Alberta Field Methane Survey – August-December 2016

October 26, 2017 Houston, Texas

GREENPATH ENERGY LTD

About GreenPath Energy

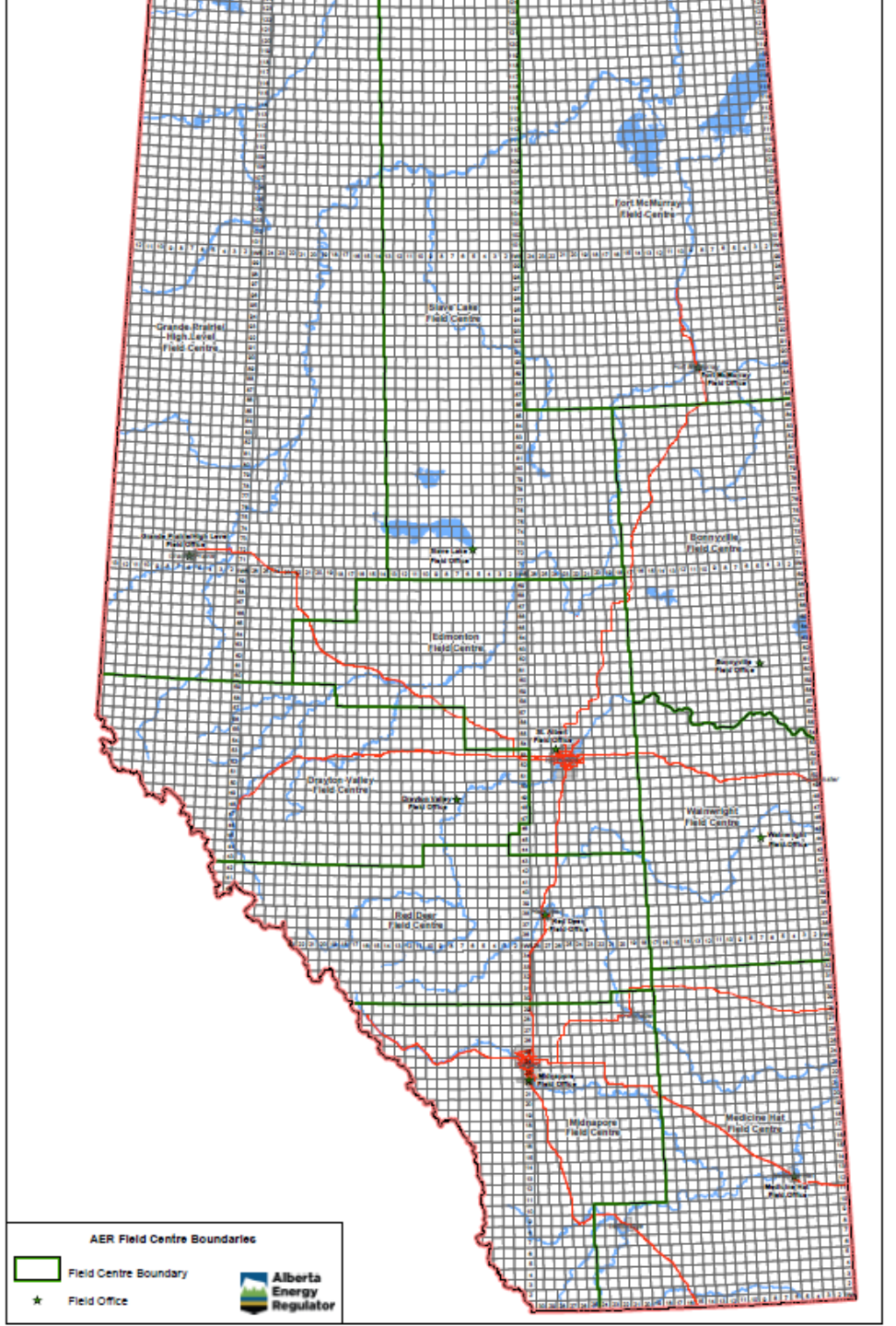
Founded in 2007, GreenPath Energy offers a range of Oil and Gas methane emission detection, measurement, and inventory development services for regulatory compliance and waste elimination programs. We engage regularly with governments, regulatory agencies, industry associations and emission reduction technology providers to ensure leading edge, cost effective methane emission management solutions.

