$/year	1015 \$27	Repair Due Date	Nov 16, 2020
Safety Concern	No	Facility Equipment	Coordinator Office		

Description

Seat of Regulating Valve on Calibration Bottle in front of South Stairs West of Office Building

Repair Comments

Change Status

TARGET ONLINE™  
2.2.2104 - 66 (production) | Contact Support

MONTROSE  
ENVIRONMENTAL

# Target Online Repair Cont.

Dashboard

Assessments

Facilities

Repair Management

Calibration Data

Search

Reports

AVO Management

Administration

Change Status

Repairs

Status Date	User Name	Status	First Repair Attempt	Final Repair Due Date	Work Order	Cost Of Repair	PPM Reading	Flow Rate	Confirmation Method	DOR Approver Name	DOR Reason	Repair Recommendation
Nov 10, 2020		Repaired	N/A	N/A		0	0	N/A	OGI			Closed Valve
Nov 5, 2020	Andrew Sheffler	Unsuccessful Attempt	N/A	N/A				N/A				Attempted to Grease Valve
Nov 1, 2020	Andrew Sheffler	Leaking	Nov 6, 2020	Nov 16, 2020				N/A				

Repairs timeline

Tue Nov 10 2020

Repaired  
Closed Valve confirmation method: OGI

Thu Nov 05 2020

Unsuccessful Attempt  
Attempted to Grease Valve

Sun Nov 01 2020

Leaking  
Fri Nov 06 2020 - Mon Nov 16 2020

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TARGET ONLINE™

2.2.2.104 - 66 (production) | Contact Support

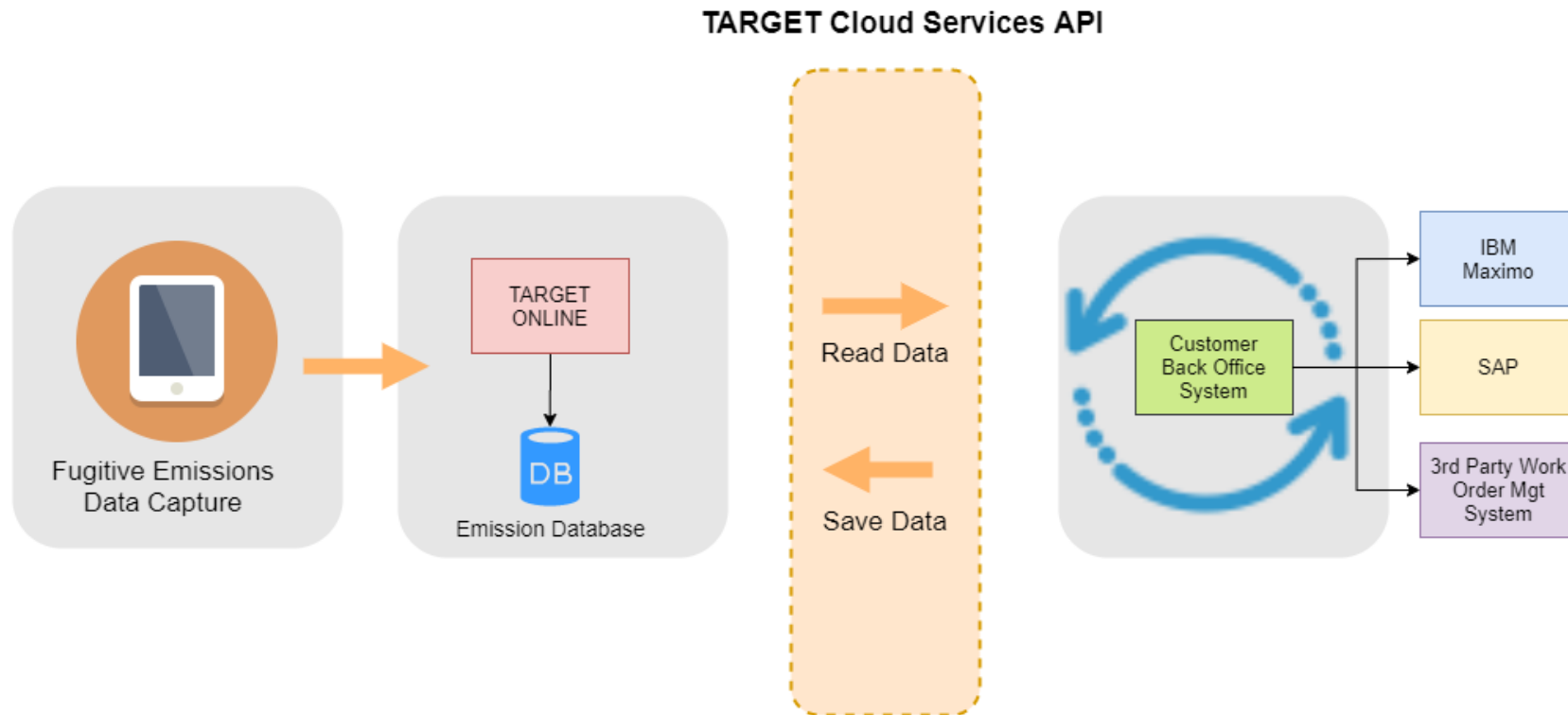
MONTROSE  
ENVIRONMENTAL

# Emission Detail Report

EMISSION DETAIL REPORT																											
Company:	Test Company USA	Facility:	Gas Plant Scan			Start Date:	11/18/2019	Technician:	Andrew Sheffler	Leaks	LDAR Leak Count:	14	Vents	Repair Required:	0	REPAIR STATUS											
District:	Plant A	Location:	32.5364511 -103.828000			End Date:	11/18/2019	Technician:	Andrew Sheffler		Non-LDAR Leak Count:	0	Mandatory Emission Tests	Leak Tests:	0	Repaired:					Delay of Repair:						
Assessment Comments:	AWP DGI Scan. Scanned operating and pressurized cryo skid. Calibration Gas Emission Added on 11.1.20. 11-18-2019-0830-Flir Loaner 2 Gas Plant Cryo Skid													12					1								
Emission ID #	Emission Type	Detection Date	Process Block	Field Equipment Designation	Component	Sub Source	Operating Mode	Emission Description	LEL - Lower Flammable Limit	Emission Severity	Gas Type	Previous Leak (Emission ID)	Rate (cfm)	Detection Method / Quantification Method	Yearly Gas Value	Repair Recommendation	Initial PPM Reading	LDAR Tag ID	Bubble Test	Repair Status	Repair Status Date	First Attempt Due Date	Final Attempt Due Date	DOR Start Date	DOR End Date	DOR Reason	DOR Approver Name
24190150	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	North Flange Seal of Central Valve F0112191% at South East Corner of Cryo Skid	Na	LOW	Curium Gas		0.09	Optical Gas Imaging of Marked Z1	\$74	Replace gaskets and tighten connection	50,000	003174.004	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190159	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	South Flange Seal of Central Valve F0112191% at South East Corner of Cryo Skid	Na	LOW	Curium Gas		0.05	Optical Gas Imaging of Marked Z1	\$41	Replace gaskets and tighten connection	350,000	003174.002	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190160	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	Top Flange of Gate Valve upstream of Central Valve T01-201% at South East Corner of Cryo Skid	Na	LOW	Curium Gas		0.03	Optical Gas Imaging of Marked Z1	\$27	Reraise connection and tighten	16,000	003179.001	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190161	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	Flange Upstream of Central Valve T01-201% at South East Corner of Cryo Skid	Na	LOW	Curium Gas		0.03	Optical Gas Imaging of Marked Z1	\$25	Reraise connection and tighten	5,970	003182.003	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190162	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	East Flange of Overhead Gate Valve above North End of Heat Exchanger E-202, East of Cryo Skid	Na	MEDIUM	Curium Gas		0.15	Optical Gas Imaging of Marked Z1	\$123	Reraise connection and tighten	450,000	003193.001	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190163	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	Flange of Overhead Drain Valve above North End of Heat Exchanger E-202, East Side of Cryo Skid	Na	LOW	Curium Gas		0.09	Optical Gas Imaging of Marked Z1	\$74	Tighten connection	10,000	003192.001	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190164	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	Unknown Source under Insulation South of Gate Valve above Central Valve P01-501B, North of Heat Exchanger E-202, East Side of Cryo Skid	Na	MEDIUM	Curium Gas		0.11	Optical Gas Imaging of Marked Z1	\$90	Reraise connection and tighten	5,000	003200.001	Yes	Delay of Repair	11/22/2019	11/23/2019	12/03/2019	11/22/2019	12/3/2020	Shutdown required	Andrew Sheffler
24190165	Leak	11/19/2019	Process Building	Cryo Skid	Valve -0000		N/A	Packaging of Gate Valve South of Central Valve P01-501B, North of Heat Exchanger E-202, East Side of Cryo Skid	Na	LOW	Curium Gas		0.03	Optical Gas Imaging of Optical Gas Imaging	\$25	Tighten valve packing	-	003204.000	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190166	Leak	11/19/2019	Process Building	Cryo Skid	Valve -0000		N/A	Seal of Drain Valve North of Central Valve P01-402B, North of Heat Exchanger E-202, East Side of Cryo Skid	Na	LOW	Curium Gas		0.07	Optical Gas Imaging of Marked Z1	\$57	Replace seal(s)	10,000	003701.000	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190167	Leak	11/19/2019	Process Building	Cryo Skid	Valve -0000		N/A	Packaging of Ball Valve to Tubing Line above Gate Valve, North of Central Valve P01-402B, North of Heat Exchanger E-202, East Side of Cryo Skid	Na	MEDIUM	Curium Gas		0.15	Optical Gas Imaging of Optical Gas Imaging	\$123	Tighten valve packing	-	003242.000	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190168	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	Top Flange at North End of Heat Exchanger E-207, East Side of Cryo Skid	Na	LOW	Butane		0.05	Optical Gas Imaging of Optical Gas Imaging	\$475	Reraise connection and tighten	-	003207.001	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190169	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	Top Threaded Connection of North Ball Valve on Overhead Drifts Fluor Meter FT-402A above Heat Exchanger E-202, East Side of Cryo Skid	Na	LOW	Curium Gas		0.04	Optical Gas Imaging of Optical Gas Imaging	\$33	Reraise connection and tighten	-	003152.001	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24190170	Leak	11/19/2019	Process Building	Cryo Skid	Connector -0000		N/A	Flange Near Side of Nozzle Valve Handheld to Fluor Transmitter FT-402, Second Level of Cryo Skid	Na	MEDIUM	Curium Gas		0.11	Optical Gas Imaging of Optical Gas Imaging	\$90	Tighten connection	-	003732.001	Yes	Repaired	11/21/2019	11/23/2019	12/03/2019	-	-	-	-
24790173	Leak	11/19/2020	Inter/Durchase Plains	Coordinator Office	Valve -0000	Valve Seat	N/A	Seal of Regulating Valve on Calibration Bents in Front of South Stair West of Office Building	Na	LOW	Sweet Gas		0.02	Optical Gas Imaging of Optical Gas Imaging	\$27	Replace seal(s)	-	000000.000	Yes	Unsuccessful Attempt	11/05/2020	11/04/2020	11/16/2020	-	-	-	-
TOTAL													1.02		\$1,282												



# Program Communication



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QUESTIONS?