Overview

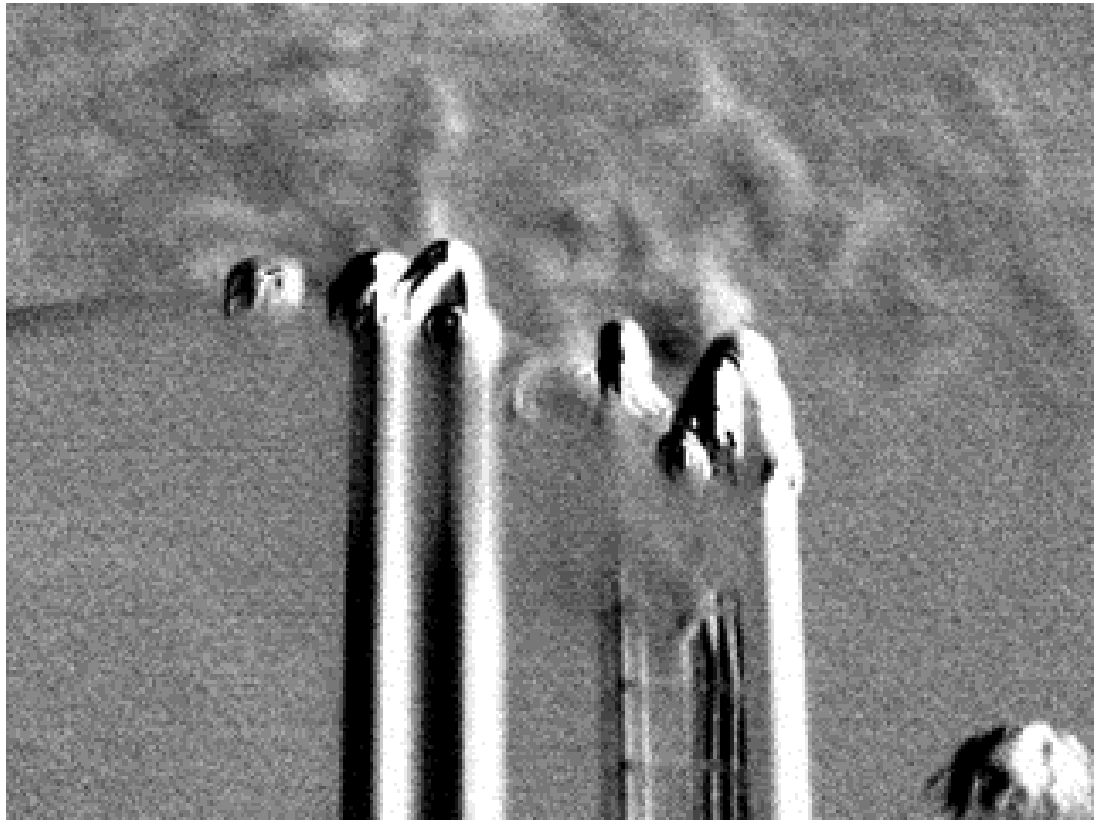
- GreenPath Energy has was commissioned to do an inventory development/emission survey in Alberta to help refine emission estimates for regulatory development;
- Over the course of 2 weeks in summer; over 300 wellsites and batteries were inspected and inventoried:
  - OGI for leaks
  - Inventory of pneumatics
  - Inventory of Tanks, Burners, Compressors
- Over 3 weeks in November/ December:
  - 279 Wells & batteries inspected by OGI for casing/tank top vents
  - A further 60 wells and batteries inventoried and inspected for leaks
- Total of 676 producing assets inspected and / or inventoried.
- Focus on wells and batteries due to gaps in previous studies.

Geographic Focus Areas

- Areas defined by AER Field Offices
  - Grand Prairie (Primarily tight gas)
  - Red Deer/Drayton Valley (mix of old + new assets)
  - Medicine Hat (shallow gas - 40% of all gas wells- but only 7% of gas production)
  - Midnapor (shallow and deep gas)
  - Bonnyville (Cold Heavy Oil production with Sand)
- Six areas comprise 91% of gas production in Alberta and likely greatest share of emissions from gas driven equipment.

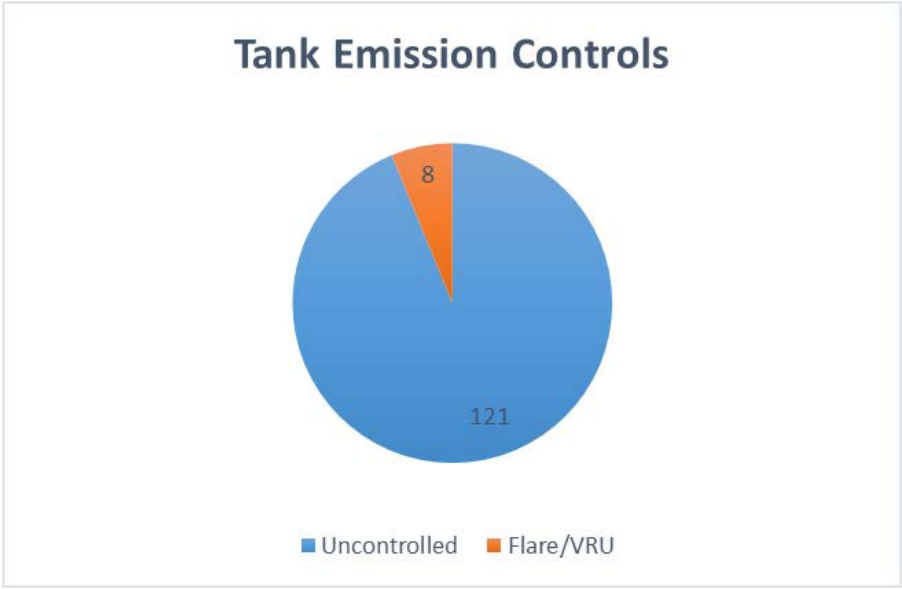


Component Leaks vs Tank Emissions



Leaks / Vents Findings

- Most tanks uncontrolled
- CHOPS wells commonly venting from tank tops/ casing
- Oil sites more leak prone than gas production sites.
- Leak rate at small facilities lower than expected.

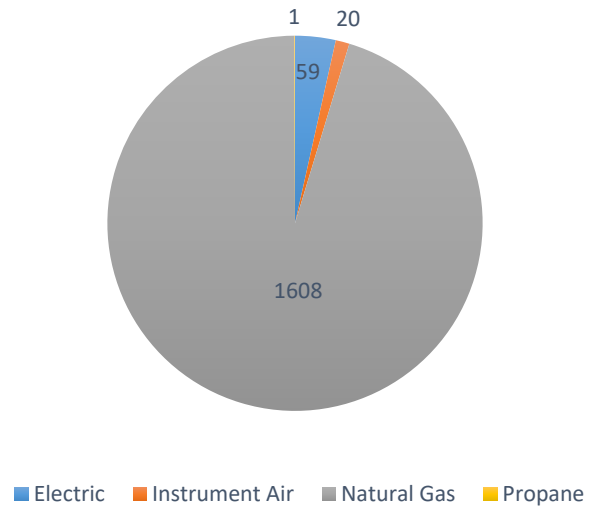


Average # of Leaks per location by commodity type	BV	DV	GP	MH	MR	RD	All Areas
Gas		0.23	0.53	0.1	0.03	0.47	**0.26**
Oil		0.18	3.00	0.25	-	1.31	**0.67**
CHOPS	2.21						**2.21**
Total	**2.21**	**0.22**	**0.58**	**0.11**	**0.02**	**0.70**	**0.79**

Pneumatic Findings

- Most pneumatic devices use fuel gas
- Several zero emission well packages (solar + electric dump valves) found at northern latitudes.
- Pneumatic devices much more common than previously thought.
- Level Controllers the most common pneumatic device

Pneumatic driver type – 1,688 pneumatic devices

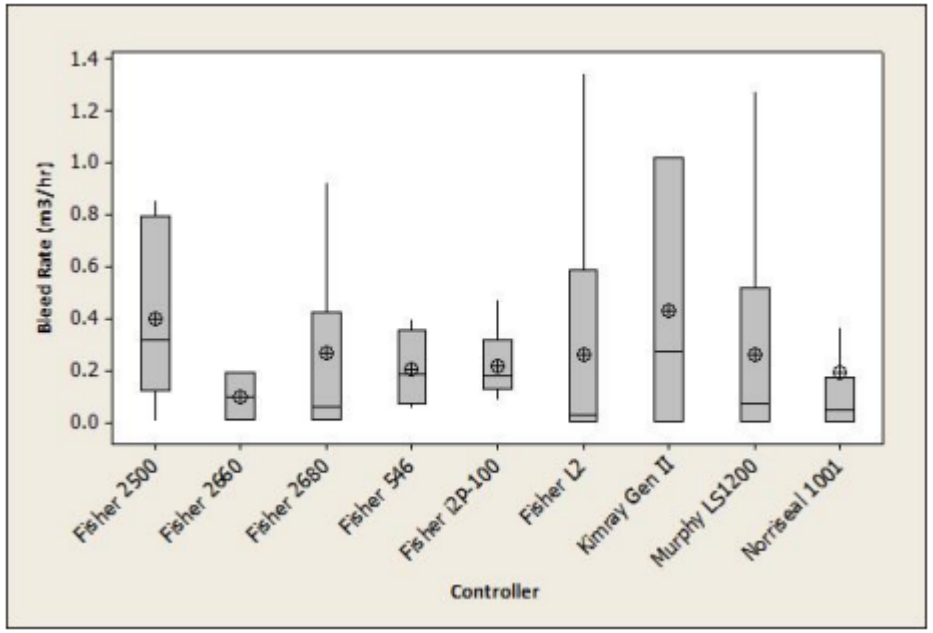


Device Type	DV	GP	MH	MR	RD	Total
Pump	1.22	1.90	0.38	0.64	1.31	1.18
Instrument	3.06	4.26	0.94	1.59	4.32	3.07
Total	4.28	6.15	1.32	2.23	5.63	4.25

Heat Trace	HLSD	HPSD	**Level Control**	Plunger Lift Control	Positioner	Pressure Control	Temp Control	Transducer
0.2%	14.4%	12.5%	**41.4%**	2.0%	1.8%	17.4%	0.9%	9.4%

Level Control – Area for Further Study

- Most variable venting pneumatic device in David Allen Study
- Manufacture stead state bleed rate a poor predictor of actual emissions
- Emissions from an active pneumatic device comprised of three elements;
  - Steady State (bleed)
  - Transient (about to dump)
  - Dynamic (dump vent)
- In an active device, dynamic may be the most significant contributor to emissions
- Large variance in reported values in Prasino Study (see right)
- Low emission controllers such as the L2sj and Norriseal EVS were not part of Prasino Study.
- GreenPath is currently completing study on level controllers on behalf of the Alberta Upstream Petroleum Research Fund.
  - Over 150 Field measurements taken
  - Program of retrofit underway and pre-post measurement
- Study results expected early 2018



Source: 2013 Prasino Report

Outcomes

- Data captured used in both Federal and Provincial Regulatory Development
- Better data resulted in a regulatory design which will achieve methane reduction
- Research campaign in summer of 2017 completed
- Lessons learned from 2016 informed and improved 2016 campaign